PORTLAND INTERNATIONAL JETPORT
CITY OF PORTLAND, PORTLAND, MAINE
DEPARTMENT OF WATERFRONT AND TRANSPORTATION

CONFORMED PROJECT MANUAL

For

PHASE 2 – PARKING GARAGE
PORTLAND INTERNATIONAL JETPORT
PORTLAND, MAINE

BID NUMBER 4208

FEBRUARY 2008

VOLUME 1 OF 1

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PHASE 2 PARKING GARAGE
PORTLAND INTERNATIONAL JETPORT
PORTLAND, ME

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SECTION 00020

INVITATION TO BID

Sealed Bids for construction of:

Phase 2 - Parking Garage
Portland International Jetport
Portland, Maine
Bid Number 4208

in accordance with Bidding and Contract Documents prepared by:

Domenech, Hicks & Krockmalnic, Inc.
155 Massachusetts Avenue
Boston, MA 02115
617-267-6408

hereinafter called the Architect, will be received by:

City Of Portland
Purchasing Office, City Hall, Room 103
389 Congress Street
Portland, Maine 04101

Attn. **Mattthew F. Fitzgerald, Purchasing Agent**
(207) 874-8654

hereinafter called the "Awarding Authority", or "Owner" at the address listed above.

Sealed Bids for the above project, whose scope is described in Section 01010: Summary of Work of this construction bid, clearly marked on the outside envelope with the name of the bidder, project, title, and bid number, shall be received by the Awarding Authority at the address listed above, no later than the times and dates specified below, at which times and place they will be publicly opened and forthwith read aloud. Any bid received after the time and date specified will not be considered.

Bids: **3:00 pm**, local legal time, Tuesday January 8, 2008

A bid deposit in the amount of five percent (5%) of the Bid amount, as applicable, shall be submitted with each Bid. Bid deposit shall be in the form of cash or a certified check, or a Treasurer's or Cashier's check issued by a responsible bank or trust company payable to **Awarding Authority**, or a bid bond (a) in a form satisfactory to the Awarding Authority, (b)

with a surety company qualified to do business in the State of Maine, and (c) conditioned upon faithful performance by the principal of the agreements contained in the Bid. Return of bid deposits will be in accordance with the provisions of the applicable General Laws.

The Awarding Authority will reject Bids when required to do so by the General Laws. In addition, the Awarding Authority reserves the right to waive any informalities in bidding and to reject any and all Bids if it deems it to be in the public interest to do so, and to act upon the bids and make it's award in any lawful manner.

The successful Bidder will be required to furnish Performance Bond and Payment Bond, each in the amount of 100% of the Contract Amount. The cost of such bonds shall be included in the bid price. Such bonds shall be of a surety company qualified to do business under the laws of the State of Maine.

All questions shall be directed in writing only, to the Purchasing Office at the above address and be received by **Thursday, December 27, 2007.** These may be faxed to 207-874-8652, e-mailed to mff@portlandmaine.gov or hand delivered to the Purchasing Office. Questions received after this time will not be addressed. Responses from the City that substantially alter this bid will be issued in the form of a written addendum to all bid holders registered in the Purchasing Office. Oral explanations or interpretations given before the award of the contract will not be binding.

All proposals shall be submitted on the attached form and are to remain open for sixty (60) days after their opening. Late bids, unsigned bids, bids without the required surety and/or facsimile bids will not be accepted.

The successful Bidder shall agree to defend, indemnify and save the City harmless from all losses, costs or damages caused by its acts or those of its agents, and, before signing the contract, will produce evidence satisfactory to the City's Corporation Counsel of coverage for General Public and Automobile Liability insurance in amounts not less than $500,000 per person, $1,000,000 per occurrence for bodily injury, death and property damage, protecting the contractor and the City, and naming the City as an additional insured from such claims, and Workers' Compensation insurance. The City disclaims any and all responsibility for injury to contractors, their agents or others while examining the job or at any other time.

Copies of Contract Documents may be obtained by each Bidder from the Office of the Owner, Portland City Hall Room 103, between the hours of 8:00 AM and 4:30 PM Monday through Friday, beginning at 12:00 Noon on **Monday, November 19, 2007**, on non-refundable payment of cash or check for **$200** per set, payable to the **Owner**. Additional copies of Contract Documents may be purchased, upon payment of **$200**, non-refundable. A fee of $35.00 shall be added to each set where shipping is requested.

Bidding and Contract Documents may be examined during regular office hours at the Owner's office and at the following places.

1. Portland International Jetport, 1001 Westbrook Street, Portland, ME

2. Domenech, Hicks, & Krockmalnic, 155 Massachusetts Avenue, Boston, MA

3. STANTEC, 22 Free Street, Portland, ME

The Awarding Authority is exempt from sales and federal excise tax to the extent permitted under law; bidders should not include such taxes in figuring or in references to any bid.

A **mandatory** pre-bid conference will be held at **10.00 am**, local legal time, on **Thursday November 29, 2007 at Portland International Airport, Conference Room**. Following the pre-bid conference, there will be a tour of the site. All bidders are invited to attend. Only those firms represented at this meeting may bid on the project.

Any inconsistency between the Invitation to Bid, Information for Bidders, Bid Forms, Conditions of the Contract, and any other Contract Documents and these statutes, or any other applicable statutes, bylaws, or regulations existing on the date on which the bids are to be received, shall not be grounds for invalidating the bidding procedures, but, where required by law, such statute, bylaw, or regulation shall be deemed to govern.

Prior to any payment by the City, the contractor will be required to supply the City with a Waiver of Lien--Material and Labor for the total awarded contract cost, guaranteeing payment in full for all labor and materials used or required in connection with the work described in this bid. The City may also require waivers of lien, signed by individual subcontractors, with requests for progress payments.

Any mechanic's lien or any other lien which may be filed against the premises which are the subject of the contract by reason of the work described herein shall be defended (by counsel reasonably acceptable to the City) and promptly discharged by the Contractor at its own expense. If the Contractor should fail either to defend the City against the lien or to discharge it, then the City may do so at the Contractor's expense. In the event of such an undertaking by the City, the Contractor will promptly reimburse the City for all its costs and expenses in so doing including, but not limited to, reimbursement of the City's reasonable counsel fees and costs which may be incurred by it in substituting a bond in place of the lien.

The contractor shall furnish all labor, materials, fixtures, supplies, equipment and transportation necessary to do the work as specified. Work shall be conducted in an orderly manner and all work shall be performed in accordance with best trade policy and in conformance with pertinent O.S.H.A., Local, State and Federal Government regulations.

The contractor shall assume all risk and bear any loss or injury to property or persons occasioned by neglect or accident during the progress of work until the same shall have been completed and accepted. The contractor shall also assume all blame or loss by reason of neglect or violation of any state or federal law or municipal rule, regulation or order.

Materials and equipment purchased for permanent installation in this project are exempt from the Sate of Maine Sales and Use tax and from all Federal Excise taxes. Each bidder shall take this exception into account in calculating his bid price for the work.

The contractor shall keep accurate records of all services performed under the agreement and shall submit such information to the Airport Facilities Manager monthly for work that is completed. Payment for such services shall be made to contractor not more than thirty (30) days after receipt of said forms and acceptance of the work by the Airport Facilities Manager . Progress payments will be made, less a 10% retainage, which will be held until release is authorized by the Airport Facilities Manager upon final inspection and acceptance of the work.

Pursuant to Portland City Code, the City reserves the right to cancel any contract immediately for cause, or for convenience on thirty days prior written notice to the contracted firm.

The City of Portland, Maine, reserves the right to waive any informalities in bids, to accept any bid and to reject any and all bids should it be deemed for the best interest of the City to do so. The City reserves the right to substantiate bidder's qualifications, capability to perform, availability, past performance record and to verify that bidders are current in their obligations to the City.

Matthew F. Fitzgerald
Purchasing Agent

END OF DOCUMENT

SECTION 00110

INSTRUCTIONS TO BIDDERS

1.00 COMPLEMENTARY DOCUMENT

A. Document 00020, INVITATION TO BID, included herewith, is complementary to this document and shall be carefully reviewed by bidders for specific instructions, which are not repeated herein.

2.00 STATUTES REGULATING COMPETITIVE BIDDING

A. Bidding procedures and award of general contract shall be in accordance with the provisions of the General Laws of the State of Maine, including all current amendments.

B. In the event of any discrepancy or inconsistency between the provisions of these Bid and Contract Documents and the above-mentioned statutes, the provisions of the above-mentioned statutes shall govern. In such event, the application of all remaining provisions not in conflict to any circumstance other than that in which the conflict occurs shall not be affected thereby.

3.00 BIDDER'S QUALIFICATIONS

A. **THE BIDDERS WILL NEED TO PROVIDE AN EXPERIENCE STATEMENT AND A LIST OF SIMILAR PROJECTS AND CURRENT ONGOING PROJECTS.**

4.00 INTERPRETATION OF DOCUMENTS: NOTIFICATION OF ERRORS

A. Interpretation of the provisions of the Bid and Contract Documents will be made by the City of Portland upon written request of any bidder, provided that the City receives such request by **3:00 pm Thursday, December 27, 2007**, and that the City considers such interpretation to be of sufficient importance. Oral or telephone interpretations will not generally be made, and if made, shall be strictly informal and not legally valid or binding.

B. Such written interpretations shall be in the form of Addenda to the Bid and Contract Documents.

C. Bidders are urged to communicate all errors and discrepancies found in the Bid and Contract Documents to the City of Portland. Telephone calls pointing out any such errors or discrepancies will be taken by the City, but only for the purpose of receiving the information in order that it may be properly processed, and not for interpretation or clarification.

5.00 EXAMINATION OF BIDDING AND CONTRACT DOCUMENTS

A. Each Bidder shall carefully examine the Bid and Contract Documents to obtain a thorough understanding of the work of his bid in addition to work of related trades. In addition, each Bidder shall personally visit the site to thoroughly acquaint himself with the conditions as they exist thereon.

B. Failure of any Bidder to thoroughly examine the Bid and Contract Documents or to visit and examine the site shall in no way relieve him of any obligation with respect to his bid or of any responsibility assigned him under the Contract.

6.00 PRE-BID CONFERENCE

A. A mandatory Pre-bid conference will be held at location and time stipulated in the Invitation to Bid.

7.00 MODIFICATION AND WITHDRAWAL OF BIDS

A. Modifications or withdrawals of Bids will be permitted after submission of such bids provided clearly written, readily understandable instructions for same are received by the Awarding Authority in writing prior to time established for opening of such bids. No Bid may be withdrawn after that time, except as otherwise provided herein or by law.

8.00 ADDENDA

A. Addenda may be required during the bidding period to modify, clarify, or interpret the Bid and Contract Documents. It is intended, but not guaranteed, that such Addenda shall be mailed or faxed by the Awarding Authority to all persons or parties to whom Bid and Contract Documents have been issued (Bidders of Record). Failure to receive such Addenda shall in no way relieve any bidder from the execution of its provisions. All bidders are cautioned to verify the number of Addenda which have been issued and to secure any needed copies from the Architect before submitting a bid.

9.00 FORM FOR BIDS

A. The Awarding Authority will make available to every person applying therefore, a Form for Bid. Each bona fide Bidder will be furnished forms for his proposal upon request. Such forms will be made available at the Awarding Authority's office during regular office hours throughout the bidding period. Bids must be submitted on the forms provided by Awarding Authority or on forms included in the bid documents of the Project Manual.

B. All blank spaces provided on the bid forms shall be filled in with ink or typewriter. Where space is provided, sums shall be expressed in both words and figures. In case of discrepancy between the two, the written words shall govern.

C. No interlineations, additions, alterations, or erasures shall be made on the forms.

10.00 ALTERNATES

A. Each Bidder shall bid on all alternates listed. In the event that any alternate does not involve a change in the amount of the bid, the bidder shall so indicate by using the words, "No Change", in the space provided for that alternate.

B. Bidders shall enter on the Form for Bid a single amount for each alternate, such amount to consist of the total of all the amounts for the given alternate plus the amount for work of the alternate to be performed by the General Contractor.

C. If alternate(s) are accepted, they shall be accepted in the order listed. The low bidder will be determined on the basis of the sum of the Base Bid and the alternates accepted.

11.00 SUBMISSION OF BIDS

A. The Bid Form shall be properly executed and enclosed with the required bid deposit in a sealed envelope plainly marked on the outside with the information stated in Document 00020, Invitation to Bid.

B. If Bids are mailed, the above required envelope shall be enclosed in a second envelope

identified with the above markings and mailed to the place of bid opening, as described in the Invitation to Bid. Mailed Bids must be received before time scheduled for opening of Bids.

12.00 PERFORMANCE AND PAYMENT BONDS

A. The Performance and Payment Bonds required of the Contractor shall each be in the amount of 100% of the Contract Sum from a surety company qualified to do business under the laws of the State of Maine and approved by the Awarding Authority.

13.00 AWARD OF CONTRACT

A. The Contract will be awarded to the lowest responsible and eligible bidder. The Contract award is contingent upon the City of Portland receiving all associated permits from the Maine Department of Environmental Protection, and the approved funding by the City of Portland City Council.

14.00 COMMENCEMENT AND COMPLETION OF WORK

A. The successful bidder, upon execution of the Contract Agreement, shall commence the work of the Contract within seven (7) calendar days from receipt of written Notice to Proceed issued by the Awarding Authority within fourteen (14) calendar days after said execution of the Contract Agreement, and shall thereafter diligently and continuously carry on the work in such manner as to substantially complete the work within the number of calendar days proposed by the bidder. NOTE: Contractor's use of site will commence May 19, 2008.

15.00 PROVISIONS FOR A + B BIDDING

A. PROPOSAL SHALL SPECIFY GROSS SUM. Each proposal shall specify the correct gross sum for both A & B portions in the manner hereafter described for which the work will be performed according to the plans and specifications and any amendment to the specifications if the same are issued prior to the date of receipt of the proposal. The lowest bid shall be determined by the City of Portland on the basis of the gross sum for which the entire work will be performed, arrived at by a correct computation of all items specified in the proposal (A portion), plus the total number of calendar days proposed by the bidder to complete the B portion times the daily cost (B portion). The City of Portland reserves the right to reject any proposal in which any of the bid prices are significantly unbalanced. An unbalanced bid is considered to be one containing lump sum or unit bid items which do not reflect reasonable actual costs plus a reasonable proportionate share of the bidder's anticipated profit, overhead costs, and other indirect costs which are anticipated for the performance of the items in question.

AWARD OF CONTRACT. The award of contract will be made only to the lowest responsible bidder as determined under these provisions for A+B bidding. The City of Portland reserves the right to reject any or all proposals, to waive minor informalities, to advertise for new proposals, or to proceed to do the work otherwise, if, in its opinion, the best interest of the City will thereby be promoted.

B. GENERAL. The bidding for this project will take into account not only the lump sum amount bid (A portion) but also the bidder's stated total number of calendar days times the appropriate daily cost (B portion) to substantially complete the work. The total bid will consist of the amount of awarded contract, which shall be known as the A portion of the bid, plus the sum of the product of the number of calendar days specified by the contractor for the B portion of the work times the daily cost. The total of this product shall be known as the B portion of the bid. The sum of A portion + B portion shall be used only in determining the lowest bidder. However, the days bid and the amount specified as the daily cost by the City will be used to determine any

disincentive payments relative to timely performance of the B portion work under this contract.

C. B PORTION WORK: The time for B portion work will be the number of calendar days contractor will need from the starting event noted below to substantially complete the project.

NOTE: The City expects to award and execute the contract for this work in February 2008. Although the contract will be awarded in February 2008, the contractor will not be given full use of the site until May 2008. **The starting date or event for determining the number of consecutive calendar days for the performance of the B portion work will be the date contractor receives notice allowing full use of the site, which is scheduled to be May 19, 2008. The counting of consecutive calendar days for the B portion work will begin when notice allowing full use of site has been received and end when the project is deemed substantially complete**.

The B portion work includes all work described and included within these contract documents.

DATA for Bid Preparation of B Portion Work:

Maximum number of consecutive calendar days that can be bid: **270**

Daily cost: **$7,500**

D. DEFINITION OF TERMS: For this project, the following definitions shall apply:

(a) Calendar Day - Every day shown on the calendar.

(b) Amount of the Awarded Contract - The total lump sum set forth in the proposal by the bidder. (A portion of bid).

(c) Daily Cost - The amount which represents the average daily cost of interference and inconvenience to the user and the daily cost to the City, but excludes the engineering inspection costs.

(d) Engineering Inspection Costs - The costs to the City for inspection of the contractor's work.

(e) Substantially complete - THIS DEFINITION SHALL APPLY ONLY TO B PORTION WORK. The work will be considered substantially complete when it has received approval for occupancy by the City of Portland, the Architect, and is ready for beneficial use by the Portland International Jetport.

E. PREPARATION OF PROPOSAL. The bidder shall establish the number of consecutive calendar days to perform the work subject to A+B Bidding as specified in C above (B PORTION WORK).

The bid sheet for this project provides space to list the number of consecutive calendar days to substantially complete work subject to A+B Bidding. The contractor shall enter the number of consecutive calendar days bid to substantially complete the work noted in this contract in the space provided on the bid sheet.

F. CONSIDERATION OF BIDS. The submitted bid shall consist of two parts:

(A) The lump sum amount of awarded contract (A portion);

(B) The product of the number of consecutive calendar days bid to substantially complete work multiplied by the daily cost.

The lowest bid for the project will then be determined by the City using the combination of (A) + (B).

The sum of (A) + (B) shall be used only to determine the lowest bid for the project and shall not be used to determine the amount of the awarded contract nor the final payment to the contractor when the project is completed, other than using the daily costs for any disincentive calculations based on performance of the B portion work subject to A+B Bidding.

G. FAILURE TO SUBSTANTIALLY COMPLETE WORK IN THE TIME BID UNDER THE B PORTION. Failure to substantially complete the work within the number of consecutive calendar days bid for the work will result in the **daily cost of $7,500** being assessed for every calendar day in excess of the number of consecutive calendar days bid, up to the time when the work is substantially complete.

The architect shall be the sole authority in determining when the work is substantially complete.

H. ADJUSTMENTS TO B PORTION WORK. The number of days for the performance of the work will be extended when a contract extension of time is granted.

16.00 DELAY REMEDY

A. In the event that the Project is delayed for any reason, the sole remedy for the Contractor, and any subcontractor, for such delay shall be an extension of the Contract Time. No party shall have any other rights or remedies against the Owner, and shall make no claim therefor.

17.00 EQUAL EMPLOYMENT AND AFFIRMATIVE ACTION

A. The Awarding Authority is an equal opportunity employer and has an active affirmative action employment plan. The Contractor shall have an Affirmative Action Plan and shall upon request submit it to Owner's Attorney for approval before execution of the Agreement for the Project.

END OF DOCUMENT

SECTION 00220

SOIL BORING DATA

(Boring Logs)

A. This data on subsurface conditions has been furnished only for the BIDDER's information and convenience without any warranty or guarantee, expressed or implied, that the subsurface conditions actually encountered will be the same as shown on the boring logs. Borings are not intended as representations or warranties and it is expressly understood that neither the OWNER nor the ARCHITECT will be responsible for the accuracy thereof nor for any interpretations or conclusions drawn therefrom by the BIDDER.

B. The BIDDER shall satisfy themselves as to subsurface conditions.

C. All soil boring data is located in Appendix A of this Project Manual.

END OF DOCUMENT

SECTION 00420

NOTICE OF AWARD

To: Peter Benard
President
Ledgewood Construction
27 Main Street
South Portland, Maine 04106

Project Description: **Phase 2-Parking Garage**

The City of Portland (OWNER) has considered the Bid submitted by you for the above-described Work in response to its Advertisement for Bids and Information for Bidders dated November 16, 2007.

You are hereby notified that your Bid has been accepted for items in the amount of $18,522,865.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance Bond, Payment Bond and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your Bid as abandoned. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the OWNER.

Dated this 8th day of February, 2008.

OWNER: City of Portland
By: Paul H. Bradbury, P.E.
Title: Facilities & Engineering Manager

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged
By: **Ledgewood Construction**
This, the 11th day of February, 2008.
By Peter Benard
Title President

END OF SECTION

SECTION 00531

CONSTRUCTION CONTRACT

THIS AGREEMENT is made this _____ day of February, 2008, by and between the **CITY OF PORTLAND**, a body politic and corporate having a place of business in the County of Cumberland, State of Maine (hereinafter "**CITY**") and **Ledgewood Construction**, with a mailing address of 27 Main Street, South Portland, Maine 04106 (hereinafter "**CONTRACTOR**").

W I T N E S S E T H:

WHEREAS, the **CITY** did advertise for Requests for Bids by Bid # 4208 entitled PHASE-II PARKING GARAGE, PORTLAND INTERNATIONAL JETPORT, PORTLAND, MAINE; and

WHEREAS, the **CONTRACTOR** did under date of January 15, 2008, submit a bid for such work; and

WHEREAS, after due consideration of all of the bids the **CITY** did award the bid to the **CONTRACTOR**;

NOW, THEREFORE, in consideration of the mutual promises made by each party to the other, the parties covenant and agree as follows:

1. SCOPE OF WORK.

The **CONTRACTOR** will furnish the materials, supplies, equipment and labor (hereinafter the "Work") required to construct and complete the PHASE-II PARKING GARAGE, project, all as more fully set forth in:

i. Specifications:

ii. Drawings:

iii. General and Supplemental Conditions

iv. Section 00020-Invitation to Bid, and

v. Any subsequent addenda to the above.

The **CONTRACTOR** hereby acknowledges receipt of the items described in subparagraphs i., ii., iii., iv and v. above. The Specifications, Drawings, General and Supplemental Conditions are incorporated and made a part of this Contract by reference.

2. TIME FOR PERFORMANCE.

The **CONTRACTOR** will commence work within 10 days, after execution of this Contract by the **CITY**. The entire project shall be substantially completed as part of the General Contract's substantial completion. Ledgewood Construction's bid for this work provided a time for substantial completion of 250 Calendar Days from the May 19, 2008 date for full use of site. If work is not substantially complete within this time, Ledgewood Construction agrees to pay Owner the Part B daily cost of $7,500 per calendar day. The Time for performance may only be extended in writing by **CITY**.

3. MATERIALS.

Unless otherwise stipulated, the **CONTRACTOR** shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation and facilities necessary for the execution and completion of the Work. Material and equipment shall be new, free from defects, perfect and complete, unless otherwise stipulated.

4. CITY'S RIGHT TO TERMINATE CONTRACT.

If the **CONTRACTOR** should be adjudged a bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of its insolvency, or if it should persistently or repeatedly refuse or should fail, except in for cases which extension of time is provided, to supply enough properly skilled workers or proper materials or labor, or persistently disregard laws, ordinances, or otherwise be guilty of a substantial violation of any provision of the Contract, then the **CITY** may, without prejudice to any other right or remedy, and after giving the **CONTRACTOR**, and its surety, seven (7) days' written notice, terminate the employment of the **CONTRACTOR** and take possession of the Premises and of all materials, tools and appliances thereon and finish the Work by whatever method it may deem expedient. In such case, the **CONTRACTOR** shall not be entitled to receive any further payment until Work is finished. If the unpaid balance of the Contract amount shall exceed the expense of finishing the Work, including compensation for additional architectural, managerial and administrative services, such excess shall be paid to the **CONTRACTOR**. If such expense shall exceed such unpaid balance, the **CONTRACTOR** shall pay the difference to the **CITY**.

5. BONDS.

The **CONTRACTOR** shall furnish to the **CITY**, upon execution of the Contract, a Contract Performance Bond and a Contract Labor and Material Payment Bond each for the full amount of the Contract and issued by a surety company or surety companies authorized to do business in the State of Maine and approved by the **CITY**.

The Bonds shall remain in effect for one (1) year after final acceptance of the Work, and protect the **CITY**'s interest in the one (1) year guaranty of workmanship and materials, and also shall insure settlement of claims, for the payment of all bills for labor, materials and equipment by the **CONTRACTOR**.

Any Mechanic's Lien or any other lien which may be filed against the Premises which are the subject of this Contract by reason of the Work described herein shall be defended (by counsel reasonably accepted to the **CITY**) and promptly discharged by the **CONTRACTOR** at its own expense. If the **CONTRACTOR** should fail, either to defend the **CITY** against the lien or to discharge it, then the **CITY** may do so at the **CONTRACTOR**'s expense. In the event of such an undertaking by the **CITY**, the **CONTRACTOR** will promptly reimburse the **CITY** for all of its costs and expenses in so doing, including, but not limited to, reimbursement of the **CITY**'s reasonable counsel fees, as well as costs which may be incurred by it in substituting a bond in place of the lien. This requirement is in addition to, and supersedes any conflicting condition which may appear in the General Conditions.

6. RELEASE OF LIENS.

Neither the final payment nor any part of the retained percentage shall become due until the **CONTRACTOR**, if required, shall deliver to the **CITY** a complete release of all liens which might arise from the Work, or receipts in full in lieu thereof; and if required, in either case, an affidavit reciting that so far as it has knowledge or information, the releases and receipts include all the labor and materials for which a lien might be filed. The **CONTRACTOR** may, if any subcontractor should refuse to furnish a release or receipt in full, provide a bond, satisfactory to the **CITY**, to indemnify it against any lien. If any lien should remain unsatisfied after all payments have been made, the **CONTRACTOR** shall refund to the **CITY** all monies that the latter may be compelled to pay in discharging such a lien, including all costs and reasonable attorney's fees. This

requirement is in addition to and supersedes any conflicting condition which may appear in the General Conditions.

7. INDEMNIFICATION.

The **CONTRACTOR** shall indemnify and hold harmless the **CITY**, its officers and employees and agents, and the Architect and its officers, agents and employees, from and against all claims, damages, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense:

a. is attributable to bodily injury, sickness, disease or death, or injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

b. is caused, in whole or in part, by any negligent act or omission of the **CONTRACTOR**, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose act any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

CONTRACTOR hereby expressly agrees that it will defend, indemnify and hold the **CITY** harmless from any and all claims made or asserted by **CONTRACTOR**'s agents, servants or employees arising out of **CONTRACTOR**'s activities under this Contract. For this purpose, **CONTRACTOR** hereby expressly waives any and all immunity it may have under Maine's Workers Compensation Act in regard to such claims made or asserted by **CONTRACTOR**'s agents, servants or employees. The indemnification provided under this paragraph shall extend to and include any and all costs incurred by the **CITY** to answer, investigate, defend and settle all such claims, including, but not limited to, the **CITY**'s costs for attorneys fees, expert and other witness fees, the cost of investigators, and payment in full of any and all judgments rendered in favor of **CONTRACTOR**'s agents, servants or employees against the **CITY** in regard to claims made or asserted by such agents, servants or employees.

8. INSURANCE.

CONTRACTOR shall provide all insurance required by the General and Supplemental Conditions to this Contract.

9. PAYMENT.

a. **CONTRACTOR** agrees to perform the Work required by this Agreement for the Contract Sum of Eighteen million five hundred twenty two thousand eight hundred sixty five dollars Dollars ($18,522,865).

b. All applications for payment and processing of payment shall be in accordance with the terms of the General Conditions to this Contract.

c. **CITY** shall withhold ten percent (10%) of each invoice amount as retainage until the **CONTRACTOR** certifies that the work is seventy-five percent (75%) complete. Upon verification by **CITY**'s Architect that work is seventy-five percent (75%) complete, **CITY** shall reduce the retainage amount held to five percent (5%) of the amounts invoiced.

10. ASSIGNMENT.

Neither party to the Contract shall assign the Contract without the written consent of the other. The **CONTRACTOR** shall not assign any monies due or to become due to it hereunder without the previous written consent of the **CITY**.
The Owner will ASSIGN the "furnish" Precast/Prestressed Structural Members, as outlined in Precast bid package #8607, to this contract for the entire duration of the project. The Owner contracted a Precast

Contractor in August 2007.

The terms and conditions of the Precast Contract shall not be altered by virtue of assignment. All costs and expenses related to the assignments must be included in the Contractor's Base Bid.

11. USE OF PREMISES.

The **CONTRACTOR** shall confine its equipment, the storage of materials, and the operations of its workers to limits indicated by law, ordinances, permits or directions of the **CITY**, and shall not unreasonably encumber the Premises with such materials.

The **CONTRACTOR** shall not load nor permit any part of the structure to be loaded with a weight that will endanger its safety. The **CONTRACTOR** shall enforce the **CITY**'s instructions regarding signs, advertisements, fires and smoking.

If any part of the structure is completed and ready for occupancy, the **CITY** may, by written and mutual consent, without prejudice to any of the workers' rights or the rights of the **CONTRACTOR**, enter in and make use of such completed parts of the structure. Such use or occupancy shall in no case be construed as any acceptance of any Work or materials.

12. WORKMANSHIP.

All workmanship, materials and equipment either at the site or intended for it, shall conform in all respects with the requirements of all of the Contract Documents.

All labor shall be performed by mechanics skilled in their respective trades.

CONTRACTOR shall guarantee the Work against any defects in workmanship and materials for a period of one (1) year from the date of the written acceptance of the project.

13. CLEANING UP.

The **CONTRACTOR** shall at all times keep the Premises free from the accumulation of waste materials or rubbish; and, at the completion of the Work, it shall remove all rubbish from and about the Project, all tools, scaffolding and surplus materials, and shall leave the Work "broom clean" or its equivalent, unless more exactly specified. In case of the failure to comply by the **CONTRACTOR**, the **CITY** may perform the clean up and deduct the costs from any monies due the **CONTRACTOR**.

14. ALTERNATE DISPUTE RESOLUTION.

If, in the performance of the Contract, there should arise a dispute between the **CITY** and the **CONTRACTOR** which can not be settled, then any such dispute shall be resolved as provided in the General Conditions to this Contract.

15. TERMINATION FOR CONVENIENCE.

The **CITY** shall have the right to terminate this Contract at any time for its convenience on prior written notice to **CONTRACTOR**. If Contract should be terminated by **CITY** for such convenience, the **CITY** shall pay **CONTRACTOR** for all Work performed and all materials purchased, pursuant to this Contract, prior to the receipt of such notice.

16. TERMINATION FOR CAUSE.

The **CITY** may terminate this Contract for cause by written notice to the **CONTRACTOR**. In the event of such termination, **CONTRACTOR** shall not be entitled to any further payment under this Contract from the date of receipt of said notice.

IN WITNESS WHEREOF, the said **CITY OF PORTLAND** has caused this Contract to be signed and sealed by Joseph E. Gray, its City Manager, thereunto duly authorized, and **Ledgewood Construction** has caused this Contract to be signed and sealed by Peter Benard, its President, thereunto duly authorized, the day and date first above written.

WITNESS:

_____

CITY OF PORTLAND

By:_____
Joseph E. Gray
City Manager

WITNESS:

_____

_____

By:_____
Peter Benard
President Ledgewood Construction

Approved as to form:

_____
Corporation Counsel's Office

Approved as to funds:

_____
Budget Office

SECTION 00610

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____ , as Principal
(Name of Contractor)

a _____
(Corporation, Partnership, or Individual)

hereinafter called "Principal" and _____
(Surety)

_____ of _____ , State of _____,

hereinafter called the "Surety", are held and firmly bound into the **City of Portland, Maine**, hereinafter called "Owner", in the penal sum of _____

_____ Dollars ($ _____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain

contract with the Owner, dated the _____ day of _____ , 2008, a copy of which is hereto attached and made a part hereof for the construction of

Phase 2 - Parking Garage
Portland International Jetport
Portland, ME

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.
PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation of this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, the parties to these present have duly executed in this bond on the

Signed and sealed this _____day of_____2008

WITNESS: CONTRACTOR_____

_____

By_____(L.S.)

_____

By_____(L.S.)

_____

By_____(L.S.)

WITNESS: SURETY:_____

_____

By_____(L.S.)

_____

By_____(L.S.)

APPROVED AS TO FORM_____, 2008

BY_____

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF DOCUMENT

SECTION 00620

LABOR AND MATERIALS PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____ , as Principal
(Name of Contractor)

a _____
(Corporation, Partnership, or Individual)

hereinafter called "Principal" and _____
(Surety)

_____ of _____ , State of _____

hereinafter called the "Surety", are held and firmly bound into **City of Portland, Maine,** acting through the Administration, hereinafter called "Owner", in the penal sum of

_____ Dollars ($ _____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain

contract with the Owner, dated the _____ day of _____ , 2008, a copy of which is hereto attached and made a part hereof for the construction of:

Phase 2 - Parking Garage
Portland International Jetport
Portland, ME

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, the parties to these present have duly executed in this bond on this

_____ day of _____ , 2008.

WITNESS: CONTRACTOR_____

_____

By_____(L.S.)

_____

By_____(L.S.)

_____

By_____(L.S.)

WITNESS: SURETY:_____ _____

By_____(L.S.)

_____

By_____(L.S.)

APPROVED AS TO FORM_____, 2008

BY_____

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF DOCUMENT

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of addenda relating to bidding requirements).

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor or (3) between any persons or entities other than the Owner and Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or part of the Project.

1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirement for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.

1.1.7 THE PROJECT MANUAL

The Project Manual is the volume usually assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contract Documents shall be signed by the Owner and Contractor as provided in the Agreement. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

1.2.4 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.2.5 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 OWNERSHIP, AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

1.3.1 The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and Architect. The Contractor, Subcontractors, Sub-subcontractors and material and equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

1.4 CAPITALIZATION

1.4.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document or (3) the titles of other documents published by the American Institute of Architects.

1.5 INTERPRETATION

1.5.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

ARTICLE 2 - OWNER

2.1 DEFINITION

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative.

2.1.2 The Owner upon reasonable written request shall furnish to the Contractor in writing information which is necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein at the time of execution of the Agreement and, within five days after any change, information of such change in title, recorded or unrecorded.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 The Owner shall, at the request of the Contractor, prior to execution of the Agreement and promptly from time to time thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. (**Note:** Unless such reasonable evidence were furnished on request prior to the execution of the Agreement, the prospective contractor would not be required to execute the Agreement or to commence the Work.)

2.2.2 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

2.2.3 Except for permits and fees which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

2.2.4 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in orderly progress of the Work.

2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

2.2.6 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Article 6 (Construction by Owner or by Separate Contractors), Article 9 (Payments and Completion) and Article 11 (Insurance and Bonds).

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner, by written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period give the Contractor a second written notice to correct such deficiencies within a second seven-day period. If the Contractor within such second seven-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 - CONTRACTOR

3.1 DEFINITION

3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to Subparagraph 2.2.2 and shall at once report to the Architect errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies or omission in the Contract Documents unless the Contractor recognized such error, inconsistency or omission and knowingly failed to report it to the Architect. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

3.2.2 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once.

3.2.3 The Contractor shall perform the Work in accordance with the Contract Documents and submittals approved pursuant to Paragraph 3.12.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless Contract Documents give other specific instructions concerning these matters.

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and

other persons performing portions of the Work under a contract with the Contractor.

3.3.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.3.4 The Contractor shall be responsible for inspection of portions of Work already performed under this Contract to determine that such portions are in proper conditions to receive subsequent Work.

3.4 LABOR AND MATERIALS

3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage of defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

3.6 TAXES

3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

3.7 PERMITS, FEES AND NOTICES

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are legally required when bids are received or negotiations concluded.

3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities bearing on performance of the Work.

3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs.

3.8 ALLOWANCES

3.8.1 The Contract shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities against which the Contractor makes reasonable objection.

3.8.2 Unless otherwise provided in the Contract Documents:

.1 materials and equipment under an allowance shall be selected promptly by the Owner to avoid delay in the Work;

.2 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts.

.3 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances;

.4 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1)

the difference between actual costs and the allowances under Clause 3.8.1.1 and (2) changes in Contractor's costs under Clause 3.8.2.3.

3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule of the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the work.

3.10.2 The Contractor shall prepare and keep current, for the Architects' approval, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Architect reasonable time to review submittals.

3.10.3 The Contractor shall conform to the most recent schedules.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction, and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of Subparagraph 4.2.7.

3.12.5 The Contractor shall review, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action.

3.12.6 The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect. Such Work shall be in accordance with approved submittals.

3.12.7 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and the Contract Documents.

3.12.8 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, or revisions other than those requested by the Architect on previous submittals.

3.12.10 Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents.

3.12.11 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

3.15 CLEANING UP

3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools construction equipment, machinery and surplus materials.

3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16 ACCESS TO WORK

3.16.1 The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

3.17 ROYALTIES AND PATENTS

3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

3.18 INDEMNIFICATION

3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Paragraph 3.18 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

3.18.3 The obligations of the Contractor under this Paragraph 3.18 shall not extend to the liability of the Architect, the Architect's consultants, and agents and employees of any of them arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys,

Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, the Architect's consultants, and agents and employees of any of them provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

4.1.3 In case of termination of employment of the Architect, the Owner shall appoint an architect against whom the Contractor makes no reasonable objection and whose status under the Contract Documents shall be that of the former architect.

4.1.4 Disputes arising under Subparagraphs 4.1.2 and 4.1.3 shall be subject to arbitrations.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents, and will be the Owner's representative (1) during construction (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the correction period described in Paragraph 12.2. The Architect will advise and consult with the Owner. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with other provisions of the Contract.

4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of on-site observations as an architect, the Architect will keep the Owner informed of progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

4.2.3 The Architect will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Paragraph 3.3. The Architect will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

4.2.4 **Communications Facilitating Contract Administration.** Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate through the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

4.25 Based on the Architect's observations and evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificate for Payment in such amounts.

4.2.6 The Architect will have authority to reject Work which does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable for implementation of the intent of the Contract Documents, the Architect will have authority to require additional inspection or testing of the Work in accordance with Subparagraphs 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

4.2.7 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for a limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no

delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgement to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, or any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.

4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, will receive and forward to the Owner for the Owner's review and records written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

4.2.11 The Architect will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made with reasonable promptness and within any time limits agreed upon. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

4.3 CLAIMS AND DISPUTES

4.3.1 **Definition.** A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 **Decision of Architect.** Claims, including those alleging an error or omission by the Architect, shall be referred initially to the Architect for action as provided in Paragraph 4.4. A decision by the Architect, as provided in Subparagraph 4.4.4, shall be required as a condition precedent to arbitration or litigation of a Claim between the Contractor and Owner as to all such matters arising prior to the date final payment is due, regardless of (1) whether such matters relate to execution and progress of the Work or (2) the extent to which the Work has been completed. The decision by the Architect in response to a Claim shall not be a condition precedent to arbitration or litigation in the event (1) the position of Architect is vacant, (2) the Architect has not received evidence or has failed to render a decision within agreed time limits, (3) the Architect has failed to take action required under Subparagraph 4.4.4 within 30 days after the Claim is made, (4) 45 days have passed after the Claim has been referred to the Architect or (5) the Claim relates to a mechanic's lien.

4.3.3 **Time Limits on Claims.** Claims by either party must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner.

4.3.4 **Continuing Contract Performance.** Pending final resolution of a Claim including arbitration, unless otherwise agreed in writing the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

4.3.5 **Waiver of Claims: Final Payment.** The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

.1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents; or

.3 terms of special warranties required by the Contract Documents.

4.3.6 **Claims for Concealed or Unknown Conditions.** If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Paragraph 4.4.

4.3.7 **Claims for Additional Cost.** If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.3. If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claims shall be filed in accordance with the procedure established herein.

4.3.8 **Claims for Additional Time.**

4.3.8.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

4.3.8.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction.

4.3.9 **Injury or Damage to Person or Property.** If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in Subparagraphs 4.3.7 or 4.3.8.

4.4 **RESOLUTION OF CLAIMS AND DISPUTES**

4.4.1 The Architect will review Claims and take one or more of the following preliminary actions within ten days of receipt of a Claim: (1) request additional supporting data from the claimant, (2) submit a schedule to the parties indicating when the Architect expects to take action, (3) reject the Claim in whole or in part, stating reasons for rejection, (4) recommend approval of the Claim by the other party or (5) suggest a compromise. The Architect may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

4.4.2 If a Claim has been resolved, the Architect will prepare or obtain appropriate documentation.

4.4.3 If a Claim has been resolved, the party making the Claim shall, within ten days after the Architect's preliminary response, take one or more of the following actions: (1) submit additional supporting data requested by the Architect, (2) modify the initial Claim or (3) notify the Architect that the initial Claim stands.

4.4.4 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect's decision will be made within seven days, which decision shall be final and binding on the parties but subject to

arbitration. Upon expiration of such time period, the Architect will render to the parties the Architect's written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Architect may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.5 ARBITRATION

4.5.1 Controversies and Claims Subject to Arbitration. Any controversy or Claim arising out of or related to the Contract, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator or arbitrators may be entered in any court having jurisdiction thereof, except controversies or Claims relating to aesthetic effect and except those waived as provided for in Subparagraph 4.3.5. Such controversies or Claims upon which the Architect has given notice and rendered a decision as provided in Subparagraph 4.4.4 shall be subject to arbitration upon written demand of either party. Arbitration may be commenced when 45 days have passed after a Claim has been referred to the Architect as provided in Paragraph 4.3 and no decision has been rendered.

4.5.2 Rules and Notices for Arbitration. Claims between the Owner and Contractor not resolved under Paragraph 4.4 shall, if subject to arbitration under Subparagraph 4.5.1, be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect, unless the parties mutually agree otherwise. Notice of demand for arbitration shall be filed in writing with the other party to the Agreement between Owner and Contractor and with the American Arbitration Association, and a copy shall be filed with the Architect.

4.5.3 Contract Performance During Arbitration. During arbitration proceedings, the Owner and Contractor shall comply with Subparagraph 4.3.4.

4.5.4 When Arbitration May Be Demanded. Demand for arbitration of any Claim may not be made until the earlier of (1) the date on which the Architect has rendered a final written decision on the Claim, (2) the tenth day after the parties have presented evidence to the Architect or have been given reasonable opportunity to do so, if the Architect has not rendered a final written decision by that date, or (3) any of the five events described in Subparagraph 4.3.2.

4.5.4.1 When a written decision of the Architect states that (1) the decision is final but subject to arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties.

4.5.4.2 A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.5.1 and 4.5.4 and Clause 4.5.4.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.5.5 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation or joinder or in any other manner, the Architect, The Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a dispute not described therein or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

4.5.6 Claims and Timely Assertion of Claims. A party who files a notice of demand for arbitration must assert in the demand all Claims then known to that party which arbitration is permitted to be demanded. When a party fails to include a Claim through oversight, inadvertence or excusable neglect, or when a Claim has matured or been acquired subsequently, the arbitrator or arbitrators may permit amendment.

4.5.7 Judgment on Final Award. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

ARTICLE 5 - SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. The Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued. However, no increase in the Contract Sum shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such change.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreement with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractor.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2 If the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such actions by the Owner, the Contractor shall make such Claim as provided elsewhere in the Contract Documents.

6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule and Contract Sum deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgement that the Owner's or separate contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible therefor.

6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Subparagraph 10.2.5.

6.2.5 Claims and other disputes and matters in question between the Contractor and a separate contractor shall be subject to the provisions of Paragraph 4.3 provided the separate contractor has reciprocal obligations.

6.2.6 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Paragraph 3.14.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.15, the Owner may clean up and allocate the cost among those responsible as the Architect determines to be just.

ARTICLE 7 - CHANGES IN THE WORK

7.1 CHANGES

7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the

Contractor; an order for a minor change in the work may be issued by the Architect alone.

7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

7.1.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Construction Directive that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

7.2 CHANGE ORDERS

7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:

.1 a change in the Work;
.2 the amount of the adjustment in the Contract Sum, if any; and
.3 the extent of the adjustment in the Contract Time, if any.

7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Subparagraph 7.3.3

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 unit prices stated in the Contract Documents or subsequently agreed upon;
.3 cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 as provided in Subparagraph 7.3.6.

7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.6 shall be limited to the following:

.1 cost of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' or workmen's compensation insurance;
.2 cost of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
.3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 cost of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
.5 additional costs of supervision and field office personnel directly attributable to the change.

7.3.7 Pending final determination of cost to the Owner, amounts not in dispute may be included in Applications for Payment. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which

results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

7.3.8 If the Owner and Contractor do not agree with the adjustment in Contract Time or the method for determining it, the adjustment or the method shall be referred to the Architect for determination.

7.3.9 When the Owner and Contractor agree with the determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 - TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

8.1.2 The date of commencement of the Work is the date established in the Agreement. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Paragraph 9.8.

8.1.4 The term "day" as used in the Contract Documents shall mean calendar days unless otherwise specifically defined.

8.2 PROGRESS AND COMPLETION

8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by a notice to proceed given by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.

8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If the Contractor is delayed at any time in progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending arbitration, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.

8.3.3 This Paragraph 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contract for performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its

accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for operations completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for elsewhere in the Contract Documents.

9.3.1.1 Such applications may include request for payment on account of changes in the Work which have been properly authorized by Construction Directives but not yet included in Change Orders.

9.3.1.2 Such applications may not include request for payment of amounts the Contractor does not intend to pay a Subcontractor or material supplier because of a dispute or other reason.

9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitable stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application of Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1.

9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's observations at the site and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information and belief, quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1 The Architect may decide not to certify payment and may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Subparagraph 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Subparagraph 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the

Architect's opinion to protect the Owner from loss because of:

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims;
.3 failure of the Contractor to make payments properly to Subcontractors of for labor, materials or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or another contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.6 PROGRESS PAYMENTS

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

9.6.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in similar manner.

9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

9.6.4 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

9.6.5 Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.7 FAILURE OF PAYMENT

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by arbitration, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, which shall be accomplished as provided in Article 7.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notifications by the Architect. The Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall

establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall finish all items on the list accompanying the Certificate Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

9.8.3 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Subparagraph 11.2.11 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonable withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's observations and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in said final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until as least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claim, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorney's fee.

9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not

fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims. The making of final payment shall constitute a waiver of claims by the Owner as provided in Subparagraph 4.3.5.

9.10.4 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment. Such waivers shall be in addition to the waiver described in Subparagraph 4.3.5.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

10.1.2 In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless, by written agreement of the Owner and Contractor, or in accordance with final determination by the Architect on which arbitration has not been demanded, or by arbitration under Article 4.

10.1.3 The Contractor shall not be required pursuant to Article 7 to perform without consent any Work relating to asbestos or polychlorinated biphenyl (PCB).

10.1.4 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work in the affected area if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused in whole or in party be negligent acts or omissions of the Owner, anyone directly or indirectly employed by the Owner or anyone for whose acts the Owner may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Subparagraph 10.1.4.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety or persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clauses 10.2.1.2 and 10.2.1.3

caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Clauses 10.2.1.2 and 01.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded as to endanger its safety.

10.3 EMERGENCIES

10.3.1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- **.2** claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** claims for damages because of bodily injury; sickness or disease, or death of any person other than the Contractor's employees;
- **.4** claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;
- **.5** claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- **.7** claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

11.1.3 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

11.3 PROPERTY INSURANCE

11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities

who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.

11.3.1.1 Property insurance shall be on an all-risk policy from and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, false-work, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents.

11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto.

11.3.1.3 If the property insurance requires minimum deductibles and such deductibles are identified in the Contract Documents, the Contractor shall pay costs not covered because of such deductibles. If the Owner or insurer increases the required minimum deductibles above the amounts so identified or if the Owner elects to purchase this insurance with voluntary deductible amounts, the Owner shall be responsible for payment of the additional costs not covered because of such increased or voluntary deductibles. If deductibles are not identified in the Contract Documents, the Owner shall pay costs not covered because of deductibles.

11.3.1.4 Unless otherwise provided in the Contract Documents, this property insurance shall cover portions of the Work stored off the site after written approval of the Owner at the value established in the approval, and also portions of the Work in transit.

11.3.2 **Boiler and Machinery Insurance.** The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

11.3.3 **Loss of Use Insurance.** The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Subparagraph 11.3.7 for damages caused by fire or other perils covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Paragraph 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Contractor.

11.3.7 **Waivers of Subrogation.** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Paragraph 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require the Architect,

Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogations shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

11.3.8 A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.5. If after such loss no other special agreement is made, replacement of damaged property shall be covered by appropriate Change Order.

11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection be made, arbitrators shall be chosen as provided in Paragraph 4.5. The Owner as fiduciary shall, in that case, make settlement with insurers in accordance with directions of such arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's observations and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered which the Architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2 CORRECTION OF WORK

12.2.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby.

12.2.2 If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This period of one year shall be extended with respect to portions of Work first performed after Substantial Completion and the

actual performance of the Work. This obligation under this Subparagraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Paragraph 2.4. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten days after written notice, the Owner may upon ten additional days written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

12.2.5 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.6 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one year as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, the party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member or the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right of duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescent in breach thereunder, except as may specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the

Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so the Architect may observe such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so the Architect may observe such procedures. The Owner shall bear such costs except as provided in Subparagraph 13.5.3.

13.5.3 If such procedures for testing, inspection or approval under Subparagraph 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses.

13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 INTEREST

13.6.1 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor:

.1 **Before Substantial Completion.** As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statue of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;

.2 **Between Substantial Completion and Final Certificate for Payment.** As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statue of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and

.3 **After Final Certificate for Payment.** As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statue of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor, for any of the following reasons:

.1 issuance of an order of a court or other public authority having jurisdiction;

.2 an act of government, such as a declaration of national emergency, making material unavailable;

.3 because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Subparagraph 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents;

.4 if repeated suspensions, delays or interruptions by the Owner as described in Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days schedules for completion, or 120 days in any 365-day period, whichever is less; or

.5 the Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Subparagraph 2.2.1.

14.1.2 If one of the above reasons exists, the Contractor may, upon seven additional days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages.

14.1.3 If the Work is stopped for a period of 60 days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.2.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

.1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors.

.3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 accept assignment of subcontracts pursuant to Paragraph 5.4; and

.3 finish the Work by whatever reasonable method the Owner may deem expedient.

14.2.3 When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.3.2 An adjustment shall be made for increases in the cost of performance of the Contract, including profit on the increased cost of performance, caused by suspension, delay or interruption. No adjustment shall be made to the extent:

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

14.3.3 Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.

SECTION 00720

GENERAL CONDITIONS

The General Conditions of the Contract for Construction, AIA Document A201, Fourteenth Edition (1987), Articles 1-14 inclusive, is a part of this contract.

END OF SECTION

SECTION 00810

SUPPLEMENTARY GENERAL CONDITIONS
EXHIBIT A

THE GENERAL CONDITIONS

The "General Conditions of the Contract for Construction," AIA Document A201, Fourteenth Edition (1987), Articles 1 through 14 inclusive, is a part of this Contract.

THE SUPPLEMENTARY CONDITIONS

The following supplements modify and/or change, delete from and/or add to the General Conditions. Where any Article, Paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such Article, Paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any Article, Paragraph, or subparagraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such Article, Paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

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Delete "Arbitration" and the references pertaining to it.

ARTICLE I GENERAL PROVISIONS

A. Delete the fourth sentence in Subparagraph 1. 1.2 and substitute the following:

"Except as provided in Paragraph 3.18, this Contract Document shall create a contractual relationship solely between the owner and Contractor.

B. Delete Subparagraph 1.2. 1.

C. Add the following to the end of Subparagraph 1.2.3:

"All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others. In the event of conflicts or discrepancies among the Contract Documents, the Documents shall be interpreted on the basis of the following priorities:

Highest Priority:	Modifications
Second Priority:	Agreement
Third Priority:	Addenda - later date to take precedence
Fourth Priority:	General Requirements - Division I
Fifth Priority:	Supplementary Conditions
Sixth Priority:	General Conditions
Seventh Priority:	Drawings and Specifications

In case of conflicts between Drawings and specifications, or within either the Drawings or specifications, the Contractor shall provide the better quality or greater quantity of work and materials unless otherwise directed by written Addendum or Change Order to the Contract."

E. Add Subparagraphs 1.2.6 through 1.2.13 as follows:

1.2.6 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated.

1.2.7 Test boring or soil test information included with the Contract Documents or otherwise made available to the Contractor was obtained by the Owner for use by the Architect in the design of the Project or Work. The Owner does not hold out such information to the Contractor as an accurate or approximate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in Subparagraph 4.3.6.

ARTICLE 2 OWNER

A. Delete everything following the words "execution of the Agreement" in the last sentence in Subparagraph 2.1.2.

B. Delete Subparagraph 2.2.1.

C. Delete Subparagraph 2.2.4 and substitute the following:

2.2.4 Information or services required of the Owner hereunder shall be furnished by the Owner with reasonable promptness after receipt from the Contractor of a request for such information or services.

D. Delete Subparagraph 2.2.5 and substitute the following:

2.2.5 The Owner will supply the Contractor with one reproducible set of the Drawings and specifications. The Contractor shall provide its Subcontractors with Contract Documents.

E. Add Subparagraph 2.2.7 as follows:

2.2.7 The Contractor shall be responsible for coordinating the schedule for testing which is mutually agreed upon by Owner, Architect and Contractor. The Owner shall be responsible for the employment of Independent Testing Laboratories (ITL).
The Contractor shall bear all costs for retesting done by the Independent Testing Laboratory (ITL) due to nonconforming work.

F. In the sixth line of Subparagraph 2.3. 1, after the word "may" add the following:

", after Contractor's receipt of a seven (7) day written notice and failure by Contractor to cure,".

G. Delete the first and second sentences of Subparagraph 2.4.1 and substitute the following:

"If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to begin and prosecute correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies."

H. In the third sentence in Subparagraph 2.4. 1, delete the words "Change Order" and substitute the words "Construction Change Directive" and delete the fourth sentence.

ARTICLE 3 CONTRACTOR

A. Delete Subparagraph 3.2.1 and substitute the following:

3.2.1 Before starting the Work, and at frequent intervals during the progress thereof, the Contractor shall carefully review and compare the Contract Documents with each other and with the information furnished by the Owner pursuant to Subparagraph 2.2.2 and shall at once report to the Architect any error, inconsistency or omission the Contractor may discover. Any necessary change shall be ordered as provided in Article 7, subject to the requirements of Paragraph 1.2 and other provisions of the Contract Documents. If the Contractor proceeds with the Work without such notice to the Architect, having discovered such errors, inconsistencies or omissions, or if by reasonable review of the Contract Documents the Contractor could have discovered such, the Contractor shall bear all costs arising therefrom.

B. Add Subparagraph 3.2.4 and 3.2.5 as follows:

3.2.4 The Contractor shall give the Architect timely notice of any additional Drawings, Specifications, or instructions required to define the Work in greater detail or to permit the proper progress of the Work.

3.2.5 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the Architect as provided in Subparagraph 3.2.4. If the Contractor proceeds with such work without obtaining further Drawings, Specifications or instructions, the Contractor shall correct Work incorrectly done at the Contractor's own expense.

C. Delete the first sentence in Subparagraph 3.5.1 and substitute the following:

"The Contractor warrants that the materials and equipment furnished under the Contract will be new and of recent manufacture unless otherwise specified, and that all Work will be of good quality, free from faults and defects, and in conformance with the Contract Documents.

D. Delete the last two sentences in Subparagraph 3.5.1.

E. Add Subparagraphs 3.5.3 through 3.5.9 as follows:

3.5.3 In all cases in which a manufacturer's name, trade name or other proprietary designation is used in connection with materials or articles to be furnished under this Contract, whether or not the phrase "or equal" is used after such name, the Contractor shall furnish the product of the named manufacturer(s) without substitution, unless a written request for a substitute has been submitted by the Contractor and approved in writing by the Architect as provided in Subparagraph 3.5.4 and within the time limits and conforming to the procedures outlined in Section 01600 of the General Requirements.

3.5.4 If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents.

3.5.5 In requesting approval of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.

3.5.6 The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the building. The Architect shall judge the design and appearance of proposed substitutes on the basis of their suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve as equal to materials specified proposed substitutes which, in the Architect's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall, if required by the Architect, furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the Owner.

3.5.7 Any additional cost, or any loss or damage arising from the substitution of any material or requirement for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner or the Architect.

3.5.8 The warranty provided in this paragraph 3.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.

3.5.9 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, all special warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty will be performed in accordance with the warranty's terms and conditions.

E. Delete Subparagraph 3.6.1 and substitute the following:

3.6.1 The Owner is a non-profit organization and is exempt from all sales, consumer, use and other similar taxes as provided by law. The Contractor, Subcontractors, sub-subcontractors, material and equipment suppliers and the like, providing taxable goods for incorporation into the Work shall take this into account, so that the Owner does not pay such taxes. Obtain rebates for any taxes incorrectly paid and reimburse the Owner in the full amount on a Change Order. The Owner will provide the necessary evidence and certificates of tax exemption on request for those concerned.

F. Add subparagraph 3.9.1.1 as follows:

"3.9.1.1 The Contractor shall provide and maintain a telephone beeper for use by the Project Superintendent/Manager.

G. Add Subparagraphs 3.9.2 through 3.9.5 as follows:

3.9.2 The Contractor shall retain a competent Registered Professional Engineer or Registered Land Surveyor, acceptable to the Architect, who shall establish the exterior lines and required elevations of all buildings and structures to be erected on the site and shall establish sufficient lines and grades for the construction of associated Work such as, but not limited to, roads, utilities and site grading. The Engineer or Land Surveyor shall certify as to the actual location of the constructed facilities in relation to property lines, building lines, easements, and other restrictive boundaries.

3.9.3 The Contractor shall establish the building grades, lines, levels, column, wall and partition lines required by the various Subcontractors in laying out their Work.

3.9.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out between trades and that no trade, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall afford each trade, any separate

contractor, or the Owner, reasonable opportunity for the installation of Work and the storage of materials.

3.9.5 The Contractor shall arrange for and conduct job meetings with the Architect and such other persons as the Architect may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. All notices required under the Contract may be served on such representatives

H. Add Subparagraphs 3.10.4 and 3.10.5 as follows:

3.10.4 The Progress Schedule shall be based on an orderly progression of the Work, allowing adequate time for each operation (including adequate time for submission and review of submittals), and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The Progress Schedule will be reviewed by the Architect for compliance with the requirements of this Article and Section 01300 and will be accepted by the Architect or returned to the Contractor for revision and resubmittal.

3.10.5 If the Architect in agreement with the owner has determined that the Contractor should be permitted to extend the time for completion as provided in Paragraph 8.3, the Progress Schedule shall be adjusted accordingly, and the dollar value of Work to be completed as of the first of each month shall be recalculated.

I. Delete Subparagraph 3.12.7 and substitute the following:

3.12.7 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor thereby represents that the Contractor has or will have determined and verified all dimensions (including field dimensions), quantities, relationship to existing work, coordination with work to be installed later, coordination with information on previously accepted Shop Drawings, Product Data, Samples and similar submittals, and verification of compliance with an requirements of the Contract Documents. The accuracy of such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals, the Architect shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.

J. Insert the following at the end of Subparagraph 3.12.9:

"Unless such written notice has been given, the Architect's approval of a resubmitted Shop Drawing, Product Data, Sample, or similar submittal shall not constitute approval of any changes not requested on the prior submittal."

K. Delete Subparagraph 3.12.11 and substitute the following:

3.12.11 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Owner shall be entitled to rely upon such certifications, and neither the Owner nor the Architect shall be expected to make any independent examination with respect thereto.

L. In the second line of Subparagraph 3.15.2, after the word "Documents," insert the following:

"after reasonable written notice from the Owner of such failure,"

ARTICLE 4 ADMINISTRATION OF THE CONTRACT

A. Delete Subparagraph 4.1.2.

B. Delete Subparagraph 4.1.4.

C. Delete the second sentence in Subparagraph 4.2.7 and substitute the following:

"The Architect's action will be taken with reasonable promptness, while allowing sufficient time in the Architect's professional judgment to permit adequate review, taking into account the time periods set forth in the latest schedule prepared by the Contractor and reviewed by the Architect pursuant to Subparagraphs 8.2.4 through 8.2.10."

D. In Subparagraph 4.2.7, in the fifth sentence, delete the words "unless otherwise specifically stated by the Architect".

E. In Subparagraph 4.2.8 delete the following:
"Change Orders and".

Insert the following at the end of Subparagraph 4.2.8:
"and Subparagraph 7.1.2. 1. "

F. In Subparagraph 4.2.11, in the last sentence delete the words "15 days" and substitute the following:

"seven (7) days".

G. In Subparagraph 4.2.12 after the first sentence add the following:

"The Architect may, as the Architect judges desirable, issue additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Work, such drawings or instructions may be affected by field order or other notice to the Contractor, and provided such drawings or instructions are reasonably consistent with the previous existing Contract Documents, the Work shall be executed in accordance with such additional drawings or instructions without additional cost or extension of the Contract Time. If the Contractor claims additional cost or time on account of such additional drawings or instructions, the Contractor shall give the notice provided in Subparagraph 4.3.7."

H. In Subparagraph 4.3.3 ., in the first sentence change "21 days" to "7 days".

At the end of the second sentence in Subparagraph 4.3.3, add the following:

"within 7 working days and quantification of the claims made within 15 working days."

Delete the last sentence in Subparagraph 4.3.3 and substitute the following:

"Any change or addition to a previously made claim shall be made by timely written notice in accordance with this Subparagraph 4.3.3."

I. In Subparagraph 4.3.4, in the first sentence delete the words "including arbitration".

K. In Subparagraph 4.3.6 change "21 days" to the following:

"seven (7) days".

After the fourth sentence add the following:

Written notice of the claim must be made within seven (7) working days with quantification of the claim submitted within 15 working days.

Delete Subparagraph 4.3.7 and substitute the following:

4.3.7 If the Contractor claims that any acts or omissions of the Owner or the Architect, including any instructions or orders, whether oral, written, by Drawings, or otherwise, involve extra cost or time, and the Contractor has not received a written acknowledgment by the Owner or Architect that extra payment will be made or time extended on account thereof, the Contractor shall promptly (but within seven (7) days) so notify the Architect in writing of such claim and shall not proceed with the Work relating to such claim until the Contractor has received a further written order to proceed in accordance with Paragraph 4.4 except, as provided in Paragraph 10.3, in the case of an emergency affecting life or property. No claim by the Contractor on account of such acts, omissions, instructions or orders shall be valid unless the Contractor has so notified the Architect, before proceeding, and has received the further written order to proceed.

"The Contractor shall have the burden of demonstrating the effect of the claimed delay on the Contract Time, and shall furnish the Architect with such documentation relating thereto as the Architect may reasonably require, demonstrating the change to the project end date due solely to the inclusion of the delaying activity."

L. Add the following to the end of Clause 4.3.8.2:

Delaying weather is extreme weather, as defined by the National Weather Service in Gray, Maine. If another contractor works in similar conditions, no delay will be granted.

The contractor must consider weather in the schedule by adding durations to those activities which are weather dependant and occurs during seasons when weather may be an issue.

M. In Subparagraph 4.4.4 in the first sentence, delete the words "but subject to arbitration".

Replace 4.5 ARBITRATION with

4.5 DISPUTE RESOLUTION

4.5.1 Contract Performance During Dispute Resolution
During dispute resolution proceedings the Owner and Contractor shall comply with Subparagraph 4.3.4

4.5.2 Dispute Resolutions
The Owner and Contractor mutually desire to avoid construction disputes. When such disputes are unavoidable, however, the agree to participate in good faith dispute resolution processes described below in an effort to obtain fast, fair, and cost effective resolutions.

4.5.2.1 Partnering
The parties recognize partnering as a useful dispute avoidance and resolution process and agree to participate in that process, including a dispute review board.

4.5.2.2 Non-binding Mediation
In the absence of a dispute review board or in the event a dispute should remain unresolved, the parties agree to participate in non-binding mediation, pursuant to the Construction Industry Mediation Rules of the American Arbitration Association.

4.5.2.3 Waiver of Jury Trial

In the event any dispute between the parties should not be resolved by the alternate dispute methods provided herein, then the parties hereby knowingly, willingly, and voluntarily waive any right which they may have to trial by jury. They agree that any such proceeding shall be heard before a single judge of the Maine Superior Court or the United States District Court.

ARTICLE 5 SUBCONTRACTORS

A. Delete Subparagraph 5.4.2.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

A. Delete Subparagraph 6.2.5.

B. In Subparagraph 6.3.1 in the fifth line after the word "Owner" add the following:

"after written notice".

ARTICLE 7 CHANGES IN THE WORK

A. In Article 7 delete the words "a reasonable allowance for overhead and profit" wherever they occur and substitute the following:

"an amount for overhead and profit in accordance with the schedule set forth in subparagraph 7.3.3.2".

B. Add Clause 7.1.2.1 as follows:

7.1.2.1 The Architect may issue Bulletins. A Bulletin is either:

a) a clarification to the Contract Documents, in accordance with Subparagraph 4.212, or

b) a minor change in the Work in accordance with paragraph 7.4, or

c) proposed extra Work resulting in an adjustment to the Contract Sum and/or Contract Time.

Upon receipt of a Bulletin, the Contractor shall review it promptly; if a Bulletin is determined by the Contractor to be a clarification to the Contract Documents or a minor change in the Work, the Contractor shall proceed in accordance with Paragraph 7.4. If the Bulletin is determined by the Contractor to be extra Work resulting in an adjustment to the Contract Sum and/or Contract Time, the Contractor shall not proceed with the Work described in the Bulletin, unless specifically authorized to do so in writing, but shall submit a detailed estimate in accordance with new Subparagraphs 7.3.1.1 and 7.3.3.

C. Add Subparagraph 7.1.5 as follows:

In order to facilitate checking for quotations of extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over $600.00 be approved without such itemization.

D. Delete Subparagraph 7.2.2.

E. Add Clause 7.3.1.1 as follows:

7.3.1.1 Upon request of the Owner or the Architect, the Contractor shall without cost to the Owner submit to the Architect, in such form as the Architect may require, an accurate written estimate of the cost of any proposed extra Work or change. The estimate shall indicate the quantity and unit cost of each item of materials, and the number of hours of work and hourly rate for each class of labor, as well as the description and amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of materials shall be shown if required by the Architect. The Contractor shall promptly revise and resubmit such estimate if the Architect determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors. If required by the Architect, in order to establish the exact cost of new Work added or of previously required Work omitted, the Contractor shall obtain and furnish to the Architect bona fide proposals from recognized suppliers for furnishing any material included in such Work. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractors expense. The Contractor shall state in the estimate any extension of time required for the completion of the Work if the change or extra work is ordered.

F. Delete Subparagraph 7.3.3 and substitute the following:

7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods, as selected by the Owner.

(a) By unit price stated in the Contract Documents or otherwise mutually agreed upon.

(b) By Cost and Percentages estimated by the Contractor as provided in Clause 7.3. 1.1 and accepted by the Owner; the Contractor's estimate shall become a fixed price which shall not be changed by any variation in the actual cost of executing the Work covered by the change.

(c) By actual Cost determined after the Work covered by the change is completed, plus Percentage.

G. Add Subparagraphs 7.3.3.1, 7.3.3.2, 7.3.3.3, and 7.3.3.4 as follows:

7.3.3.1 As used in this paragraph, 'Cost' shall mean the estimated or actual net increase or decrease in cost to the Contractor, Subcontractor, or Sub-subcontractor for performing the Work covered by the change, including actual payments for materials, equipment rentals, expendable items, wages and associated benefits to workmen and to supervisors employed full time at the site, insurance, bonds and other provable direct costs, but not including any administrative, accounting or expediting costs, or other indirect or overhead costs, or any wages or benefits of supervisory personnel not assigned full time to the site, or any amount for profit or fee to the Contractor, Subcontractor or Sub-subcontractor.

7.3.3.2 "Percentage" shall mean an allowance to be added to or subtracted from the cost in lieu of overhead and profit and of any other expenses which is not included in the Cost of the Work covered by the change, as defined above. When, in the reasonable judgement of the Architect, a series of Construction Change Directives or Change Orders effect a single change, Percentage shall be calculated on the cumulative net increase or decrease in Cost, if any.

1. Percentage for a Sub-subcontractor shall be 10 percent of any net increase or decrease of Cost of any Work performed by the Sub-subcontractor's own forces plus 5 percent of any aggregate net increase in Cost of any work performed for the Sub-subcontractor by other contractors.

2. Percentage for a Subcontractor shall be 10 percent of any net increase or decrease of Cost of any Work performed by the Subcontractor's own forces plus 5 percent of any aggregate net increase in Cost of any work performed for the

Subcontractor by other Subsubcontractors.

3. The Percentage for the Contractor shall be 10 percent of any net increase or decrease of Cost of any Work performed by the Contractor's own forces plus 5 percent of any net increase or decrease in the Cost for all other Work covered by the change.

7.3.3.3 If the Owner elects to determine the cost of the Work as provided in method (a) using unit prices stated in the Contract Documents or subsequently agreed upon, the unit prices shall be subject to Subparagraph 7.1.4. Notwithstanding the inclusion of unit prices in the Contract Documents, it shall be the Owner's option to require the Cost of any given change to be determined by one of the other methods stated in 7.3.3. If the owner elects to determine Cost of the change work by unit prices and the nature of the work is such that its extent cannot readily be measured after the completion of such work or any subsequent work, the Contractor shall keep daily records, available at all times to the Architect for inspection, of the actual quantities of such work put in place, and delivery receipts or other adequate evidence, acceptable to the Architect, indicating the quantities of materials delivered to the site for use in such unit price work, and distinguishing such from other similar material delivered for use in work included in the base Contract Sum. If so required by the Architect, materials for use in unit price work shall be stored apart from all other materials on the Project.
7.3.3.4 If the Owner elects to determine the cost of the Work as provided in methods (c) or (d) of Subparagraph 7.3.3 or if the method of determining the cost has not been established before the work is begun, the Contractor shall keep detailed daily records of labor and materials costs applicable to the work.

H. In Subparagraph 7.3.7 at the end of the second sentence, add the following:

"and agreed to by the Owner."

ARTICLE 8 TIME

A. Add Subparagraph 8.1.5 as follows:

"The term "working day" shall mean any calendar day except Saturdays, Sundays, and legal holidays at the jurisdiction of the Project."

B. Add Subparagraphs 8.2.4 through 8.2.10 as follows:

8.2.4 Promptly after award of the Contract, but prior to the second Application for Payment, the Contractor shall submit to the Architect a Progress Schedule as described in this Subparagraph and General Requirements Section 01300, "Submittals." The schedule shall show for each class of work included in the Schedule of Values, the percentage completion to be obtained and the total dollar value of work to be completed as of the first of each month until Substantial Completion. All calculations shall be on the basis of work in place, but not including the value of materials delivered but not in place.

C. In Subparagraph 8.3. 1, delete the words "pending arbitration" in line seven. Delete the words "Change Order" in line 9 and substitute "'Construction Change Directive." Add the following to the end of Subparagraph 8.3.1:

"If the Contract Time is extended pursuant to this Subparagraph, such extension shall be the exclusive remedy of the Contractor, and said Contractor shall not be entitled to recover damages from the Owner, or the Architect."

D. Delete Subparagraph 8.3.3.

ARTICLE 9 PAYMENTS AND COMPLETION

A. In Subparagraph 9.1.1, change "total" in line two to "maximum."

B. In Subparagraph 9.2.1 in the first line delete the words "Before the first Application for Payment" and substitute the following:

"Promptly after award of the Contract but before the second Application for Payment"

Add at the end of the first sentence of Subparagraph 9.2. 1:

"and shall be revised if later found by the Architect to be inaccurate."

Add after the word "schedule" in the last sentence of Subparagraph 9.2.1:

"shall be coordinated with the progress schedule and".

C. Delete the first twelve words of the first sentence of Subparagraph 9.3.1 and substitute "At the time or times established in the Agreement". After the first sentence of Subparagraph 9.3. 1, add "The format and number of copies of such Applications for Payment shall be as directed by the Architect".

D. Delete Clause 9.3.1.1 and change Subparagraph 9.3.1.2 to 9.3.1.1

E. Add Subparagraphs 9.3.1.2, 9.3.1.3, as follows:

9.3.1.2 The Owner will pay 90 percent of the amount due the Contractor on account of progress payments.

9.3.1.3 The Owner shall make Progress Payments and Final Payment within 30 days of application date.

F. Add Subparagraph 9.3.4 as follows:

9.3.4 Each Application for Payment or periodic estimate requesting payment shall be accompanied by a waiver of liens from each Subcontractor and Contractor. Such waiver shall be in a form acceptable to the Owner.

G. In Subparagraph 9.5. 1, at the end of item 2. add the words:

"for which the Contractor is not entitled to a Claim as provided herein or which are not covered by insurance".

In Subparagraph 9.5.1, change item 6. and add new items 8. and 9. as follows:

"6. reasonable evidence that the Work will not be completed within the Contract Time,"

"8. a lien or attachment is filed contrary to Subparagraph 4.5.9; or

9. failure of mechanical trade or electrical trade subcontractors to comply with mandatory requirements for maintaining record drawings. The Contractor shall check record drawings each month. Written confirmation that the record drawings are current will be required by the Architect before approval of the Contractor's monthly payment requisition."

H. Delete Subparagraph 9.6.3.

I. Delete Subparagraph 9.6.4 and substitute the following:

9.6.4 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, Sub-subcontractor or material supplier.

J. Delete Subparagraph 9.6.5.

K. Delete the words "or awarded by arbitration" from line 6 of Subparagraph 9.7.1.

L. Add at the end of Subparagraph 9.8.1:

"and only minor items which can be corrected or completed without any material interference with the Owner's use of the Work remain to be corrected or completed."

M. Delete Subparagraph 9.8.2 and substitute the following:

9.8.2. When the Contractor considers that the Work, or a portion thereof designated in the Contract Documents for separate completion, is substantially complete and the premises comply with Subparagraph 3.15. 1, the Contractor shall submit to the Architect (1) a list of items to be completed or corrected, (2) all special warranties required by the Contract Documents, endorsed by the Contractor and in a form reasonably acceptable to the Architect and (3) the permits and certificates referred to in Subparagraph 13.5.4. The failure to include any items on the list mentioned in the preceding sentence does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract documents. When the Architect on the basis of an inspection determines that the Work or designated portion thereof is substantially complete and the other conditions have been met, the Architect will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate for Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

Delete Subparagraph 9.9.1 and substitute the following:

9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage. Such partial occupancy or use may begin whether or not the portion is substantially complete, provided that the respective responsibilities of the Owner and Contractor with respect to payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work, insurance, indemnification, correction of the Work, and warranties shall be established by agreement of the Owner and Contractor or, absent such agreement shall be determined by the Architect subject to the right of either party to contest such determination.

Delete the second sentence in Subparagraph 9.10.2 and substitute the following:

"If the Contractor fails to furnish such releases or waivers as the Owner reasonably requires to satisfy the Owner that there are no outstanding liens, the Owner may require the Contractor, as a condition of final payment and at the Contractor's expense, to furnish a bond satisfactory to the Owner to indemnify the Owner against any such liens."

At the end of Subparagraph 9.10.2 add the following:

"Final payment for a given Work Category constituting the entire unpaid balance for the Subcontract amount may be paid by the Owner to the Contractor following receipt of both the final Certificate for Payment from the Architect and the Final Lien Waiver from the Subcontractor and the Contractor. The Final Lien Waiver shall be submitted by the Subcontractor and Contractor on the form acceptable to the Owner. Final payments to the Subcontractor shall be made by Contractor after payment has been received by the Contractor.

P. Add Paragraph 9.11 as follows:

9.11 STORAGE OF MATERIALS OFF SITE

9.11.1 The Contractor, his Subcontractors, and Sub-subcontractors shall obtain prior written approval from the Owner for permission to store materials to be incorporated in the Work, for which Progress Payments will be requested, at off-site locations. Any and all charges for storage, including insurance, shall be borne solely by the Contractor. Before approval, Owner will require proper proof of insurance naming the Owner as an additionally insured party, and letter in which is furnished:

1. The name of the Contractor and/or Subcontractor or Subordinate Subcontractor leasing the storage area,
2. The location of such leased space,
3. The leased area: the entire premises of certain areas of a warehouse giving the number of floors or portions thereof,
4. The date on which the material is first stored,
5. The value of the material stored,
6. Transfer of Title to the Owner, Right of Entry and Removal.

9.11.2 The Contractor, his Subcontractors and Subordinate Subcontractors shall notify the Contractor and the Owner to inspect, at least once each month, the materials being stored at any location.

9.11.3 The Contractor, his Subcontractors and Subordinate Subcontractors shall mark each sealed carton with the name and address of the Project, the Contractor and Owner.

9.11.4 A perpetual inventory shall be maintained for all materials held in storage for which payment has been requested.

9.11.5 Payment for materials stored off site shall be at the sole discretion of the owner. Any additional costs to the Owner resulting from storage of material off site for which payment is requested, such as, but not limited to, travel expenses and time for inspectors, shall be backcharged to, and paid by, the Contractor.

9.11.6 Transfer of Title to the Owner, Right of Entry and Removal.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

A. Delete the words "or in accordance with final determination by the Architect on which arbitration has not been demanded" in the last sentence in Subparagraph 10.1.2.

B. Delete the words "asbestos and polychlorinated biphenyl (PCB's)" and the words "asbestos or polychlorinated biphenyl (PCB's)" in Subparagraphs 10.1.2, 10.1.3, and 10. 1.4 and substitute the words "unsafe materials"

C. Add Subparagraph 10.1.5

10.1.5 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance encountered but not created on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. The Owner, Contractor and Architect shall then proceed in the same manner described in Subparagraph 10.1.2. The Owner shall be responsible for obtaining the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless.

D. Delete the word "and" at the end of the Clause 10.2.1.2.

E. Add the word "and" to the end of the Clause 10.2.1.3.

F. Add Clause 10.2.1.4 as follows:

10.2.1.4 Any other property of the Owner, whether or not forming part of the Work, located at the site or adjacent thereto in areas to which the Contractor has access.

G. In Subparagraph 10.2.5, in two places after the word "10.2.1.3", add the words ", and 10.2.1.4".

H. Add Subparagraphs 10.2.8 through 10.2.11 as follows:

10.2.8 During the progress of the Work and at all times prior to the date of Substantial Completion or occupancy of the Work by the Owner, whichever is earlier, the Contractor shall provide temporary heat, ventilation, and enclosure, adequate to permit the Work to proceed in a timely fashion, and to prevent damage to completed Work or Work in progress, or to materials stored on the premises. The permanent heating and ventilation systems may be used for these purposes when available.

ARTICLE 11 INSURANCE AND BONDS

A. Delete Subparagraph 11.1.2 and substitute the following:

Prior to commencement of any work under this Contract and until completion and final acceptance of the work, the Contractor and each and every Subcontractor of the Contractor shall, at its sole expense, maintain the following insurance on its own behalf, and furnish to the City of Portland, certificates of insurance evidencing same and reflecting the effective date of such coverage as follows:

The term "Contractor & Subcontractor" as used in this insurance rider, shall mean and include Contractors and Subcontractors of every tier.

1. Workers Compensation and Occupational Disease Insurance, statutory coverage, with $100,000 limit for Employer's Liability coverage.

2. Commercial General Liability with a combined Bodily Injury and Property Damage limit of $ 400,000 Coverage should include Contractual Liability, Broad Form Property Damage, "X,C&U" coverage where applicable, Personal Injury Liability, Independent Contractors. All coverage to be provided on an "occurrence" basis with licensed, admitted carriers approved by the City.

3. Commercial Automobile Liability, including all owned, non-owned and hired vehicles, with a

combined limit of $400,000 for Bodily Injury or Property Damage.

4. The certificate for above insurance shall each contain the provision that:

   This insurance will not be cancelled, materially changed or not renewed without a thirty (30) day advance written notice to the City of Portland, Portland, ME.

5. The amount of insurance contained in aforementioned insurance coverages, shall not be construed to be a limitation of the liability on the part of the Contractor or any of its Subcontractors.
6. The Contractor shall file certificates of insurance prior to the commencement of work and/or payment with the City of Portland which shall be subject to the City of Portland and approval of adequacy of protection and the satisfactory character of the Insurer. The carrying of the insurance described shall in no way be interpreted as relieving the Contractor of any responsibility for liability under this Contract.

7. Prior to commencement of any work under this Contract and until completion and final acceptance of the work, the Contractor at its sole expense will provide and maintain the following insurance for the City of Portland, itself, and Subcontractors performing work or services in connection with the project.

   "Bulder's Risk/All Risk" Property Insurance on the project and all materials, equipment and supplies located at the project site which are to become a permanent part of the construction, while awaiting erection and until completion of erection. Coverage is provided on a replacement cost basis.

8. The carrying of the insurance described shall in no way be interpreted as relieving the Contractor of any responsibility for liability under this Contract.

9. Any policies effected by the Contractor on its Owned and/or Rented Equipment and Materials shall contain a provision requiring the insurance carriers to waive their rights of subrogation against the City of Portland, and all other indemnities named in the Contract.

10. Should the Contractor or a Subcontractor engage a Subcontractor, the same conditions will apply under this contract to each Subcontractor, however, the Subcontractor shall be required to maintain limits of liability not less than Four Hundred Thousand Dollars ($400,000) per occurrence and in the aggregate, with said limits applicable on a per project basis, or such greater limits as may be required by the Contractor.

11. Certificates of Liability for each policy should be required to be provided to the City before work is commenced. City of Portland should appear as Additional Insured in all cases and the certificate should provide for notice of cancellation, material change or non-renewal to the City at least thirty (30) days prior to the cancellation, change or non-renewal.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

A. At the end of Subparagraph 12.2.2 add the following:

   "For the purpose of establishing the guarantee period, the Date of Substantial Completion shall be deemed to occur when Certificates of Substantial Completion have been issued for all Work. In the case of Owner use and/or occupancy of a portion of the Work (including mechanical or electrical equipment) prior to completion of this phase of the Project, the guarantee period for said portion of Work shall commence upon the date of Owner occupancy."

ARTICLE 13 MISCELLANEOUS PROVISIONS

A. Add Subparagraph 13.2.2 as follows:

B. Delete Subparagraph 13.4.2 and substitute the following:

13.4.2 No consent or waiver, express or implied, by the Owner or the Architect to, or of, any breach of any covenant, condition or duty of the Contractor shall be construed as a consent to or waiver of any other breach of the same or any other covenant, condition or duty.

C. In the last sentence of Subparagraph 13.5.2, after the word "costs" add the following: "and changes to the Contract Time".

D. Delete Subparagraph 13.5.4 and substitute the following:

13.5.4 The Contractor shall obtain and deliver promptly to the Architect any occupancy permit and any certificates of final inspection of any part of the Contractor's work and operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the Architect shall be a condition precedent to Substantial Completion of the Work.

F. Delete Paragraph 13.7.

G. Add Paragraph 13.8 as follows:

13.8 EQUAL OPPORTUNITY

13.8.1 The Contractor shall maintain policies of employment as follows:

1. The Contractor and his Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

2. The Contractor and his Subcontractors shall, in all solicitations for advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

H. Add Paragraph 13.9 as follows:

ARTICLE 14 TERMINATION OF THE CONTRACT

A. In Subparagraph 14.1.2 in the first fine delete the word "above, and after the word "exists" add the following:

"it as stated in Subparagraph 14.1.1,".

In Subparagraph 14.1.2 in the fourth line after the word "executed" add the following: "termination and cancellation costs, "

B. In Subparagraph 14.2.2 in the first sentence delete the words "above" and "upon certification by the Architect that sufficient cause exists to justify such action".

In Subparagraph 14-2.2 in the first line after the word "exist" add the following:

"as stated in Subparagraph 14.2. 1, ".

C. Delete Paragraph 14.3 and substitute the following:

14.3 TERMINATION BY THE OWNER FOR CONVENIENCE

14.3.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

14.3.2 Upon receipt of written notice from the owner of such termination for the Owner's convenience, the Contractor shall:

1. Cease operations as directed by the Owner in such notice;

2. Take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

3. Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

14.3.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment from the Owner on the same basis provided in Subparagraph 14.1.2.

Add ARTICLE 15 - OTHER CONDITIONS OF THE CONTRACT

15.1 Typographical errors in application for Payments or Change Orders shall not be grounds for additional payments.

15.2 If Section 952 of the Omnibus Reconciliation Act of 1980 is found to apply to this contractual relationship, it is agreed that the following Access to Records provision applies.

1. Until the expiration of four years after the furnishing of the services provided under this Contract, the Contractor will make available to the Secretary, U. S. Comptroller General, and their representatives, this Contract and all books, and documents and records necessary to certify the nature and extent of the costs for those services. If the Contractor carries out the duties of the Contract through a subcontract worth $10,000.00 or more over a twelve month period with a related organization the subperiod will also contain the access clause to permit access by the Secretary, Comptroller-General, and their representative to the related organization's books and records.

15.3 It is the intent of the parties hereby to comply with the provisions of Section 1861(v) (1) (1) of the Social Security Act.

END OF SECTION

SECTION 00834

CHANGE ORDER

ORDER NO:

DATE OF ISSUANCE:

PROJECT: Phase 2 - Parking Garage

OWNER: City of Portland

OWNER'S PROJECT NO:

ARCHITECT: DOMENECH, HICKS & KROCKMALNIC, INC.

ARCHITECT'S PROJECT NO: 2608

CONTRACTOR:

CONTRACT FOR:

ORIGINAL PRICE: $

The following changes are hereby made to the Contract Documents:

DESCRIPTION:

JUSTIFICATION:

This change results in an (increase) (decrease) (unchanged) Contract Price of.....$_____

Current Contact Price adjusted by previous Change Orders .....$_____

The new Contract Price including this Change Order will be .....$_____

Change to Contract Time: The Contract Time will be (increased) (decreased) (unchanged) by _____ calendar days.

The date of completion of all work will be _____(date).

Approvals Required:

Requested by: _____
(OWNER, ARCHITECT, CONTRACTOR)

Recommended by: _____
(ARCHITECT'S Signature)

Ordered by: _____
(OWNER/Authorized Representative's Signature)

Accepted by: _____
(CONTRACTOR'S Signature)

END OF SECTION

SECTION 00835

CERTIFICATE OF SUBSTANTIAL COMPLETION OF WORK

OWNER'S Project No._____ARCHITECT'S Project No. 2608

Project: Construction of Phase 2 - Parking Garage

CONTRACTOR _____ Contract Date

Contract for Construction of Phase 2 - Parking Garage

==========

Project or Specified Part Shall Include

DEFINITION OF SUBSTANTIAL COMPLETION

The date of Substantial Completion of a Project or specified part of a Project is the date when the construction is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part of the Project can be utilized for the purpose for which it was intended.

To: City of Portland, Maine

And To
(CONTRACTOR)

Date of Substantial Completion

The Work performed under this contract has been inspected by authorized representatives of the OWNER, CONTRACTOR and ARCHITECT, and the Project is hereby declared to be substantially completed on the above date.

A tentative list of items to be completed or corrected is appended hereto. The failure to include an item on it does not alter the responsibility of the CONTRACTOR to complete all the Work in accordance with the Contract Documents.

City of Portland_____ _____
OWNER AUTHORIZED REPRESENTATIVE DATE

DOMENECH, HICKS & KROCKMALNIC _____
ARCHITECT AUTHORIZED REPRESENTATIVE DATE

==========

The CONTRACTOR accepts the above Certificate of Substantial Completion and agrees to complete and correct the items on the tentative list.

_____ _____
CONTRACTOR AUTHORIZED REPRESENTATIVE DATE

==========

EXCEPTIONS AS TO GUARANTEES AND WARRANTIES:

ATTACHMENTS:

END OF SECTION

SECTION 00836

CERTIFICATE OF FINAL COMPLETION OF WORK

CONTRACT NO. _____ AGREEMENT DATE _____

CONTRACT DESCRIPTION: Phase 2 - Parking Garage

FINAL COMPLETION DATE PER AGREEMENT AND CHANGE ORDERS _____

FINAL CERTIFICATION OF CONTRACTOR

I hereby certify that the Work as identified in the Final Payment Request for construction Contract Work dated _____, represents full compensation for the actual value of Work completed. All Work completed conforms to the terms of the Agreement and authorized changes.

_____ _____
Date CONTRACTOR

_____
Signature

_____
Title

FINAL CERTIFICATION OF ARCHITECT

I have reviewed the CONTRACTOR'S Final Payment Request dated _____ and hereby certify that to the best of my knowledge, the cost of the Work identified on the Final Estimate represents full compensation for the actual value of Work completed and that the Work has been completed in accordance with the terms of the Agreement and authorized changes.

_____ DOMENECH, HICKS AND KROCKMALNIC

Date ARCHITECT

_____
Signature

_____
Title

FINAL ACCEPTANCE OF OWNER

I, as representative of the OWNER, accept the above Final Certifications and authorize Final Payment in the amount of $_____ The guaranty for all Work completed subsequent to the date of Substantial Completion, expires one (1) year from the date of this Final Acceptance.

_____ City of Portland
Date OWNER

_____
Authorized Representative

_____
Signature

END OF SECTION

SECTION 00837

WAIVER OF LIEN
MATERIAL OR LABOR

State of

County of

To all whom it may concern:

Whereas _____ the undersigned

has been employed to furnish for the project known as Phase 2 - Parking Garage

City of Portland _____ County of Cumberland

State of Maine _____.

Know then for know ye that _____ the undersigned for

_____ and in consideration of the sum of

$ _____ and other good and valuable consideration the receipt

whereof is hereby acknowledged, do hereby waive and release from any and all, or claim the

right to lien on said above described project under the status of the State of

_____.

Relating to Mechanic's Lien on account of Labor or Material or both furnished or which may be

furnished by the undersigned to or on account of said _____ for said

building and premise.

Given under _____ my hand and seal this _____ day

of_____, 20_____.

Notarized: _____ this _____ day of _____, 2008

My commission expires _____ .

END OF SECTION

SECTION 00840

SPECIAL CONDITIONS

PART 1GENERAL

1. REQUIREMENTS INCLUDED

1.01 Project Timeframe:

Bids will be received on this project on Tuesday, January 8, 2008. The intent of this project is to construct the Phase 2 - Parking Garage. The contract time is spelled in the contract documents.

1.02 Milestone Schedule:

The Milestone Schedule indicates dates for significant activities during the construction period. Completion of an activity is considered to be attained when the Work of subsequent activities can proceed in accordance with scheduled dates. The Contractor shall coordinate construction scheduling and operations with the Precast Contractor to meet the milestone and completion dates outlined in this section.

The Contractor shall include a sufficient force of workmen and/or overtime work required to meet the completion dates bid by contractor under Part B. The Owner will not compensate the successful Contractor for any additional manpower and/or overtime work to meet completion dates.

If the Owner requests additional work to be completed, requiring premium/overtime, the Contractor shall perform such work for net costs plus applicable taxes and insurance, but without any addition for overhead or profits.

The following list of activities is not intended to be a complete breakdown of the Contractor's work; it is rather a list of projected project milestones, which must be met by the Contractor in order to insure timely project completion. Time is of the essence for this Contract. Final schedule to be developed between the Precast Contractor and the successful General Contractor based upon the schedule bid by the GC. The following schedule is the maximum allowed under the Part B schedule.

DESCRIPTION	START	COMPLETE
1. General Contractor Possession of Site	5/19/08	2/12/09
2. Anticipated Start of Foundations	6/1/08	
3. Erection of Precast	6/15/08	
4. Project Completion	2/12/09	

2. Construction Phasing/Construction Schedule:

2.01 Construction shall be performed in accordance with the Phasing Plans shown on the Contract Drawings, with modifications as approved by the Architect as necessary

throughout the progress of the work. The construction schedule has been carefully designed to provide the minimum interference with airport operations. It is imperative that the Contractor plan his/her work so that the schedule will be met.

It is the sole responsibility of the Contractor to complete each work area within the allotted time frame as designated on the detailed work schedules. The Contractor shall submit his/her work schedule for the upcoming week to the Resident Engineer 48 hours prior to the weekly meetings. Failure to submit this work schedule shall result in the cancellation of the weekly meeting and no work approved for the following week. No time extensions or additional costs will be considered by the Owner when this type of delay occurs.

The Contractor is required to provide sufficient labor, materials, and equipment to complete the project within the schedule prescribed in the Phasing Plans on the Contract Drawings.

3. Restriction on the Use of Grounds:

3.01 The Contractor shall confine its operations to the actual work sites, access routes and storage areas designated by the City's Facility Department or by its designee.

3.02 The Contractor shall have sole responsibility for providing all materials, equipment, or tools and any storage required will be at the Contractor's own risk.
The Owner will not assume responsibility for any loss of materials, equipment, or tools stored on its property.

3.03 All roads and haul routes used by the Contractor shall be maintained and kept clean during the course of the work. Any damage to existing surfaces, caused by the Contractor's operations shall be repaired and the areas involved restored to their previous condition, without cost to the Owner.

4. Vehicle Traffic Control and Access:

4.01 All vehicles, storage of materials and debris, and the operations of the Contractor in connection with the activities under this Section shall be confined to limits of the contract as shown on the drawings or as otherwise provided herein.

4.02 No arrangements for parking of personal vehicles will be made and employees are encouraged to take public transportation. Arrangements for temporary storage or parking of Contractor's trucks, cranes and other vehicles must be made in advance through the Architect.

4.03 Contractor shall arrange, provide, and maintain all safety barricades, temporary work enclosures and posting of safety/hazard signs in the work areas.

4.04 The work shall be conducted in a manner that will not interrupt or interfere with daily operations of the Portland International Jetport, the Jetport's lease holders, or with the orderly and safe passage of the general public.

5. Safety Summary and Airport Operations

5.01 The Contractor shall assume full responsibility and liability for compliance with all applicable standards and regulations pertaining to accident prevention, life, health and safety of all persons on the construction site, as well as the preventing damage to materials, supplies, and equipment. The Contractor will hold the City harmless for any

action, error, or omission on the Contractor's part, by the Contractor's employees or the Contractor's subcontractors that result in illness, injury or death.

The Contractor shall coordinate activities so as to ensure and identify specific operations that must be performed in accordance with special safety requirements and standards. Specific operations include, but are not limited to, the following:

Erection, inspection and maintenance of hand rails, barricades, nets, scaffolds, shoring, and warning signs.

Shoring and sheeting or sloping excavations, including the lighting and barricading of excavations that traverse or run parallel to roads or streets and that may thereby constitute a hazard to pedestrians and vehicular traffic.

Training and use of signalmen.

Certification of machine and equipment operators.

Ensure adequate sanitary facilities. Determine employee's physical qualification to assume their assigned duties.

5.02 The Contractors responsibilities:

The Contractor is responsible for the safety of all persons exposed to the site operation.

The Contractor shall provide first aid materials and resources, and shall post emergency phone numbers and procedures for the treatment of personnel in a conspicuous place. In addition, the Contractor shall clearly identify and maintain fire lanes and emergency exit routes. Further, the Contractor shall provide fire prevention plans and equipment along with the training of personnel in the use of said plans and equipment.

The Contractor shall provide personal protective equipment such as hardhats, eye protection, ear protection, etc., to personnel as required.

The Contractor shall also be responsible for general housekeeping and associated removal of trash that could possibly contribute to a safety hazard.

The Contractor shall provide proof of manufacturer's warranties and/or inspection for all equipment to be utilized on the job site prior to its being made operational.

5.03 Accident investigation and reporting:

The Contractor shall report all accidents resulting in disabling or fatal injuries along with those involving damage to property, materials, supplies and/or equipment. A standard form will be furnished to the Contractor along with instructions on how to prepare and submit a report for each reportable accident occurring on the project site.

5.04 Normal airport operations will be conducted on the airfield during construction and the work shall be performed in such a manner as not to interfere with the necessary operation of the airport. The Contractor shall take all precautions necessary to ensure the safety of operating aircraft as well as his/her own equipment and personnel. All crane use must be coordinated with Airport Operations in order to comply with FAA FAR Part 77 airspace restriction requirements. All changes in crane operations or heights must be scheduled at least 48 hours in advance of there erection to allow the issuance of a Notice to Airmen by Airport Operations. Contractor should expect that during times of low

visibility when instrument flight rules are active restrictions to the use of cranes may be imposed. Cranes must have flags and lighted beacons at all times.

6. Airport Security Requirements

6.01 The City of Portland is the operator of the Portland International Jetport. As the operator, the City is responsible for ensuring compliance with all security requirements as described in 49 CFR Part 1542. Security at the Portland International Jetport is necessary due to the sensitive and critical nature of civil aviation operations. This contract is outside the Security Identification Display (SIDA) and Air Operations Area (AOA), but it is expected that contractor will maintain site security and may be required to badge certain employees (Supervisors and managers) if the US Department of Homeland Security Threat level is raised. Under the current threat level employee badging is not necessary for the work being performed under this contract.

6.05 The Contractor shall submit a detailed safety and security plan covering all construction activities in or adjacent to AOA's for review and approval by Jetport Operations prior to the start of construction.

7. Hoisting Equipment and Machinery

7.01 All hoisting equipment and machinery required for the proper and expeditious execution and progress of the work shall be furnished, installed, operated and maintained in a safe condition by the Contractor and each Subcontractor for its own use. Written notification of deliveries must be provided to the Architect 72 hours in advance by the Contractor and each Subcontractor. Written approval must be obtained from the Architect at least 72 hours prior to delivery of cranes of hoists to the project.

7.02 Before any crane, pile drivers, or similar equipment can be utilized on the AOA or in landside areas affecting aircraft safety as defined by FAA regulations or the Jetport's Aviation Operations, the Contractor shall get approval from the Jetport Operations Department. The Contractor shall provide the Jetport with proposed heights/operating areas, and operating schedules of all cranes, pile drivers, and similar equipment. All tall equipment shall either have booms lowered or shall be moved out of areas affecting aircraft operations when not in operation or when directed for safety reasons. Such equipment shall, at all times, be provided with flags (international orange and white checkered) and obstruction lights at their tallest points and subject to approval by the FAA and Jetport Operations prior to erection.

7.03 The contractor shall obey all instruction as to the operation and routes to be taken by equipment traveling on Jetport property. Any signs, lights, signals, markings, traffic control and other devices which may be required by the Jetport shall be provided and maintained by the Contractor during the course of the work, subject to the approval of the Architect. No aircraft pavement or navigation aid currently lighted shall be left unlighted overnight unless closed to all airport operations. The Contractor shall check all temporary lighting to assure its operating condition before leaving the job each day.

END OF SECTION

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 PROJECT IDENTIFICATION AND REQUIREMENTS

A. Project Identification: The name of the Project on Contract Documents is Phase 2, Parking Garage, Portland International Jetport, Portland, Maine.

B. Scope: The work of this CONTRACT, Parking Garage and Site Improvements, for the Phase 2 Parking Garage includes, but is not limited to, the construction of:

- construction of a five-level precast concrete parking garage at grade, inclusive of a West stair/elevator tower separated form the garage by a 2-hour fire-rated construction.
- pedestrian canopies along the west, south and east boundary of the garage
- access to the underground electrical room located under the existing pedestrian ramp to the Car Rental Facility of the Phase-I structure.
- A truck shed and an office space addition to the existing Operators Building
- limited modifications to the existing Phase-I garage structure and the Operators Building
- limited temporary and permanent modifications of existing parking lots
- landscaping, signage and utility work associated with all of the above
- construction of stormwater treatment pond in the airport area adjacent to Yellowbird Rd.

C. Permits: The Contractor shall obtain and pay for all utility permits and fees, and City Road opening Permits. Fees from Central Maine Power and Verizon shall be paid directly by the Owner.

1.03 WORK UNDER OTHER CONTRACTS

A. Briefly without limitation, the work of this Contract includes coordination with other contractors performing the following work under separate contracts with the Owner:

B. Work of Other Contracts:

1. The City of Portland may have other Contractors working on various projects at the Portland International Jetport. The Contractor shall fully coordinate his work with that of other Contractors.

1.04 CONTRACT AND CONTRACT PROVISIONS

A. Contract Coordination: Briefly without limitation, the work of this Contract includes coordination with other contractors performing work under separate contracts with the Owner.

1.05 CONTRACTOR'S USE OF PREMISES

A. Contractor shall have complete and exclusive use of designated areas of the premises for execution of the Work. Contractor's use of premises is limited only to the Owner's right to perform work with his own forces. Contractor lay down areas shall be coordinated with the Facilities Department at the Portland International Jetport

B. Coordinate use of premises under direction of Architect and Owner.

C. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.

D. Move any stored Products, under Contractor's control, which interfere with operations of the building owner, building manager, Owner, or separate contractor.

E. Obtain and pay for the use of additional storage or work areas needed for operations.

F. Coordinate construction areas with all affected utility companies, rental car agencies, Lease holders, and airfield operations over the life of the contract.

1.06 OWNER'S OCCUPANCY

A. Partial Owner Occupancy: The Owner reserves the right to place and install equipment in completed areas of the building prior to Substantial Completion, provided that such occupancy does not interfere with completion of the Work.

1. Execute Certificate of Substantial Completion for each specific Portion of the Work prior to Owner occupancy.

1.07 OWNER-FURNISHED PRODUCTS

A. Products furnished and paid for by the Owner, described in Specification Sections, as determined at a later date.

B. Owner's Responsibilities:

1. Arrange for testing by an independent materials firm.
2. Inspect deliveries jointly with Contractor.
3. Submit claims for transportation damage.

C. Contractor's Responsibilities:

1. Designate delivery date for each Product in the Construction Schedule.
2. Review shop drawings, product data, and samples.
3. Receive and unload Products at the site.
4. Promptly inspect products jointly with Owner, record shortages, damaged, or defective items.
5. Handle Products at the site, including uncrating and storage.
6. Protect Products from exposure to elements, from damage.
7. Assemble, install, connect, adjust, and finish Products, as stipulated in the respective Section of Specifications.
8. Repair or replace items damaged by Contractor.

PART 2 PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01020

DIG SAFE

PART 1 GENERAL

1.01 DESCRIPTION

A. Comply with all regulations and laws concerning excavation, demolition or explosive work and be advised of "Dig Safe" requirements.

1. Comply with all regulations and laws concerning excavation and demolition in any public way, any public utility company right of way or easement, or privately owned land under which any public utility company maintains facilities. Use of explosives will not be allowed.

1.02 DIG SAFE

A. Within the State, "Dig-Safe" is the name of the Utility Underground Plant Damage Prevention Authority. The phone number is **1-888-344-7233 or 1-888-DIG-SAFE**.

B. The CONTRACTOR must notify "Dig-Safe" in writing, of contemplated excavation, demolition, or explosive work in public or private ways, and in any Utility Company Right of Way or Easement.

C. This notification must be made at least seventy-two (72) hours prior to the work, but not more than sixty (60) days before the contemplated work. Such notice shall set forth the name of the street or the route number of said way and an accurate description of the location and nature of the proposed work.

D. "Dig-Safe" is required to respond to the notice within seventy-two (72) hours from the time said notice is received, by designating at the locus the location of pipes, mains, wires or conduits.

E. The CONTRACTOR shall not commence work until "Dig-Safe" has responded as noted above. The work shall then be performed in such a manner, and with reasonable precautions taken to avoid damage to utilities under the surface in said areas of work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01022

ALLOWANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

B. Coordinate allowance work with other work of this project to ensure that each allowance is completely integrated and interfaced with related and adjacent work.

1.02 DESCRIPTION OF REQUIREMENTS

A. Definitions and Explanations: Certain requirements of the work related to each allowance are shown and specified in Contract Documents. The allowance has been established in lieu of additional requirements for that work, and further requirements (if any) will be issued at a later date by modification to the contract documents.

B. Types of allowances scheduled herein for the work include the following:

1. Lump sum allowances.

C. Selection and Purchase: At earliest feasible date, advise Architect of date when final decision on each allowance must be made in order to avoid delays in the work.

1. Submit suggestions, proposals and recommendations for each allowance to assist Owner in making final decisions.
2. Submit suggestions, proposals and recommendations for allowances in form required for change orders.
3. Purchase products and systems for each allowance as specifically directed (in writing) by the Architect.

D. Change Order Data: Where applicable, include in each proposed change order both the quantities of products being purchased and unit costs, along with total amount of purchases to be made.

E. Furnish Contractor's certification that quantities of products being purchased are the actual quantities needed with reasonable allowance for cutting losses, tolerances, mixing wastes, normal product imperfections and similar margins. When requested, prepare explanations and documentation to substantiate the margins as claimed. The Owner reserves the right to establish the actual quantity of work-in-place by an independent quantity survey, measure or count.

F. Indicate amounts of applicable trade discounts.

G. Comply with provisions of Owner/Contractor Agreement and General and Supplementary Conditions. For each allowance, Contractor's claims for increased costs must be submitted

with initial change order authorizing work to proceed on that allowance; otherwise, such claims will be rejected.

H. Excess Materials: Submit invoices or delivery slips to indicate actual quantities of materials delivered to site for each allowance.

1. Where economically feasible, and when so requested by the Architect, return unused materials to the manufacturer/supplier for credit to the Owner, after the installation has been completed and accepted.
2. Where it is not economically feasible to return unused material for credit and when so requested by the Architect, prepare unused material for the Owner's storage, and deliver to the Owner's storage space as directed. Otherwise, disposal of excess material is the Contractor's responsibility.

I. Unit-Cost Allowances: Each change order amount for unit-cost type allowances shall be based solely on the difference between the actual unit purchase amount and the unit allowance, multiplied by the final measure or count of work-in-place.

1. For unit-cost type allowances, submit a substantiated survey of quantities of materials, coordinate with the "Schedule of Values," and corresponding with change order quantities.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALLOWANCES:

A. Allowance No. 1: Allow $50,000 for revenue equipment, to be determined by the Owner.

B. "Allowance No. 2: Allow $150,000 to furnish and install a new Siemens HIPATH 4000 System (PBX Switch) in Tel/Com room #207 of the Terminal, a new HIPATH 4000 IPAP in Tel/Com room #G2-2 of the existing Phase 1 Garage, a new HIPATH 4000 IPAP in room #2312 of the Terminal, and the removal of the existing HICOM 300 system located in room #2312. Also included in the Cost of this allowance shall be the furnishing and installation of fiber optic interfaces at the equipment and the termination for all fiber and copper connections to the equipment as accomplished by Siemens Communications Inc. Personal. See section 16741: IP-BASED COMMUNICATION WITH CIRCUIT-SWITCHED COMMUNICATION SYSTEM"

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 PROCEDURES

A. For unit price items, the CONTRACTOR shall be paid for the actual amount of work accepted during the period of construction. After the Work is completed and before final payment is made, the ARCHITECT shall make final measurements to determine the quantities of the various items of work accepted as the basis for final payment.

B. For lump sum items, the CONTRACTOR shall be paid in accordance with the progress schedule and schedule of values on the basis of actual work accepted until the work item is completed. Upon completion of the item, one hundred percent (100%) of the lump sum price may be paid, less retained amounts.

C. All units of measurement shall be standard United States convention as applied to the individual items of work as specified and as interpreted by the ARCHITECT.

D. At the end of each day's work or at other frequencies determined by all parties, the CONTRACTOR'S superintendent or other authorized representative of the CONTRACTOR may meet with the Resident Project Representative and determine the quantities of unit price and/or lump sum price work accomplished and/or completed during the work day.

E. Once, and only once, each month the CONTRACTOR will prepare and sign an Application for Payment, and submit the original and seven (7) copies for review and signature of the Resident Project Representative and the ARCHITECT'S Construction Project Manager. These completed forms will provide the basis upon which payment will be made to the CONTRACTOR.

1.02 SCOPE OF PAYMENT

A. Payments to the CONTRACTOR will be made for the lump sum of the contract.

B. No payment of any Application for Payment or of any retained percentage shall relieve the CONTRACTOR of the obligation to repair or replace any defective parts of the construction or to be responsible for all damage due to such defects during the construction period or the one-year correction period.

1.03 PARTIAL PAYMENTS

A. Partial payments shall be made monthly as the work progresses. All partial invoices and payments shall be subject to correction in the final Application for Payment.

1.04 PAYMENT FOR MATERIAL DELIVERED

A. When requested by the CONTRACTOR, and at the discretion of the OWNER, payment

may be made for all or part of the value of acceptable, non-perishable materials and equipment which are to be incorporated into the Work, which have not been used and which have been delivered to the construction site, and placed in a storage area acceptable to the OWNER. The Application for Payment shall be accompanied by such data, satisfactory to the OWNER, that will establish the OWNER'S title to the material and equipment and protect the OWNER'S interest therein, including insurance. Each subsequent Application for Payment shall include an affidavit of the CONTRACTOR stating that all previous progress payments received on account of the Work have been applied to discharge in full, all of the CONTRACTOR'S obligations reflected in prior Applications for Payment. The OWNER shall have the right to deduct from the next progress payment an amount equal to payment for said material and/or equipment if reasonable and adequate proof is not submitted.

B. Materials and equipment, when so paid for by the OWNER, shall become the property of the OWNER and in the event of default on the part of the CONTRACTOR, the OWNER may use, or cause to be used, these materials and equipment in the construction of the Work. The CONTRACTOR shall be responsible for any damage to, or loss of, these materials and equipment. The amount paid by the OWNER shall reduce the estimated amounts due the CONTRACTOR as the material is incorporated into the Work.

C. No partial payment shall be made for fuels, supplies, lumber, false work, or other expendable or temporary materials, or on temporary structures of any kind which are not a permanent part of the Contract.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 GENERAL

A. The items of work required by the General Conditions – Section 00720, Special Conditions – Section 00840, and Division 1 – General Requirements shall not be measured and paid separately, except as expressly indicated therein, but shall be included in the prices bid for each unit and lump sum item.

B. The payment for various unit and lump sum items listed below shall include all materials, labor, tools, equipment, and incidental work necessary to complete the item in accordance with the plans and specifications whether or not the particular work is mentioned in the following paragraphs.

3.02 MEASUREMENT AND PAYMENT

A.

BID ITEM NO.	MEASUREMENT AND PAYMENT
1	PHASE 2 - PARKING GARAGE AND ADDITIONS TO OPERATORS BUILDING

Measurement shall be on a lump sum basis for construction of the Phase II Parking Garage, and other work required for this project.

Payment shall be at the lump sum, complete for all labors, materials, tools, and equipment necessary for the successful completion of the Phase 2 - Parking Garage Project. See Section 01010, Summary.

END OF SECTION

SECTION 01027

APPLICATION FOR PAYMENT

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for submitting the following:

1. Schedule of values.
2. Applications for Payment.

1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Document 00531, AGREEMENT; Agreement between Owner and Contractor.
2. Document 00720, GENERAL CONDITIONS and Document 00810, MODIFICATIONS TO GENERAL CONDITIONS; Progress Payments, Retainages, and Final Payment.
3. Section 01700, CONTRACT CLOSEOUT; Final payment.

1.03 SCHEDULE OF VALUES

A. Timing: Submit Schedule of Values allocated to the various portions of the Work within ten days after award of Contract.

B. When requested by Architect, submit substantiating data supporting the values submitted.

C. Intent: Unless objections are stated by Architect, the Schedule of Values will be used as the basis for the Contractor's Applications for Payment.

D. Form and Content of Schedule of Values: Type schedule on 8-1/2 in. x 11 in. white paper. Contractor's standard forms and automated printout will be considered for approval by Architect upon Contractor's request. Identify schedule with title of Project and location, Architect's project number, name and address of Architect, name and address of Contractor, Contract designation, and date of submission.

1. Line Item Categories: Follow the Table of Contents of Project Manual for major category items.
2. List installed value of component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.

E. Sub-Values: For each major line item, list sub-values of major products or operations under the item.

F. Overhead and Profit: For the various portions of the Work, include a directly proportional amount of the Contractor's overhead and profit.

G. Stored Material: Payments for stored material will be at the sole discretion of the Owner. If required, Contractor will be responsible for all costs of travel and lodging for Architect,

Engineers, and Owner to offsite storage locations. For items on which progress payments will be requested for stored materials, break down the value into the following sub-values:

1. The cost of material, delivered and unloaded at Project site, with taxes paid.
2. Installation cost including overhead and profit.
3. Insurance certificate, transfer of title, and photos.

H. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.04 APPLICATION FOR PAYMENT

A. Format: Submit itemized applications typed on AIA Document G702, Application and Certificate for Payment, and continuation sheets AIA Document G703.

B. Provide itemized data on continuation sheet. Format, schedules, line items and values shall match those of the Schedule of Values accepted by Architect.

C. Initial Application for Payment: Administrative actions and submittals that must precede submittal of initial application for payment, include the following:

1. List of subcontractors, suppliers, and fabricators.
2. Schedule of values.
3. Progress schedule.
4. Submittal schedule.
5. Copies of permits and other communications from authorities.
6. Performance bond and payment bond.
7. Unit price schedule (if required).

D. Preparation of Application for Payment: Execute each Application for Payment consistent with previous applications and payments certified by Architect and paid for by Owner. Review application with Architect/Engineer, on site, prior to submittal. Provide partial lien waivers for Work in progress, and full lien waivers for completed Work; for all subcontractors and suppliers. Fill in required information, including Change Orders information executed prior to date of submittal of this application. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets. Execute certification with signature of responsible officer of Contractor. Fill out continuation sheets as follows:

1. Fill in total list of scheduled component items of Work, with item number and scheduled dollar value for each item.
2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.
3. List each Change Order executed prior to date of submission at end of continuation sheets. List by Change Order Number, and description, as if an original item of work.

E. Substantiating Data for Progress Payments: When Owner or Architect requires substantiating data, submit suitable information with cover letter, identifying Project name, Architect's Project number, application number and date, and detailed list of enclosures. Submit one copy of data and cover letter for each copy of application.

1. For stored products, identify Item number and identification as shown on application along with description of specific material.

F. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. Show on this Application for Payment any Certificates of Partial Substantial Completion issued previously for Owner Occupancy of portions of the Work. Administrative actions and submittals that must precede submittal of this Application for Payment, include the following:

1. Occupancy permits.
2. Warranties.
3. Test/adjust/balance records.
4. Maintenance and operation instructions.
5. Meter readings.
6. Final cleaning.
7. Application for reduction of retainage.
8. Consent of surety.
9. Notification of shifting insurance coverages.
10. Final progress photographs.
11. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

G. Preparation of Final Application for Payment: Fill in Application form as specified for progress payments. Use continuation sheet for presenting the final statement of accounting as specified in Section 01700, CONTRACT CLOSEOUT. Administrative actions and submittals that must precede submittal of final Application for Payment, include the following:

1. Completion of Project closeout requirements.
2. Completion of incomplete Work.
3. Assurances that unsettled claims will be settled.
4. Transmittal of Project record documents to Owner.
5. Proof that taxes, fees, and similar obligations have been paid.
6. Removal of temporary facilities and services.
7. Removal of surplus materials, rubbish, and similar elements.
8. Change lock cylinders or cores.

H. Submittal Procedure: Submit Monthly Application for Payment to Architect at intervals stipulated in the Agreement, and as follows:

1. Number of Copies: Seven (7) copies of each Application.
2. When Architect finds Application properly completed and correct, he will transmit Certificate for Payment to Owner.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01028

MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies administrative and procedural requirements required for handling modifications to the Contract Documents, including, but not limited to:

1. Preliminary procedures.
2. Documentation of proposals and claims.
3. Architect's Supplemental Instructions.
4. Proposal Request (PR).
5. Construction Change Directive (CCD).
6. Change Order (CO).

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01300, SUBMITTALS.
2. Section 01600, MATERIAL AND EQUIPMENT; Substitutions.
3. Section 01700, CONTRACT CLOSEOUT.

1.04 DEFINITIONS

A. Change Order (CO):

1. Definition: See General Conditions.
2. Form: Unless otherwise indicated, form shall be AIA Document G701, Change Order.

B. Construction Change Directive (CCD):

1. Definition: A written order to the Contractor, signed by Architect which amends the Contract Documents as described, and authorizes Contractor to proceed with a change which affects the Contract Sum or the Contract Time, for inclusion in a subsequent Change Order.
2. Form: Unless otherwise indicated, form shall be AIA Document G714, Construction Change Directive.

C. Architect's Supplemental Instructions:

1. Definition: A written order, instructions, or interpretations, signed by Architect making minor changes in the Work not involving a change in Contract Sum or Contract Time.
2. Form: As stipulated by the Architect.

D. Proposal Request (PR):

1. Definition: A request to the Contractor, signed by the Architect, for submission of an itemized quotation for changes in the Contract Sum or Contract Time. This is not a Change Order or a direction to proceed with the Work.
2. Form: Unless otherwise indicated, form shall be AIA Document G709, Proposal Request.

1.05 PRELIMINARY PROCEDURES

A. Architect may initiate change by submitting a Proposal Request (PR) to Contractor. Request will include:

1. Detailed description of the Change, Products, and location of the change in the Project.
2. Supplementary or revised Drawings and Specifications.
3. The projected time span for making the change, and a specific statement as to whether overtime work is, or is not, authorized.
4. A specific period of time during which the requested price will be considered valid.
5. Such request is for information only, and is not an instruction to execute the changes, nor to stop Work in progress.

B. Contractor may initiate changes by submitting a written notice to Architect, containing:

1. Description of the proposed changes.
2. Statement of the reason for making the changes.
3. State of the effect on the Contract Sum and the Contract Time.
4. Statement of the effect on the work of separate contractors.
5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.06 CONSTRUCTION CHANGE AUTHORIZATION

A. In lieu of Proposal Request, Architect may issue a Construction Change Directive for Contractor to proceed with a change for subsequent inclusion in a Change Order.

B. Directive will describe change in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change, and will designate the method of determining any change in the Contract Sum and any change in Contract Time.

C. Architect will sign and date the Construction Change Directive and send it to the Owner for authorization for the Contractor to proceed with the changes.

D. Once authorized by the Owner, the Architect will send the Construction Change Directive to the Contractor. Contractor shall sign and date the Construction Change Directive to indicate agreement with the terms therein.

1.07 DOCUMENTATION OF PROPOSALS AND CLAIMS

A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Architect to evaluate the quotation.

B. On request provide additional data to support time and cost computations including, but not limited to:

1. Labor required.
2. Equipment required.
3. Products required.
   a. Recommended source of purchase and unit cost.
   b. Quantities required.
4. Taxes, insurance, and bonds.
5. Credit for work deleted from Contract, similarly documented.
6. Overhead and profit.
7. Justification for any change in Contract Time.

C. Support each claim for additional costs, and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal, plus additional information:

1. Name of the Owner's authorized agent who ordered the work, and date of the order.
2. Dates and times work was performed, and by whom.
3. Time record, summary of hours worked, and hourly rates paid.
4. Receipts and invoices for:
   a. Equipment used, listing dates and times of use.
   b. Products used, listing quantities.
   c. Subcontracts.

D. Document requests for substitutions for Products as specified in Section 01600, MATERIAL AND EQUIPMENT.

1.08 PREPARATION OF CHANGE ORDERS

A. Unless otherwise indicated, Architect will prepare each Change Order.

B. Form: Unless otherwise indicated, Change Order form shall be AIA Document G701.

C. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.

1.09 LUMP-SUM/FIXED PRICE CHANGE ORDER

A. Content of the Change Orders will be based on either:

1. Architect's Proposal Request and Contractor's responsive Proposal as mutually agreed between Owner and Contractor.
2. Contractor's Proposal for a change, as approved by Architect.

B. Owner and Architect will sign and date the Change Order as authorization for the Contractor to proceed with the changes.

C. Contractor shall sign and date the Change Order to indicate agreement with the terms therein.

1.10 UNIT PRICE CHANGE ORDER

A. Content of Change Orders will be based on, either:

1. Architect's definition of the scope of the required changes.
2. Contractor's Proposal for a change, as approved by Architect.
3. Survey of completed Work.

B. The amounts of the unit prices to be:

1. Those stated in the Agreement.
2. Those mutually agreed upon between Owner and Contractor.

C. When quantities of each of the items affected by the Change Order can be determined prior to start of the Work:

1. Owner and Architect will sign and date the Change Order as authorization for Contractor to proceed with the changes.
2. Contractor shall sign and date the Change Order to indicate agreement with the terms therein.

D. When quantities of the items cannot be determined prior to start of the Work:

1. Architect will issue a Construction Change Directive directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.
2. At completion of the change, Architect will determine the cost of such work based on the unit prices and quantities used.
   a. Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.
3. Architect will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
4. Owner and Contractor will sign and date the Change Order to indicate their agreement with the terms therein.

1.11 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/CONSTRUCTION CHANGE DIRECTIVE

A. Architect will issue a Construction Change Directive directing Contractor to proceed with the changes.

B. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this Section.

C. Architect will determine the allowable cost of such work, as provided in the AGREEMENT.

D. Architect will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.

E. Contractor will sign and date the Change Order to indicate their agreement therewith.

1.12 CORRELATION WITH CONTRACTOR'S SUBMITTALS

A. Periodically revise Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record the adjusted Contract Sum.

B. Periodically revise the Construction Progress Schedule to reflect each change in Contract Time.

1. Revise subschedules to show changes for other items of work affected by the changes.

C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01030

ALTERNATES

PART 1 GENERAL

1.01 SUMMARY

A. For each of the alternates Scheduled at the end of this Section, state the amount in the proposal to be added to or deducted from the Contract Sum for the work.

1.02 ALTERNATES

A. Definition: "Alternates" are alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at the Owner's option and under the terms established by the Contract or Agreement, be selected for the work in lieu of the corresponding requirements of the Contract Documents. Selection may occur prior to the Contract Date, or may, by the Agreement, be deferred for possible selection at a subsequent date.

B. Alternate Requirements: A Schedule of Alternates is included at the end of this Section. Each alternate is defined using abbreviated language, recognizing that the Contract Documents define the requirements. Coordinate related work to ensure that work affected by each alternate is complete and properly interfaced with work of each selected alternate.

C. Provide written proposals for each alternate on the Bid Form for Owner's consideration. Each proposal amount shall include the entire cost of the alternate portion of the work including overhead, profit, and other costs including cost of interfacing and coordinating the alternate with related and adjacent work.

D. Selection of Alternates: Selection of alternates to be included in the work will be by the Owner.

E. Notification: Immediately following award of Contract, prepare and distribute to each entity a notification of status of each alternate. Indicate which alternates have been accepted, rejected, or deferred for consideration at a later date. Include full description of negotiated modifications to alternates, if any.

1.03 DESCRIPTION OF ALTERNATES

A. Base Bid and Alternates:

1. Base Bid: For all structural steel exposed to view; Shop applied galvanizing and color coating per Section 05030, Galvanizing and Metal Coatings. Field applied UV topcoat.

2. Alternate No. 1: For all structural steel exposed to view; zinc rich system with UV topcoat, per Section 09900, Paint.

3. Alternate No. 2: For all structural steel exposed to view; zinc rich system with Floropolymer topcoat, per Section 09900, Paint.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 01040

COORDINATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies supervisory and administrative requirements for coordination of Work, including, but not limited to:

1. Coordination of work of employees and subcontractors.
2. Coordination Drawings.
3. Expedition of Work to assure compliance with schedules.
4. Coordination of Work with that of other contractors and work by Owner.
5. Compliance with orders and instructions of Architect or Owner.
6. Coordination of work with affected utility companies.
7. Coordination with airport operations.
8. Coordination with Avis Rental Car and other rental car agencies.
9. Coordination of work with airport Lease holders and their operations.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 00840, SPECIAL CONDITIONS.
2. Section 01045, CUTTING AND PATCHING.
3. Section 01200, PROJECT MEETINGS.
4. Section 01300, SUBMITTALS.
5. Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
6. Section 01700, CONTRACT CLOSEOUT.

1.04 COORDINATION BY CONTRACTOR

A. Coordinate the Work of the Contract, including utility and electrical work, and other subcontractors. Anticipate areas where the installation of utilities and electrical work will be restricted, congested, or difficult. Consult various affected subcontractors, utility companies, and end users.

B. Coordinate all Airfield Operation Area work with the Jetport Operations Department and those affected by the work.

C. Coordinate modifications to the Control Tower fence and access gate with Tower personnel.

1.05 COORDINATION DRAWINGS

A. General: Submit Coordination Drawings for areas where close and careful coordination of trades is required. The Contractor shall be fully responsible for coordinating trades, coordinating construction sequence and schedules, and coordinating actual installed location and interface of work.

B. Timing: Prior to fabricating materials or beginning work, supervise and direct the creation of one complete set of Coordination Drawings showing complete coordination and integration of work.

C. Intent: Coordination Drawings are for the Contractor's use during construction and are not to be construed as replacing Shop Drawings or Record Drawings. Architect's review of submitted Coordination Drawings shall not relieve Contractor from his overall responsibility for the coordination of work of the Contract.

D. Contractor Review and Submission: The Contractor shall carefully review, modify and approve Coordination Drawings in cooperation with subcontractors to assure conflicts are resolved before work in field is begun and to ensure location of work exposed to view is as indicated or as approved by Architect. The Contractor shall stamp, sign, and submit Coordination Drawing originals to Architect for review and approval following specified procedures and policies for "Submittals". Do not commence work in these areas until Coordination Drawings have been received and reviewed by Architect.

E. Distribution: When Coordination Drawings have been completed and approved by all parties, make prints and copies and distribute to Owner, subcontractors, suppliers, fabricators, and other parties requiring information from Coordination Drawings for proper coordination and performance of Work. Print copies of Coordination Drawings from approved reproducibles, only.

1.06 EXISTING UTILITIES

A. The Contractor shall notify public and private utility companies as required by law in advance of construction so that existing utilities may be accurately located and identified by the appropriate agency or utility. Comply with the requirements of the "Dig Safe" Maine.

B. Give advance notice to public and private utility companies as required by law, and provide proper disposition, subject to Architect approval of existing pipe lines, conduits, sewers, drains, poles, wiring, and other utilities that interfere with work, whether or not they are specifically indicated on Drawings. The Contractor shall immediately notify Architect and appropriate authorities when coming across an unknown utility line, and await decision as to how to dispose of same. When an existing utility line must be cut and plugged or capped, moved, or relocated, or has become damaged, the Contractor shall notify Architect and utility company involved, and assure protection, support, or moving of utilities to adjust them to new work. The Contractor shall be responsible for damage caused to existing, active utilities under work of this Contract, whether or not such utilities are indicated on Drawings, including resultant damages or injuries to persons or properties.

C. Provide temporary utility connections as indicated in the project construction drawings.

D. Phasing of the utility relocations is generally shown in the construction drawings. A detailed phasing plan shall be submitted by the contractor for review and approval prior to construction. The phasing plan shall detail the progress of the work, affected utilities, interruptions to utility service, and effects to traffic and other airport operations.

E. Provide stub connections for tie-ins to be completed under other contracts. Provide swing ties to locate stub connections.

F. The utility lines and other underground structures shown on the Contract Drawings have been compiled from field surveys and record, but the accuracy of the locations shown and the completeness of information is not guaranteed.

G. The Contractor shall check and verify the location of all existing utilities both underground and overhead before proceeding to begin the work or to order materials. Excavation shall be in accordance with all statutes, ordinances, rules and regulations of any city, state or Federal Agency that may be applicable. Any damage to the existing utilities caused by negligence on the part of the Contractor, and any other costs arising out of said excavation or by reason thereof, shall be repaired immediately by the Contractor at no additional expense to the Authority.

H. All known underground utility lines, drains and pipe lines are shown on the Contract Drawings. Should any phase of the work require excavating under existing utilities or otherwise endanger their support, the Contractor shall furnish and install at his/her own expense such temporary supports as may be required to prevent damage to or interruption of the utility or utilities involved. The required work involves excavating and constructing building foundations in close proximity to the existing utilities. Extreme care shall be used in working in areas where buried utilities are known to exist. Excavation in these areas shall be by hand. The Contractor shall have on the site, at all times, proper equipment for locating buried cable and such cable shall be located by hand-dug test pits before power equipment is permitted to work in the area. All existing underground utilities uncovered shall be located by the Contractor and noted on the Record Drawings. The Record Drawings shall note the type of utility, material, size, elevation, and horizontal position.

I. Should any other underground utility conflict be encountered, the Architect and the Owner may make a field check and direct such additional procedure as may be necessary to maintain or eliminate the interfering utility.

J. The Contractor shall be familiar with all utilities in the project area. Exploratory excavations shall be made to locate utilities that may be affected by the work, as directed by the Architect and the Owner. It is the Contractor's responsibility to locate and mark out these existing utilities to the best of his ability prior to beginning any excavation. No excavation shall commence until the Architect is satisfied that the Contractor has made every effort available to him to locate and mark out existing utilities. These efforts shall include, but will not be limited to, opening manholes, handholes, and light bases to determine the orientation of existing circuits, measuring cable insulation resistances and using a utility locator device capable of locating both metallic and nonmetallic utilities. The Contractor shall have an underground utility cable tracer located on-site and utilized on the site for the duration of the Contract. Once all existing utilities have been located and marked on the ground, the Contractor shall hand excavate all material in the vicinity of the known existing utility. Contractor shall be responsible for repairing any damaged utility immediately at his own expense.

K. Any electrical work performed must be coordinated with the Jetport Facilities Department in advance. If power is shut off because of work being performed by the Contractor, it is the responsibility of the Contractor to witness the shut-off by City personnel, as well as energizing of the system by City personnel. At no time will the Contractor be allowed to independently interrupt any electrical service or communications service. The Contractor shall not leave the

work area until all electrical and/or communications work has been inspected by the Architect and returned to full operation.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies administrative and procedural requirements for cutting, fitting, and patching work, including attendant excavation and backfill, required to complete the Work or to:

1. Make its several parts fit together properly.
2. Uncover portions of the Work to provide for installations of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to requirements of Contract Documents.
5. Remove samples of installed work as specified for testing.
6. Provide routine penetrations of non-structural surfaces for installation of piping, ductwork, and conduit.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01010, SUMMARY OF WORK; Description of Project.
2. Section 01040, COORDINATION.
3. Section 01600, MATERIAL AND EQUIPMENT; Substitutions and product options.

1.04 QUALITY ASSURANCE

A. Permission to patch any items of work does not imply a waiver of the Owner or Owner's Representative's right to require complete removal and replacement in said areas and of said items if, in Owner or Owner's Representative's opinion, patching does not satisfactorily restore quality and appearance of work.

B. Requirements for Structural Work: Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.

C. Operational and Safety Limitations: Do not cut-and-patch operational elements and safety-related components in a manner resulting in a reduction of capacities to perform in the manner intended or resulting in decreased operational life, increased maintenance, or decreased safety.

D. Visual Requirements: Do not cut-and-patch work that is exposed on exterior or in occupied spaces of building, in a manner resulting in reduction of visual qualities or resulting in

substantial evidence of cut-and-patch work, both as judged solely by the Owner or Owner's Representative. Remove and replace work judged by the Owner or Owner's Representative to be visually unsatisfactory.

1.05 SUBMITTALS

A. Submit a written request to Owner or Owner's Representative well in advance of executing any cutting or alteration which affects:

1. Work of Owner or separate contractor.
2. Structural value or integrity of any element of the Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance, or safety of operational elements.
5. Visual qualities of sight-exposed elements.

B. Request shall include:

1. Identification of the Project.
2. Description of affected work.
3. The necessity for cutting, alteration, or excavation.
4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of Project.
5. Description of proposed work:
   a. Description of why cutting-and-patching cannot (reasonably) be avoided.
   b. Scope of cutting, patching, alteration, or excavation.
   c. How it will be performed.
   d. How structural elements (if any) will be reinforced.
   e. Trades who will execute the work.
   f. Products proposed to be used.
   g. Extent of refinishing to be done.
   h. Approximate dates of the work, and anticipated results in terms of variations from the work as originally completed (structural, operational, visual, and other qualities of significance).
6. Alternatives to cutting and patching.
7. Cost proposal, when applicable.
8. Written permission of any separate contractor whose work will be affected.

C. Should conditions of Work or the schedule indicate a change of products from original installation, the Contractor shall submit request for substitution as specified in Section 01600, MATERIAL AND EQUIPMENT.

D. Submit written notice to Owner or Owner's Representative designating date and time the work will be uncovered.

PART 2 PRODUCTS

2.01 MATERIALS

A. Except as otherwise indicated or authorized by the Owner or Owner's Representative, provide materials for cutting-and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and including visual effect where applicable. Comply with the requirements, and use materials identical with the original materials where feasible and where recognized that satisfactory results can be produced thereby.

B. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of Project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of Products, or performance of work.

C. Report unsatisfactory or questionable conditions to Owner or Owner's Representative in writing; do not proceed with work until Owner or Owner's Representative has provided further instructions.

3.02 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of Work.

B. Provide devices and methods to protect other portions of Project from damage.

C. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.03 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

1. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
2. Comply with the requirements of applicable sections of Division 2 - SITEWORK where cutting-and-patching requires excavating and backfilling.

B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

C. Employ original installer or fabricator to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.
2. Sight-exposed finished surfaces.

D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

E. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.

F. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.

H. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.

1. Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch.

I. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.
2. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies field engineering services required for the Project, including but not limited to:

1. Survey work.
2. Civil, structural, geotechnical, or other professional engineering services specified, or required to execute Contractor's construction methods.

B. Owner's Representative will identify existing control points and property line corner stakes indicated on the Drawings, as required.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01010, SUMMARY OF WORK; Project description.
2. Section 01700, CONTRACT CLOSEOUT; Record documents.
3. Section 02145, Dewatering and Predrainage
4. Section 02401, Lateral Support of Excavation

1.04 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Qualified engineer or registered land surveyor, acceptable to Architect.

B. Registered professional engineer of the discipline required for the specific service on the Project, licensed in the State of Maine.

1.05 SURVEY REFERENCE POINTS

A. Existing basic horizontal and vertical control points for the Project are those designated on Drawings.

B. Locate and protect control points prior to starting sitework, and preserve all permanent reference points during construction.

1. Make no changes or relocations without prior written notice to Architect.

2. Report to Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require surveyor to replace Project control points which may be destroyed.
   a. Establish replacements based on original survey control.

1.06 PROJECT SURVEY REQUIREMENTS

A. Establish a minimum of two permanent bench marks on-site, referenced to data established by survey control points.

   1. Record locations, with horizontal and vertical data, on Project Record Documents.

B. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:

   1. Site improvements.
      a. Stakes for grading, fill, and topsoil placement.
      b. Utility slopes and invert elevations.
   2. Batter boards for foundations and structures.
   3. Controlling lines and levels required for mechanical and electrical trades.

C. From time to time, verify layouts by same methods.

1.07 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. On completion of foundation walls and major site improvements, prepare a certified survey showing all dimensions, locations, angles, and elevations of construction.

1.08 SUBMITTALS

A. Submit name and address of surveyor and professional engineer to Architect.

B. On request of Architect, submit documentation to verify accuracy of field engineering work.

C. Submit certificate signed by registered engineer or surveyor certifying that elevation and locations of improvements are in conformance, or non-conformance, with Contract Documents.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01090

REFERENCES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section identifies abbreviations and acronyms and includes definitions of words and phrases used in Contract Documents, definitions of standard Specification language, and explanation of Specification format and content.

1.03 QUALITY ASSURANCE

A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes establish stricter standards.

B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

1.04 ABBREVIATIONS AND NAMES OF ORGANIZATIONS

A. Obtain copies of referenced standards direct from publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents. For abbreviations not listed, and for addresses and phone numbers, refer to the "Encyclopedia of Associations", published by Gale Research Co., Inc., available in most public libraries.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials.
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGC	Associated General Contractors of America
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPA	American Sod Producers Association
ASTM	American Society for Testing and Materials

AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CDA	Copper Development Association
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
EJMA	Expansion Joint Manufacturer's Association
FGMA	Flat Glass Marketing Association
FM	Factory Mutual System
FS	Federal Specification
GA	Gypsum Association
IEEE	Institute of Electrical and Electronics Engineers
IMIAC	International Masonry Industry-All Weather Council
ISA	International Society of Arboriculture
MIL	Military Specification
ML/SFA	Metal Lath/Steel Framing Association
NAAMM	National Association of Architectural Metal Manufacturers
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NHDOT	New Hampshire Department of Transportation
NRCA	National Roofing Contractors Association
NSWMA	National Solid Waste Management Association
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	Product Standard
SCPI	Structural Clay Products Institute
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPRI	Single Ply Roofing Institute
SSPC	Steel Structures Painting Council
TAS	Technical Aid Series
TCA	Tile Council of America, Inc.
UL	Underwriters' Laboratories, Inc.

WCLIB West Coast Lumber Inspection Bureau

1.05 DEFINITIONS

A. General: Basic Contract definitions are included in the AGREEMENT.

B. Indicated: The word "indicated" refers to graphic representations, notes or schedules on Drawings, Paragraphs or schedules in Specifications, and similar requirements in Contract Documents. Terms such as "shown", "noted", "scheduled", and "specified" are used to help locate a reference. No limitation on location is intended except as specifically noted.

C. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted", are hereby defined as "directed by Architect", "requested by Architect", "authorized by Architect", etc. No implied meaning shall be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

D. Approved: The term "approved" when used in conjunction with the Architect's action on the Contractor's submittals, applications, and similar requests, is limited to the duties and responsibilities of the Architect as stated in the AGREEMENT. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.

E. Furnish: Supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

F. Install: Operations at Project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

G. Provide: To furnish and install, complete and ready for intended use.

H. Installer: The Contractor or entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1.06 SPECIFICATION FORMAT AND CONTENT

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16 Division format and Masterformat numbering system.

B. Specification Content: These Specifications use certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. Theses conventions are explained as follows:

1. Abbreviated Language: Language used in Contract Documents is abbreviated. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural, and plural words interpreted as singular where applicable.
2. Imperative Language: In general, imperative language is used in the Specifications. Except where specifically indicated otherwise, the subject of imperative statements is the

Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities to be fulfilled indirectly by the Contractor, or others when so noted.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01150

USE OF SITE, SCHEDULING AND PHASING OF WORK

PART 1 B GENERAL:

1.01 RELATED WORK:

A. Temporary partitions and barriers, and other temporary construction and services: SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

B. Site Work Phasing and Control Measures: SECTION 01901 - SITE PHASING.

1. Refer also to Site Phasing Drawings.

C. Access Roads, Parking Areas, and pedestrian ways: SECTION 01950 – TEMPORARY ACCESS ROADS, PARKING AREAS, AND PEDESTRIAN WALKWAYS .

D. Security: Section 01151 – JETPORT SECURITY REQUIREMENTS

1.02 GENERAL:

A. Except as otherwise specified herein all existing buildings and facilities of the Portland International Jetport, hereinafter referred to as Jetport must be kept in operation for purposes intended throughout entire Work of this Contract.

1.03 PROGRESS AND PHASING SCHEDULE:

A. General: Within 30 days of date established for Commencement of Work, submit a comprehensive computer generated CPM GANT type progress schedule indicating a time frame for each significant category or unit of work to be performed, including submittals, purchasing, staging and other preconstruction work. Arrange schedule to indicate required sequencing of units, and to show time allowances for submittals inspections and similar time margins.

1. Progress and submittal schedules may be submitted separately.

2. Show critical submittal dates related to each time item and time frame, or prepare separate coordinated listing of critical submittal dates.

3. Include multiple time frames to show each significant separate location for each category of work, if required.

a. Include separate locations for new construction and alteration work, as a minimum requirement.

4. Show phases of work within each time frame for major elements which involve purchase lead-time, fabrication, seasonal treatment, mockups, testing, or similar phases as well as installation. Where length of installation time exceeds 3 months, divide phase into 10 equal-dollar-volume segments (not necessarily of equal time length).

5. Show double cost line immediately below date line in heading, showing pre-calculated dollar-volume and space for recording actual dollar-volume of completed work at end of each period scheduled.

B. Phasing: Incorporate all Phasing requirements, both those specifically indicated and those required, in Progress Schedules.

C. Distribution of Schedules: Following initial revision of schedule after Architect and Owner=s review, print and distribute schedule to entities with a need-to-know responsibility, including three copies to Architect. Post in temporary office space. Revise at intervals matching payment requests, and redistribute/reports. Provide required copies with payment requests.

1. Post copies in project meeting room and temporary field offices.
2. When revisions are made distribute to entities receiving earlier versions.
3. Delete entities from distribution list as their assignments are completed and are no longer involved in the Work.

1.04 CONTRACT SITE; USE OF PREMISES:

A. Definitions:

1. "Limit of Work Lines" mean general limits of construction and alteration work intended under Contract as indicated on Drawings. Such terminology does not mean that any work beyond such "Limits of Work Lines" are not required. In particular, work necessary for connection or extension of new utilities or other work to existing shall be performed as required, even though such existing work is beyond the "Limits of Work Lines".

2. "Contract Site" means and includes:

a. General areas assigned to Contractor for new building construction and renovations.

b. Additional area as indicated, assigned for storage, staging and similar purposes, which will not necessarily be contiguous with the building area, or within the Limit of Work lines.

c. Areas required by Contractor for performance of site work beyond indicated Contract Site areas, including work within existing buildings and for roads and other construction in the public ways, while such work is in progress.

d. Note that Contract Site areas are subject to relocation as work of Project progresses and to suit needs of Owner.

e. Refer to Site Drawings for location of initial Contract Site areas and other requirements.

B. Work Outside of Indicated Contract Site Areas: Note that Jetport must remain in operation during construction period, and that all work beyond the indicated Contract Site Areas must be performed pursuant to Owner's requirements.

1. Contractor shall coordinate all activities with Owner, to provide as little dislocation and in convenience as possible to Jetport activities.

2. Contractor shall coordinate use of Contract Site with work to be performed directly by or under separate contracts by Owner.

3. It is expected that certain phasing of building construction and alteration work will be required, in addition to Site Phasing as specified in SECTION 01901.

   a. Note that work must be coordinated with Owner's requirements to keep the existing parking garage and terminal building facilities open throughout entire construction period, seven days a week, and within the Site Phasing requirements.

   b. Refer to SECTION 01901 and Drawings for additional requirements.

4. All work outside of Contract Site shall be subject to control, direction and approval of Owner as well as governing authorities having jurisdiction.

   a. Do no work in, or make use of in any way, outside of initial Contract Site areas, or beyond limits of work indicated, or in any areas indicated to be preserved or undisturbed, without prior approval.

   b. Where Work of Contract is necessary outside of Contract Site areas but within Jetport limits, such as for installation or connection of utilities, notify Owner minimum of ***TWO WEEKS*** in advance and secure approval. Perform all such work in a Get-in-and-get-out basis, only as absolutely necessary and with minimum feasible annoyance to staff or public; and minimum disturbance to construction, plants or other material to be preserved. Restore areas to pre-existing condition to extent feasible and to satisfaction of Architect.

   c. Do not utilize any areas outside of Contract Site areas for parking, storage, staging or other work unless otherwise specified without specific prior approval of Owner.

   d. **NOTE:** In all cases clearly define area of Contractor control, by approved barricades or, subject to approval of Owner, yellow caution ribbons for minor work operations. Conform to requirements of SECTION 01500 for caution signs. Place caution signs on doors or access roads/entrances leading to spaces or areas occupied exclusively by Contractor.

C. Restrictions on Jetport Usage: Comply with following site usage restrictions, for work both within and outside the Contract Site Areas:

1. All applicable rules and regulations of Owner.

   a. Comply in particular with all regulations pertaining to fire prevention, safety and use of facility by staff and public.

2. Security Requirements: Refer to SECTION 01151.

3. Comply with applicable laws and regulations regarding access to and egress from site.

4. Comply with specified erosion and sedimentation control requirements, as well as those required by governing laws, rules and regulations of DEP and other authorities having jurisdiction.

5. Allow Owner and others as designated by Owner access to Contract Site areas for approved activities.

6. Allow Owner and/or separate contractors access to Contract Site for performing of separate contract work indicated.

7. Do not disturb use of Jetport for intended purpose. Allow full access for buses, trucks and other vehicles.

   a. In particular do not impede access of emergency vehicle to any structures or facilities, including new construction and renovation work required under this Contract.

8. Conform to all speed, traffic control, parking, security and other requirements of Owner.

   a. Enforce compliance with all such requirements on employees, subcontractors and their employees.

9. Conform to designated access routes to site.

10. Owner reserves right to make reasonable restrictions on use of Jetport facilities and property by Contractor, at no additional cost to Owner, including but not limited to following:

    a. Prohibiting or limiting deliveries of materials or equipment during periods of highest airport passenger traffic.

D. Work During Evening Hours: ***NOTE:*** Evening Hours for this Contract is defined as between 8:00 p.m. and 5:00 a.m., seven days a week. There are no other periods when Jetport activity is slack.

1. Required Evening Work: Following work must be performed during evening hours, unless specifically approved otherwise by Owner, at no additional cost to Owner:

   a. Termination of any essential service, such as but including electrical or water service, and then only after two weeks minimum notice to Owner.
   b. All roadway work, sidewalks, other site construction affecting traffic to **and through** the Jetport.
   c. Selective removals and demolition work or construction which affects traffic to and through the Jetport..
   d. New construction work elsewhere, where it adversely affects flight operations.

2. Evening Work for Owner's Convenience: Owner may order other work to be performed during evening hours, at no additional cost to Owner.

3. Designated Evening Work During Other Hours: Owner may, but will not be required to, waive requirements for performance of designated work during evening hours, when it is determined that such work will not unduly affect Jetport operations. Owner reserves right to rescind any such approvals at any time.

4. Work During Evening Hours for Contractor's Convenience: Contractor may perform other work during evening hours for own convenience, subject to prior approval of and at no additional cost to Owner.

E. Parking: Contractor shall require employees to limit parking to assigned spaces and Contract Site areas. Violators shall be subject to all fines and other penalties imposed for illegal parking on the Jetport.

a. Owner does not guarantee availability of such parking spaces on the scheduled date.
b. Contractor shall make own arrangements with subcontractors for use of these or other facilities that may be provided by Owner.

F. Work on Road Ways: Perform work to provide minimal interference and annoyance to public. Comply with all requirements of authorities having jurisdiction. Apply for, pay for and obtain all necessary permits required for prosecution of the work, including but not limited to special street and sidewalk use permits, except as provided for otherwise in the Conditions of the Contract.

1. Provide heavy timber curbing around curbs, plywood boarding with beveled edges over sidewalks, before trucking over curbs or delivering heavy equipment.
2. Refer to 01900 Sections of Division 1 for additional requirements.

G. Access to Site: As indicated on Drawings.

H. Existing Services: Do not allow existing services to be disrupted, except for required brief disruptions for connection of power or other utilities.

1. Shutdown of Services: **NOTE WELL:** Where shutdown of essential services is required, no matter how briefly, Owner must be notified minimum of **two weeks** in advance, with notification stating date, starting time and expected duration of shutdown. **Do not make any disruption until Owner has granted approval.**

a. **NOTE WELL:** All such shutdowns shall be confined to period between 1:00 a.m. and 6:00 p.m., unless specifically approved by Owner, and shall be only for periods approved in advance by Owner. In all cases, restoration **must** be made prior to designated restoration period, using continuous emergency methods if necessary.

2. If any services are accidentally disrupted, immediately take all action necessary to restore same at earliest possible moment, and to mitigate results. Notify Owner as well as applicable utilities services or other entities.

3. In event of accidental disruption to emergency systems immediately notify Owner and appropriate emergency service agencies as designated by fire and police chiefs.

I. Egresses: Applicable egress codes must be complied with while the structure is occupied for any purpose. In particular building entrances and exitways must be kept open at all times while the building is occupied for any purpose, including during non-business hours.

1. Where necessary provide and maintain legally adequate temporary egresses, including plywood ramps with railings conforming to handicapped accessible requirements. Refer to SECTION 01500 for additional requirements.

1.05 SCHEDULING AND PHASING OF WORK:

A. Substantial Completion: Except as otherwise specified Substantial Completion is hereby defined to mean a stage of completion sufficient for Owner to have beneficial use and occupancy of the Work, including each room or space involved, less only minor corrections and repairs that can be performed without undue annoyance to staff, public and visitors which shall be documented on the "punch list" as specified hereinafter. Beneficial use and occupancy requires removal of all debris, surplus equipment and material, and areas involved by construction activities in broom clean condition or equivalent, all Code and security requirements met.

1. Refer to Conditions of the Contract for further description of Substantial Completion.

B. Phasing: Refer to SECTION 01901 - SITE PHASING and related Drawings. In addition to the specific Site Phasing requirements, building construction and alteration work must be phased to include following requirements:

1. New construction work cannot start until necessary site removals, utilities and other necessary site work is completed sufficiently to allow building construction to start.
2. Phasing and scheduling of work within the existing building is to be coordinated with Owner's requirements for keeping facilities operating at all times.
3. Note also that work must be coordinated with other projects in the immediate vicinity of the site that are being undertaken concurrently by other contractors to ensure that parking garage, terminal and other facilities remain accessible and operational at all times.

1.06 SECURITY:

A. Refer to SECTION 01151 - JETPORT SECURITY REQUIREMENTS.

END OF SECTION 01150

SECTION 01151

JETPORT SECURITY REQUIREMENTS

PART 1 GENERAL:

1.01 RELATED WORK:

A. Summary of Work: SECTION 01010.

B. Use of Site, Scheduling and Phasing: SECTION 01150.

C. Temporary Partitions and barricades and Other Temporary Construction and Services: SECTION 01950 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

D. Temporary Services: SECTION 01500.

E. Site Work Phasing Requirements: SECTION 01901.

1.02 FAA SECURITY REQUIREMENTS:

A. Conform to the requirements of Federal Aviation Administration (FAA) security regulations, FAR 1542, governing operation of airports with regularly scheduled air carrier operations. These documents can be accessed on the government website http://www.gpoaccess.gov/ecfr/.

A. When applicable, conform to requirements of the Appendix included in this SECTION 01151 entitled "Airport Security Regulations During Construction", outlining portions of FAA regulations pertinent to the Portland International Jetport. It is anticipated that most of the work on the Phase 2 Parking Garage project will be performed outside of the Security Identification Display Area (SIDA). However, there will likely be occasion when the contractor or its subcontractors may require access to this restricted area to perform project related work or activities. On these occasions, the security badging and airside restricted area security requirements as outlined in Appendix 1 of this section will apply.

1.03 GENERAL SECURITY REQUIREMENTS:

A. Initiate and maintain a Security Plan for entire Project Site, subject to approval of Jetport security authorities.

B. Provide temporary security and protection measures, including, but not by way of limitation, fire protection, barricades, warning signs/lights, site enclosure fencing, sidewalk bridges, building enclosure/lockup, personnel security program (theft prevention), environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at Project Site. Provide security/protection services and systems in coordination with activities and in a manner to achieve 24-hour, 7-day-per-week effectiveness.

C. Provide and maintain adequate protective measures to separate new construction areas from existing buildings and environs utilized by Owner, until new construction is Substantially Complete and in use by Owner.

D. Consult with and coordinate with Jetport security staff. Prepare and distribute a summary of agreements reached to all concerned entities, including all subcontractors and major material vendors.

1. Conform to all fire prevention and other safety regulations of Owner. Comply with all directives of Jetport fire department, Jetport safety personnel, and security department.

E. Conform to following as minimum requirements:

1. Provide system for control of vehicles and persons entering and leaving the Contract Sites and Related areas, as approved by Owner's security staff.

a. Provide approved system for identifying authorized vehicles.
b. Provide approved system of identification for all employees and authorized individuals.
c. Provide approved means of check-in and identification of authorized visitors.

2. Keep perimeters of Contract Sites secure at all times.

a. Keep gates, doors and other access to Contract Sites and related areas secured at all times other than normal working hours.

b. Unless gates, doors and other access points are locked, post guards at access points when Contract Sites are vacated or substantially vacated during normal working hours, as during lunch breaks.

3. Provide and maintain temporary fencing, temporary partitions and other work as indicated and required.

a. Refer to SECTIONS 01500 of Division 1 for additional requirements.

4. At earliest possible date, secure building against unauthorized entrance at times when personnel are not working. Provide secure temporary enclosures at all locations of possible entry, with locked entrances.

a. Coordinate with Jetport security staff.

5. Provide and maintain adequate protective measures to separate new construction areas from existing buildings and environs utilized by Owner, until new construction is Substantially Complete and in use by Owner.

1.04 PROTECTION OF EXISTING SERVICES:

A. Do not allow existing utilities or other services to be terminated other than for brief shutdown periods where necessary to connect new work. Before making any shutdowns, notify Owner at least two weeks in advance.

1. Refer to SECTION 01150 - USE OF SITE, SCHEDULING AND PHASING, for additional requirements.

1.05 FIRE PROTECTION:

A. General: Initiate system of fire protection for protection of the Work of Contract as well as all existing facilities and operations.

1. Conform as a minimum to all requirements of Portland Fire Department, represented by its Fire Prevention Division.

2. Conform in particular to requirements covering access by emergency vehicles to and through the various Contract Sites.

B. Fire Department Telephone Numbers: Post local fire department call number on each telephone instrument and at each fire extinguisher at Project Site.

C. Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at Project Site. Provide Type A extinguishers at locations of low potential for either electrical or grease-oil-flammable liquids fires; provide Type ABC dry chemical extinguishers at other locations. Post warning and quick-instructions at each extinguisher location, and instruct personnel at Project Site, at time of their first arrival, on proper use of extinguishers and other available facilities at Project Site.

1. Use of Permanent Portable Fire Extinguishers: Do not use permanent portable fire extinguishers for temporary construction use. Temporary units may be placed in permanent new cabinets or brackets, but fresh new extinguishers must be provided at or just before Substantial Completion.

D. Permanent New Fire Protection System: Complete each fire protection facility at earliest reasonable date, make ready for emergency use, and instruct personnel at site on availability and proper use.

E. Existing Fire Alarm and Fire Protection Systems: Maintain existing fire alarm and fire protection systems at all times. If shutdowns are necessary, confine to periods when building is unoccupied and only after prior notification to local fire department and Owner's insurance services. If terminated accidentally, notify police and fire department immediately and take all measures necessary to resume protection as soon as possible.

1. **NOTE:** Where existing fire alarm fire protection systems must be shutdown, Contractor shall engage fire watch from Portland Fire Department and pay all costs in connection therewith. **Arrange for invoices to be sent directly to Contractor, not Owner or Jetport.**

2. **NOTE:** If existing fire alarms or fire protection system accidentally terminated, notify Fire Department immediately and arrange for immediate fire watch until services are resumed, at full expense of Contractor.

Followed by Appendix 1 Airport Security Requirements During Construction.

Appendix 1

AIRPORT SECURITY REGULATIONS DURING CONSTRUCTION

This document is offered as an aid to assist the Contractor in planning and executing construction. It is offered as a guideline and thus is not all-inclusive.

At some point every airport must perform some form of construction or maintenance. It is a necessity for airports to grow and develop; however, as necessary as construction may be, airports assume a great deal of risk and liability during construction events. Construction activities can be difficult and dangerous and airports must take appropriate precautions to limit their exposure and risk. The following outlines are intended as an overview that may change or be added to at anytime during construction so it is important that the Contractor develop a relationship and remain in constant communication with the Airport Security Coordinator at all times to monitor and act upon any changes which may be occurring.

PRE-CONSTRUCTION PLANNING

The Contractor must develop a Security Plan. The plan is a mandatory item for all construction projects to maintain the safety of passengers, airline crews and Jetport personnel. The Security Plan is a mandatory item to ensure continuity of operations during construction. The Security Plan must be presented to the Jetport at the preconstruction meeting for review and must be in operation from the first day of mobilization through the last day of demobilization. The Security Plan should consist of, but is not limited to the following:

The Contractor must meet with all affected parties before the beginning of construction. Gather contact information for points of contacts and emergency contacts identified in the Security Plan.
The Contractor must develop and coordinate a construction vehicle control plan – see section on Ground Vehicles.

The Contractor must advise the Jetport how they will apply and comply with the Security Plan before they begin construction work.

The Contractor must develop procedures for protecting safety areas, obstruction slopes, and other areas that must be protected.

The Contractor must set specific limitations for construction activity that will effect operations or passenger safety.

The Contractor must know and understand all airport operational procedures that may affect them or their work.

The Contractor must advise the Jetport of all procedures that will be used during construction to adapt to and accommodate significant changes in airport operations or construction.
Construction has a significant potential to develop foreign object debris (FOD) – the Contractor must plan to limit the amount of FOD and keep the construction site clean at all times. Regular garbage disposal must be part of the plan

The Contractor must use sweepers on the ramp to control FOD.

The Contractor must note that non-compliance to the Security Plan will result in severe penalties.

The General Contractor can be fined up to $25,000 and employees up to $10,000 for not observing the security guidelines; therefore it is very important that the Contractor familiarizes himself with these procedures.

The Contractor is responsible for all education of control procedures for Sub-Contractors.

The Contractor must be aware that aircraft, ramp personnel and their support vehicles always have the right of way.

The Contractor must make sure that construction lighting is shielded to prevent blinding pilots or the ATCT. (Air traffic control tower)

The Contractor must inspect closed areas thoroughly before opening to airport operation use.
Before construction begins, the Contractor must make sure to use as-built plans and other documents to prevent the accidental disruption of NAVAID, power, or communications cables/wires.

The Contractor must put in place measures to control dust during construction. Dust clouds can disrupt visibility, can obscure markings and signage, damage aircraft and can be an environmental hazard.

The Contractor shall be required to properly train and badge its designated employees in accordance with the City of Portland's Security Training Program. It is recommended that the ratio of non-badge employee to a badged employee should be no more than 4:1. See security guidelines for details.

SAFETY AREAS AND WORK LIMITS

Every day the Contractor must check in with the Communication Center and convey the nature of work for that particular day. The Contractor can also at that time get parking validated if parking in the garage and/or get issued contractor keys if applicable.
During construction the Contractor must implement the specifics of the safety plan, including performing actions needed to protect critical areas such as runway safety areas, obstacle free zones for emergency vehicles and ramp equipment.

The Contractor will not be allowed to stockpile materials in the emergency access ways.

The Contractor should not park equipment in the emergency access ways.
Temporary cranes must be NOTAM'd (notice to airmen) and marked with flags during the day and at night the boom must be stored in the horizontal (lowered) position.

GROUND VEHICLES

The Security Plan must address ground vehicle control and operator training. All drivers that are projected to drive on the ramp (secure areas) must attend the driver's education class and pass an examination. The class is every Thursday at 9:00am and takes approximately 45 minutes. All vehicle operators on the ramp must be thoroughly trained in airport procedures, airport geometry, and communications. Heavy fines will apply if the Contractor does not comply with procedures.

The Contractor must ensure that crane parking areas do not restrict Air Traffic Control's (ATC) line-of-sight, infringe on Navaid signals, or impact FAR Part 77 imaginary surfaces.

The Contractor must limit vehicle access to airfield movement areas using security procedures at perimeter gates, utilizing guards and signs.

The Contractor must limit vehicles in the secure areas to only those absolutely necessary.

The Contractor is responsible to provide authorized escorts to construction/delivery vehicles as needed.

The Communication Center will issue a temporary pass for each vehicle temporary access to the aircraft operations area. Vehicles will be restricted to non-movement areas (ramps) unless under escort by an authorized vehicle in accordance with Federal Aviation Regulations. Temporary vehicle passes are colored and numbered sequentially. When requesting a vehicle pass the contractor should provide vehicle registration as well as a certificate of insurance with the City of Portland named as additional insured. This pass should be placed on the dash of the vehicle. When the work is completed, the pass must be returned to the Communication Center.

SECURITY GUIDELINES

There are specific security issues/requirements associated with construction and the Portland International Jetport. It is the Contractor's responsibility, as mentioned previously, to coordinate and communicate with the Airport Security Coordinator and/or the Communication Center at all times during the construction period. They must be briefed on all phases of the construction regarding breaches of the secure area to allow monitoring and communication with the TSA (Transportation Security Administration) group.

The Contractor must ensure that temporary gates are monitored when in use, adequately secured when not in use, and equipped so they can be securely closed at the end of the day.
The Contractor must familiarize employees with the importance of the term "piggybacking". "Piggybacking" is where authorized persons have passed through an entry point but only presented one badge. It is mandatory that all authorized persons use their badge when passing through into the secure area.

Temporary fencing must not only keep out unwanted personnel and vehicles, it must also be designed to prevent access of animals. All penetrations to fencing must be reported to the Communication Center and repaired immediately to prevent entry of large animals onto the ramp.

On an as needed basis, the Contractor will provide qualified security personnel in the construction zone for purposes necessary to complete the work if no authorized employee is available. The Contractor must employ either the Portland Police department or the security company currently contracted by the Jetport.

If vehicles owned by the Contractor and/or Sub Contractors are to be used on the Air Carrier Apron, the vehicles will be equipped with roof mounted strobe amber colored lights for easy identification.

The Contractor must ensure that no equipment be located, at any time, any closer than 6 feet from the outside of the construction fence to maintain security.

The Contractor must assign one of their employees as Security Supervisor and make that person known to the Airport Security Coordinator.

The Security Plan must ensure that each authorized person continuously displays airport issued or approved identification while in restricted areas. Unescorted access allows properly identified individuals who have met the requirements of Federal Aviation Regulations to work in restricted areas without a representative of the airport present. For contractors this identification is BLUE in color and issued by the City of Portland. A properly authorized supervisor and/or foreman may act as an escort for a crew.

Employees who will require unescorted access to restricted areas must have a (Portland International Jetport) PWM security I.D. prior to beginning work at the airport. All employees who are projected to have a PWM security I.D. must be fingerprinted. All employees who are projected to have a PWM security I.D. must fill out the Badge and Fingerprint forms which are available at the airport manager's office. Copies of these forms are attached to this appendix. Both forms must be filled out and signed by the employee and employer, and the employer must verify on the reverse side of the badge application. A list of acceptable forms of identification are attached with the badge application. These ID's must be brought to the Communication Center along with the badge application and fingerprinting forms. The fingerprinting will not take place if the I.D.'s are not presented and forms complete. The cost of the application, per person, is $40. The Portland International Jetport fingerprints individuals 9am - 12pm & 1pm-5pm Monday-Friday. The fingerprinting process should take

no longer than 1/2 hour. The results are normally returned within 72 hours however only individuals that are cleared and posted on the cleared individuals list will be allowed to take the computer based training. Drivers education for "Limited" and "Unlimited"must be scheduled through Brad Wallace, Airport Operations.(207-842-8296) "Restricted" driving privileges can be given via the automated computer based testing once the contractor has a designated a trainer or has contacted Brad Wallace and set up other arrangements.

The Contractor must monitor their personnel's compliance with airport rules and the construction Security Plan for the duration of the project.

The City of Portland is accountable to the Transportation Security Administration (TSA) for all airport issued identification. Fines for lost, stolen or non-returned identification are as follows:

Personal Identification: First reissue - $100
Second reissue - $150
Third reissue - $200

The City of Portland is authorized to produce, retrieve and control airport issued identification.

Temporary Fencing: Should a phase of construction require that the existing perimeter fence be removed, temporary security fencing must be erected by the contractor. This security fence must provide the same degree of security as the existing fence. At no time should an unauthorized individual be able to gain access to the air operations area as the result of the lack of fencing. It may be necessary for the contractor to assign properly badge individual(s) whose main function is to prevent such an event from occurring during times when the fence is not in place. It will be the responsibility of the contractor(s) to ensure that unauthorized persons and vehicles do not gain access to the air operations area or any other restricted area.

Perimeter Gates: All field gates are controlled by the Jetport's Intellikey Lock System. All other gates have been permanently padlocked shut. Keys are non-duplicable and may be issued to authorized, properly badged individuals through the Communication Center. Should access authority be removed for an individual possessing a key, the key and identification must be returned to the Communication Center as soon as possible after termination of access authority.

While gates are open and unsecured, there must be at least one properly badged individual positioned at the gate until the gate is again secured. This individual will be responsible for ensuring that no unauthorized persons are allowed access to the air operations area. This individual is also responsible for ensuring that persons and vehicles entering the air operations area are displaying proper identification.

Persons having access authority under the Lock and Key Control Plan will be required to acknowledge by signature the policies of this plan and understand that lost keys will result in a lost badge fee of $50. Keys will be provided to only those persons whose office duties require access to the area beyond that point of access.

The Contractor must not leave any vehicle, tools, equipment, or materials unattended at any time outside of the construction zone fence. Failure to observe this will result in heavy fines and confiscation of the article left unattended.

END OF SECTION 01151

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies administrative and procedural requirements for project meetings, including but not limited to:

1. Pre-Construction Meeting.
2. Pre-Installation Conference.
3. Progress Meetings.
4. Coordination Meetings.
5. Special Meetings.

B. Representatives of contractors, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. Architect may attend meetings to ascertain that Work is expedited consistent with Contract Documents and construction schedules.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01040, COORDINATION
2. Section 01300, SUBMITTALS.
3. Section 01700, CONTRACT CLOSEOUT.

1.04 PROJECT MEETINGS, GENERAL

A. Agendas: Agendas for Project Meetings shall be prepared by the Architect. Distribute copies to parties in attendance. For meetings involving the contractor his/her employees, and subcontractors, agendas shall be prepared by the contractor.

B. Meeting Notices: Prepare and distribute written notices of Project Meetings four working days in advance of each meeting.

C. Arrangements: Make physical arrangements for Project Meetings, including but not limited to:

1. Arranging space and seating.

D. Preside at Project Meetings.

E. Minutes: Record minutes of Project Meetings, including procedures and decisions. Written minutes of all project meetings called for by the Architect will be distributed by the Architect. Minutes of all other meetings shall be prepared by the Contractor.

F. Distribution of Minutes: Reproduce and distribute copies of Project Meeting minutes within three working days after each meeting to participants of meeting, to parties affected by decisions made at meetings, and to Architect.

1.05 PRE-CONSTRUCTION MEETING

A. Schedule within 15 days after date of Notice to Proceed.

B. Location: A central site, convenient for all parties, designated by Architect.

C. Attendance: Require and notify the following to attend

1. Architect and his Professional Consultants.
2. Contractor's Superintendent.
3. Major subcontractors.
4. Major suppliers.
5. Utility Company representatives.
6. Others as appropriate, including but not limited to, Rental Car Agencies, APCOA, Airfield operations, Portland Fire Department, Lease holders, etc.

D. Suggested Agenda:

1. Submittal of executed bonds and insurance certificates.
2. Execution of Contract.
3. Distribution of Contract Documents.
4. Submittal of list of Subcontractors, list of products proposed for installation, schedule of values, and progress schedule.
5. Project Coordination, including designation of responsible personnel.
6. Projected Construction Progress Schedules.
7. Critical work sequencing.
8. Major equipment deliveries and priorities.
9. Submittal of list of products proposed for substitution under Section 01600 - Product Option and Substitution.
10. Procedures and processing of:
    a. Field decisions.
    b. Proposal Requests.
    c. Submittals.
    d. Change Orders.
    e. Application for Payment.
    f. Testing and quality control
11. Certified payroll requirements for CONTRACTOR and Subcontractors.
12. Adequacy of distribution of Contract Documents.
13. Procedures for maintaining Record Documents.
14. Safety and first-aid procedures.
15. Security procedures.
16. Housekeeping procedures.
17. Coordination with other contracts and/or work.
18. Use of premises by OWNER and CONTRACTOR.

19. Construction facilities and controls provided by CONTRACTOR.
20. Construction facilities and controls provided by OWNER.
21. Temporary utilities provided by OWNER.
22. Field engineering.
23. Preconstruction/Preblast Survey.
24. Major equipment deliveries and priorities.
25. Project inspection.
26. Labor requirements.
27. Requirements of railroads, highway departments, other agencies and utility companies.
28. Rights-of-way and easements.
29. Winter maintenance.
30. Requirements for start-up of equipment.
31. Inspection and acceptance of equipment put into service during construction period.
32. Substantial completion of Work.
33. Final completion of Work.

1.06 PRE-INSTALLATION CONFERENCES

A. Conduct pre-installation conferences at site prior to construction activities which require coordination. Installers, manufacturer's representatives, and fabricators of materials or systems affected shall be required to attend. Advise Architect of scheduled meeting dates.

B. Do not allow affected work to proceed if the conference cannot be successfully concluded. Initiate actions necessary to resolve impediments to performance of the work and reconvene the conference at the earliest feasible date.

1.07 PROGRESS MEETINGS

A. Schedule regular periodic meetings, as required. Initially weekly meetings will be held to coordinate work activities.

B. Hold called meetings as required by progress of the Work.

C. Location of the meetings: Project field office of Contractor.

D. Attendance: Require and notify the following to attend:

1. Architect, and his professional consultants as needed.
2. Subcontractors, as appropriate to the agenda.
3. Suppliers, as appropriate to the agenda.
4. Utility Company representatives, as appropriate to the agenda.
5. Others, as appropriate to the agenda.

E. Suggested Agenda:

1. Review and approval of minutes of previous meeting.
2. Review of Work progress since previous meeting.
3. Field observations, problems, conflicts.
4. Problems which impede Construction Progress Schedule.
5. Review of off-site fabrication, and delivery schedules.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Progress Schedule.
8. Progress schedule during succeeding work period.

9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for:
    a. Effect on Construction Progress Schedule and on completion date.
    b. Effect on other contracts of the Project.
14. Other business.

1.08 COORDINATION MEETINGS

A. Conduct Coordination Meetings as necessary to properly coordinate the trades. Require representation of parties involved in coordination or planning of activities involved.

1.09 SPECIAL MEETINGS

A. Conduct Special Meetings as required throughout the course of the Work. Special meeting issues may include, but are not limited to:

1. Safety issues.
2. Security issues.
3. Labor issues.
4. Special schedule issues.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies administrative and procedural requirements for submittals required for performance of Work, including:
   1. Progress schedules.
   2. Submittal schedule.
   3. Shop drawings.
   4. Product data.
   5. Samples.
   6. Progress reports.
   7. Construction photographs.
   8. Construction Administration software and procedures.

B. Administrative Submittals: Refer to requirements specified the Contract Documents, for administrative submittals, including:
   1. Permits.
   2. Applications for payment.
   3. Performance and payment bonds.
   4. Insurance certificates.
   5. List of subcontractors.
   6. Partial Lien Waivers.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:
   1. Section 01010, SUMMARY OF WORK.
   2. Section 01040, COORDINATION; Coordination drawings.
   3. Section 01050, FIELD ENGINEERING; Survey and layout data submittals.
   4. Section 01410, TESTING LABORATORY SERVICES; Testing Laboratory reports.
   5. Section 01600, MATERIAL AND EQUIPMENT; Manufacturer's instructions.
   6. Section 01600, MATERIAL AND EQUIPMENT; Contractor's list of Products.

7. Section 01700, CONTRACT CLOSEOUT; Closeout submittals.

1.04 SUBMITTAL PROCEDURES

A. The Owner requires that construction administration submittals shall be made via a web-based application for construction administration (WEB-CA) system allowing the electronic storage of documents under the Portable Document Format (PDF). This WEB-CA system will be kept available - to individuals allowed access to it - at all times. All information posted to WEB-CA will be maintained throughout the duration of the Construction Contract. Paper copies are not acceptable unless legally required by jurisdictions (i.e. for permit documents) or by City of Portland departments (i.e. for requisitions). Use one of the following:

1. E-Builder (http://www.e-builder.net) or PROLOG (http://www.meridiansystems.com) or Owner approved equal. Either as part of WEB-CA or as a separate procedure, provide an electronic file uploading (posting) notification procedure via electronic mail messaging to all entities required to be noted as set forth in each section of this project manual.
2. Use of these systems shall be in accordance with AIA Documents E201, Digital Data Protocol Exhibit and AIA Documents D401, Certification of Document's Authenticity. Version 2007.
3. Provide a minimum of 20 hours of training in use of selected system to Architect and Owner's personnel prior to the start of the Work. The hours of training will be divided in two sessions to occur in two locations: Portland ME and Boston MA.
4. Provide list of names of Contractor's personnel trained in system use.
5. Pay all license fees for the project team.
6. Furnish an implementation plan to the Architect and Owner for approval, within 15 days of award of Contract.

B. Coordination of Submittals: Coordinate timing of submittals with construction activities. Transmit submittals well enough in advance of performance of Work to avoid delays. Coordinate submittals of related elements of Work.

1. Architect may reject, or withhold action on submittals requiring coordination with other submittals until related submittals are received.

C. Processing of Submittals: Allow sufficient review time to ensure installation will not be delayed because of time required to process submittals. Minimum processing times are as follows:

1. Review by Architect: Allow ten business days for review and processing after date of posting in WEB-CA.
2. Review by Architect and Consultant: Allow ten business days for review and processing of submittals by Architect, and an additional five business days for review by each consultant.
3. Reprocessing of Submittals: For submittals not approved initially, allow ten business days for review and reprocessing of submittals by Architect, and an additional five business days for review by each consultant.
4. No extension of Contract Time will be authorized due to failure to transmit submittals

sufficiently in advance of scheduled performance of Work.

D. Contractor's Preparation of Submittals: Via electronic mail messaging, Submit to ARCHITECT posting notification of each submittal in WEB-CA using transmittal form provided in this Section. Indicate Project Name, Architect's Project Number, Specification Section number and title, date of submittal, name and address of Architect, name and Address of Contractor, name and address of subcontractor and/or supplier, name of manufacturer, Drawing number and detail reference.

1. Modify and customize submittals as required to show interface with adjacent work and attachment to building.

E. Transmittal of Submittals: Identify Project, Contractor, subcontractor, major supplier; identify pertinent Drawing sheet and detail number, and Specification section number, as appropriate, in transmittal.

1. Source: Submittals received from sources other than Contractor will be returned without action.
2. Deviations from Contract Documents: When products, materials, or systems submitted deviate from Contract Documents, record deviations clearly in transmittal.

F. Comply with progress schedule for submittals related to Work progress.

G. After Architect returns reviewed submittal, revise and resubmit as required. Identify changes made since previous submittal.

H. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report inability to comply with provisions.

1.05 PROGRESS SCHEDULE

Procedures for preparation and submittal of construction Progress Schedules and periodic updating are as follows:

A. Timing: Submit progress schedule within 30 calendar days of Award of Contract.

B. Format:

1. Prepare Schedules as a critical path method charting (CPM) with separate node for each major portion of Work or operation, identifying first work day of each week and identifying each portion of the Work that is critical to timely project completion. All project scheduling shall be prepared using CPM analysis. Pre-Installation Meetings and Coordination Meetings, shall be included in Progress Schedules
2. Sequence of Listings: The chronological order of the start of each item of Work.
3. Scale and Spacing: Provide space for notations and revisions.
4. Sheet Size: Multiple of 11x17 inches.

C. Content:

1. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction and total activity duration.
2. Identify each item by major specification section number.
3. Specifically identify activity predecessors (i.e., which activities must be completed before following activity can start) and successor (i.e., which activities must be followed once an

activity is completed)

4. Identify work of separate stages or separate floors, and other logically grouped activities.
5. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the last day of each month.
6. Provide separate schedule of submittal dates for shop drawings, product data and samples, and dates reviewed submittals will be required from Architect. Show decision dates for selection of finishes.
7. Coordinate content with Payment Items.
8. CONTRACTORS shall not engage in float manipulations which have the net effect of sequestering float time. Examples of networking techniques disallowed under this provision includes such strategies as extending time duration estimates, and scheduling items required for final completion as though they were prerequisites to substantial completion.
9. Schedule must identify length of work week; length of work day; and anticipated holidays.

D. Submittals:

1. Submit initial Progress schedule at the pre-construction conference. After review, resubmit required revised data within ten (10) days.
2. Submit revised progress schedules for review and approval, at a minimum, with each application for payment, or whenever, in the Architect's opinion, sufficient progress slippage warrants a more timely update. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.
3. Post electronic files in WEB-CA in prearranged and clearly identifiable electronic folders.

E. Distribution:

1. Communicate either electronically or through distribution of hardcopies to job site file, subcontractors, suppliers, and other concerned entities the reviewed schedule.
2. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

1.06 SUBMITTAL SCHEDULE

A. Timing: Prepare and issue complete Submittal Schedule no later than ten working days after Architect accepts Progress Schedule.

B. Preparation: Coordinate Submittal Schedule with Progress Schedule, and Schedule of Values.

C. Content of Submittal Schedule: Prepare schedule in order by Specification Section. Provide the following information for each submittal:

1. Scheduled date of initial submittal.
2. Specification Section number.
3. Submittal type.
4. Name of subcontractor or supplier.

D. Distribution: The Submittal Schedule will be communicated electronically through WEB-CA to

the Owner and the Architect. Subcontractors and other parties affected will be notified as required, either through WEB-CA or by printing and distributing to them hardcopies of the Submittal Schedule. Post copies in field office.

E. Submit initial Submittal schedule at the pre-construction conference. After review, resubmit required revised data within ten (10) days.

F. Revisions: Update and reissue Submittal Schedule monthly in conjunction with Application for Payment or as required.

1.07 SHOP DRAWINGS

A. Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this Project by posting files in prearranged electronic folder locations in the WEB-CA. Show adjacent conditions and related work. Show accurate field dimensions where appropriate. Identify materials and products shown. Note special coordination required. Standard information prepared without specific reference to Project is not considered shop drawings.

B. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings.

C. Show every component of fabricated item, notes regarding manufacturing process, coatings and finishes, identifying numbers conforming to Contract Documents, (i.e. stair numbers, door numbers, etc.) dimensions, and appropriate trade names. Show anchorage and fastening details, including type, size and spacing. Show material gage and thickness. Indicate welding details and joint types.

D. Shop Drawing Sheet Size: Except for templates, patterns, and other full-size drawings, submit shop drawings on sheets at least 8-1/2 in. x 11 in., but no larger than 36 in. x 48 in.

1.08 CONTRACTOR REVIEW

A. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.

B. Coordinate submittals with requirements of Work and of Contract Documents.

C. Sign and date each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify ARCHITECT in writing at time of submittal, of any deviations from requirements of Contract Documents.

D. Do not fabricate or ship products or begin work which requires submittals until return of submittal that ARCHITECT has reviewed and approved.

E. CONTRACTOR shall check and verify all field measurements and shall be responsible for prompt submission of all shop and working drawings so that there shall be no delay in the Work.

F. CONTRACTOR shall be responsible for the delays and/or additional expenses that result from the CONTRACTOR'S failure to submit a complete submittal and/or to identify portions of the submittal that do not conform to the specifications.

1.09 SUBMITTAL REQUIREMENTS

A. Transmit submittals postings to the WEB-CA with standardized electronic mail messages, in accordance with the Progress Schedule and in such sequence as to avoid delay in the Work.

B. Apply CONTRACTOR'S electronic signature or electronic stamp, certifying to review, verification of products, field dimensions and field construction criteria, and coordination of information with requirements of Work and Contract Documents.

C. Coordinate submittals into logical groupings to facilitate interrelation of the several items:

1. Finishes which involve ARCHITECT selection of colors, textures, or patterns.
2. Associated items, which require correlation for efficient function or for installation.

D. Submit shop drawings and product data as indicated in paragraph 1.07. The Architect's review will be returned to the CONTRACTOR in electronic format through WEB-CA.

E. Submit number of samples required by individual specification sections via surface mail, but utilize the WEB-CA electronic process to record the transmittal of the sample. Architect's review will be returned through WEB-CA.

F. Via electronic mail messaging, submit to ARCHITECT posting notification of each submittal in WEB-CA. Indicate clearly in the notification message the following: Project title, work/product by specification section, paragraph number and submittal entry number and revision number.

G. Review by ARCHITECT of any deviation in material, workmanship or equipment proposed subsequent to approval of the shop drawings, samples or design data shall be requested in writing by the CONTRACTOR.

1.10 RESUBMITTALS

A. Make resubmittals under procedures specified for initial submittals; identify changes made since previous submittal.

B. The ARCHITECT will review each submittal and the first resubmittal without cost to the CONTRACTOR. The CONTRACTOR, shall reimburse the OWNER for all subsequent resubmittal reviews.

1.11 ARCHITECT REVIEW

A. ARCHITECT will respond to submittals with reasonable promptness.

B. Submittals will be reviewed in accordance with paragraph 1.19 of this section:

1.12 DISTRIBUTION

A. Distribute reproductions of shop drawings, copies of product data, and samples, which bear ARCHITECT'S electronic review stamp to job site file, Record Documents file, the OWNER, the Maine Department of Environmental Protection, subcontractors, suppliers, other affected contractors, and other entities requiring information.

1.13 SCHEDULE OF SUBMITTALS

A. Shop drawings, product data and sample submittals shall be made in a timely and logical fashion taking into account work scheduling and job progress.

B. It is the CONTRACTOR'S responsibility to prepare, coordinate, and review all submittals prior to delivery to ARCHITECT. The ARCHITECT will review each submittal and the first resubmittal at no cost to the CONTRACTOR. The CONTRACTOR shall reimburse the OWNER for all reasonable costs associated with the ARCHITECT'S, and his consultants, review of each subsequent resubmittal.

1.14 REVIEW QUALIFICATION

A. Regardless of corrections made or acceptance of such drawings by the ARCHITECT, the CONTRACTOR will nevertheless be responsible for the accuracy of such drawings and for their conformity to the Contract Documents. The CONTRACTOR shall notify the ARCHITECT in writing of any deviations at the time he furnishes such drawings.

1.15 PRODUCT DATA

A. Definition: Product data includes manufacturer's standard published literature, such as installation instructions, catalog cuts, color charts, rough-in diagrams and wiring diagrams. When product data must be prepared specifically because standard published data is not suitable for use, submit as shop drawing.

B. Preparation: Before posting the electronic documents to WEB-CA, electronically Mark each segment of the product data to show applicable choices and options. Where published product data includes information on several products and choices, electronically mark the relevant segments to clearly indicate information applicable to this Project.

C. Do not submit product data until compliance with requirements of Contract Documents has been confirmed.

1.

E. Installer Copy: Verify that installer of Work possesses a current copy of Architect-approved product data prior to installation.

1.16 SAMPLES

A. Submit samples identical with materials and products to be installed. Where indicated, prepare samples to match Architect's sample. Label sample with description, source, manufacturer's name, and catalog number. Submit samples along with certifications that products comply with referenced standards.

B. Architect's Review: Architect will review samples for confirmation of visual intent, color, pattern, texture, and type. Architect will not test samples for compliance with other specified requirements, which shall remain exclusive responsibility of Contractor.

C. Submittal Quantities: When variation in color, pattern, or texture can be expected in finish work, submit multiple samples (minimum of three) to show approximate limits of variations. Submit samples in following quantities:
   1. Initial Selection: For initial selection of color, texture, and pattern, submit one full set of manufacturer's available samples.
   2. Verification Samples: Submit three sets of samples selected. One set will be returned to Contractor for use at Project Site for quality control comparisons.

D. Distribution: Distribute additional sets of approved samples to subcontractors, suppliers, installers, and others required for proper performance of Work. Indicate distribution on transmittal forms.

1.17 DAILY PROGRESS REPORTS

A. Daily construction Progress Reports will be provided by the Architect's Engineer on site representative. Record following information concerning events on Project Site and a clearly defined electronic file location in WEB-CA:
   1. List of subcontractors at site.
   2. General weather conditions.
   3. Accidents and unusual events.
   4. Meetings and significant decisions.
   5. Orders and requests by governing authorities.
   6. Change orders received.
   7. Equipment or system tests and start-ups.
   8. Partial completions and occupancies.
   9. Authorized substantial completions.

1.18 CONSTRUCTION PHOTOGRAPHS

A. General: Employ competent photographer to take construction record photographs monthly during course of Work.

B. Provide photographs taken monthly, and at completion of major stages of construction, including:
   1. Site clearing.
   2. Site grading.
   3. Excavations.
   4. Pavements and curbing.
   5. Foundations.
   6. Framing.
   7. Enclosure of building, including roofing.
   8. Exterior curtain wall system and glazing.
   9. Interior partitions and framing.

10. Major equipment installations.
11. Interior finishes.
12. Landscaping.

C. View and Quantities Required: At each specified time, photograph Project from three different views approved by Architect. Provide three prints of each view and post photos in WEB-CA.

D. Negatives: Negatives shall remain property of photographer. Require that photographer maintain negatives for two years from Date of Substantial Completion of Project.

E. Costs of Photography: Pay costs for specified photography and prints. Parties requiring additional photography or prints will pay photographer directly. Furnish additional prints to Owner and Architect at commercial rates applicable at time of purchase.

F. Prints: When hardcopies are requested by Owner or Architect, Provide 8 in. x 10 in. black and white prints on single weight print paper, neutral black image tone, with white base. Provide smooth surface, glossy finish.

G. Identify each print on back, listing name of Project, orientation of view, date and time of exposure, name and address of photographer, and numbered identification of exposure.

H. Techniques: Provide factual presentation, with correct exposure and focus, with high resolution and sharpness, maximum depth-of-field, and minimum distortion.

I. Views Required: Illustrate condition of construction and state of progress. At successive periods of photography, take at least one photograph from same overall view as previously. Consult with Architect at each period of photography for instructions concerning views required.

J. Delivery of Prints: For hardcopies requested by Owner or Architect, Deliver prints as soon as processed, one set each to DHK, STANTEC and Project Record File.

1.19 ARCHITECT'S ACTION

A. General: Architect will review submittals, apply electronic review stamp and indicate action, and return to Contractor. Architect will review submittals for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Architect's review and approval of submittals shall be held to limitations stated in the AGREEMENT. In no case shall approval or acceptance by Architect be interpreted as release of Contractor of responsibility to fulfill requirements of Contract Documents. No acceptance or approval of submittals, nor any indication or note marked by Architect on submittals, shall constitute authorization for increase in Contract Sum.

B. Action Stamp: Architect will stamp each submittal with an action stamp. Stamp will indicate action taken as follows:

1. "APPROVED": No corrections, no marks: Resubmission not required.
2. "APPROVED AS NOTED": Minor amount of corrections; all items can be fabricated without further corrections to original submittal; checking is complete and all corrections are deemed obvious without ambiguity. Resubmission not required.
3. "REVISE AS NOTED AND RESUBMIT": Minor corrections required; items noted shall not be

fabricated until further corrections of original submittal is completed and Architect approval is obtained; checking is complete; clarify details of items noted by checker for approval; items without marks may be fabricated without further submittal. Resubmission required.

4. "REJECTED - RESUBMIT": Submittal does not conform to Contract Documents, and requires too many corrections, or is rejected for other justifiable reasons. Architect will state reasons for rejection. Correct and resubmit. Do not fabricate.
5. "REVIEW NOT REQUIRED AS NOTED": Submittal does not require review for reasons stated.

C. Other Action: Submittal for information or record purposes will be returned with no action marked.

D. Required Resubmittals: Make corrections or changes to submittals required by Architect and resubmit until approved. Revise initial shop drawings or product data, and resubmit as specified for initial submittal. Indicate changes made other than those requested by Architect. Submit new samples as required for initial submittal.

1.20 DISTRIBUTION BY CONTRACTOR

A. Distribution: When submittal is marked "APPROVED" or "APPROVED AS NOTED", make prints and copies and distribute to, subcontractors, suppliers, fabricators, and other parties requiring information from submittal for proper coordination and performance of Work. Print copies of shop drawings from approved reproducible only.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01410

QUALITY CONTROL AND TESTING SERVICES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for quality-control and testing services.

B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

1.02 REQUIREMENTS

A. Employment of inspection and testing services shall in no way relieve Contractor's obligations to perform the Work of the Contract.

B. In addition to the Contract's testing, the Owner reserves the right, at his sole discretion, to select and pay for the services of an Independent Testing Laboratory to perform specified services and testing as may be in the Owner's best interest.

C. Contractor shall cooperate with the inspection and testing services to facilitate the execution of the quality control activities.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
2. Section 03300, CAST-IN-PLACE CONCRETE
3. Section 04200, UNIT MASONRY
4. Section 05120, STRUCTURAL STEEL
5. Section 05300, METAL DECK
6. Section 05411, LIGHT GAUGE METAL FRAMING
7. Section 07255, CEMENTITIOUS FIREPROOFING
8. Other sections of specifications, as indicated: Certification of products.

B. Refer to Maine State Building Code for quality, workmanship and requirements for all materials.

1.04 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum. Contractor's quality control responsibilities are specified in, but not limited to, the following Sections:

Section 02200, EARTHWORK
Section 03450, ARCHITECTURAL PRECAST CONCRETE
Section 07410, METAL PANELS
Section 07530, SINGLE-PLY MEMBRANE ROOFING
Section 07900, SEALANTS
Section 09900, PAINTING

1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.
   a. Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless agreed to in writing by the Owner.
3. The costs of the following tests and inspections shall be accounted for separately and reported to the Owner.
   a. Tests and inspection of materials and workmanship not conforming to contract requirements.
   b. Tests and inspection necessitated by any other noncompliance with contract requirements.
   c. Acceptance tests for materials because of changes in properties or changed sources.
   d. Costs of inspector's time and expenses wasted because of cancellations or delays of the work.
   e. Tests and services of inspectors required by a public Owner.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

1. Provide access to the Work.
2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
4. Provide facilities for storage and curing of test samples.
5. Deliver samples to testing laboratories.
6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
7. Provide security and protection of samples and test equipment at the Project Site.

D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties.

1. The Testing Laboratory shall make all necessary arrangements with the General Contractor to insure the presence of the required inspectors at all contract operations specified to be included under the Testing and Inspection Agreement. The General Contractor shall notify the Testing Laboratory a reasonable time in advance (not less than 24 hours) of the time when operations requiring inspection or testing are scheduled to start.
2. Provide necessary personnel, equipment and facilities for tests and inspection. Personnel shall be experienced and competent in their particular specialties.
3. The Testing Laboratory shall conduct its work so as not to cause delay in the progress of construction. Any non-compliance with the Contract Documents shall be immediately reported to the General Contractor and the Architect.
4. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
5. Nothing herein specified permits the Testing Laboratory to allow the General Contractor to deviate from the requirements of the Contract Documents.
6. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
7. The agency shall not perform any duties of the Contractor.

E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
2. A complete set of Drawings and Specifications for the project work will be made available by the Owner at the project site. The Testing Laboratory personnel shall become thoroughly familiar with all provisions of these documents which apply for the testing and inspection services.

1.05 SUBMITTALS

A. Qualifications: Submit qualifications of testing laboratories proposed for use for approval.

B. Schedule: Submit a schedule of required tests and inspections for review.

C. Reports: Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing Owner, when the Owner so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
   a. Date of issue.
   b. Project title and number.
   c. Name, address, and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and an interpretation of test results.
   j. Ambient conditions at the time of sample taking and testing.
   k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
   l. Name and signature of laboratory inspector.
   m. Recommendations on retesting.

1.06 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

B. Engage inspection and testing services agencies, including independent testing laboratories, which are prequalified as complying with applicable provisions of ACIL Ref. 1 and requirements of local, state, and federal authorities having jurisdiction, and which specialize in the types of inspections and tests to be performed. Qualifications of laboratories shall be based on industry standards established for the particular work and materials requiring testing or inspection, including but not limited to the following:

1. ASTM C 1077.
2. ASTM D 3666.
3. ASTM D 3740.
4. ASTM E 329.
5. ASTM E 543.

C. Wherever the source or characteristics of materials change or the quality of materials provided indicates lack of compliance with contract requirements, full or partial acceptance tests shall be performed as directed by the Architect.

1.07 LIMITATIONS OF OWNER OF INSPECTION AND TESTING SERVICES

A. Inspection and testing services are not authorized to:

1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the Work, except as specifically authorized by the specifications.
3. Perform any duties of the Contractor.

1.08 CONDUCT OF INSPECTIONS AND TESTS

A. The Contractor shall notify the Owner, Architect, and Testing Laboratory a minimum of 72 hours before the performance of work to permit the proper conduct of Owner-authorized inspections and tests.

B. Representatives of Testing Laboratory shall inspect the manufacture, assembly, and placement of materials as required and as authorized by the Owner, and shall report their findings to the Architect, Owner, and Contractor.

C. Work shall be checked as it progresses, but failure to detect any defective work or materials shall in no way prevent later rejection when such defect is discovered nor shall it obligate the Owner to accept such work.

1.09 TESTS REQUIRED

A. General Construction Tests: More detailed testing requirements are given in individual Specification Sections. The Owner shall retain the right to make any additional tests the Architect deems necessary or appropriate. The Contractor is responsible for providing his own tests to determine that materials meet specified requirements. The scope of tests required and paid for by the Owner (unless otherwise noted below) shall include as a minimum the following:

1. Earthwork: Lab tests to determine suitability of all fill materials shall be paid for by Contractor. Owner reserves the right to retain and pay for his own testing for checking purposes.
2. Earthwork: Proctor tests for compaction.
3. Asphalt Concrete Paving: Field and lab tests for asphalt paving.
4. Concrete Paving and General Concrete Work: Concrete mix design testing shall be paid for by Contractor. Owner reserves the right to retain and pay for his own testing for checking purposes
5. Concrete Paving and General Concrete Work: Concrete test cylinders as specified in Section 03300, CONCRETE.
6. Masonry Mortar: Three cylinders tested for compressive strength at 10 days; ASTM C 91 tests.
7. Metals: Strength; dimension; coating thickness; bolt torque; welding X-ray or ultrasonic tests.
8. Wood: Moisture content; treatment retention; strength; dimension.
9. Sealants: Chemical analysis; adhesive strength; compatibility with adjacent materials; elasticity.
10. Paints and Finishes: Chemical analysis; coating thickness.

B. Plumbing: At least the following tests shall be performed. Conform to requirements specified in individual Division 15 Specification Sections. The test shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on site representative:

1. Water supply piping hydrostatic pressure test.
2. Sanitary piping test before fixture installation: Cap pipes and fill to highest point in system.
3. Plumbing fixture operation.

C. Fire Protection System: At least the following tests shall be performed. Conform to requirements specified in individual Division 15 Specification Sections. The test shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on site representative:

1. Fire protection system flushed and pressure tested.

D. HVAC Testing: All HVAC work shall be tested by an independent testing and balancing agency. Conform to requirements specified in individual Division 15 Specification Sections. The tests shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's Representative. Adjustments shall be made by the subcontractor as directed by the Owner. At least the following tests will be performed:

1. Piping hydrostatic tests.
2. Air and water balancing.
3. Thermostat control monitoring and testing.
4. Boiler efficiency testing.

E. Electrical Power System Testing: At least the following tests shall be performed. Conform to requirements specified in individual Division 16 Specification Sections. The tests shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on-site representative:

1. Polarity tests.
2. Operation of all circuits.
3. Testing of emergency system.
4. Security systems.
5. Generation system.
6. Grounding systems.
7. Voice/Video/Data networking testing.

F. Electrical Lighting System Testing: Conform to requirements specified in individual Division 16 Specification Sections. At least the following tests shall be performed and paid for by the subcontractor:

1. Operation of every component of entire system.

G. Fire Alarm System Testing: At least the following tests will be performed. Conform to requirements specified in individual Division 16 Specification Sections. The test shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on site representative:

1. All smoke and heat detectors.

2. Proper operation as required by authorities having jurisdiction.

H. Local Owner Inspections: The Contractor is also responsible for coordinating and cooperating with local requirements for inspections.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 TESTING AND INSPECTION

A. The Testing Laboratory shall maintain and distribute continuous record of the quality of materials and workmanship under its control, and certify that such materials and workmanship meet the contract requirements.

B. The inspection and control shall be performed under the direction of the Structural Engineer of Record through the Architect.

C. The duties of the Testing Laboratory shall include:

1. Tests and certification of materials or components designated to be tested at place of fabrication or at the job site.
2. Supervision and certification of fabrication and erection of materials designated to be inspected.
3. Acceptance testing of concrete design mixes.
4. Submission of reports:
   a. Copies of each report of plant and field inspection shall be made and distributed within 3 days. Copies of each report of tests shall be distributed within 2 days of the performance of tests. Results of tests showing non-conformance to contract requirements shall be advised to the Architect and General Contractor by phone on the same day.
   b. Distribution of one copy of each report shall be as follows: Owner, Architect, Structural Engineer, General Contractor, Inspectional Services.
   c. All reports shall include accurate and unambiguous descriptions of the source of the materials and their location in the structure.

3.02 QUALITY CONTROL FOR CONCRETE

A. Provide inspection and testing as specified in Section 03300, CAST-IN-PLACE CONCRETE.

3.03 QUALITY CONTROL FOR UNIT MASONRY

A. The structural inspections listed below shall be required for masonry construction.

INSPECTION OR TEST	REFERENCED CRITERIA	
	ACI 530/ASC4/ TMS 402	ACUI 530.1 ASCE 6/TMS 602
1. Material		Sec. 2.2
2. Masonry Strength		Sec. 1.6

3. Construction Operations: a. Proportioning, mixing consistency of mortar and grout. b. Application of mortar grout and masonry units c. Condition, size, location and spacing of reinforcement d. Protection of masonry during cold weather (temperature below 40 degrees F) or hot weather (temperature above 100 degrees F). e. Anchorage	Chapter 8 Sec 4.2; 5.14	Sec. 2.3; 2.5; 4.2.2 Sec. 2.3.2.2; 2.3.2.3
4. Inspection of welding of reinforcement, grouting, consolidation and reconsolidation for buildings assigned to Seismic Performance Category C or D in accordance with 780 CMR 1612.1.7.	Note b.	Note b.

Note a: The specific standards reference are those listed in Appendix A.
Note b: Referenced criteria not applicable.

3.04 QUALITY CONTROL FOR STRUCTURAL STEEL

A. Inspection of structural steel will be directed at verifying that inspection required to be carried out by the Contractor's testing and quality control personnel, as specified in the Contract Documents, has been completed.

B. Inspection of Fabricators: Where fabrication of structural load-bearing members and assemblies is being performed on the premises of a fabricator's shop, structural inspection of the fabricated items shall be required. The fabricated items shall be inspected as required by 780 CMR 1705.0 and as required elsewhere in 780 CMR.

1. Fabrication procedures: The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures which provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved drawings, project specifications and referenced standards. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.
2. Procedures implementation: The structural inspector shall verify that the fabricator is properly implementing the fabrication and quality control procedures outlined in 780 CMR 1705.4.1.

C. Field Inspection of Structural Steel: This inspection will be on a full-time basis while structural steel is being erected, as requested by the Structural Engineer of Record, and will include the following:

1. Proper erection of all pieces.
2. Proper fit of bolts, including nicking of threads.
3. Plumbness.
4. Proper installation of high-strength bolts, including checking of impact wrenches.
5. Weld visual inspection.

6. Comparison with approved Shop Drawings.
7. Examination of erector's quality control and testing records for compliance with Contract Document.
   a. Inspection and Testing of High-strength Bolts:
      i). The visual examination of all joints to ascertain that bolts and washers are properly installed and have been tensioned.
      ii). Tightness of bolts shall be checked by using a manual torque wrench in accordance with the requirements of Contract Documents. As a minimum check one bolt per connection or ten percent (10%) of the bolts involved. If these tests indicate that proper tension in the bolts is not being achieved, then the frequency of the tests shall be increased in consultation with the structural engineer.
   b. Inspection and Testing of Welding:
      i). Verify the certification papers of each welder and his qualifications for the particular welding positions in which he will work on the structure. Establish and record each welder's symbol. The Testing Laboratory may reject a welder's work and call for a retest at any time there is doubt of the quality of work.
      ii). Welds shall be examined visually, for structural steel, steel deck, and studs. Surfaces to be welded and all filler metal shall be carefully inspected. Surface preparations, fit-up, and cleanliness of surfaces shall be noted. Electrodes shall be checked for size, type and condition. Preheating of steel and heating of electrodes shall be noted when required.
      iii). Check that all welds have been marked with the welder's symbol; mark all welds requiring repairs or rewelding; make a reinspection of corrected work; maintain a written record of all welds. Welds shall be tested where required by Contract Documents.
      iv). Welds required to be tested by the Contractor shall be inspected by the Testing Laboratory and verify that all welds have been performed and tested in accordance with the Contract Documents.
      v). Testing of welds in the field shall consist of
         a). Visual inspection of all welds
         b). 10% testing of all fillet welds
         c). 100% testing of all penetration welds
   c. Inspection and Testing of Shear Connectors:
      i). All headed stud shear connectors shall be checked for the following indications of an insufficient weld:
         a). Less than 360 degree fillet, voids, undercuts, or insufficient penetration.
         b). Burn-off (reduction in length after welding) less than 1/8 inch.
         c). Cold appearance of the weld.
      ii). If, after welding of any shear connectors, visual inspection indicates any of the imperfections listed above or any other questionable appearance, such stud shall be struck hard with a three-pound hammer and bent 15 degrees off perpendicular to beam and toward nearest end of beam. Studs which fail this test, as provided in the AWS Code, shall be replaced. Studs which show no sign of failure after this test may be left in bent position if not portion of the stud is less than one inch from a proposed concrete surface.
   d. Wall panels and Veneers: Structural inspection is required for exterior wall panels and their attachment to the building.
   e. Light Gauge Metal Framing: Structural inspection is required for light gauge metal framing systems for roofs, floors, and load-bearing curtain walls that have a story height greater than ten feet.

3.05 QUALITY CONTROL FOR STEEL DECK AND SHEAR CONNECTORS

A. Inspection of steel deck and shear connectors will be directed at verifying that the Contractor's testing and quality control, as specified in the Contract Documents, has been completed.

B. Field Inspection of Steel Deck: This inspection will be on a full-time basis while steel deck and shear connectors are being erected, as requested by the Structural Engineer of Record, and will include the following:

1. Proper erection of all pieces.
2. Proper gage and coating.
3. Weld visual inspection.
4. Metal fasteners and side lap connections.
5. Examination of erector's quality control and testing records for compliance with Contract Document.
   a. Inspection and Testing of Shear Connectors
      i). All headed stud shear connectors shall be checked for the following indications of an insufficient weld:
         a). Less than 360 degree fillet, voids, undercuts, or insufficient penetration.
         b). Burn-off (reduction in length after welding) less than 1/8 inch.
         c). Cold appearance of the weld.
      ii). If, after welding of any shear connectors, visual inspection indicates any of the imperfections listed above or any other questionable appearance, such stud shall be struck hard with a three-pound hammer and bent 15 degrees off perpendicular to beam and toward nearest end of beam. Studs which fail this test, as provided in the AWS Code, shall be replaced. Studs which show no sign of failure after this test may be left in bent position if no portion of the stud is less than one inch from a proposed concrete surface.

3.06 QUALITY CONTROL FOR WALL PANELS AND VENEERS AND LIGHT GAUGE METAL FRAMING

A. Structural inspection is required for exterior wall panels and their attachment to the building.

B. Structural inspection is required for light gauge metal framing systems for roofs, floors, and load-bearing curtain walls that have a story height greater than ten feet.

C. Check components for size and configuration material grade against approved shop drawings.

D. Visually examine welds and metal fasteners for conformance with referenced standards.

3.07. QUALITY CONTROL FOR SPRAYED FIREPROOFING

A. Provide inspection and testing for the sampling and testing of sprayed fire protection including thickness, density, and bonding strength in accordance with project specifications and as follows:

1. Verify applied thickness and density meets fire rating requirements.
2. Verify installation meets approved test reports and acceptable sample installation.

3. Samples: Inspect a maximum of six locations of one square foot each for each 5,000 square foot of fireproofing area, in accordance with ASTM E 605.
   a. The required thickness of sprayed fireproofing shall be met at every test probe. Average thickness shall not be used in determining satisfactory installation.

3.08 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION

SECTION 01420

MOCK-UPS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. General: Provide and coordinate mock-up assemblies at Project site for Architect review and acceptance, in accordance with requirements of the Contract Documents. Refer to individual Specification Sections for mock-up requirements. Generally, without limitation, mock-ups on site include the following:

1. Mock-ups of individual pieces of the work, as specified within individual Specification Section.
2. Field Mock-Up of exterior wall components.

B. It shall be the responsibility of the Contractor to coordinate the work of the related Specification Sections so that each mock-up meets the specified requirements.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 01410, TESTING LABORATORY SERVICES; inspection and testing.
2. Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS; temporary enclosures.
3. Individual Specification Sections that specify field mock-ups of individual pieces of the Work.
4 Individual Specification Sections that specify field mock-ups of exterior wall Work.

1.04 SUBMITTALS

A. Shop Drawings of Mock-Ups: Provide large scale shop drawings for fabrication, installation and erection of all parts of each mock-up. Provide plans, elevations, and details of anchorage, connections and accessory items.

B. Photographs of Mock-Ups: Submit photographs of mock-ups after completion of installation and acceptance of each mock-up.

C. Samples: Refer to individual Specification Sections for submittal requirements of mock-up components and coordinate accordingly.

1.05 QUALITY ASSURANCE

A. Design Modifications: Make design modifications to work only as required to meet performance requirements and to coordinate the work. Indicate proposed design modifications on shop drawings. Maintain original design concept without altering profiles and alignments indicated.

PART 2 PRODUCTS

2.01 MATERIALS AND PRODUCTS

A. Provide materials, components, and products for exterior wall assembly mock-up and for specified interior construction components as specified in individual Specification Sections.

PART 3 EXECUTION

3.01 GENERAL

A. Refer to PART 3, EXECUTION portions of the various Specification Sections for specific requirements regarding condition of surfaces, erection, and erection tolerances.

3.02 FIELD MOCK-UP OF EXTERIOR WAL

A. Obtain Architect acceptance of visual qualities prior to commencing work that individual mock-up is intended to represent. Protect and maintain approved mock-ups throughout the work of the Contract. Locate mock-ups at the Project site as directed by the Architect. Provide a field mock-up for each of the following:

1. Typical floor exterior wall of the garage, size approximately 12 ft. high by 6 ft. wide, showing the guard rail and the louver assemblies.
2. Provide modifications to mock-up as required until Architect approval has been received.

3.03 FIELD MOCK-UP OF INTERIOR CONSTRUCTION

A. Obtain Architect acceptance of visual qualities prior to commencing work that individual mock-up is intended to represent. Protect and maintain approved mock-ups throughout the work of the Contract. Locate mock-ups at the Project site as directed by Architect. Provide a field mock-up for each of the following:

1. Acoustically treated wall in the Car Rental Facility above the counter area, size approximately 12 ft. high by 12 ft. wide including one regular window

B. Interior Construction Mock-ups: Provide mock-ups of various interior construction as indicated or as specified in the applicable Specification Section, as directed by the Architect

3.04 OTHER MOCK-UPS

A. Provide mock-ups of types and sizes required by individual Specification Sections to evaluate and set the standard of quality for that work. Obtain Architect acceptance of visual qualities prior to commencing work that individual mock-up is intended to represent. Protect and maintain approved mock-ups throughout the work of the Contract. Locate mock-ups at the Project site as directed by Architect.

1. Provide as many mock-ups as required until Architect approval has been received.
2. When indicated in individual Specification Sections, approved mock-ups may be incorporated into the finish work.

3.05 REMOVAL AND DISPOSAL

A. Demolish and remove mock-ups from site at the completion of the Project. Legally dispose of demolished mock-up materials.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies construction facilities and temporary controls, including, but not limiting to:

1. Temporary utilities.
2. Temporary construction and support facilities.
3. Temporary signage.
4. Security and protection facilities.
5. Architect/Engineer on site representative trailer.

B. Contractor shall pay for all costs related to temporary facilities and utility service including but not limited to temporary heat, water, power, and other utilities.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect the Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. AGREEMENT; Conditions of the Contract.
2. Section 01010, SUMMARY OF WORK.

1.04 SUBMITTALS

A. Schedule: Submit a schedule indicating implementation and termination of each temporary utility within fifteen days of date established for Commencement of the Work.

1.05 QUALITY ASSURANCE

A. Comply with requirements of authorities having jurisdiction, codes, utility companies, OSHA, and industry standards including, but not limiting to:

1. NFPA 241.
2. NFPA 70.
3. ANSI A10.
4. NECA NJG-6.

B. Electric Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test temporary utilities prior to use. Obtain required certifications and permits.

1.06 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Architect, change from use of temporary service to use of permanent service.

B. Conditions of Use: Maintain temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload temporary facilities. Do not allow hazardous, dangerous, or unsanitary conditions to develop on site.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. Lumber and Plywood: Provide materials that conform to requirements below:

1. Signs and Directory Boards: Provide exterior grade, Medium Density Overlay (MDO) plywood, conforming to USDC PS1, of size and thickness indicated.
2. Fences, Vision Barriers, and Safety Barriers: Provide exterior grade, C-D veneered plywood.

C. Gypsum Wallboard: Provide gypsum wallboard and metal framing systems for temporary offices and partitions.

2.02 TEMPORARY UTILITIES

A. Scope: Temporary utility work includes, but is not limited to:

1. Electric power and light.
2. Telephone service.

B. Temporary Electric Power and Light: Arrange with utility company to provide service required for power and lighting. Pay costs for service and for power used.
1. Provide circuit and branch wiring, with area distribution boxes located so power and lighting is available throughout construction by use of construction-type power cords.
2. Provide adequate artificial lighting where natural light is not adequate for work, and for areas accessible to public.
3. Work shall meet applicable requirements of NFPA 70 and Division 16 - ELECTRICAL.

C. Temporary Telephone Service: Arrange with local telephone company to provide direct line telephone service at construction site for personnel and employees and for Architect. Pay costs for installation, maintenance, and removal, and pay service charges for local calls. Toll charges shall be paid by party who places call. Service required shall include:

1. One direct line instrument in Contractor Field Office.

2. One direct line for facsimile (Fax) machine in Contractor Field Office.
3. Other instruments at the option of the Contractor, or as required by regulations.

2.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES

A. Scope: Temporary construction and support facilities include, without limitation:

1. Temporary heat.
2. Field offices and storage sheds.
3. Engineer/Architect's Field office
4. Sanitary facilities.
5. Temporary enclosures.
6. Construction aids.
7. Temporary elevator use.
8. Waste disposal services.
9. Water control.
10. Rodent and pest control.
11. Pollution and dust control.

B. Temporary Heat and Ventilation: Provide temporary heat and ventilation required to maintain adequate environmental conditions to facilitate progress of Work, to meet manufacturers' specified minimum installation conditions, and to protect materials and finishes from damage due to temperature and humidity.

1. Ventilate enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.
2. Portable heaters shall be standard approved units with controls.
3. Pay costs of installation, maintenance, operation, removal, and fuel consumed.

C. Contractor's Field Offices and Sheds: Prior to installation of offices and sheds, consult with Architect on location, access, and related facilities. Provide field offices and sheds as follows:
1. Construction: Provide structurally sound, weathertight units, with floors raised above ground. At Contractor's option, portable or mobile buildings may be used. Mobile units, when used, shall be modified for office use.
2. Temperature and Moisture Transmission Resistance: Compatible with occupancy and storage requirements.
3. Contractor's Office and Facilities: Size units as required for general use and to provide space for project meetings.
4. Furnishings in Meeting Area: Provide conference table and chairs for at least ten people. Provide racks and files for Project Record Documents in, or adjacent to, the meeting area.
5. Other furnishings: Contractor's option.
6. Miscellaneous Items: Provide one 10 in. outdoor type thermometer.
7. Storage Sheds: Provide types and sizes required to meet requirements of various trades and to adequately store and handle products. Provide heating and ventilation necessary to comply with manufacturer's product data and with code requirements for products stored.

D. Engineer/Architect's Field Office: Prior to installation of office, consult with Architect on location, access, and related facilities. Provide field office as follows:

1. A separate structure for sole use of ENGINEER/ARCHITECT, with secure entrance doors and three keys.

2. Area: 350 contiguous square feet minimum, with minimum dimension ten (10) feet. Floor area to be contained in one (1) independent unit.
3. Lavatory: Built-in private sink with hot and cold potable running water and toilet with cold water connection, both fully connected to a temporary sewer system.
4. Windows:
   a. Minimum: three (3), with a minimum total area of ten percent (10%) of floor area.
   b. Operable sash and insect screens.
   c. Locate to provide view of construction areas.

5. Furnishings:

   a. Standard size desks with three (3) drawers, one (1) desk per occupant.
   b. One (1) drafting table: 39 inches x 72 inches x 36 inches high, with one (1) equipment drawer. Locate table oriented in relation to the site at a window with a view of the site.
   c. One (1) metal, double-door storage cabinet, or closet.
   d. One (1) plan rack to hold a minimum of six (6) racks of project drawings.
   e. Standard four-drawer legal-size metal filing cabinet with locks and keys; one (1) filing cabinet per occupant.
   f. Six (6) linear feet of bookshelves.
   g. Three (3) swivel arm chairs.
   h. Two (2) straight chairs.
   i. One (1) drafting table stool.
   j. One (1) waste basket per desk and table.
   k. One (1) tackboard, 36 inches x 30 inches.
   l. One (1) plain paper copier including all required supplies for operation for the duration of the project.
   m. One (1) facsimile machine (Fax) including all required supplies for operation for duration of project.
   n. One (1) indoor thermometer and one (1) 10-inch outdoor thermometer.
   o. One (1) wall mounted standard pencil sharpener.
   p. One (1) electric calculator with display and paper tape and with addition, subtraction, multiplication and division functions.
   q. One (1) 3-hole paper punch.
   r. One (1) hand stapler and a full box of refills.
   s. One (1) conference table and chairs for at least eight (8) persons.
   t. Racks and files for Project Record Documents in, or adjacent to, meeting area.
   u. Four (4) cubic foot refrigerator.

6. Services (for the duration of the project):

   a. Lighting: fifty (50) foot-candles at desk top height.
   b. Exterior lighting at entrance door.
   c. Automatic, permanently installed, heating and mechanical cooling equipment (12,000 BTU AC unit) to maintain comfort conditions.
   d. Minimum of four (4) 120 volt duplex electric convenience outlets, at least one (1) on each wall.
   e. Electric distribution panel: Two (2) circuits minimum, 120 volt, 60 hertz service.
   f. Drinking water cooler using commercially supplied, sanitary sealed bottled water.
   g. Telephone: One (1) direct line instrument and connections for facsimile machine.
   h. Toilet paper and hand towels for lavatory.

E. Sanitary Facilities: Provide and maintain clean portable toilet facilities. Do not use permanent facilities within the building unless permitted by Architect in writing.

1. If use of permanent facilities is permitted, maintain washrooms in clean and sanitary condition and supply exhaustible materials such as soap, hand towels, and toilet tissue.

F. Temporary Enclosures: Provide temporary weathertight enclosures of exterior walls as Work progresses. Design and construct temporary enclosures to provide acceptable working conditions, to provide weather protection for materials, to allow effective temporary heating, and to prevent entry of unauthorized persons.

1. Provide temporary exterior doors with self-closing hardware and padlocks.
2. Design enclosures to be removable to allow handling of materials.

G. Construction Aids: Provide construction aids and equipment required by personnel to facilitate execution of the Work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, and other such facilities and equipment.

1. Refer to respective sections for particular requirements for each trade.
2. When permanent stair framing is in place, provide temporary treads, platforms, and railings, for use by construction personnel.

H. Waste Disposal: Maintain all areas under Contractor's control free of extraneous debris. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.

1. Provide containers for deposit of debris.
2. Prohibit overloading of trucks to prevent spillage on access and haul routes.
3. Provide periodic inspection of traffic areas to enforce requirements.
4. Schedule periodic collection and disposal of debris.
5. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

I. Water Control: Provide methods to control surface water to prevent damage to Project, site, and adjoining properties. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.

1. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and water.
2. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas and properties.

J. Pollution Control: Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of noxious substances from construction operations. Provide equipment and personnel, perform emergency measures required to contain any spillage and to remove contaminated soils or liquids.

1. Excavate and legally dispose of any contaminated earth off-site, and replace with suitable compacted fill and topsoil.
2. Take special measures to prevent harmful substances from entering public waters.
3. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.

4. Provide systems for control of atmospheric pollutants.
5. Prevent toxic concentrations of chemicals.
6. Prevent harmful dispersal of pollutants to atmosphere.

K. Dust Control: Provide positive methods and apply dust control materials to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into the atmosphere.

L. Tree and Plant Protection:

1. Preserve and protect existing trees and plants designated to remain at site, and those adjacent to site.
2. Consult with Architect, and remove agreed-on roots and branches which interfere with construction.
3. Carefully supervise excavating, grading and filling, and subsequent construction operations, to prevent damage.
4. Replace, or suitably repair, trees and plants designated to remain which are damaged or destroyed due to construction operations.
5. Relocate trees and plants to the designated area on Jetport property as directed by the Architect and or owner

M. Erosion Control

1. Plan and execute construction and earth work by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.

   a. Minimize areas of exposed bare soil.
   b. Provide temporary control measures such as berms, dikes and drains.

2. Construct fill and waste areas by selective placement to eliminate surface silts or clays which will erode.

3. Periodically inspect earthwork to detect any evidence of the start of erosion. Apply corrective measures as required to control erosion.

4. Construct sediment basins, diversion ditches, hay bale dikes or such other erosion control devices to control runoff from any area subject to erosion during construction. All such precautionary measures including, but not limited to, construction of sediment basins, diversion ditches, benches, berms or hay bale dikes or laying fiber matting on slopes until vegetation is established, shall be at no extra cost to the OWNER.

5. Comply with all local, state and federal permits and requirements.

6. Provide Hay Bales around all catch basins and culverts in or downhill of the construction area. Hay bales and cost of cleaning catch basins and culverts shall be paid for by the CONTRACTOR.

7. The CONTRACTOR shall keep all trenches stabilized during non-working hours. The CONTRACTOR shall place approved crushed gravel in the trench every night. The CONTRACTOR shall furnish and install crushed stone or other approved material in the trench to stabilize it as directed by the Architect.

N. Traffic Safety

1. Schedule construction and place excavated material so that vehicular and pedestrian traffic may be maintained at all times. The CONTRACTOR shall be responsible for obtaining required state and local highway opening/curb cut permits prior to commencing construction of work in a highway.

2. Traffic shall be protected by barricades, warning and advance warning signs. The placement and materials shall be in general compliance with the U.S. Department of Transportation's Manual on Uniform Traffic Control Devices, latest edition, and be subject to the approval of the OWNER and Architect. If the CONTRACTOR'S operations cause traffic hazards, the CONTRACTOR shall repair the road surface, provide temporary ways, erect barricades or fences and/or take other safety measures in accordance with local, state and federal regulations.

3. The CONTRACTOR shall provide experienced flagpersons as directed by the Architect.

2.04 TEMPORARY SIGNAGE

A. Scope: Temporary signage includes, but is not limited to:

1. Project identification sign.
2. Other signage as required in the Contract Documents.

B. Project Identification Signs: Provide one painted sign, of not less than 32 sq. ft. area, with painted graphic content to include, title of Project, name of Owner, name of Owner's Representative, and name of Contractor. Sign design shall be approved by the Architect.

C. Sign Painter: Professional with minimum five years experience in type of work required.

D. Finishes, Painting: Adequate to resist weathering and fading for scheduled construction period.

E. Sign Structure and Framing: New or used, wood or metal, in sound condition structurally adequate to work and suitable for specified finish.

F. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard 4 ft. x 8 ft. sheets.

G. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles.

H. Rough Hardware: Galvanized steel or cadmium plated.

I. Paint: Exterior quality.

1. Use Bulletin colors for graphics.
2. Colors for structure, framing, sign surfaces, and graphics: As selected by the Architect.

2.05 SECURITY AND PROTECTION FACILITIES

A. Scope: Security and protection facilities includes, but is not limited to:

1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Temporary flagmen and traffic control.
4. Temporary access routes.
5. Temporary site control fence.
6. Security procedures.

B. Temporary Fire Protection: Provide and maintain suitable fire protection equipment and services. Establish procedures for fire protection for welding and other potentially hazardous construction operations. Ascertain and comply with requirements of Project insurance carrier, City of Portland Fire Department and the State of Maine Fire Marshal. Permanent fire protection system may be activated to meet these requirements. Replace fusible link heads and other expended or discharged components at time of Substantial Completion.

1. Locate temporary portable fire extinguishers in convenient locations, not less than one extinguisher per floor.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes.

C. Barricades, Warning Signs, and Lights: Provide and maintain barricades, warning signs, warning lights, railings, walkways, and the like. Paint signs and barricades with appropriate colors, graphics, and warnings to inform public and job-site personnel of hazards.

D. Access Roads: Locate roads, drives, walks, and parking facilities to provide uninterrupted access to construction offices, mobilization areas, work and storage areas, and other areas required for execution of the Contract.

1. Location : as designated; consult with Architect regarding any desired deviation therefrom.
2. Maintain traffic areas free as possible of excavated materials, construction equipment, Products, snow, ice, and debris.
3. Keep fire hydrants and water control valves free from obstruction and accessible for use.
4. Provide, operate, and maintain temporary equipment, services, and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, at on-site access roads, and parking areas during construction.
5. Remove temporary equipment and facilities when no longer required, restore grounds to original, or specified conditions.

E. Police Details: Provide qualified police detail when construction operations require, or as required by the Owner.

F. Construction Parking Control: Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations. Monitor parking of construction personnel's private vehicles:

1. Maintain free vehicular access to and through parking areas.
2. Prohibit parking on or adjacent to access roads, or in nondesignated areas.
3. Coordinate with APCOA, the Portland's Jetport Parking Management consultant during the work.

G. Haul Routes: Consult with governing authorities, establish public thoroughfares which will be used as haul routes and site access. Confine construction traffic to designated haul routes.

1. Provide traffic control at critical areas of haul routes to expedite traffic flow and to minimize interference with normal public traffic.
2. The Contractor shall not close or obstruct any portion of any street, public or private, without obtaining permits therefore from the proper authorities. If any street or private way shall be rendered unsafe by the Contractor's operations, the Contractor shall make such repairs or provide such temporary ways or guards as shall be acceptable to the governing authority.
3. The Contractor shall conduct the work at all times so that the abutters shall have access to their property. When public or private property is isolated by the temporary closure of a road, the Contractor shall be responsible for providing such safe means of access to a public way.

H. Safety Controls and Safety Signing:

1. Detour signs shall have breakaway post assemblies conforming to the applicable provisions of MDOT Specifications.

I. Temporary Site Control Fence: Prior to start of work at the Project site, install control fence with suitably locked entrance gates. Locate fence to enclose substantially entire Project site, or that portion the Contractor establishes as required to encompass entire Project construction operation. Locate vehicular entrance gates in suitable relation to construction facilities; and to avoid interference with traffic on public thoroughfares.

1. Construct fence in accordance with industry standards, and as shown on Drawings.
2. Unless otherwise indicated, fence height shall be 6 ft. minimum.

J. Security Procedures: Secure project against unauthorized entry at all times. Provide secure, locked, temporary entrances to prevent vandalism, theft, and similar violations of security.

1. Storage: Provide secure, locked facilities for areas where materials and equipment are stored.
2. Comply with Owner's security program.
3. Secure entry during construction hours. All construction personnel shall wear a photo ID badge while on site. General Contractor shall be responsible for preparing, issuing, and controlling badges. The General Contractor shall provide a security guard at site entrance to check for badges on entry.
4. All construction personnel shall sign in with the security guard on entry and exit from the site. The first and last entries for each day shall be written certification by the General Contractor's superintendent and posted security guard that premises were fully secured at both start and close of the work day. Entry log shall employ tamperproof metal locking sheaths imprinted with project ID and consecutive numbering
   a. General Contractor shall maintain this log and submit a copy of the log and used locking bands weekly to the Architect and Program Manager.

PART 3 EXECUTION

3.01 MAINTENANCE, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit waste and abuse.

B. Maintenance: Maintain temporary facilities in operating condition; repair damages immediately upon discovery. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour per day basis.

C. Termination and Removal: Unless otherwise requested by Architect, remove each temporary facilities when no longer useful, or when replaced by permanent facility. Clean and renovate permanent facilities that have been used during construction period, including:

1. Replace air filters and clean inside of ductwork and housings.
2. Replace worn parts.
3. Replace lamps.

END OF SECTION

SECTION 01550

ACCESS ROADS AND PARKING AREAS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 REQUIREMENTS INCLUDED

A. Provide and maintain vehicular access to site and within site to provide uninterrupted access:

1. To temporary construction facilities, storage, and work areas.
2. For use by persons and equipment involved in construction of Project.
3. For use by emergency vehicles.
4. For use by the public using the facility.
5. For use by the Rental Car Agencies at the facility.
6. For use by Lease holders at the Jetport.
7. For use by Ground Transportation, and taxi service.

B. Provide and maintain temporary parking areas for use by construction personnel.

C. Remove temporary construction road and parking facilities when no longer needed, and restore areas.

D. Coordination with the Jetport's parking management firm, APCOA.

E. Maintenance of traffic flow on Westbrook Street.

F. Cleaning of access roads and parking areas affected by the construction.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 00840, SPECIAL CONDITIONS

2. Section 01040, COORDINATION.
3. Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
4. Section 01570, TRAFFIC REGULATION.

1.04 ON-SITE ROADS AND PARKING AREAS.

A. Locate roads, drives, walks, and parking facilities to provide uninterrupted access to construction offices, mobilization areas, work and storage areas, and other areas required for execution of the Contract.

1. Location: As designated by Building Owner; consult with Building Owner and Architect regarding any desired deviation therefrom.

B. Maintain traffic areas free as possible of excavated materials, construction equipment, Products, snow, ice, and debris. The contractor shall have available on a daily basis a vacuum assisted street sweeper to maintain construction areas.

C. Keep fire hydrants and water control valves free from obstruction and accessible for use.

PART 2 PRODUCTS

2.01 BASE AND TOPPING MATERIALS

A. For temporary construction which will be removed when no longer needed for construction purposes: To Contractor's option.

B. For earthwork and topping which will become a permanent part of the Work: Respective sections of Specifications.

2.02 CALCIUM CHLORIDE

A. Calcium chloride for roadway dust control shall conform to MDOT Specifications.

PART 3 EXECUTION

3.01 PREPARATION

A. Clear areas required for access roads and parking areas.

B. Fill, compact, and grade areas as necessary to provide suitable support for vehicular traffic under anticipated loadings.

C. Provide for surface drainage of facilities and surrounding areas.

1. Provide and operate temporary pumps.

3.02 CONSTRUCTION

A. Construction methods for temporary facilities to be removed when no longer needed: To Contractor's option to provide the required results.

B. For work which will become a part of permanent Work, comply with respective sections of Specifications for preparation and construction.

3.03 MAINTENANCE

A. Maintain roads, walks, and parking areas in a sound, clean condition.

1. Repair or replace any portions damaged during progress of construction work.

3.04 DUST CONTROL

A. Contractor shall be responsible for dust control during all construction operations. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. If the Architect decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread calcium chloride as directed. Methods and materials for dust control shall be as approved by the Architect.

3.05 REMOVAL

A. Completely remove temporary materials and construction when construction needs can be met by use of permanent installation.

1. Remove and dispose of compacted materials to depths required by various conditions to be met in completed Work.

B. Restore areas to original or to specified conditions at completion of Work.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 REQUIREMENTS INCLUDED

A. Provide, operate, and maintain temporary equipment, services, and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, at on-site access roads, and parking areas during construction.

1. Maintain unobstructed access to fire hydrants and other access routes.

2. Provide open fire lane maintained throughout the construction period to provide uninterrupted access to Project site.

3. Provide temporary flagmen and traffic control at designated project entrances during any and all hauling and heavy traffic operations.

4. Coordinate with Portland Fire Department, for work on the deep gravity drainage system.

5. Coordinate with Jetport operations personnel to control traffic on the airfield.

B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or specified conditions.

C. Maintain traffic flow on Westbrook Street.

D. Maintain Airfield service roads.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 00840, SPECIAL CONDITIONS.
2. Section 01040, COORDINATION.
3. Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
4. Section 01550, ACCESS ROADS AND PARKING AREAS.

1.04 REFERENCED STANDARDS

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. State of Maine, Department of Transportation:

Manual	Manual on Uniform Traffic Control Devices
Specifications	Standard Specifications for Highways and Bridges

1.05 TRAFFIC CONTROL

A. Provide traffic control required to direct and maintain an orderly flow of traffic in all areas under Contractor's control, or affected by Contractor's operations. Coordinate with Architect.

B. Provide traffic control and directional signs, mounted on barricades or standard posts:

1. At each change of direction of a roadway and at each crossroad.
2. At detours.
3. At parking areas.

C. Provide electronic message boards to be located around the project site as coordinated through the Architect and the owner.

D. Control Construction vehicle traffic on the Airfield. Follow all security requirements outlined in the specifications.

1.06 POLICE DETAILS

A. If required by local authorities, provide qualified police detail when construction operations encroach on city traffic lanes.

1.07 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner and Architect operations, or construction operations. Locate parking for construction vehicles at locations approved by the Architect and Owner.

B. Monitor parking of construction personnel's private vehicles:

1. Maintain free vehicular access to and through parking areas.
2. Prohibit parking on or adjacent to access roads, or in nondesignated areas.

1.08 HAUL ROUTES

A. Consult with the Owner and Architect to establish public thoroughfares which will be used as haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to expedite traffic flow and to minimize interference with normal public traffic.

D. The Contractor shall not close or obstruct any portion of any street, public or private, without obtaining permits therefore from the proper authorities. If any street or private way shall be rendered unsafe by the Contractor's operations, the Contractor shall make such repairs or

provide such temporary ways or guards as shall be acceptable to the governing authority.

E. The Contractor shall conduct the work at all times so that the abutters shall have access to their property. When public or private property is isolated by the temporary closure of a road, the Contractor shall be responsible for providing such safe means of access to a public way as the Architect deems essential.

F. Haul routes on the airfield shall be coordinated in accordance with the Jetport security program, as outlined in Section 00840.

PART 2 PRODUCTS

2.01 SAFETY CONTROLS AND SAFETY SIGNING

A. Safety controls and safety signing for construction operations shall conform to the relevant provisions of DOT Specifications.

B. Detour signs shall have breakaway post assemblies conforming to the applicable provisions of DOT Specifications.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies administrative and procedural requirements for materials and equipment used for the Project.

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. AGREEMENT.
2. Section 01010, SUMMARY OF WORK.
3. Section 01300, SUBMITTALS.
4. Section 01630, SUBSTITUTION REQUEST FORM.
5. Section 01700, CONTRACT CLOSEOUT.

1.04 MATERIAL AND EQUIPMENT INCORPORATED INTO THE WORK.

A. Conform to applicable specifications and standards.

B. Comply with size, make, type and quality specified, or as specifically approved in writing by the Architect.

C. Manufactured and Fabricated Products:

1. Design, fabricate and assemble in accord with the best engineering and shop practices.
2. Manufacture like parts of duplicate units to standard size and gages, to be interchangeable.
3. Two or more items of the same kind shall be identical, by the same manufacturer.
4. Products shall be suitable for service conditions.
5. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

D. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.05 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.06 MANUFACTURERS' INSTRUCTIONS

A. When work is specified to comply with manufacturers' instructions, submit copies of said instructions, as specified in Section 01300, SUBMITTALS, distribute copies to persons involved, and maintain one set in field office.

B. Perform work in accordance with details of instructions and specified requirements. Should a conflict exist between Specifications and manufacturer's instructions, consult with Architect.

1.07 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

B. Transport Products by methods to avoid Product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.

C. Provide equipment and personnel to handle Products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and products are undamaged.

E. Product Handling

1. Immediately upon delivery, inspect shipment to assure:

a. Product complies with requirements of Contract Documents and reviewed submittals.

b. Quantities are correct.

c. Containers and packages are intact, labels are legible.
d. Products are properly protected and undamaged.

2. Expedite replacement of damaged products.

3. Provide equipment and personnel necessary to handle products, including those provided by OWNER, by methods to prevent soiling or damage to products or packaging.

4. Provide additional protection during handling as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.

5. Handle products by methods to prevent bending or overstressing.

6. Lift heavy components only at designated lifting points.

1.08 STORAGE AND PROTECTION

A. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weathertight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

B. For exterior storage of fabricated Products, place on sloped supports above ground. Cover Products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure Products are undamaged and are maintained under required conditions.

E. After installation, provide coverings to protect Products from damage from traffic and construction operations, remove when no longer needed.

F. Maintenance of Storage

1. Maintain periodic system of inspection of stored products on scheduled basis to assure that:

   a. State of storage facilities is adequate to provide required conditions.

   b. Required environmental conditions are maintained on continuing basis.

   c. Surfaces of products exposed to elements are not adversely affected. Any weathering of products, coatings and finishes is unacceptable under requirements of Contract Documents.

2. Mechanical and electrical equipment which requires servicing during long term storage shall have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on exterior of package. Comply with manufacturer's instructions on scheduled basis.

3. Any product damaged because of improper storage or protection shall be unacceptable for installation and shall be removed from the site.

1.09 PRODUCT OPTIONS

A. Within 30 days after date of Contract, submit complete list of major Products proposed, with name of manufacturer, trade name, and model.

B. Options:

1. Products specified only by reference standard: Any Product meeting that standard.
2. Products specified by naming several manufacturers: Products of any named manufacturer meeting Specifications.
3. Products specified by naming one or more manufacturers and "or equal": Submit a request for substitution for any manufacturer not specifically named.

4. Products specified by naming only one manufacturer: No option.

1.10 MATERIAL SUBSTITUTIONS

A. Where products or materials are specified by manufacturer's name, trade name or catalog reference, the words "or approved equal" shall be understood to follow unless there is a statement specifically indicating that no substitution will be allowed. An item shall be considered equal to the item so named or described if in the opinion of the Architect:

1. It is at least equal in quality, durability, appearance, strength and design; including compliance with applicable specifications and compatibility with physical space allocations provided for the item;
2. It performs at least equally the function imposed by the general design for the work;
3. It conforms substantially, even with deviations to the detailed requirements for the item as indicated by the specifications.

B. Where two or more products or materials are specified, the choice of these shall be optional with the Contractor.

C. Should the Contractor, after the award of the Contract, wish to use any products or materials other than those specified, he shall request written permission of the Architect. His request shall name and adequately describe (including shop drawings) the proposed substitutions, furnish any information requested by the Architect, and state what difference, if any, will be made in the Contract price, including the cost of changes in the Work, for such substitutions should they be accepted. Upon receipt of complete information from the Contractor, the Architect will consider all aspects of the proposed substitution and advise the Contractor in writing approving or disapproving the substitution. The principal reasons for approval or disapproval of the substitution will be enumerated by the Architect. Disapproval of the substitution shall not be cause for an increase in contract price or a delay in schedule.

D. Request constitutes a representation that Contractor:

1. Has investigated proposed Product and determined that it meets or exceeds, in all respects, specified Product.
2. Will provide the same warranty for substitution as for specified Product.
3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects.
4. Waives claims for additional costs which may subsequently become apparent.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request on the form included at the end of this Section, or when acceptance will require substantial revision of Contract Documents.

F. The Architect will determine acceptability of proposed substitution, and will notify Contractor of acceptance or rejection in writing within a reasonable time.

G. Any additional cost, or any loss or damage arising from the substitution of any materials, equipment or execution of work for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Architect, unless such substitution was made at the written request or direction of the Architect.

H. Redesign

1. Redesign of any portion of the work affected by the substitution and coordination of installation of the substitution shall be the responsibility of the CONTRACTOR. There shall be no increase in Contract Price for redesign due to substitution of products.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01630

SUBSTITUTION REQUEST FORM

No substitutions will be considered
without this completed substitution request form and supporting documentation.

Substitutions made without completion of this form
will be considered defective work

Date: _____ Number: _____

Project: Phase 2- Parking Garage
Parking Garage and Sitework
Portland International Jetport

To: Domenech Hicks & Krockmalnic

Re: Request for Substitution

The Contractor proposes the following substitution in accordance with the requirements of the Contract Documents:

Scope of Substitution _____

_____

Specification Reference _____

_____

Drawing Reference _____

_____

Reason for Proposed Substitution _____

_____

_____

_____

Impact on Project Cost _____

_____

Impact on Project Schedule _____

_____

Impact on Guarantees and Warranties _____

_____

Coordination Required with Adjacent Materials and System _____

_____

List Deviations From Specified Requirements _____

_____

_____

_____

Attachments: Attach supporting documentation sufficient for Architect to evaluate substitution. Substitution Request Forms submitted without adequate documentation will be returned without review.

Attachments _____

_____

_____

Response Date: List date by which response by Architect is requested to maintain project schedule and allow sufficient time for inclusion of proposed substitution.

Response Date _____

Submitted By _____

Firm and Address _____

_____

Signature below signifies acceptance of responsibility for accuracy and completeness of information included in this Substitution Request Form.

Authorized Signature _____

ARCHITECT'S RESPONSE

Notations listed below shall have same meaning as on Architect's approval stamp. Clarifications to or changes in project schedule or time shall be processed using standard project forms.

Architect's Response

_____ Approved

_____ Approved as Corrected

_____ Revise and Resubmit

_____ Rejected

_____ Returned Without Review

Remarks _____

_____

_____

_____

_____

_____

Date Signed _____

END OF FORM

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies administrative and procedural requirements during contract closeout, including, but not limited to:

1. Substantial Completion.
2. Final Acceptance.
3. Record document submittal.
4. Operating and maintenance data.
5. Warranties.
6. Final cleaning.

B. Requirements for Closeout

1. Neither the final payment nor the remaining retained percentage shall become due until the CONTRACTOR has satisfied the requirements of THE CONTRACT and the following:

a. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the OWNER might in any way be responsible, have been paid or otherwise satisfied (see attached form at end of this section).

b. Data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent, and in such form as may be designated by the OWNER. If any subcontractor refuses to furnish a release or waiver required by the OWNER, the CONTRACTOR may furnish a bond satisfactory to the OWNER to indemnify the OWNER against any resulting lien. If any such lien remains unsatisfied after all payments are made, the CONTRACTOR shall refund to the OWNER all monies that the latter may be compelled to pay in discharging such lien, including all costs and attorney's fees.

2. Additional requirements for Project closeout shall include submittal, (if not previously submitted) of the following:
a. Evidence of compliance with requirements of governing authorities.

1. Certificate of occupancy.

2. Certificates of inspection required for mechanical and electrical systems.

b. Project Record Documents: In accordance with Section 01720 - Project Record Documents.

c. Operation and Maintenance Data: In accordance with Section 01730 - Operation and Maintenance Manuals.

d. Warranties and Bonds: In accordance with Section 01740 - Warranties and Bonds.

e. Evidence of payment and release of liens in accordance with conditions of the Contract (see attached form at end of this section).

f. Consent of Surety to final payment (see attached form at end of this section).

1.03 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. AGREEMENT; Fiscal provisions, legal submittals, and additional administrative requirements.
2. Section 01010, SUMMARY OF WORK; Owner occupancy.
3. Section 01720 RECORD DOCUMENTS.
4. Section 01730 OPERATIONS ANDMAINTENANCE MANUALS.
5. Respective Sections of Specifications: Closeout Submittals for work of the Section.

1.04 SUBSTANTIAL COMPLETION

A. Prior to requesting inspection for certification of Substantial Completion, complete the following:

1. On Application for Payment, show 100% completion for portions of work claimed as substantially complete. Submit list of incomplete items, value of incomplete work, and resubmission of occupancy permits.
2. Submission of warranties.
3. Submission of test/adjust/balance records.
4. Submission of maintenance instructions.
5. Submission of meter readings.
6. Final cleaning.
7. Application for reduction of retainage.
8. Consent of surety.
9. Notification of shifting insurance coverages.
10. Final progress photographs.

B. Within reasonable time, the Architect will inspect to determine status of completion.

C. Should Architect determine Work is not substantially complete, he will promptly notify Contractor in writing, giving reasons therefor.

D. Contractor shall remedy deficiencies, and send a second written notice of Substantial Completion. The Architect will re-inspect the Work.

E. When Contractor determines Work is Substantially Complete, he will prepare Certificate of Substantial Completion in accordance with the AGREEMENT for approval of Architect.

1.05 FINAL ACCEPTANCE

A. Prior to requesting final inspection for certification of Final Acceptance and final payment, complete the following:

1. Submission of final payment request with releases and supporting documentation.
2. Completion of incomplete Work.
3. Assurances that unsettled claims will be settled.
4. Submission of updated final statement, including accounting for final additional changes to the Contract Sum. Show additional Contract Sum, additions and deductions, previous Change Orders, Total Adjusted Contract Sum, previous payments, and Contract Sum due.
5. Submission of consent of surety.
6. Submission of evidence of final, continuing insurance coverage complying with insurance requirements.
7. Transmit final Project Record Documents to Owner.
8. Transmit certified property survey.
9. Prove that taxes, fees, and similar obligations have been paid.
10. Remove temporary facilities and services.
11. Remove surplus materials, rubbish and similar elements.
12. Change lock cylinders or cores, and submit keys and keying schedules.
13. Certify Work has been inspected for compliance with Contract Documents.
14. Certify Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
15. Certify equipment and systems have been tested in presence of Architect, and are operational.
16. Certify Work is complete and ready for final inspection.

B. Architect will inspect to verify status of completion with reasonable promptness.

C. Should Architect consider Work is incomplete or defective, he will promptly notify Contractor in writing, listing incomplete or defective work.

1. Contractor shall take immediate steps to remedy deficiencies and send a second written certification that Work is complete, and Architect will re-inspect the work.
2. When Architect finds Work is acceptable, he will consider closeout submittals.
3. Re-inspection Fees: Should of Architect perform re-inspections due to failure of Work to comply with claims made by the Contractor, the Owner will deduct the amount of such compensation from final payment to the Contractor.

D. Application for Final Payment: Submit Application for Final Payment in accordance with procedures and requirements in Conditions of the Contract.

1.06 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction.

1. Review contents of manual with personnel in full detail to explain all aspects of operation and maintenance.

1.07 FINAL CLEANING

A. General: General cleaning during construction operations is specified as Work of Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

B. Employ experienced workers or professional cleaners for Final Cleaning. Clean each surface to the condition expected in a normal building cleaning and maintenance program. Comply with manufacturer's instructions and recommendations.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

A. General: Provide cleaning materials that will not create hazards to health nor property, and will not damage surfaces or finishes.

B. Use cleaning materials and methods recommended by manufacturer of surface to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.01 FINAL CLEANING

A. Employ skilled workers for final cleaning.

B. Clean and restore adjoining surfaces and other work soiled or damaged during installation; replace work damaged beyond successful restoration. Where performance of subsequent work could result in damage to complete unit or element, provide protective covering and other provisions to minimize potential for damage.

C. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed surfaces.

D. Complete the following cleaning operations prior to requesting inspection for Certification of Substantial Completion:

1. Remove labels that are not permanent.
2. Clean glass and mirrors.
3. Polish glossy surfaces to clear shine.
4. Clean interior and exterior finishes to a clean, dust-free condition. Remove stains, films, and similar foreign substances.
5. Leave concrete floors broom clean.
6. Clean site areas of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; rake ground surfaces clean.

E. Replace lamps in permanent light fixtures used during construction with lamps specified in Division 16 - ELECTRICAL.

F. Before final completion and Owner-occupancy, inspect sight-exposed exterior surfaces and work areas to verify that Work is clean.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintaining and submitting record documents and samples.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Maintain at the site for OWNER one record copy of:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Accepted shop drawings, product data, and samples.
6. Field test records.
7. Inspection certificates.
8. Manufacturer's certificates.
9. Manufacturer's operating and maintenance manuals.

B. Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage for record documents and samples.

C. Label and file record documents and samples in accordance with section number listings in Table of Contents of this Specification. Label each document "PROJECT RECORD" in neat, large, printed letters.

D. Maintain record documents in a clean, dry and legible condition. Do not use record documents for construction purposes.

E. Keep record documents and samples available for inspection by ARCHITECT.

1.03 RECORDING

A. Record information on a set of blue line drawings.

B. Use felt tip marking pens, maintaining separate colors for each major system, for recording information.

C. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

D. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:

1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.

3. Field changes of dimensions and details.
4. Changes made by modifications.

5. Details not on original Contract Drawings.

6. References to related shop drawings and modifications.

7. Swing ties to all underground utilities.

E. Specifications: Legibly mark each item to record actual construction, including:

1. Manufacturer, trade name and catalog number of each product actually installed, particularly optional items and substitute items.

2. Changes made by addenda or modifications.

F. Other Documents: Maintain manufacturer's certifications, inspection certifications, and field test records, required by individual Specification sections.

1.04 SUBMITTALS

A. At Contract closeout, deliver record documents and samples as specified in Section 01700 - Contract Closeout, to ARCHITECT for use in the preparation of Project Record Drawings.

B. Transmit with cover letter in duplicate, listing:

1. Date.
2. Project title and number.
3. CONTRACTOR'S name, address, and telephone number.
4. Number and title of each Record Document.
5. Signature of CONTRACTOR or authorized representative.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Compiling of product data and related information required for maintenance of products.

B. Preparing of operation and maintenance data and instructions for systems and equipment.

C. Schedule of required submittals.

1.02 QUALITY ASSURANCE

A. Prepare instructions and data using personnel experienced in maintenance and operation of described products.

1.03 FORMAT

A. Prepare data in the form of an instructional manual.

B. Binders: Commercial quality, 8-1/2 x 11 inch three-ring binders with hardback, cleanable, plastic covers; two inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title "OPERATION AND MAINTENANCE INSTRUCTIONS"; list title of Project and identify equipment covered by manual.

D. Arrange content by section numbers and provide Table of Contents.

E. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data on twenty (20) pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME

A. Table of Contents: Provide title of Project; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of subcontractors, manufacturers and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

E. Typed Text: Prepare as required to supplement product data. Provide logical sequence of instructions for each procedure. Incorporate manufacturer's instructions for delivery, storage, assembly, installation, start-up, adjusting, finishing, operation and maintenance.

F. Warranties and Bonds: Bind in one (1) copy of each.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Building Products, Applied Materials, and Finishes: Include product data with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture-protection and Weather-exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As Specified in individual Specification sections.

1.06 MANUFACTURER'S MANUALS FOR EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System: Include a description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data, tests, and certifications where appropriate and complete nomenclature and commercial number of replaceable parts, where applicable.

B. Panel Board Circuit Directories: Provide electrical service characteristics and name of load on each branch circuit breaker.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions. Provide servicing and lubrication schedule, and list of lubricants required.

E. Controls: Provide the following:

1. Sequence of operation.

2. Original parts list, illustrations, assembly drawings, and diagrams required for maintenance.

3. As-installed control diagrams.

4. CONTRACTOR'S coordination drawings, with as-installed color coded piping diagrams.

5. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

6. As-installed color coded wiring diagrams.

F. Additional Requirements: As specified in individual Specification sections.

1.07 SUBMITTALS

A. Submit six (6) copies of a draft Operation and Maintenance Manual for equipment and component parts within thirty (30) days after shop drawing approval. Draft manuals need only include the substantive material and need not comply with the presentation and format requirements of this section. Four (4) copies will be returned, One (1) copy will have ARCHITECT'S comments.

B. Submit six (6) copies of revised manual in final form complying with all paragraphs of this section and all ARCHITECT'S comments within thirty (30) days from the return of the reviewed manual under paragraph 1.07 A. Four (4) copies will be returned, One (1) copy of which will have the ARCHITECT'S comments. Revise content of documents as required prior to final submittal.

C. Submit four (4) copies of revised manual in final form within thirty (30) days from the return of manuals under paragraph 1.07 B.

D. The ARCHITECT will review each manual submitted in a reasonable amount of time, not limited to fifteen (15) days.

1.08 SCHEDULE OF SUBMITTALS

A. Operation and Maintenance Manuals conforming to this specification and individual specifications, shall be submitted for the following equipment.

<u>Equipment Description</u>
Site Lighting

The above schedule is not all inclusive of individual sections requiring operation and maintenance manuals. The CONTRACTOR remains responsible for operation and maintenance manuals for equipment both on the schedule and not on the schedule but called for in the individual specifications.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01731

SERVICES OF MANUFACTURER'S REPRESENTATIVES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Observing installation of equipment.

B. Checking, inspecting and adjusting equipment and certification of equipment, alarms, instrumentation and controls.

C. Performance testing and start-up of equipment, alarms, instrumentation and controls.

D. Operator training.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 OBSERVING INSTALLATION, CHECKING, INSPECTION AND ADJUSTING EQUIPMENT AND CERTIFICATION OF EQUIPMENT, INSTRUMENTATION AND CONTROLS

A. Furnish the services of a manufacturer's qualified representative to observe the actual installation of equipment indicated on the schedule in paragraph 3.04.

B. Furnish the services of a manufacturer's qualified trained service representative or designee acceptable to the ARCHITECT, to check, inspect, and adjust all equipment and accessories in accordance with the schedule in paragraph 3.04 and in accordance with individual specification sections. The services shall begin when the equipment is requested to be placed into operation by the CONTRACTOR and as approved by the ARCHITECT.

C. The minimum period of time that the service representatives shall perform the services described herein shall be in accordance with the schedule in paragraph 3.04 and in accordance with individual specification sections. Any additional time to correct and make equipment ready to start-up will be "as required" and at no additional cost to the OWNER. The individual specification sections noted on the schedule are not all inclusive of sections requiring service representation.

D. The service representative shall: inspect the equipment for proper installation, lubrication and adjustment, damage and missing parts; inspect and check control systems and accessory equipment whether or not supplied by other manufacturers; and, make all necessary corrections to make equipment ready to start-up and properly operate after start-up.

E. Prior to equipment start-up, the service representative shall furnish a letter to the ARCHITECT confirming that equipment installation is in conformance with the manufacturer's recommendations; that all alignments, adjustments and corrections have been made; and, that the equipment is ready for operation.

3.02 PERFORMANCE TESTING AND START-UP OF EQUIPMENT, INSTRUMENTATION AND CONTROLS

A. Performance testing shall not be performed until after the service representative's letter of installation certification has been furnished to ARCHITECT.

B. Performance testing of all electrical, mechanical and hydraulic equipment and associated controls and instrumentation shall be performed to demonstrate that the equipment and associated systems meet the specified performance conditions.

C. The CONTRACTOR shall provide the services of a manufacturer's qualified service representative or designee acceptable to the ARCHITECT, as required for equipment provided on the Project, to directly supervise the performance testing of equipment installed on the Project. These services shall be provided in addition to the installation observation and/or installation certification requirements and operator training requirements as described in this section.

D. All mechanical, electrical and hydraulic equipment and associated control systems and instrumentation are to be tested. Performance criteria and/or procedures are contained in various sections of the individual equipment specifications. Where a specific procedure is not described in the individual specifications, testing procedures common to the industry shall be employed to verify performance.

E. All scheduling of performance testing shall be approved by the ARCHITECT and a minimum of seven (7) days notice shall be provided to the ARCHITECT by the CONTRACTOR prior to scheduling of testing. In addition, when more than one system is to be tested within a given week, the CONTRACTOR shall provide a proposed equipment testing schedule to the ARCHITECT for review prior to initiating equipment tests.

F. Performance testing of all equipment shall be performed prior to plant start-up and/or acceptance of the Work. Requests for exception of this requirement must be submitted to the ARCHITECT in writing for approval.

G. Prior to initiating the performance tests, the general procedure to be used shall be submitted to the ARCHITECT for his review and approval.

H. All equipment, instrumentation, materials and labor shall be provided by the CONTRACTOR and/or the service representative.

I. During the performance tests, the designated service representative shall record data necessary to verify that the equipment being tested meets the specified performance criteria.

J. Following completion of the performance tests, the CONTRACTOR shall submit a performance test report which summarizes the results of the performance tests and certifies that the equipment meets the specified performance requirements.

K. If the equipment fails to meet the specified performance requirements, the equipment shall be modified or replaced and retested with the end result being that the equipment meets the specified performance criteria. Modification, replacement and retesting shall be provided at no extra cost to the OWNER.

L. Requests for acceptance of a piece of equipment or system will be considered only after completion of successful performance testing and submittal of the performance test report by

the CONTRACTOR.

3.03 OPERATOR TRAINING

A. Operator training shall not be performed until after the service representative's letter of installation certification has been approved.

B. After certifying to the installation of the equipment and at the direction of the ARCHITECT, the manufacturer's representative shall train the OWNER'S operational staff in the start-up, operation and routine maintenance of the equipment as described in Section 3.04 in the presence of the ARCHITECT.

C. An overall scheduling proposal shall be submitted to the ARCHITECT for approval. In addition, prior to performing operator training services, a schedule for training services proposed shall be submitted to the ARCHITECT for approval at least three (3) days in advance of the proposed operator training. When more than one system is proposed for operator training in a given week, a proposed schedule for that week shall be submitted to the ARCHITECT for approval.

D. Following the training, the manufacturer shall provide written certification to the ARCHITECT that the required training was provided.

E. All inspection and training shall be coordinated with the ARCHITECT.

3.04 SCHEDULE OF MANUFACTURER'S SERVICE REPRESENTATIVE

A. Services of the manufacturer's representatives for observing installation, inspecting, adjusting, testing and start-up shall be provided.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Preparing and submitting of warranties and bonds.

1.02 FORM OF SUBMITTALS

A. Bind in commercial quality 8-1/2 x 11 inch, three-ring side binders, with hardback, cleanable, plastic covers.

B. Label cover of each binder with typed or printed title "WARRANTIES AND BONDS", with title of Project; name, address and telephone number of CONTRACTOR; and name of responsible principal.

C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Contract Documents, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

D. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.03 PREPARATION OF SUBMITTALS

A. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers, and manufacturers within ten (10) days after completion of the applicable item of work. Except for items put into use with OWNER'S permission leave date of beginning of time of warranty open until the date of substantial completion is determined. All warranty coverage shall be extended directly to the benefit of the OWNER.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

1.04 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with OWNER'S permission, submit documents within ten (10) days after acceptance.

B. Make other submittals within ten (10) days after date of substantial completion, prior to final application for payment.

C. For items of Work when acceptance is delayed beyond date of substantial completion, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01900

SITEWORK DIVISION 1 (01900 SERIES) SECTIONS

PART 1 GENERAL:

1.01 GENERAL:

A. Specifications Sections numbered in the "019xx" Series are Division 1 (General Requirements) Sections pertaining to Sitework as specified under DIVISION 2 Sections **and** indicated on the "C" Series Drawings.

B. **NOTE:** All requirements of **other** Sections of DIVISION 1 apply to Sitework also.

1. In event of discrepancy, the requirements of the 01900 Series Specifications take precedence, to the extent that they refer to Sitework as specified under DIVISION 2 and applicable Drawings only.

2. Preparation of the 01900 Series Specifications is for convenience only and is in no manner intended to imply a separation of responsibility of Contractor for the entire Work of the Contract.

1.02 ADDITIONAL REQUIREMENTS FOR SITEWORK:

A. General: Note that all provisions of DIVISION 1 apply, including those preceding the 01900 Series Sections. Major items applicable include, but are not limited to, the following:

B. Project Record "As-Built" Documentation: Refer to SECTION 01720 – PROJECT RECORD DOCUMENTS, Paragraph 1.03 RECORDING. Note that all locations of **all below grade and concealed construction is to be accurately located, from permanent visible construction, and that other requirements for project documentation apply.**

C. Use of Site, Scheduling and Phasing of Work: Refer to SECTION 01150. Note in particular requirements for detailed Progress Schedule, which must include and be coordinated with specific phasing requirements of SECTION 01901. Note also requirements and definitions of "Contract Sites" and "Limits of Work".

D. Testing Laboratory Services: Refer to SECTION 01410 – QUALITY CONTROL AND TESTING SERVICES.

E. Quality Assurance; Submittals: Refer to SECTION 01410 - QUALITY CONTROL AND TESTING SERVICES. Note that quality assurance and submittal procedures shall conform to requirements of SECTION 01410 unless specified otherwise under the applicable Technical Sections (Division 2).

F. Temporary Facilities and Controls: Refer to SECTION 01500 CONSTRUCTION FACILITES AND TEMPORARY CONTROLS. Requirements of SECTION 01500 apply except where more stringent requirements are required under the 01900 Series or DIVISION 2 Sections.

END OF SECTION 01900

SECTION 01901

SITE PHASING

PART I GENERAL

1.01 WORK INCLUDED

A. Phasing the construction work to maintain continuous, convenient, and safe vehicle and pedestrian access in and around the terminal facility for the duration of this project is critical. Refer to SECTION 01150-USE OF SITE, SCHEDULING AND PHASING OF WORK for additional information. The areas that must remain accessible are:

1. The main access road to the Jetport facility and the loop road which circles the parking areas and parking garage must remain passable to all vehicles, from passenger cars and motorcycles to low-boy tractor trailers, at all times. Only one lane of the loop road in front of the terminal may be closed to vehicular traffic at any time. The other lane must remain accessible by all vehicles. See the project drawings for specific phasing requirements for construction improvements proposed directly in front of the Terminal Building.

2. Vehicles must be able to access the existing parking garage and remaining areas of surface parking lots not specified for contractor use for the duration of the project.

3. Vehicles must have continuous access to the security gate for the Air Traffic Control Tower.

4.. Vehicles must have continuous access to and from the Jetport Fire Department facility.

5. Vehicles must have continuous access to Baggage Claim Parking Area at all times.

6. Safe and convenient pedestrian access must be maintained from the existing parking garage and surface parking lots to the Terminal Building, for the duration of the project. All temporary pedestrian access ramps shall meet both ADA and City of Portland handicapped access requirements.

B. To accomplish these goals, sheet C3-2 "Construction Phasing Plans and Details" of the construction drawings outlines a recommended plan for site construction phasing. This drawing describe the general sequence of construction, limits of each phase, recommended access routes, and the work to be accomplished during each phase in the vicinity of the Terminal. Additionally, the Contractor should refer to sheet C6-3 "Filter Pond Grading Plan" for special construction phasing requirements for construction of the stormwater treatment pond. In addition, the following requirements must be adhered to by the Contractor, throughout the life of the project.

1. For each Phase, the Contractor shall furnish all required spot lights, safety lights, signs, fencing, barricades, temporary pavement markings and ramps, and other items necessary to provide a safe work site, as well as safe and convenient vehicular and pedestrian access to the areas outlined above, and/or other areas requested and approved by the Architect. The number and location of all required lights, signs, fencing, barricades, markings, and ramps shall be approved by the Architect prior to their placement. These items shall be in place prior to

commencement of construction within the particular Phase, and shall remain in place for the duration of the Phase. All areas of the work site, with the exception of the Phase under construction, shall be safely accessible, 24 hours per day, seven days per week without causing significant inconvenience for Jetport visitors and personnel.

a. All work performed under this Section requiring temporary ramps, etc., must conform to ADA and other applicable handicap code requirements.

2. The Contractor, when necessary or requested by the Architect, shall provide at least three flagpersons, with radios, which shall aid and direct traffic and pedestrians. At the Architects discretion, flag personnel may be necessary even during non-work hours to ensure safe vehicle and personnel passage through all areas. The flagpersons shall be stationed as directed by the Architect in the field and shall be available around the clock as deemed necessary.

3. For each phase, Jersey barriers and fencing shall be placed as shown on the Phasing Plans or as directed by the Architect. The purpose of these barriers and fencing is to delineate the current work site and prevent vehicles and pedestrians from accessing the area. Access walkways shall guide pedestrians to the appropriate entry/exit point, and restrict and limit road crossings to only the designated crosswalks. Temporary striping and way finding signage shall be as shown on the drawings and as directed by the architect.

4. Stormwater drainage must be maintained through the existing stormwater system until such time as the proposed stormwater system modifications are operational. The Contractor shall make provisions to mitigate all stormwater drainage through erosion and sedimentation control best management practiceprior to commencement of any work.

5. All temporary vehicle ramps between existing and constructed grades shall be built to permit unobstructed passage of all vehicles, including low boy 18 wheel auto transport trucks, with no damage to the vehicle or the site. Such ramps shall be removed once their need has passed.

6. Contractor shall submit for approval the proposed Phasing Plan for each Phase prior to commencement of work within that Phase. In addition, daily coordination with the Architect and Airport Personnel prior to commencement of work for that day will be required.

7. Contractor shall receive daily approval from the Architect that all lights, signs, fences, and barricades (lighted) are in place and operational prior to leaving the work site for that day.

8. Continual coordination with the appropriate parties will be required to ensure that facility utilities, sidewalks, apron parking and other improvements are performed in a manner to prevent redundancy of work and/or conflicts. All concrete for use in site improvements shall be protected by the contractor for the full curing period.

9. All utilities beneath the project area shall be installed during the appropriate work phase. All utilities installed shall be capped and protected until final connection is made. Coordination with the building trades is required to minimize utility shutdowns and ensure expedient and accurate connections.

10. Contractor is responsible for all layout of the work. This layout is subject to

verification and approval by the Architect prior to any groundbreaking or demolition.

11. Unless otherwise indicated on the drawings, the Contractor shall restore all staging areas, haul routes, temporary access entrances, and temporary facility locations to their original condition upon completion of the project.

12. All costs associated with installing, relocating during changes in phasing, and removal of temporary lights, signs, fencing, gates, barricades, barriers, traffic cones, markings, and ramps required for safe and convenient pedestrian and vehicle access as shown on the drawings or as required by the Architect shall be incidental to the project and included in the Contractor's lump sum bid for the project.

13. All the above requirements are mandatory for the entire length of the project and to the satisfaction of the City of Portland and the Architect.

END OF SECTION

SECTION 01946

WATER SYSTEM PROTECTION AND REPAIRS

PART I GENERAL

1.01 WORK INCLUDED

A. Coordinating construction with Portland Water District.

B. Locating water mains and services.

C. Protecting existing water system.

D. Maintaining water system repair materials inventory.

E. Repairing broken water mains .

F. Repairing broken water services.

G. Backfilling around water mains and services.

1.02 REFERENCE STANDARDS

A. ANSI A21.4/AWWA C104 - Cement-Mortar Lining for Ductile- Iron and Grey-Iron Pipe and Fittings for Water.

B. ANSI A21.10/AWWA CIIO - Grey-Iron and Ductile-Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids.

C. ANSI A21.11/AWWA C111 - Rubber-Gasket Joints for Ductile- Iron and Grey-Iron Pressure Pipe and Fittings.

D. ANSI A21.51/AWWA.C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water and Other Liquids.

E. ANSI A21.53/AWWA C153 - Ductile Iron Compact Fittings, 3 Inch through 12 Inch, for Water and Other Liquids.

F. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25,125, 250 and 800.

G. AWWA C504 - Rubber-Seated Butterfly Valves.

H. AWWA C509 - Resilient Seated Gate Valves, 3 Through 12 NPS, for Water and Sewage Systems.

1. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 01300 Submittals.

1.04 LOCATING AND PROTECTING EXISTING WATER SYSTEM

A. The existing water system in the construction areas shall be protected at all times during construction.

B. The location of the water system shown on the plans is based on available existing information. The OWNER does not warrant this information to be correct and it shall be the responsibility of the CONTRACTOR to properly locate all water mains and services prior to construction.

1.05 NOTICE OF WATER MAIN AND SERVICE BREAKS

A. Upon breaking or damaging an existing water main or service the CONTRACTOR shall immediately notify the ARCHITECT and/or the OWNER. The ARCHITECT will coordinate with OWNER to identify which valves shall be closed to isolate the break.

B. No part of water system shall be without water service for a period of more than one (1) hour unless authorized by the OWNER and the ARCHITECT.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All materials and equipment shall conform to the requirements of the standard specifications referenced herein.

B. Substitutions: Except where specifically noted that the OWNER has standardized on equipment, products of equal quality, detail, function and performance may be proposed for substitution by following the procedures in Section 01340.

2.02 MATERIALS

A. Ductile Iron Pipe: Pipe shall conform to ANSI A21.51/AWWA C151, Class 52 and shall have push-on joints except that pipe installed in vaults shall have flanged ends conforming to ANSI B16.1. Pipe shall be double cement- lined inside with seal coat inside and out, conforming to ANSI A21.4/AWWA C104. Push-on joints and rubber gaskets shall be in accordance with ANSI A21.11/AWWA C111.

B. Pipe Fittings: Fittings shall be cast iron, 250 psi pressure rating, or ductile iron, 350 psi pressure rating, conforming to ANSI A21.10/AWWA CIIO with mechanical joints. Compact ductile iron fittings conforming to ANSI A21.53/AWWA C153 will be acceptable. Joints and gaskets shall conform to ANSI 21.II/AWWA C111. All mechanical joints shall be furnished with ductile iron retainer glands. Retainer glands shall have a minimum of 9 set screws for 8-inch pipe and 12 set screws for 12-inch pipe. Fittings shall be double cement-lined inside and seal- coated inside and out in accordance with ANSI A21.4/AWWA C104. Tees for hydrant branches and for stubs for future use shall be anchor tees.

2.03 VALVES

A. Gate Valves:

1. Gate valves shall be resilient seated manufactured to meet or exceed the requirements to AWWA C509. Valves shall have an unobstructed waterway when fully opened equal in diameter to at least 1/4 inch greater than the nominal valve

size.

2. All internal surfaces shall be coated with epoxy to a minimum thickness of 4 mils. Said coating shall be non-toxic, impart no taste to water and shall conform to AWWA C550.

3. Valves shall be provided with two O-ring stem seals and antifriction washer shall be located below and above the thrust collar.

4. The wedge gate shall consist of a cast iron gate having a vulcanized synthetic rubber coating with no rubber metal seams or edges in the waterway when in the fully closed position. When valve is in closed position the wedge gate shall provide zero leakage at the water working pressure when installed with the line flow in either direction.

5. All valves shall be seat tested at the rated working pressure in accordance with Section 6 of AWWA C509. Valve shall be rated at 200 psi working pressure and 400 psi hydrostatic test pressure.

6. Valves shall open per water department requirements.

7. Gate Valves shall be a Gate M & H C509 Resilient Seated Gate Valve or approved equal.

B. Butterfly Valves:

1. All butterfly valves shall be of the rubber-seated tight-closing type and shall meet or exceed AWWA C504. Valves shall be designed for underground service.

2. Valves shall have mechanical joint ends. Standard mechanical joint accessories shall be provided.

3. Valve shall open per water department requirements and be equipped with a 2-inch AWWA operating nut.

4. All valves shall be rated at 200 psi working pressure and hydrostatically tested at 400 psi.

5. Valves shall have thermosetting epoxy coating on the interior and the vane. The coating shall meet all requirements of AWWA C550. All bodies and vanes shall be factory coated prior to assembly and tested. All ferrous surfaces of the valve body, waterway and vane shall receive an epoxy coating with a minimum dry film thickness of 4 mils. All exterior surfaces shall be coated with asphalt varnish.

6. Butterfly Valves shall be Mueller Lineseal Butterfly Valve or approved equal.

D. Valve Boxes:

1. Valve boxes shall be furnished for all valves.

2. Valve boxes shall be standard cast-iron, adjustable, sliding type, together with cast-iron covers with the word "WATER" plainly cast in relief on the top surface.

3. The bottom section shall have a minimum 1. D. of 5-1/4- inches. The top section

shall have a minimum 1. D. of 6-1/8-inches. There shall be a minimum 6-inch overlap between sections.

4. Valve boxes shall be completely and thoroughly coated with two coats of bitumastic paint.

2.04 MISCELLANEOUS

A. Corporation stops shall be brass compression-type with thread. Stops shall be Mueller Co., Mark II Oriseal or approved equal.

B. Tubing for services and chlorine injection points shall be Type K annealed Seamless Copper designed for buried water service. The name or trademark of the manufacturer and type shall be stamped at intervals along the pipe.

C. Service saddles shall be double strap-type with 360° contact with the main line. The saddle shall be a high grade malleable iron or cast iron, with shop applied corrosion resistant coatings, and tapped to accept a specified sized corporation. Straps shall be high strength malleable iron with shop-applied corrosion resistant coatings.

D. Adapter couplings may be required for repairing service lines. Such fittings shall be compression connections and provide electrical continuity.

E. Couplings to be used in connecting two plain ends of cast iron, ductile iron, or AC pipe shall be of cast or ductile iron with bolts and nuts complying with AWWA C1111 Couplings shall be Dresser Style 53 or 153, or approved equal.

F. Repair couplings shall be ductile or cast iron split repair sleeves of the type and size required for the pipe being repaired. Repair couplings shall have a minimum pressure rating of 200 psi "Wrap around" repair clamps shall not be used without approval of the ARCHITECT.

G. Curb Stops and Boxes:

1. Curb stops shall be of brass and shall be Mueller Co., Mark II Oriseal or approved equal. The inlet and outlet shall have compression connections and provide electrical continuity.

2. The cast iron box shall be the extension type with arch pattern. Inside diameter of upper section shall be at least 1-1/2 inches for 3/4-inch and 1-inch curb stops and shall be at least 2 inches for 1-1/2 inch and 2- inch curb stops.

2.05 MATERIALS INVENTORY

A. The CONTRACTOR shall maintain an inventory of water system repair materials at all times during the project to insure timely repairs of broken or damaged water mains and services.

B. Inventory shall include the following material:

	ITEM	SIZE	QUANTITY
1.	Ductile Iron Pipe-C1.52	12"	36 LF
		8"	36 LF
		6"	36 LF

		4"	36 LF
2.	D.I. Solid Repair Sleeves	12"	2
		8"	2
		6"	2
		4"	2
3.	Cast Flex. Couplings	12"	4
		8"	4
		6"	4
		4"	4
4.	Gaskets for Sleeves and Couplings–	AC to DI – all sizes	– 4 ea. size
		CI to DI – all sizes	– 4 ea. size
		DI – all sizes	– 4 ea. size
5.	Service Saddles	¾" for all sizes	– 2 ea. size
		1" for all sizes	– 2 ea. size
6.	Corporation Cocks	¾-inch	4
		1-inch	4
7.	Copper Service Pipe	¾-inch	100 LF
		1-inch	100 LF
8.	Curb Stops w/ boxes	1-inch	4
		¾-inch	4
9.	Compression Couplings - IPPJxIPPJ	¾-inch	4
		1-inch	4
10.	Bell Joint Clamps	4", 6", 8", 12"	1 ea. size

C. The CONTRACTOR shall restock the inventory as required during construction. The ARCHITECT may periodically inspect the inventory to ensure that materials are of quantity and quality required and are stored properly on site.

PART 3 EXECUTION

3.01 GENERAL

A. All required repairs which are the result of the CONTRACTOR'S negligence shall be performed at no additional cost to the OWNER.

B. All broken and disturbed water mains and house services shall be repaired immediately. All materials and methods of repair shall be in accordance with these specifications.

C. If repairs cannot be made in a timely fashion, the CONTRACTOR shall install temporary water service to all affected water system users at no additional cost to the OWNER.

3.02 EXCAVATION NEAR WATER MAINS AND SERVICES

A. The CONTRACTOR shall exercise extreme care when excavating near existing water utilities.

B. Protect all utilities by bracing, shoring, underpinning, and other methods to prevent pipes

from shifting and settling.

C. When backfilling around the existing services or pipes the CONTRACTOR shall use materials and compaction in accordance with the plans and details. All material around pipes shall be thoroughly tamped to support pipe.

D. As the excavation approaches pipe, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools. Such manual excavation shall be included in the work to be done under items involving normal excavation.

3.03 REPAIR OF BROKEN WATER MAINS

A. If a water main is broken, the CONTRACTOR shall carefully excavate around the break to determine the extent of repairs required. All repairs must be approved by the ARCHITECT.

B. All repair sleeves, clamps and couplings shall be installed in accordance with manufacturer's instructions.

C. If a section of pipe must be replaced, it shall be neatly cut at least two feet on either side of visible damage and shall be replaced with a section of new ductile iron pipe and couplings.

D. The repair shall be inspected for visible leaks before backfilling. No backfilling shall be done until the repair is approved by the ARCHITECT.

E. Backfilling around the repair shall be in accordance with Section 02225 – Excavating, Backfilling, and Compacting for Building and Utilities.

3.04 REPAIR OF BROKEN WATER SERVICES

A. If a water service is broken, the CONTRACTOR shall excavate to the main corporation to determine if the corporation has been disturbed.

B. If the corporation has been disturbed, the CONTRACTOR shall replace the corporation with a service saddle (if required), corporation, copper pipe and shall connect to the existing service at a point acceptable to the ARCHITECT. A gooseneck shall be installed in the copper service pipe.

C. Where required, the CONTRACTOR shall furnish and install a new curb stop and box in a location acceptable to the ARCHITECT.

D. The ARCHITECT shall approve all repairs prior to backfilling.

E. Backfilling shall be in accordance with Section 02225 - Excavating, Backfilling, and Compacting for Building and Utilities.

3.05 CASTINGS

A. All water main valve and curb boxes shall be located and adjusted to finished grade after backfilling and prior to final paving.

END OF SECTION

SECTION 01950

TEMPORARY ACCESS ROADS, PARKING AREAS, AND PEDESTRIAN WALKWAYS

PART I GENERAL

1.01 REQUIREMENTS INCLUDED

A. Providing and maintaining vehicular access to and within site including:.

1. To temporary construction facilities, storage and work areas, including paved temporary construction entrances.
2. For use by persons and equipment involved in construction of Project.
3. For use by emergency vehicles.
4. For OWNER'S representatives and personnel.

B. Providing and maintaining temporary parking facilities for use by construction personnel and OWNER'S representatives and personnel.

B. Providing and maintaining temporary walkways and facilities including any temporary lighting, ramps, handrails, construction barricades as indicated on the plans and as necessary to provide safe passage of pedestrians through or around the construction area and to and from public parking areas and the terminal facility.

C. Removing temporary construction and facilities when no longer needed, and restoring disturbed areas.

1.02 SITE ACCESS ROADS AND WALKWAYS

A. Provide uninterrupted temporary site access for construction equipment and vehicles from public thoroughfares. Provide uninterrupted pedestrian traffic walkways shall also be accommodated for the life of the project.

1.03 ON-SITE ROADS AND PARKING AREAS

A. Locate roads, drives, walks and parking facilities to provide access to and from the terminal, for mobilization and to construction offices, work, storage areas, and other areas required for execution of the Contract.

B. Size temporary parking facilities to provide for needs of personnel. When parking needs exceed on-site capacity, provide additional off-site facilities. Locations of such areas shall be coordinated with the ARCHITECT prior to construction.

C. Provide access for emergency vehicles. Maintain driveways a minimum of 15 feet wide between and around combustible materials in storage and staging areas.

D. Maintain traffic areas free from excavated materials, construction equipment, products, snow, ice and debris.

E. Keep fire hydrants and water control valves free from obstruction and accessible for use.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 PREPARATION

A. Clear areas required for access roads and parking areas.

B. Fill, compact and grade areas as necessary to provide suitable support for vehicular traffic under anticipated loadings.

C. Provide for surface drainage of facilities and surrounding areas. Provide and operate temporary pumps as required.

3.02 GENERAL

A. Comply with applicable requirements of Contract Documents especially Section 01151, Jetport Security.

3.03 MAINTENANCE AND RESTORATION

A. Maintain roads, walks and parking areas in a sound, clean condition during the construction. Repair or replace any portions damaged during progress of construction including any temporary site or access lighting. Continual relocation of temporary facilities shall be required over the life of the project. The Contractor shall be fully responsible for the safe and adequate construction and relocations of those temporary facilities.

B. Restore existing roads, walks and parking areas damaged as a result of the construction to the satisfaction of the Architect. Additionally, the Contractor's attention is directed to the project drawings which call for milling, repaving, and remarking, at the completion of the project, of certain portions of surface parking lots, that were used by the contractor as access routes or staging areas during the construction.

3.04 REMOVAL

A. Completely remove temporary materials and construction when construction needs can be met by use of permanent installation. Remove and dispose of compacted materials to required depths that conform with conditions to be met in completed Work.

B. Restore all areas to original or to specified conditions at completion of Work. There is no additional payment for the construction, maintenance and demolition of temporary access roads and parking areas. This work, and all work required for phasing, is considered incidental to the project.

3.05 ADDITIONAL INFORMATION

A. The CONTRACTOR shall also refer to Specification Section 01150, Use of Site, Scheduling and Phasing of Work and Section 01901, Site Phasing for additional information regarding this subject matter.

END OF SECTION

DIVISION 2 -

Section

02005 - Flaggers

02006 - Uniformed Traffic Officer

02052 - Selective Building Removals and Demolition

02060 - Structure, Utility, Equipment Demolition

02140 - Dewatering

02160 - Excavation Support

02221 - Selective Demolition

02222 - Exploratory Excavation

02225 - Excavating, Backfilling, and Compacting

02270 - Slope Protection and Erosion Control

02510 - Bituminous Concrete Paving

02517 - Pavement Markings

02523 - Concrete Pavers on Concrete Base

02528 - Granite Curb

02530 - Granite Stonework Bollards

02720 - Storm Drains, Perimeter Drains, and Culverts

02830 - Chain Link Fence and Gates

02900 - Landscape Work

02990 - Miscellaneous Work and Cleaning Up

SECTION 02005

FLAGGERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. The CONTRACTOR shall provide qualified flagperson(s), when ordered.

PART 2 PRODUCTS

2.01 APPROVAL

A. All flagperson(s) provided by the CONTRACTOR shall be approved for said position by the ARCHITECT or the OWNER.

2.02 QUALIFICATIONS

A. Flagperson(s) shall possess, alertness, good sight, and hearing.

B. Flagperson(s) shall be courteous, have a firm manner and project a neat and presentable appearance.

C. Additionally, flagperson(s) should have a pleasing personality and a sense of responsibility.

D. Flaggers working within the airfield operations area should have proper security training as outlined in the SPECIAL CONDITIONS.

PART 3 EXECUTION

3.01 GENERAL

A. Flagperson(s) shall have received specified instructions from the CONTRACTOR as to their duties and responsibilities, both to the public and to their fellow workers on the job.

B. Flagperson(s) shall handle the movement of the traveling public and shall do all that is reasonable to expedite said movement.

C. Flagperson(s) shall have authority to direct the actions of the construction vehicles as well as vehicles of the traveling public.

D. Flagperson(s) shall be suitably clothed and shall be attired with a blaze orange vest with or without white stripes.

E. Extra reflectorization and lighting may be necessary at night.

F. Duties, responsibilities and actions of the flagperson(s) shall be monitored by the CONTRACTOR and the ARCHITECT.

END OF SECTION

SECTION 02006

UNIFORMED TRAFFIC OFFICER

PART 1 GENERAL

Not used.

PART 2 PRODUCTS

2.01 GENERAL

A. The CONTRACTOR shall furnish all necessary barricades, lighting, signals, signs, and traffic control devices as ordered by the Uniformed Traffic Officer and the ARCHITECT. The CONTRACTOR shall also be responsible for the employment of the Uniformed Traffic Officers.

PART 3 EXECUTION

3.01 GENERAL

A. All work in, upon, under, or across public streets and roads shall be in accordance with the permit granted by the governing authority. The CONTRACTOR shall work with the OWNER to obtain the required permits.

B. The CONTRACTOR shall employ Uniformed Traffic Officer(s) on any highway or street whether under state or local jurisdiction, when, in the opinion of the OWNER, the ARCHITECT, the local Police Department, or the Highway Official, public safety or convenience requires. These services will be required, at a minimum, where normal two-way traffic is reduced to one lane and where interference with the normal traffic flow pattern can be expected, such as equipment entering, leaving or crossing roads.

C. The CONTRACTOR shall make all arrangements with the local Police Department to obtain police assistance and shall pay all expenses incurred, including the wages of the police officers. The CONTRACTOR shall be required to employ flagging personnel to assist and/or supplement the uniformed traffic officer(s).

D. The CONTRACTOR shall setup, maintain and remove all needed barricades, lighting, signals, signs, and traffic control devices on a daily basis as directed by the Uniformed Traffic Officer or the ARCHITECT.

E. The intent is to insure public safety by Police direction of traffic. Police are not to serve as watchmen to protect the CONTRACTOR'S equipment and materials.

F. Nothing contained herein shall be construed as relieving the CONTRACTOR of any of his responsibilities for protection of persons and property under the terms of the Contract.

3.02 REMOVAL

A. Upon completion of the work, the CONTRACTOR shall remove and dispose of all temporary materials and construction required under this Section.

B. All areas and utilities shall be restored to original or specified conditions at the completion of the Work.

END OF SECTION

SECTION 02052

SELECTIVE BUILDING REMOVALS AND DEMOLITION

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

A. The Bidding Documents, Conditions of the Contract, and all Sections of Division 1 are hereby made a part of this Section.

B. Coordinate work with that of other trades affecting or affected by work of this Section. Cooperate with such trades to assure steady progress of the Work and prevention of damage to any existing work to remain or new construction.

C. Refer in particular to SECTION 01045 – CUTTING AND PATCHING for additional requirements.

D. NOTE: Although some drawings are listed and prepared as demolition drawings, demolition is also shown to a lesser degree on other drawings in the contract set.

1.02 DESCRIPTION OF WORK:

A. General: ***Intent*** of this SECTION 02052 is to describe general procedures applicable to Selective Removal work as indicated on Demolition Drawings, and other removal work enumerated herein.

B. Removals: Remove all existing work indicated to be removed or if not indicated as required to accommodate new work indicated. Work includes but is not limited to, removal of following:

1. Selective demolition of building spaces and conditions pertaining to the protection of portions of the building adjacent to or affected by selective demolition, as well as removal and legal disposal of demolished materials off site and reinstallation of existing parking equipment is detailed in Section 02221: SELECTIVE DEMOLITION.

2. Site work items including concrete pavers, concrete slabs on grade, bituminous pavement, granite curbing, concrete curbing, bituminous curbing, bollards, excavation and backfill, revenue control equipment, signs, catchbasins, handholes, plantings, underground piping, conduit and other work below slabs as indicated; other related work as indicated or required.

3. Mechanical and electrical work as indicated and required and not otherwise specified under Paragraph "Related Work Specified Elsewhere."

a. Include removal of lighting fixtures, electrical devices, speakers, alarms, boxes, wiring, conduit, and other existing electrical work as indicated or required to be removed and as required to accommodate new work indicated, except where removal is included under Electrical Work documents.

b. Include removal of piping, hangers, and other existing plumbing work as indicated or required to be removed and as required to accommodate new work indicated, except where removal is included under Mechanical Work documents.

c. Include removal of radiation units and covers, unit heaters, vents, grilles, louvers, heating system piping, ductwork, hangers, and all other work in connection with existing heating and ventilating system, except where removal is included under Mechanical Work documents.

d. Include removal of conduit, wiring, devices, piping, other electrical and mechanical work within walls, floor structures, chases, ceilings and ceiling spaces and the like to be removed, except where removal is included under Electrical Work documents.

4. All other demolition and removal work as indicated or required for successful completion of Work of Contract, not specified elsewhere.

5. Complete removal from premises of all removed materials, and legal disposal thereof, other than items designated to be salvaged or relocated.

C. Relocated/Salvaged Material: Remove carefully existing construction as indicated for re-use in Project or for salvage by Owner, as indicated. Work includes but is not limited to following:

1. granite curbing
2. concrete pavers in good condition
3. revenue control equipment
4. plantings
5. guardrail
6. signage
7. exterior lighting poles and fixtures
8. granite Bollards

D. Protection:

1. Provide and maintain temporary supports as required to prevent structural collapse of building or any portion thereof, during and after cutting, removal, or other operations performed under this Section. Coordinate with installation of new permanent construction indicated.

2. Provide and maintain temporary weather protection for existing work to remain, during and following removal of exterior wall components.

3. Restore to original condition all existing items to remain, which has been damaged as a result of work under this SECTION 02052, to satisfaction of Architect.

E. Related Work Specified Elsewhere: Following work is not part of this Section and is to be performed under designation Sections or otherwise as indicated:

1. Hazardous Materials: The Owner has no knowledge of existing hazardous materials within the limits of work or within the garage structure to be demolished. The bidder shall assume that none exists for the purpose of preparing bid proposals. In the event that the Contractor suspects / discovers evidence of hazardous materials during the progress of the work, the Contractor shall immediately notify the Owner and Architect for further instructions.

a. **NOTE WELL: Contractor shall comply with all applicable EPA, DEP, OSHA and other requirements as to notification prior to performing any demolition or removal work, *including in locations where zero amounts of asbestos are expected.* Contractor shall compensate**

Owner for any fines or penalties assessed to Owner for failure to provide such notification, as well as additional legal or other costs involved.

b. Refer to SECTION 01045 for additional requirements.

2. Fine cutting, and other removal work not indicated on Drawings and/or within this Section to be removed, but required for performance of work under Contract: SECTION 01045 – CUTTING AND PATCHING.

3. Requirements for scheduling and phasing, use of site, maintenance of access for public and staff: SECTION 01150 – USE OF SITE, SCHEDULING AND PHASING and SECTION 01901 SITE PHASING.

4. Dustproof partitions, other temporary construction: SECTION 01500 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

5. Removal of Mechanical and Electrical Work: Refer to Mechanical and Electrical Drawings and Specifications for extent of mechanical and electrical work to be removed/relocated/salvaged. Unless otherwise specified or indicated under respective Specifications or Drawings following removal work is part of respective mechanical and electrical trades:

a. Turning off of utility services to mechanical and electrical equipment, fixtures, devices and the like.

b. Removal of mechanical or electrical items indicated to be removed and replaced in original location, relocated or salvaged (if any).

c. Removal of energized electrical panel boxes and the like.

d. Connections of services to reinstalled, relocated, or replaced equipment

e. **NOTE:** All other removal of mechanical and electrical work, specifically including that within walls, partitions and ceiling structures to be removed, is included under scope of this SECTION 02052 unless otherwise specified or indicated on Mechanical or Electrical Drawings or Specifications.

F. Alteration Work: Unless indicated otherwise, perform all work normally included under this Trade Section necessary for the removal/alteration/relocation of existing work and for the joining of new work to existing. Unless indicated otherwise, provide work to match existing and equal to quality of new work as specified under this Section, and as approved by Architect.

1. Refer to SECTION 01045 – CUTTING AND PATCHING for additional requirements.

1.03 QUALITY ASSURANCE: SUBMITTALS:

A. Quality Assurance: Conform to requirements of SECTION 01300 – SUBMITTALS.

B. Professional Engineer: Contractor shall engage a licensed Maine Professional Engineer to make structural determinations as to bearing conditions and other structural conditions, and for determining safe procedures for removal of structural members.

1. Professional Structural Engineer on Contractor's payroll will be acceptable.

C. Removal Procedures and Schedule: Submit two copies of proposed methods and operations for phasing and removal work, to Architect for review prior to commencement of work.

1. Indicate proposed methods, in detail, for maintaining structural integrity, coordination with other trades, terminating/continuation of utility services and other requirements.

2. Include proposed methods for temporary weather protection of structure during and following removal until new permanent closures are installed.

3. Include shop drawings or other methods prepared under direction of Professional Engineer engaged by Contractor, for removal of major structural elements, including bearing walls, roof structures, columns, beams, girders, existing work to remain and the like. Indicate on shop drawings all structural shoring, bracing, sequencing and other work necessary to protect against collapse or other structural damage.

4. Indicate which items cannot or should not be removed during initial removals stage of the Project.

1.04 OWNERSHIP:

A. Except as otherwise indicated, all materials to be demolished or removed, as well as all debris, rubbish, and other surplus material shall become property of Contractor and shall be removed from Project Site and legally disposed of at Contractor's expense.

B. It is expected that Bid Prices will reflect salvage value of removed material. Unless specifically indicated otherwise, salvage value of removed material, not indicated to be salvaged for Owner's use or to be relocated, shall accrue to party removing such material. Bidders, however, in the event of a Contract or Subcontract award, shall accept premises as they find them; no claim for alleged or actual losses due to reduced salvage value of any items or material will be considered by Owner, for any reason whatever.

C. Contractor shall not sell material from Project Site or elsewhere on Owner's property, or store on site, unless otherwise permitted in writing by Owner.

1.05 JOB CONDITIONS:

A. Scheduling and Phasing: Refer to SECTION 01150 – USE OF SITE, SCHEDULING AND PHASING OF WORK: and SECTION 01901 – SITE PHASING.

B. Building Occupancy: the terminal and existing Phase 1 parking garage building are to be in use during entire construction period, including demolition and removals.

1. Contractor will be given access to specific work sites only.
2. Arrange with Owner for temporary vacating of adjacent facilities during major structural removals or other operations which could cause hazard or major inconvenience to occupants.
3. Note that existing and temporary entrances/egresses to existing facilities must be maintained at all times while buildings are occupied.

C. Weather Protection: Do no remove work that will expose building interiors during inclement weather, or when such weather is forecasted. Coordinate all work so that new construction sufficient to enclose and secure structure, follows immediately that of removal work, so as to keep building interiors exposed to weather for minimum period possible.

4. Provide adequate temporary protection to protect interiors immediately as inclement weather occurs, and at the end of each working day. Provide well secured, watertight tarpaulins or equivalent.

5. Take special care with roof openings. Coordinate work so that openings are not cut until new work indicated is ready for installation, and capable of being installed by end of working day or before inclement weather strikes. Arrange for new roofing/flashing work to be performed immediately following installation of other new work, or for adequate temporary weather protection if permanent roofing work cannot be performed by end of working day or before inclement weather.

D. Conditions of Structures: Owner assumes no responsibility for actual condition of structures or parts of structures to be demolished or to remain.

E. Damages: Promptly repair damages to new improvements or existing work to remain, caused by demolition or removal operations, as directed by Architect at no cost to Owner.

1.06 EXTERIOR WALL AND ROOFING OPENINGS:

A. Coordinate removal work at exterior walls closely with that of new construction to follow.

1. Do not remove any exterior walls until dustproof partitions are in place.

2. In addition to dustproof partitions, provide adequate temporary protection against the elements as exterior wall components are removed; maintain in place until new construction is sufficiently advanced to provide this protection.

B. Coordinate work with roofing as specified under DIVISION 7 Sections to assure against penetration of rain or other elements through roof during and following removal work.

C. Remove only such material as can be immediately followed by new construction, or by adequate temporary weather protection, so that building interior is not left exposed overnight, or to elements during inclement weather.

PART 2 - PRODUCTS:

2.01 BACKFILL MATERIALS:

A. Conform to trench backfilling materials as specified under SECTION 02225 – EXCAVATING, BACKFILLING AND COMPACTING .

PART 3 - EXECUTION

3.01 POLLUTION CONTROLS:

A. Comply with all applicable laws, rules and regulations of authorities having jurisdiction.

B. Take all reasonable precautions to avoid annoyance to staff and public, in particular by limiting amount of dust and dirt rising in the air, and noise control.

1. Spray down plaster, drywall, concrete, masonry, and similar dust-producing materials before and during placing in trucks or in open storage containers.
2. Use only trucks equipped with approved tarpaulins for transporting of dust-producing materials or materials that could be dislodged by wind.

C. Do not throw materials down onto trucks. Provide and maintain suitable chutes leading, enclosed where necessary, to refuse trucks or enclosed containers.

3.02 EXCAVATION AND BACKFILL BELOW EXISTING SLABS-ON-GRADE AND FOUNDATIONS

A. Conform to requirements of applicable earthwork and related work Sections, including but not necessarily limited to:

1. Section 02145 – Dewatering and Predrainage.
2. Section 02160 – Excavation Support.
3. Section 02225 - Excavating, Backfilling and Compacting.

3.03 SALVAGE AND RELOCATION:

A. General: Remove carefully, all items specified or indicated to be salvaged or relocated, whether loose or affixed to structure.

1. Stockpile salvaged material for Owner's use in secure area as directed by Owner. Protect until picked up by Owner. Obtain signed receipt when turned over to owner.
2. Coordinate work with Owner to ascertain that facilities will be ready to receive salvaged equipment. Unless otherwise indicated deliver items FOB tailgate of truck at shop.

B. Protection: Carefully remove, disassemble as required, all materials, equipment, or other items to be salvaged or relocated; adequately support and protect during removal and hauling operations. If items are to be relocated, store as required, transport carefully to new location and properly re-install. Make appropriate disconnections of services, not performed under mechanical and electrical trades, carefully prior to removal.

C. Inspect closely each item prior to its removal, and report any damages or defects to Architect. Failing this, Contractor shall be responsible for any damages to same other than latent defects not readily apparent from a close inspection, and shall repair or replace same as directed by and to satisfaction of Architect.

D. Reinstall items, not specified elsewhere, as indicated. Set in place, where applicable level and adjust to plumb and level condition, and secure to building structure. Unless otherwise indicated or approved, reinstall in same manner as at original location.

3.04 PROCEDURES:

A. General: Proceed with demolition work in a systematic manner, and in accordance with approved Removal Procedures and Schedule.

1. Refer to Structural Drawings for additional requirements.
2. Do not allow site or environs to be excessively burdened by refuse and debris from removal/demolition activities.

B. Bearing Conditions: Contractor shall be fully and solely responsible for determining which walls, partitions, and other components are load bearing structures.

1. Where necessary licensed Professional Engineer engaged by Contractor shall make such determinations.
2. Perform all cutting and rough patching of existing walls, floors, ceilings, roofs, and other structures. All cutting of existing materials shall be held to absolute minimum as required to perform the work properly.

C. Protections: Execute all work so as to protect all work which is to remain.

1. Conduct operations to prevent damage by falling debris or other cause to other facilities as well as persons, and to minimize disruption and annoyance to adjacent facilities of Owner and abutters.

2. Provide interior and exterior shoring, bracing or support to prevent movement or settlement or collapse of structures to be demolished.

3. Unless Architect's attention is directed immediately to any pre-existing latent defects or damages in existing work as they are discovered, Contractor shall be responsible for same and shall make them good at no additional cost to Owner.

4. Locate demolition equipment carefully and remove materials frequently so as to not impose excessive loads to supporting walls, floors, roofs, or framing.

5. **NOTE:** Do not allow anyone above or below areas where underpinning, bracing or shoring work is in progress. Post warning notices and barricades.

3.05 TERMINATIONS AND ABANDONMENT:

A. Wherever items serviced by gas, water, sanitary, electrical, or other facilities are removed, services shall be properly capped, plugged, or otherwise terminated.

B. Terminations in areas exposed to view in finished work shall be concealed in new or existing work, with no evidence of such services showing in finished work. Existing construction shall be carefully removed as necessary to expose services to be terminated, and properly restored when required.

C. Piping, ductwork, conduit, and similar items within existing partitions, above suspended ceilings, in attics or within other existing construction to remain, or items indicated to be abandoned, may be left in place after termination if fully concealed; all other services shall be removed in their entirety.

3.06 DISPOSAL:

A. All removed material, other than that indicated to be relocated or turned over to Owner, shall become property of Contractor.

B. Remove all such material promptly from site and legally dispose of at Contractor's expense.

1. Stockpiling or otherwise storing materials on site will not be acceptable unless otherwise agreed to by Owner in writing.

END OF SECTION 02052

SECTION 02060

STRUCTURE, UTILITY, AND EQUIPMENT DEMOLITION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Demolishing designated structures, utilities, fixtures and equipment as shown on Drawings.

B. Removing materials from site in accordance with all local, state, and federal regulations.

1.02 SUBMITTALS

A. Submit demolition and removal procedures and schedule in accordance with Section 01150 Use of Site, Scheduling and Phasing of Work and Section 01300 Submittals. The demolition schedule shall be part of a phased plan of construction.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate with appropriate utility companies, when applicable, prior to initiating Work.

B. Protect buildings and their contents from damage due to weather at all times, providing all necessary temporary enclosures to accomplish this protection.

C. Erect and maintain temporary partitions to prevent spread of dust, fumes, noise, and smoke to allow for OWNER occupancy and operations.

D. Provide, erect, and maintain temporary barriers and security devices.

E. Protect existing items which are not indicated to be altered.

3.02 EXECUTION

A. All material demolished under this Section shall become the property of the CONTRACTOR except those items specifically sited by the contract plans.

B. Conduct demolition to minimize interference with adjacent utilities, building structures and with facility operations. Maintain protected egress and access at all times.

C. Conduct demolition to minimize interference with OWNER'S activities.

D. Demolish indicated structures, utilities, equipment and appurtenances in an orderly and careful manner.

E. Protect existing structures, building areas, pipelines, and equipment to remain from damage during demolition. Take precautions to guard against movement or settlement of existing work; provide bracing or shoring necessary or proper in connection herewith; be responsible

for safety and support of such work; be liable for any such movement or settlement and any damage or injury caused thereby or resulting thereof.

F. Cease operations and notify ARCHITECT immediately if adjacent structures appear to be affected. Any and all additional supports necessary to safeguard the structure or prevent such movement or settlement shall be installed prior to resuming operations. Do not resume operations until corrective measures have been taken. CONTRACTOR shall assume full responsibility and expense for his methods and any damages caused by his operations.

G. Assign the work of moving, removal, cutting and patching, to CONTRACTOR'S personnel qualified to perform the Work in a manner to cause least damage to each type of work, and provide means of returning surfaces to same appearance of new work.

H. Perform cutting and removal work to remove minimum necessary, and in a manner to avoid damage to adjacent work.

I. Disconnect utilities. Cap as directed by the ARCHITECT and in accordance with the drawings. Identify disconnected utilities and indicate locations of disconnected utilities on Project Record Documents.

J. Remove materials to be re-installed or retained in a manner to prevent damage. Store and protect as necessary.

K. Remove materials and equipment indicated herein and/or on the Drawings to be retained by OWNER. Deliver to OWNER in accordance with ARCHITECT'S field instructions.

L. Do not burn or bury materials on site.

M. Notify ARCHITECT immediately of any contaminated, vermin infested, dangerous or hazardous materials encountered and remove and properly dispose materials of in accordance with local, state and federal health, safety and environmental regulations.

N. Remove contents of buried tanks located within demolition area. Remove underground tanks, components, and piping from site.

O. Backfill open pits and holes caused as a result of demolition. Use material specified in Section 02225 EXCAVATING, BACKFILLING AND COMPACTION.

P. Rough grade and compact areas affected by demolition to design site grades and contours.

Q. Immediately remove demolished materials from site as Work progresses. Upon completion of Work, leave areas of Work in clean condition. Dispose of materials in accordance with federal, state and local regulations.

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Clearing site of plant life and grass as indicated on the Drawings.

B. Removing root systems of trees and shrubs in areas cleared.

C. Pruning trees to remain where branches or roots will interfere with construction operations.

D. Removing debris.

1.02 REGULATORY REQUIREMENTS

A. Conform to applicable local, state and federal regulations for disposal of debris.

B. Burning or disposing of debris on site is prohibited.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PROTECTION

A. Protect plant growth and features remaining as final landscaping.

B. Protect bench marks and existing work from damage or displacement.

C. Maintain designated site access for vehicle and pedestrian traffic.

D. Protect existing trees and other vegetation to remain in place against unnecessary cutting, breaking, skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line and excess foot or vehicular traffic, or parking of vehicles within drip line.

3.02 CLEARING AND GRUBBING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs within marked areas and where shown on Drawings. Grub out stumps, roots, and surface rocks.

C. Clear undergrowth and deadwood, without excavating topsoil and subsoil.

D. Remove and dispose of all materials used for mulch and/or ground cover. Do not stockpile or reuse the material.

E. Use only hand methods for grubbing inside drip lines of trees that remain in place.

3.03 PRUNING TREES

A. Carefully and cleanly cut roots and branches of trees indicated to remain, where such roots and branches obstruct the construction.

B. Prune trees in accordance with standard horticultural practice. Do not cut tree leaders.

C. Repair, paint tree wounds in accordance with standard horticultural practice.

3.04 REMOVAL

A. Remove debris from site.

B. Dispose of debris in accordance with local, state and federal regulations.

END OF SECTION

SECTION 02145

DEWATERING AND PREDRAINAGE

PART 1 GENERAL

1.01 GENERAL

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. The CONTRACTOR shall design install, operate, monitor, maintain, and remove a temporary dewatering and predrainage system as necessary to lower and control water levels below the excavation subgrade to permit construction of the work in-the-dry, to maintain the bearing soils firm and undisturbed and to prohibit flotation of completed work.

B. The CONTRACTOR shall collect and properly dispose of discharge water from the dewatering and predrainage system.

1.03 RELATED SECTIONS

A. Section 02225: Excavation, Backfilling and Compaction

B. Section 02145: Excavation Support

1.04 DESIGN AND PERFORMANCE RESPONSIBILITY

A. The methods of controlling groundwater shall be designed by the CONTRACTOR, who shall be solely responsible for the location, arrangement and depth of the system selected to accomplish the work. The CONTRACTOR shall engage a Geotechnical Engineer registered as a Professional Engineer in the State of Maine, to design the dewatering, predrainage and monitoring systems. The Geotechnical Engineer shall visit the site and review the dewatering, predrainage and monitoring systems at least bi-weekly during the construction dewatering period.

B. The CONTRACTOR shall be responsible for the proper installation, operation, monitoring and maintenance of the dewatering and predrainage system. Modifications to the systems that may become necessary during construction shall be made under the direction of the Geotechnical Engineer. All cost of the geotechnical engineer and any modifications shall be borne by the CONTRACTOR at no additional cost to the OWNER.

C. The CONTRACTOR shall be responsible for and shall repair without cost to the OWNER, any damage to work in place, construction equipment, the excavation, and surrounding property that may result from his/her negligence, inadequate design and operation of the dewatering and predrainage system, and any mechanical or electrical failure of the dewatering and predrainage system.

D. Design review, and field monitoring activities of the ARCHITECT shall not relieve the CONTRACTOR of his/her responsibilities for proper design, installation, operation, monitoring and maintenance of the dewatering and predrainage system.

1.05 JOB CONDITIONS

A. Prior to submitting a bid, the CONTRACTOR shall review and understand the information contained in the following report. This report is made available to the CONTRACTOR for information only and shall not be interpreted as a warranty of subsurface and/or environmental conditions whether interpreted from written text, boring logs, laboratory chemical test data or other data.

1. "Report on Subsurface and Foundation Investigation, Proposed Phase II Parking Garage, Portland International Jetport, Portland, Maine," prepared by Sebago Technics, Inc., dated February 23, 2006.

B. The boring information is considered to represent the conditions at the locations of test borings at the time the test borings were made. The CONTRACTOR should anticipate variations from the conditions disclosed by the borings in planning and estimating the work. Water levels can be expected to vary with season, precipitation, temperature and other construction activity in the area. Therefore, water levels encountered during construction may differ from those shown.

C. Predrainage to lower the groundwater level below the lowest excavation level may be required to achieve and maintain a stable excavation.

1.06 QUALITY ASSURANCE

A. Comply with all rules, regulations, laws and ordinances of the State of Maine, the City of Portland and all other authorities having jurisdiction over the Work.

B. Full-time monitoring of dewatering and predrainage system will be required of the CONTRACTOR.

C. The CONTRACTOR shall have a minimum of five years experience within the last 10 years in construction dewatering and predrainage installations of similar type and complexity as is required for the project.

D. The CONTRACTOR shall perform any and all preparatory work at no additional cost to the OWNER to discover, protect, maintain, relocate, and restore existing and new site improvements (i.e., utilities). The CONTRACTOR shall include and incorporate the findings of this preparatory work on his/her submittals.

1.07 SUBMITTALS

A. The CONTRACTOR shall submit the following information to the ARCHITECT at least two (2) weeks prior to beginning excavation and predrainage,

1. Shop drawings showing arrangements, locations and depths of the dewatering and predrainage system, observation wells, berms, ditches, wells, wellpoints, etc. and discharge lines.

2. Capacities of wells, wellpoints, pumps and standby equipment.

3. Design calculations for the dewatering and predrainage system.

4. Detailed description of equipment, materials, sequence and procedures for installation, operation and maintenance, in relation to proposed sequence of drilled minipiles, excavation, temporary/semi-permanent lateral support systems and backfilling.

5. Revisions to shop drawings, as necessary to accommodate field conditions and comply with design criteria.

6. Records of water levels in observation wells.

PART 2 MATERIALS

2.1 GENERAL

A. Pipe for observation wells shall consist of minimum 1.5 in. I.D. Schedule 40 PVC pipe and machine-slotted PVC wellpoint, maximum slot size 0.10 in.

B. Filter sand for backfill around the observation well shall consist of standard Ottawa sand, in accordance with ASTM Designation C-778.

C. Cement grout for sealing observation wells shall consist of Type I Portland cement and water, mixed in ration of 1:1 by volume.

PART 3 EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall control surface water and groundwater such that excavation to final grade and subgrade preparation are made in-the-dry, the bearing soils are maintained firm and undisturbed and softening and/or disturbance due to the presence of seepage of water does not occur. All subsequent construction and backfilling shall proceed in-the-dry and floatation of completed portions of the structure shall be prohibited.

3.02 SURFACE WATER CONTROL

A. The CONTRACTOR shall construct a surface water control system as necessary to intercept and divert precipitation and runoff away from the excavation. The system shall be removed when the excavation backfill is completed, or as approved by the ARCHITECT.

3.03 WATER LEVEL CRITERIA

A. The CONTRACTOR shall be required to predrain the groundwater to at least 2 ft. below the lowest excavation for the garage, retaining walls and other site improvements and 1 ft. below the lowest grade for trench excavations prior to the start of excavation and to maintain these levels until dewatering and predrainage are no longer required.

B. Water levels shall subsequently be maintained so as to prohibit floatation of completed portions of the structure.

C. Water level criteria are applicable to all saturated soils below the final excavation level, within the plan limits of the excavation, down to bedrock level.

D. The CONTRACTOR shall maintain water levels below the maximum levels specified until completion and backfilling of utility trenches, completion and start up of the perimeter and underslab drainage system for the structure and other site improvements.

E. Water levels shall be monitored by the CONTRACTOR by observation wells installed as specified.

3.04 DESIGN AND INSTALLATION OF DEWATERING AND PREDRAINAGE SYSTEM

A. Design and installation of the dewatering and predrainage system shall be compatible with the CONTRACTOR's design excavation and temporary/semi-permanent lateral support systems and utility construction.

B. The dewatering and predrainage system shall be installed in accordance with shop drawings submitted to the ARCHITECT for review.

C. The dewatering and predrainage system shall de designed and installed to provide predrainage and water level control as specified. The system shall be modified, at no additional cost to the OWNER, in the event that water level criteria cannot be achieved. Proposed modifications shall be submitted to the ARCHITECT for review.

D. Deep wells, ejector wells or wellpoints shall be installed with suitable filters and other provisions necessary to prevent migration or piping of soil fines.

E. The CONTRACTOR shall locate the dewatering and predrainage system components to minimize interference with other construction operations.

F. The CONTRACTOR shall install the system in a manner, which does not cause loss of ground, or affect stability of existing or future construction.

G. The CONTRACTOR shall provide adequate protection from erosion from any of the dewatering operations utilized during the course of the construction. Any damage, disruption or interference to newly constructed work or existing properties, buildings, structures, utilities and/or other work resulting directly or indirectly from dewatering operations conducted under this Contract shall be remedied by the CONTRACTOR to the satisfaction of the ARCHITECT, at no cost to the OWNER.

H. The CONTRACTOR shall provide such additional treatment of dewatering discharge as may be required to meet the provisions of the Contract. This may include the construction of sumps and/or settling basins, stone rip-rap, silt fences or other requirements. They shall be provided and later removed and/or filled in with acceptable backfill material, and restored to original conditions once they are no longer needed, at no additional cost to the OWNER.

3.05 STANDBY EQUIPMENT

A. The CONTRACTOR shall be equipped with standby pumps, wells and power generating equipment, in order to maintain continuous operation of the dewatering and predrainage system in the event of a disruptive occurrence such as equipment breakdown, power outage, or vandalism.

3.06 PERFORMANCE MONITORING

A. The CONTRACTOR shall install groundwater observation wells to monitor water levels in the soils within the plan limits of the excavation.

B. The CONTRACTOR shall install a minimum of six (6) observation wells at locations selected by the CONTRACTOR within the excavation limits. The spacing of observation wells in the garage excavation shall be less than 100 ft. on center. The spacing of observation wells in trenches shall be less than 200 ft. The observation wells shall be located to obtain the maximum distance between the observation point and the nearest pumped well or wellpoints.

C. Each observation well shall be installed in a minimum 3-in. diameter borehole. The annular space between the observation well and the borehole shall be backfilled with filter sand from the bottom to a level 2 ft. above the top of the slotted wellpoint. Upon excavation to final grade, cement grout shall be placed by tremie procedures to seal the annular space between the observation well and the borehole wall from the top of the filter sand to the subgrade surface. A vented cap shall be placed on the top of the observation well rise pipe.

D. After each observation well installation is completed, the CONTRACTOR shall submit a Groundwater Observation Well Installation report to the ARCHITECT. The report shall include the following data:

1. Elevation top and bottom of borehole;
2. Elevation top and bottom of observation wellpoint screen;
3. Elevation top and bottom of filter sand;
4. Elevation top of riser pipe;
5. Diameter of borehole, well riser pipe and wellpoint screen

E. The CONTRACTOR shall read each well daily until excavation to final grade is complete and weekly thereafter until the well is dismantled or the trench is backfilled. The CONTRACTOR shall report readings daily to the ARCHITECT.

F. The CONTRACTOR shall maintain and replace observation wells, which are damaged or do not function.

G. When necessary to remove the upper portions of a riser pipe to permit readings to be made from the bottom of the excavation, the CONTRACTOR shall establish the new top of riser pipe elevation, and report it to the ARCHITECT.

H. Observation wells shall be dismantled with the ARCHITECT's approval. Riser pipes shall be cutoff at excavation grade and filled with sand.

I. The CONTRACTOR shall use the observation well readings and other available information to evaluate the effectiveness of the dewatering system.

3.07 MAINTAINING EXCAVATION IN DEWATERED CONDITION

A. The CONTRACTOR shall operate and maintain the dewatering and predrainage system around-the-clock from the time of installation until approval is given by the ARCHITECT to dismantle the system or portions thereof. The system operation shall be continuous and interruptions for any reason shall not be permitted.

B. Personnel skilled in operation and maintenance of the system shall operate the dewatering and predrainage system.

C. Operation of the dewatering and predrainage system shall result in no soil particles in the discharge water after the initial 24 hours of pumping.

D. When the final excavation level is obtained, surface water entering the excavation shall be controlled by drainage to sumps and removed by pumping. Surface water shall be controlled to maintain a dry, stable subgrade.

3.08 SYSTEM REMOVAL

A. When construction is complete for utility trenches and the permanent underdrain and perimeter foundation drain is operational for the structure and other site improvements, as approved by the ARCHITECT, the CONTRACTOR shall remove all dewatering and predrainage equipment from the site. All wells shall be backfilled. All ditches, berms and other temporary installations required for dewatering or control of surface water shall be removed. Removal of equipment shall not cause disturbance to the existing subgrade and bearing soils.

END OF SECTION

SECTION 02160

EXCAVATION SUPPORT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Designing, furnishing, installing and maintaining excavation support systems for the following:

1. Excavation for structures.

2. Trench excavation.

B. Removing excavation support systems.

C. Complying with local, state and federal safety regulations.

1.02 REFERENCE STANDARDS

A. ASTM A328 - Steel Sheet Piling.

B. NFPA - National Forest Products Association.

1.03 SYSTEM DESCRIPTION

A. Excavation support systems shall include soldier piles, trench boxes, wood sheeting and steel sheeting, including bracing members such as walers, struts, shores, lagging, and tieback anchors and all other system members.

1.04 JOB CONDITIONS

A. Prior to submitting a bid, the CONTRACTOR shall review and understand the information contained in the following report. This report is made available to the CONTRACTOR for information only and shall not be interpreted as a warranty of subsurface and/or environmental conditions whether interpreted from written text, boring logs, laboratory chemical test data or other data.

1. "Report on Subsurface and Foundation Investigation, Proposed Phase II Parking Garage, Portland International Jetport, Portland, Maine," prepared by Sebago Technics, Inc., dated February 23, 2006.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wood: Tongue and groove; #3 common Douglas Fir or Hemlock; or Utility Grade Southern Pine; NFPA grading.

B. Steel: ASTM A328.

C. Trench Boxes: Fabricated steel.

PART 3 EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall be totally responsible for the means and methods of excavation and for the design and construction of the excavation support systems.

B. The support system shall be designed for the maximum loads that will occur during construction.

C. Excavation support systems shall be constructed to support all vertical and lateral loads and other surcharge loads imposed on the system during construction including earth and groundwater pressures, utility and construction loads in order to provide safe construction of the permanent structures and prevent movement and/or damage to adjacent soil, buildings, structures and utilities.

D. Do not brace to concrete unless authorized by the ARCHITECT, and if concrete has reached its design strength as determined by compressive test of representative concrete cylinders which have been cured on site for a period of at least 14 days.

E. Do not embed any part of excavation support system in the Work. Do not construct sleeves or openings in the structures to permit bracing through the structures unless authorized by the ARCHITECT.

F. Do not perform excavations in unstable earth. Unstable earth shall be stabilized with excavation support systems before excavation proceeds.

G. Monitor all excavations as a means of detecting movement of adjacent soil, buildings, structures and utilities. Where movement or damage is observed, the CONTRACTOR shall immediately cease excavation operations and correct such deficiency in the excavation support system that allowed for movement or damage and repair all damage at no additional cost to the OWNER and at no additional time for performance.

H. The CONTRACTOR shall be responsible for, and shall repair all damage resulting from his excavations at no additional cost to the OWNER and at no additional time for performance.

3.02 SHEETING LEFT-IN-PLACE

A. Cut off all sheeting left-in-place at least three feet below the ground surface, whether such sheeting is ordered left in place by the ARCHITECT or is left in place for the convenience of the CONTRACTOR.

END OF SECTION

SECTION 02221

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. The work of this section includes, but is not limited to, selective demolition at interior spaces as required for new construction and the following:

1. Protection of portions of the building adjacent to or affected by selective demolition, including, but not limited to:
   a. Erection of dust barriers.
   b. Maintain existing pedestrian ramp.
   c. Maintain existing crossing canopy.
   d. Maintain existing vault.

2. Removal and legal disposal of demolished materials off site.
3. Remove and reinstall existing parking equipment, as directed by Owner's representative.

B. Contractor shall assume that demolition activities which require entry into other tenant spaces or which produce excessive noise must be performed on weekends or after normal business hours.

1.03 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements which affect the work of this section. Certain construction, systems, or equipment identified in the Contract Documents or by the Architect in the field shall remain in-place for future service and shall be protected.

1.04 SUBMITTALS

A. Submit detailed operational plan and time line for demolition operations.

1.05 INTENT

A. A major intent of the work of this section is to demolish, remove from site and legally dispose of items to be completely or selectively demolished as required.

B. Upon completion of selective demolition work, spaces and surfaces shall be broom clean and all nails, wires, hangers, system components, and other items shall be removed down to bare substrates unless indicated otherwise.

C. Contractor shall comply with requirements of all applicable Federal, State, and local safety and health regulations regarding the demolition of structures including ANSI/NFPA 241 - Building Construction and Demolition Operations.

1.06 PROJECT CONDITIONS

A. Occupancy: Areas to be demolished will be unoccupied prior to start of work.

B. Condition of Structures: Owner assumes no responsibility nor makes any claim as to the actual condition or structural adequacy of any existing construction to be demolished. The Contractor shall investigate and assure himself of the condition of the work to be demolished and shall take all precautions to ensure safety of persons and property.

C. Salvage: Items indicated to be reused shall be removed by workmen skilled in the type of work involved and stored, as directed by the Owner, in a manner to prevent damage. Removal shall include anchors where applicable.

1. Remove and reinstall existing Parking Equipment as indicated on the Drawings.

2. Items of value designated to be demolished which are not indicated to be returned to the Owner or to be reused, shall become the property of the Contractor. Storage or sale of items on the project site is prohibited.

D. Dust and Noise Control: Take special care to control dust and noise to avoid creating a nuisance. Obtain Architect's and Owner's approval of means, methods and techniques used to control dust and noise.

E. Weather Protection: Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.

F. Utilities: Maintain all utilities except those requiring removal or relocation. Keep utilities in service and protect from damage. Do not interrupt utilities serving used areas without first obtaining permission from the utility company, building owner, and the Owner. Provide temporary services as required.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION

3.01 DEMOLITION

A. Engineer, provide and maintain throughout the course of construction all bracing and shoring required or necessary to support the existing building elements. Ensure complete compliance with all relevant notes and details on the architectural and structural drawings prior to commencement of demolition.

B. Prior to demolition of any building elements that are to be essentially duplicated by restoration of existing materials or replacement with new materials, such building elements are to be sufficiently measured, photographed, drawn, shape molded, or otherwise documented to allow accurate restoration, replacement or reinstallation as applicable.

C. Demolish items to be demolished completely and legally remove from site. Use demolition methods within limitations of governing regulations.

D. Proceed with demolition systematically. Demolish in small sections and avoid overloading structure. Notify Architect immediately upon discovery of unsuitable existing structure and remove structural members only after obtaining Structural Engineer's written permission.

E. Remove all debris from site and dispose of legally. Burning on site is not permitted.

END OF SECTION

SECTION 02222

EXPLORATORY EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Exploratory excavation.

B. Backfilling exploratory excavation.

D. Restoration of surface.

1.02 DESCRIPTION

A. Exploratory excavation shall be performed for the purpose of determining the location of underground structures and utilities using tight control machinery supplemented by hand labor.

B. Damage to existing structures and utilities must be avoided during exploratory excavation. Any such structures or utility damaged by the CONTRACTOR shall be replaced or repaired at no cost to the OWNER.

1.03 CONTROL OF WORK

A. The locations at which exploratory excavations are to be made shall be designated by the ARCHITECT in each specific instance.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 SCHEDULING

A. Consult frequently with the ARCHITECT as to location of the exploratory excavations so that this work may be scheduled sufficiently in advance of installation of other items of the Work.

B. Obtain all available information on the location of existing underground structures and utilities prior to starting this type of excavation.

C. Notify the owners of the structures and/or utilities to be affected, in sufficient time to allow their representatives to observe the exploratory excavations.

3.02 EXCAVATION

A. Conduct all excavations with extreme care so as not to damage any existing structure or utility. If damage occurs, notify the ARCHITECT and the respective owner immediately. Make repairs promptly.

B When the location of underground structures or utilities has been determined, notify the ARCHITECT.

3.03 BACKFILL AND RESTORATION

A. Exploratory excavations shall be backfilled and the surface restored according to the applicable section of the Contract Documents, unless otherwise directed by the ARCHITECT.

END OF SECTION

SECTION 02225

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Excavating topsoil and stockpiling topsoil for later use.

B. Saw cutting pavement and excavating pavement.

C. Excavating subsoil and stockpiling subsoil for later use.

D. Excavating unsuitable material.

E. Excavating rock, boulders, solid rubble masonry and Portland cement concrete that is less than two cubic yards in volume.

F. Replacing rock excavation and excavated unsuitable material with select fill material or common fill material.

G. Placing select fill materials below utilities, tankage and concrete structures.

H. Backfilling excavations with common fill materials.

I. Placing common fill materials for bringing site to subgrade.

J. Complying with compaction requirements.

K. Removal and disposal of excess topsoil and subsoil, excavated unsuitable material, and excavated pavement, rock, boulders, solid rubble masonry and Portland cement concrete off site.

L. Grading and rough contouring the site to the cut limits required for construction.

1.02 REFERENCE STANDARDS

A. ASTM C33 - Concrete Aggregates.

B. ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D75 - Sampling Aggregates.

D. ASTM D1557 - Tests for Moisture - Density Relations of Soils and Soil- Aggregate Mixtures, Using 10-lb Rammer and 18-inch Drop: (Modified Proctor).

E. ASTM D2922 - Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. State of Maine Department of Transportation (MDOT) Standard Specifications (latest edition).

1.03 SAMPLES

A. Submit Samples in accordance with Section 01300 Submittals. Samples shall be obtained in accordance with ASTM D75.

B. Submit in air-tight containers, a 25-lb sample of each type of material to be tested, to ARCHITECT.

1.04 TESTING

A. Tests and analysis of fill materials will be performed in accordance with Section 01410 Quality Control and Testing Services and the methods in ASTM C136.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record location of utilities remaining, rerouted utilities, and new utilities by horizontal dimensions, elevations or inverts, and slope gradient.

B. Provide records of utility locations to ARCHITECT prior to Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

A. Topsoil: Friable, fertile, natural, free-draining loam typical of the locality; free of subsoil, roots, grass, sticks, weeds, clay, sod lumps, debris and stones larger than 1-inch in maximum dimension. Soil shall not be excessively acid or alkaline, nor contain toxic material harmful to plant growth.

B. Unsuitable Material: Cut or broken pavement, debris, concrete or other rubble, organic materials; muck, peat, silty soils or clayey soils; rock over 6 inches in maximum dimension; or any material which in the opinion of the ARCHITECT will not provide sufficient support or maintain the completed construction in a stable condition.

2.02 COMMON FILL MATERIALS

A. Subsoil (suitable for reuse): Material excavated on site which is friable, natural soil composed of gravel, sand, or silty or clayey gravel and sand; free from debris, concrete or other rubble, organic matter, muck, peat, excavated rock and boulders over 6 inches in maximum dimension.

B. Additional Fill: Imported material which is friable, natural soil composed of gravel, sand, or silty or clayey gravel and sand; free from debris, concrete or other rubble, organic matter, muck, peat, excavated rock and boulders of 6 inches in maximum dimension.

2.03 SELECT FILL MATERIALS

A. Sand: Clean, free from organic matter with the following particle size limits when tested in accordance with ASTM C136:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve TOTAL SAMPLE
2 inch	90 - 100

No. 200	0 - 15

B. Crushed Stone: Clean, hard, durable crushed particles or fragments of stone or ledge rock of uniform quality and reasonably free from thin and elongated pieces. The material shall be free from ice, snow, rubbish, sods, roots and other deleterious or organic material and shall conform to the following gradation requirements meeting ASTM C33 and stone size No. 67.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve TOTAL SAMPLE
1-inch	100
3/4-inch	90 - 100
3/8-inch	20 - 55
No. 4	0 - 10
No. 8	0 - 5

C. Aggregate Base: Aggregate base shall meet the requirements of MDOT Standard Specification Section 703.06 and shall conform to the following gradation requirements:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve TOTAL SAMPLE		
	Type A	Type B	Type C
1/2 inch	45-70	35-75	
1/4 inch	30-55	25-60	25-70
No. 40	0-20	0-25	0-30
No. 200	0-5.0	0-5.0	0-5.0

Type A aggregate for base shall only contain particles of rock which will pass the 2 inch square mesh sieve.

Type B aggregate for base shall only contain particles of rock which will pass the 4 inch square mesh sieve.

Type C aggregate for base shall only contain particles of rock which will pass the 6 inch square mesh sieve.

D. Aggregate Subbase: Aggregate subbase shall meet the requirements of MDOT Standard Specification Section 703.06 and shall conform to the following gradation requirements:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve TOTAL SAMPLE			
	Type D	Type E	Type F	Type G
1/4 inch	25-70	25-100	60-100	-
No. 40	0-30	0-50	0-50	0-70
No. 200 0-7.0	0-7.0	0-7.0	0-7.0	0-10

Aggregate for subbase shall not contain particles of rock which will not pass the 6 inch square mesh sieve.

E. Structural Fill: Clean, free-draining granular material; free from silt, topsoil, clay, and organic matter; meeting the following limits when tested in accordance with ASTM C136:

Sieve Percentage by Weight Passing Square Mesh Sieve

Designation	TOTAL SAMPLE
3-inch	100
No. 4	30 - 90
No. 40	10 - 50
No. 200 (*)	0 - 8

(* Based on fraction passing No. 4)

F. Filter Pond Coarse Loamy Sand: Shall consist of a mixture of coarse loamy sand soil with 20-30% by volume of moderately fine shredded bark or wood fiber mulch that has no less than 8% fines passing the No. 200 sieve. The coarse loamy shall meet the following gradation:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve TOTAL SAMPLE
No. 10	85 -100
No. 20	70 - 100
No. 60	15 - 40
No. 200 (*)	8 - 15

G. Filter Pond Coarse Gravel: Shall consist of a well graded clean, course gravel meeting the MDOT specification 703.22, Underdrain Type B for underdrain backfill. The coarse gravel shall contain not more than 5% fines passing the No. 200 sieve. The coarse gravel shall meet the following gradation:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve TOTAL SAMPLE
1-Inch	95-100
½ -Inch	75 -100
No. 4	50 - 100
No. 20	15 – 80
No. 50	0-15
No. 200 (*)	0 - 5

2.04 FILTER FABRIC

A. Filter fabric shall be non-woven fabric Mirafi 140N or approved equal . Substitution of a product equal or better quality, detail, function and performance may be proposed for substitution by following the procedures in Section 01600 Materials and Equipment.

PART 3 EXECUTION

3.01 PREPARATION

A. Request available information on existing utilities and structures from ARCHITECT.

B. Identify required lines, levels, contours, and datum.

C. Identify known underground utilities. Stake and flag locations.

D. Identify and flag surface and aerial utilities.

E. Notify utility companies to locate and temporarily support, remove, and/or relocate utilities.

F. **Notify DIG-SAFE (1-888-344-7233 or 1-888-DIG-SAFE) in accordance with Section 01020 Dig Safe.**

3.02 PROTECTION

A. Protect trees, shrubs, lawns, and other features remaining as a portion of final landscaping.

B. Protect bench marks, existing structures, fences, stone walls, sidewalks, paving, and curbs from equipment and vehicular traffic.

C. Protect above and below grade utilities and structures which are to remain.

D. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

E. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

F. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

3.03 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, landscaped, or graded, and stockpile. Remove excess topsoil not being reused from site. Topsoil suitable for reuse shall be in conformance with paragraph 2.01 A. Stockpiled topsoil shall be protected from erosion.

3.04 PAVEMENT EXCAVATION

A. All pavement shall be cut with saws or acceptable power tools prior to removal.

B. Excavate pavement within the limits shown on the Drawings.

C. Keep excavated pavement separate from topsoil and subsoil stockpiles.

D. Remove and dispose of pavement excavated from site.

3.05 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be landscaped or graded to the limits shown on the Drawings.

B. Excavate subsoil required for structures, utilities or yard piping and other work to the limits necessary or as shown on the Drawings. **NOTE:** No more than one pipe joint in active water lines may be uncovered at any one time.

C. Stockpile excavated material to be reused and remove and dispose of unsuitable subsoil and excess subsoil not being reused, off site. Subsoil suitable for reuse shall be in conformance with paragraph 2.02 A. Stockpiled subsoil shall be protected from erosion.

D. Remove all muck, peat and other unsuitable material within trench limits or where structures are to be located. If unsuitable material exists at limits of excavation shown on Drawings, obtain excavation authorization from ARCHITECT prior to removal of material. Unauthorized excavation of unsuitable material will not be considered for payment. Excavated unsuitable material shall be replaced with backfill material as specified.

E. Notify ARCHITECT of unexpected subsurface conditions, discovery of unknown utilities or concealed conditions, and discontinue affected work in area until notified to resume work. Unexpected subsurface conditions do not include those conditions identified in the Contract Documents.

F. Slope sides of excavation to satisfy OSHA requirements.

G. Excavations shall not interfere with normal 45 degree bearing influence of any foundation.

H. Grade top perimeter of excavations to prevent surface water run-off into excavation.

I. When excavation through roots is necessary, cleanly cut roots.

J. Correct unauthorized excavation at no cost to OWNER. Backfill with material acceptable to the ARCHITECT.

K. Maintain bottom of all excavations stable, dry and free of water on a continual basis.

3.06 BACKFILLING PREPARATION

A. Brace walls and slabs of structures to support surcharge forces and construction loads to be imposed by backfilling operations.

B. Remove all water, snow, ice and debris from excavations and trenches before placing pipe bedding, foundation material under tankage or concrete structures or backfilling.

C. Compact subgrade surfaces disturbed by construction operations to density requirements for backfill material. Do not place bedding, foundation material or backfill on porous, unstable or unsuitable subgrade.

3.07 BEDDING AND BACKFILLING

A. Bedding and backfilling materials shall not contain frozen materials, ice or snow.

B. Backfill with crushed stone bedding beneath all utility pipes.

C. Install pipe on shaped, undisturbed subgrade or on bedding material in accordance with paragraph 3.12 SCHEDULE OF BEDDING, BACKFILL AND COMPACTION.

D. Support pipe during placement and compaction of bedding material.

E. Filter fabric shall be placed to completely enclose crushed stone used for bedding material or for replacement material where rock, boulders or unsuitable material have been removed in pipe trenches unless authorized otherwise by ARCHITECT. Under structures, where crushed stone is used, the filter fabric shall enclose the material on the sides and bottom, and on top, extend 2 feet under all edges of the proposed structure.

F. Place and compact bedding for utilities and yard piping in accordance with the specifications and typical trench details shown on the Drawings.

G. Backfill excavations and trenches to depths, contours and elevations required.

H. Each layer of backfill shall be compacted to the specified density the same day it is placed.

I. Maintain optimum moisture content of backfill materials to attain required compaction density.

J. Fill that is too wet for proper compaction shall be disced, harrowed or otherwise dried to a proper moisture content for compacting to the required density. If the fill material cannot be dried within 48 hours of placement, it shall be removed and replaced with drier fill.

K. Fill that is too dry for proper compaction shall be watered uniformly over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.

L. Employ placement and compaction methods that will not disturb or damage Work or existing structures or utilities. Disturbed or damaged Work, structures or utilities shall be repaired at no additional cost to the OWNER and at no additional time for performance.

M. Do not backfill against unsupported foundation walls or before required concrete strength has been achieved. Backfill simultaneously on each side of unsupported foundation walls.

N. Backfilling shall be performed as required to avoid interference with OWNER'S operations and/or other contractor's or subcontractor's Work.

O. Grade backfill to provide a smooth surface which will readily shed water and provide positive drainage. Areas to receive compacted fill shall be graded to prevent ponding of surface water runoff.

3.08 BACKFILLING TOLERANCES

A. Top Surface of Backfilling or Subgrade: Plus or minus one inch.

3.09 COMPACTION

A. The maximum density at optimum moisture content for bedding and backfill materials shall be determined in accordance with ASTM D1557 (Modified Proctor).

B. All bedding and backfill materials shall be compacted to the density shown in paragraph 3.12 SCHEDULE OF BEDDING, BACKFILL AND COMPACTION.

C. Testing density of soil in place (compaction) will be performed in accordance with ASTM D1556, ASTM D2167, or ASTM D2922. If tests indicate compacted bedding and/or backfill does not meet specified requirements, remove, replace and retest at no additional cost to OWNER and at no additional time for performance.

3.10 GRADING

A. Grading Areas to be Loamed and Seeded:

1. Perform all rough grading required to attain the elevations indicated on the Drawings or as required.

2. Grade to elevations shown on the Drawings or as required for landscaping. Remove all material, including rock and boulders to a point at least 4 inches below the finished grade of landscaped areas to be loamed and seeded.

3. Remove all ruts and other uneven surfaces by surface grading.

B. Grading Areas to be Paved or Surfaced:

1. Perform all rough grading, including shaping, sloping, and any work necessary to prepare the subgrades of all roadways, walks and parking areas. Subgrade shall be brought to the bottom elevation of the base course under paved or surfaced areas.

2. Accomplish all grading within the slope and grade lines as indicated on the Drawings or as necessary to accomplish the Work, unless otherwise authorized in writing by the ARCHITECT. The roadway shall be graded to full cross section width at subgrade before placing any type of subbase or pavement except that partial width construction may be permissible where necessary for the maintenance of traffic.

C. Slope grade away from structure minimum 2 inches in 10 feet, unless noted otherwise.

D. Make gradual changes in grade. Slopes shall transition gradually into level areas.

E. Grade all areas completely and remove and dispose of all excess excavated, bedding and backfill materials from site.

F. Backfill to original grade or as indicated herein or on the Drawings. Deviations and settlement shall be corrected at no cost to the OWNER and at no additional time for performance.

3.11 FIELD QUALITY CONTROL

A. All subgrades must be inspected and accepted by the ARCHITECT prior to proceeding with Work. Sufficient time must be allowed for the ARCHITECT to observe and to have any necessary tests performed on the subgrade.

3.12 SCHEDULE OF BEDDING, BACKFILL AND COMPACTION

A. The following schedule identifies location; bedding and/or backfill materials to be used (identified from upper to lower fill type); loose thicknesses of each fill lift; and, compaction expressed as a percentage of maximum density and optimum moisture determined in accordance with ASTM D1557 (Modified Proctor).

Location	Material/Thickness	Lifts (Loose)/Compaction
Disturbed, Excavated Subgrade	Natural Subgrade/ Existing	Existing/ 90 percent or equal to average density of undisturbed material
Beneath Structures Beneath Structures from which Rock, Boulders or Unsuitable	Structural Fill/12 inches min. Structural Fill /12 inches min. top of structural fill to underside of structure	8-inch lifts/ 95 percent

Material has been Removed	Structural Fill/as req'd to 12 inches below structure	8-inch lifts/ 95 percent
Slabs-On-Grade	Structural Fill / 4-inches min on natural subgrade or structural Fill Structural Fill/as req'd	4-inch min/ 95 percent
Around Structures	Structural Fill/as req'd	8-inch lifts to top of fill/95 percent
Around Structures with Foundation Perimeter Drainage	Structural Fill/as req'd	8-inch lifts to top of fill/95 percent
Pipe Bedding		
DI Water Pipe and DI Sewage Force Main PVC Water Pipe, DI Gravity Sewer, PVC Gravity Sewer and PVC Sewage Force Main, HDPE Storm Drain, HDPE Underdrain	Crushed Stone/6 inches min to springline of pipe Crushed Stone/6 inches min. below pipe to springline of pipe	Existing/ 95 percent or equal to average density of undisturbed material. 6 inch lifts/ 95 percent
RCP Storm Drain	Shaped, Undisturbed Subgrade/Existing	Existing/ 95 percent or equal to average density of undisturbed material
Location Pipe Bedding cont'd. Gas Pipe Pipe Blanket	Material/Thickness Sand/12 inches below pipe to springline of pipe	Lifts (Loose)/Compaction 6-inch lifts/ 95 percent
All Pipe in Area of Rock Excavation	Crushed Stone/6 inches min. below pipe to springline of pipe	6-inch lifts/ 95 percent
All Pipe in Area of Unsuitable Material Excavation	Crushed Stone/As req'd, 6 inches min. from excavation limits below pipe to springline of pipe	6-inch lifts/ 95 percent
DI Water Pipe and DI Sewage Force Main	Sand/From trench bottom to 12 inches above pipe	6-inch lifts/ 95 percent
PVC Water Pipe, DI Gravity Sewer, PVC Gravity Sewer, PVC Sewage Force Main, HDPE Storm Drain, HDPE Underdrain	Crushed Stone/From springline of pipe to 12 inches above pipe	6-inch lifts/ 95 percent
RCP Storm Drain	Common Fill/From trench bottom to 12 inches above pipe	6-inch lifts/ 95 percent

Gas Pipe	Sand/From springline of pipe to 12 inches above pipe	6-inch lifts/ 95 percent
Backfill		
Under Grassed Areas	Common Fill/From subgrade or 12 inches above pipe, to 4 inches below finished grade	15-inch lifts/ 90 percent
Under landscaped areas	Common Fill/From subgrade or 12 inches above pipe to 12 inches below finished grade	15-inch lifts/ 90 percent
Under paved areas	Common Fill/From subgrade or 12 inches above pipe to underside of subbase for paved areas	8-inch lifts/ 95 percent
Base and Subbase		
Bituminous Pavement and Concrete Sidewalks	As shown on drawings	6-inch lifts/ 95 percent

END OF SECTION

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Planning and executing measures to prevent and control soil erosion.

B. Furnishing, installing and maintaining erosion control materials.

1.02 REFERENCE STANDARDS

A. Standards and specifications for erosion prevention in developing areas as contained in the 2003 online version of the Maine Erosion Control Best Management Practices (BMP) Manual as published by the Maine Department of Environmental Protection.

1.03 SUBMITTALS

A. Submit plans and details showing specific slope protection and erosion control measures to be taken for each phase of the construction. Plans and details shall conform to the Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices. Submit information on proposed materials/methods in accordance with Section 01300 Submittals.

1.04 PROJECT CONDITIONS

A. Schedule temporary seeding, mulching and other erosion control measures to take place as soon as possible.

B. When temporary seeding cannot be accomplished to have established or visible growth by October 15, the disturbed areas shall be covered with six (6) inches of mulch for the winter.

PART 2 PRODUCTS

2.01 MATERIALS

A. Hay Bales: Securely tied baled hay at least fourteen (14) inches by eighteen (18) inches by thirty (30) inches long.

B. Mulch Material: Select mulch material for erosion control that will best meet the site conditions from the following:

1. Hay or Straw - Shall be dry, free of mold and weed seeds.

2. Hydromulch as specified in Section 02900..

D. Fertilizer: Complete fertilizer 10-20-20 (standard product).

E. Lime: Ground limestone containing not less than ninety-five percent (95%) total carbonates (calcium or magnesium).

F. Temporary Seed Mixture: When it is impractical to establish permanent protective vegetation on disturbed earth by October 15, use "Conservation Mix" or the following seed

mixture:

Kind of Seed	Lbs per Acre
Switchgrass (Blackwell or Shelter)	4.0
Big bluestem (Niagara or Kaw)	4.0
Little bluestem (Camper or Blaze)	2.0
Sand lovegrass (NE-27 or Blaze)	1.5
Birdsfoot trefoil (Viking)	2.0

G. Inoculum specific to Birdsfoot trefoil must be used with this mixture. If seeding by hand, a sticking agent such as milk or cola shall be used to stick inoculum to the seed. If seeding with hydroseeder, use four (4) times the recommended amount of inoculum.

H. Permanent Seed Mixture for Slopes and Embankments: Section 717.03 of MDOT Standard Specifications, Road Side Mixture No. 2

I. Permanent Seed Mixture for Lawns and Landscaping: Per Section 02900 Landscape Work.

J. Permanent Seed Mixture for Filter Pond: Wetland Seed Mixture as follows:

New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites as supplied by New England Wetland Plants, Inc., Amherst, Massachusetts, Tel: 413-548-8000, containing the following species:

Switchgrass (*Panicum virgatum*), Virginia Wild Rye (*Elymus virginicus*), Creeping Red Fescue (*Festuca rubra*), Fox Sedge (*Carex vulpinoidea*), Creeping Bentgrass (*Agrostis stolonifera*), Soft Rush (*Juncus effusus*), New England Aster (*Aster novae-angliae*), Grass-leaved Goldenrod (*Euthamia graminifolia*), Nodding Bur Marigold (*Bidens cernua*), Green Bulrush (*Scirpus atrovirens*), Joe-Pye Weed (*Eupatorium maculatum*), Boneset (*Eupatorium perfoliatum*), Blue Vervain (*Verbena hastata*).

K. Siltation Fence: Siltation fence shall consist of a woven, polypropylene geotextile fabric that is inert to biological degaradation and naturally encountered chemicals, alkalies and acids.

L. Wood Stakes: Wood stakes shall have a minimum size of 1 inch by 1 inch and minimum length of 4 feet.

M. Erosion Control Blanket: Erosion Control blanket shall be composed of a straw fiber matrix sewn between two photodegradable nets, such as S150 Erosion Control Blanket as manufactured by North American Green or approved equal.

N. Filter Fabric Drainage Inlet Protection Devices: Filter fabric devices for the protection of drainage inlets shall be specifically designed for the purpose and shall be constructed of high tensile strength monofilament geotextile fabric with high flow capacity. Devices shall be designed with emergency overflow drain holes to minimize potential for flooding during heavy rainfall events. Filter fabric devices for drainage inlet protection shall be "The Street Bag" as manufactured by Earth & Road Corporation or approved equal.

O. Riprap: Riprap stone shall be sized as shown on the project plans. Riprap stones shall be sound, durable rock which is angular in shape and free from overburden, shale, spoil, and organic materials. Round stones, boulders, sandstone, or similar soft stone or relatively thin slabs are not acceptable. Stones shall weigh at between 10 and 200 pounds each,

except that when available, stones weighing more than 200 pounds may be used. Approximately 50 percent of the stones by volume shall exceed a unit weight of 50 pounds each. The remainder of the stones shall be graded such that, when placed with the larger stones, the entire mass will be compact and structurally sound.

P. Geotextile Fabric For Riprap Aprons And Spillways. The geotextile shall be furnished in a protective wrapping which shall protect the fabric from ultraviolet radiation and from abrasion due to shipping and handling. Fabric shall be furnished in rolls with minimum 15 ft. widths and shall be equal to that manufactured by Exxon Chemical Company or LINQ Industrial Fabrics, Inc., specification 130 EX or as approved by the Engineer.The geotextile fabric to be installed as a part of riprap aprons, plunge pools, inlets, outlets, and spillways and underdrain systems or as shown on the construction drawings shall be a non-woven needle-punched geotextile fabric with the following properties:

Physical Property:	**Test Method:**	**Minimum Average Roll Values:**
Weight, oz/s.y.	ASTM D-3776	4.0
Tensile Strength, lbs.	ASTM D-4632	100
Elongation, %	ASTM D-4632	50
Coefficient of Water Permeability, cm/sec	ASTM D-4491	2.0
Puncture Strength, lbs.	ASTM D-4833	60
Mullen Burst Strength, psi	ASTM D-3786	215
Thickness (mils)	ASTM D 1777	50
Flow (gpm)	ASTM D 4491	140

PART 3 EXECUTION

3.01 GENERAL CONSTRUCTION SEQUENCE TO MINIMIZE EROSION

A. Erect hay bale dikes and/or silt fences as shown on Drawings and as may be required in the field to protect property, waterways, wells and springs.

B. Commence excavation. Stockpile soil so that erosion is minimized. Extra precautions shall be taken when soil is saturated.

C. Control surface water and erosion in accordance with Section 02145 –Dewatering and Pre-drainage and Section 01500 Construction Facilities and Temporary Controls.

D. Backfill excavation to grade. Grade site so that soil erosion caused by runoff will be minimized.

E. Seed and mulch exposed ground.

3.02 SEEDING AND MULCHING

A. All areas which will remain open shall be seeded and mulched within five (5) days of being stripped or backfilled and graded.

B. Soil samples may be sent to the Soil Conservation Service for analysis to determine the

proper seed mixture and fertilizer requirements.

C. The following procedures shall be followed for temporary seeding:

1. Apply lime at a rate of seventy-five (75) to one hundred (100) pounds per one thousand (1000) square feet. Incorporate into top two (2) inches of soil.

2. Apply fertilizer at a rate of thirty (30) pounds per one thousand (1000) square feet. Mix thoroughly into the top two (2) inches of soil.

3. Apply seed mixture at a rate of two (2) pounds per one thousand (1000) square feet evenly in two (2) intersecting directions. Rake lightly.

4. Apply mulch material within twenty-four (24) hours after seeding in accordance with the following:

   a. Hay or Straw: Application rate - seventy-five (75) to one hundred (100) pounds per one thousand (1000) square feet. Spread by hand or with machine. Anchor on slopes and where subject to blowing or slipping.

5. Anchor mulch on all slopes exceeding five percent (5%) and other areas as required.

3.03 HAY BALE DIKES

A. Embed hay bales into soil and anchor in place with stakes as shown on the Drawings. Butt hay bales together tightly.

B. Hay bales shall be replaced when they become clogged with soil particles or as directed by the ENGINEER.

3.04 DAMAGE AND REPAIR

A. Repair all damages caused by soil erosion or construction equipment at or before the end of each working day.

3.05 SILTATION FENCE

A. Install siltation.fence in accordance with the details shown on the drawings and in accordance with manufacturer's instructions.

3.06 RIPRAP

A. Install Riprap in accordance with the details shown on the plans.

END OF SECTION

SECTION 02510

BITUMINOUS CONCRETE PAVING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Bituminous concrete paving for roads, parking areas, driveways, walkways, and associated preparatory work.

B. Gravel subbase and base courses.

C. Final grading of subbase and base courses.

D. Installation of subbase, base binder course.

1.02 REFERENCE STANDARDS

A. State of Maine, Department of Transportation, Standard Specifications, December 2002, including the latest revisions of adopted Supplemental Specifications.

1.03 SUBMITTALS

A. Submit certification prepared by manufacturer certifying that the component materials and finished product to be delivered to site conforms to job mix data, MDOT Standard Specifications Division 300, Division 400, and Division 700. Submittals should be in conformance to Section 01300.

PART 2 PRODUCTS

2.01 MATERIALS

A. Subbase and base aggregate: Material shall be in accordance with MDOT Section 703.06, described in specification Section 02225 - Excavating, Backfilling, and Compacting.

B. Hot Mix Asphalt Pavement, 19.0mm Superpave.

C. Hot Mix Asphalt Pavement, 12.5mm Superpave.

D. Hot Mix Asphalt Pavement, 9.5mm Superpave.

PART 3 EXECUTION

3.01 GENERAL

A. The placement of subbase and base courses shall be in accordance with MDOT Standard Specifications, Section 304.03. The number and thickness of each course shall conform to the drawings.

B. Bituminous concrete material shall be placed in accordance with MDOT Standard Specification 401.07 through and including 401.18.

C. The number of paving courses and the thickness of each course shall conform to the

Drawings or as directed by the ARCHITECT.

3.02 QUALITY CONTROL AND ASSURANCE TESTING

A. Quality Control and Assurance testing will be accomplished in accordance with Quality Control and Assurance Method A as outlined in MDOT Standard Specification Section 401.18 and 401.201.

3.03 TEMPORARY TRENCH PATCH

A. Temporary trench patch shall be placed upon a properly installed subbase, as specified herein, in all trenches within existing pavement areas.

B. Temporary trench patch shall be binder course mix, minimum 2 inches thick.

C. Temporary trench patch shall be placed within 5 days of backfilling. The CONTRACTOR shall schedule his paving operations so that temporary pavement is installed prior to the end of each work week.

D. All edges of the adjacent pavements shall be trimmed back as necessary to sound pavement and to neat straight lines and cleaned to provide a firm, regular and clean surface to bond the new pavement. All edges shall be coated with an emulsified asphalt to improve the bond between the old and new pavement. Care shall be exercised not to adversely alter original street drainage.

E. The CONTRACTOR shall maintain temporary trench patch under this Contract and shall promptly refill and repave areas which have settled or are otherwise unsatisfactory for traffic until the temporary trench patch is removed, or until the temporary trench patch is resurfaced, whichever occurs first.

3.04 PERMANENT TRENCH PATCH

A. The CONTRACTOR shall remove temporary trench patch, regrade subbase and install permanent trench patch as specified upon authorization by the ARCHITECT.

Temporary trench patch shall not be removed sooner than 90 days after installation unless otherwise authorized by the ARCHITECT.

B. All edges of the adjacent pavements shall be trimmed back a minimum of 6 inches or to sound pavement and to neat straight lines and cleaned to provide a firm, regular and clean surface to bond the new pavement prior to placement of pavement. All edges shall be coated with an emulsified asphalt to improve the bond between the old and new pavement. Care shall be exercised not to adversely alter original street drainage.

C. Permanent trench patch shall be a minimum of 2 inches of binder course mix and a minimum of 1 inch of top course mix in two separate and compacted layers for a minimum total of 3 inches or as shown on the Drawings.

D. The final pavement shall butt or overlap the existing pavement along all edges providing a smooth uniform joint.

E. The CONTRACTOR shall maintain permanent pavement under this Contract during the contract guarantee period and shall promptly refill and repave areas which have settled or are otherwise unsatisfactory for traffic.

3.05 SURFACE TOLERANCE

A. The completed surface of the base and subbase courses shall be shaped and maintained to a tolerance, above and below the required cross sectional shape of 3/8 inch.

B. The completed surface of the pavement courses shall be shaped and finished within the tolerances of MDOT Specification, 401.101. The Contractor shall provide the required straightedge for the ARCHITECT's use.

END OF SECTION

SECTION 02517

PAVEMENT MARKINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Marking Application:

1. This work shall consist of furnishing and applying pavement markings in reasonably close conformity with the plans and as designated by the ARCHITECT. Glass beads shall be utilized in the paint.

B. Marking Removal:

1. This work shall consist of removal of existing pavement markings as shown on the drawings.

PART 2 PRODUCTS

2.01 MATERIALS

Required Materials	MDOT Specifications
Pavement Marking Paint	708.03
Reflectorized Plastic Pavement Marking	712.05
Glass Beads	AASHTO M247, Type I

Submit manufacturer's printed product data in accordance with Section 01300 Submittals.

PART 3 CONSTRUCTION REQUIREMENTS

3.01 PAVEMENT MARKING REMOVAL

A. Markings shall be removed in accordance with MDOT Specification Section 627.08.

3.02 INSTALLATION

A. The application of the required pavement markings (temporary and permanent) shall be accomplished in accordance with MDOT Specification Section 627.04 through 627.06.

END OF SECTION

SECTION 02523

CONCRETE PAVERS ON CONCRETE BASE

PART 1 GENERAL

1.01 WORK INCLUDED

A. This work shall include the installation of concrete pavers over concrete base in accordance with these specifications and in conformity with the plans and details or as approved by the OWNER.

B. Related work described elsewhere:

1. Exploratory Excavation – Section 02222
2. Excavating, Backfilling and Compacting – Section 02225
3. Granite Curb - Section 02528
4. Cast-in-Place Concrete - Section 03300

PART 2 PRODUCTS

2.01 CONCRETE PAVERS

A. Concrete Pavers: shall conform to ASTM Designation Section C-902-79a. Contractor shall verify new concrete pavers will match existing on-site material (size, color, finish) and shall submit samples of each paver type to ARCHITECT prior to installation in accordance with Section 01300 Submittals..

1. Uni-décor paver as manufactured by the Ideal Concrete Block Co., 45-55 Power Road, Westford, MA 01886 (800-444-7287), or equal.

   a. Concrete paver size shall be 5 1/2" x 9" x 2 3/8" with chamfered edge
   b. Concrete paver color shall be Cypress
   c. Concrete paver finish shall be "soft"

2. Courtyard square paver as manufactured by Genest Concrete Works, Wilson Street, Sanford, ME 04073 (800-649-4773), or equal.

   a. Concrete paver size shall be 4" x 4" x 2 3/8"" with chamfered edge
   b. Concrete paver color shall be Charcoal

3. Boston Colonial paver as manufactured by the Ideal Concrete Block Co., 45-55 Power Road, Westford, MA 01886 (800-444-7287), or equal.

   a. Concrete paver size shall be 4" x 8" x 2 3/8"
   b. Concrete paver color shall be Cypress
   c. Concrete paver finish shall be "soft"

B. Concrete base for concrete pavers as specified in Section 03300 and shown on Drawings.

C. Bituminous setting bed:

1. Asphalt cement to be used in the bituminous setting bed shall conform to ASTM Designation D-3381, viscosity grade A.C. 10 or A.C. grade 20.

2. The fine aggregate to be used in the bituminous setting bed shall be clean, hard sand with durable particles and shall be free from adherent coating, lumps of clay, alkali salts, and organic matter. It shall be uniformly graded from "coarse to fine" and all passing the No. 4 sieve and it shall meet the gradation requirements when tested in accordance with the standard method of test or sieve analysis of fine and coarse aggregates ASTM Designation C-136-81.

3. The dried aggregate shall be combined with hot asphalt cement, and the mix shall be heated to approximately 300 degrees F. at an asphalt plant. The approximate proportion of materials shall be 7% asphalt cement and 93% fine aggregate. Each ton shall be apportioned by weight in the approximate ratio of 145 lbs. asphalt to 1,1855 lbs. sand. The CONTRACTOR shall determine the exact proportions to produce the best possible mixture for construction of the bituminous setting bed to meet construction requirements.

D. Neoprene-Modified asphalt adhesive:

1. Mastic (asphalt adhesive)
Solids (base) 75± 1%
Lb./Gal. 8 – 8.5 lb.
Solvent, mineral spirits (over 100 F. Flash)

2. Base (2% neoprene, 10% Asbestos-free fibers, 88% asphalt)

Melting Point – ASTM D-36	150 F. min.
Penetration – 77 100 gram load 5-second (.1mm)	23 – 27
Ductility – ASTM D-113-44 @ 25 C. @ 5 cm/minute	100 – 125 cm

E. Joint filler: Portland Cement with prepared color added shall conform to ASTM C-150. Sand shall conform to ASTM C-33.

PART 3 EXECUTION

3.01 INSTALLATION

A. Placing bituminous setting bed for concrete pavers.

1. Place control bars directly over concrete base. The depth control bars must be set carefully to bring the brick pavers, when laid to proper grade. Thickness of the setting bed shall be no more than 1-inch or less than ½-inch.

2. The setting bed shall be rolled with a power roller to a nominal depth of 3/4-inch. The thickness shall be adjusted so that when the brick pavers are placed, the top surface of the pavers will be at the required finished grade. However, under no circumstances shall the setting bed exceed 1-inch.

3. A coating of 2% Neoprene-modified asphalt adhesive shall be applied by squeegeeing to troweling over the top surface of the bituminous setting bed so as to provide a bond under the pavers.

B. Installation of concrete pavers:

1. After the modified asphalt is applied, carefully place the bricks by hand in straight courses with hand tight joints and uniform top surface. Good alignment must be kept and the pattern shall be as shown on the plans.

C. Joint treatment:

1. Hand tight joints shall read from 0-inch to maximum 1/4-inch. Sweep a dry mixture of one part colored Portland Cement to match color of bricks and three parts sand until joints are within 1/8-inch of top surface. Fog lightly with water. Cement stains that remain shall be cleaned.

3.02 OTHER CONDITIONS

A. Vehicular Traffic: If there is to be vehicular traffic over Concrete Pavers, prime concrete base with emulsified asphalt (RS-1 or CRS-1).

B. Bricks shall be retained at edges of pavement. Curb, sidewalk or suitable steel or plastic material shall be used.

C. Slope: Desired minimum slope of pavement is 1-inch in 10-feet.

END OF SECTION

SECTION 02528

GRANITE CURB

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing granite curb.

B. Installation of granite curb.

C. Removing and resetting existing granite curb.

1.02 REFERENCE STANDARDS

A. State of Maine Department of Transportation Standard Specifications, including the latest revisions of adopted Supplemental Specifications.

1.03 SUBMITTALS

A. Submit certification, prepared by manufacturer that the component materials and finished product conform to MDOT Standard Specification 609 and Division 700.

B. Submit Shop Drawings and product data in accordance with Section 01300 – Submittals.

PART 2 PRODUCTS

2.01 GRANITE CURB

A. Granite curb shall conform to MDOT Standard Specification Section 712.04 Stone Curbing and Edging.

PART 3 EXECUTION

3.01 GENERAL

A. Granite curb shall be installed in locations shown on the Drawings or determined by the ARCHITECT.

3.02 INSTALLATION

A. Granite curb shall be installed in accordance with MDOT Standard Specifications 609.03, 609.06, 609.07 and 609.08 and as shown on the drawings.

END OF SECTION

SECTION 02530

GRANITE STONEWORK BOLLARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Installation of new granite stonework bollards and relocation of existing granite stonework bollards.

PART 2 PRODUCTS

2.01 GRAVEL SUB-BASE

A. Gravel for sub-base shall consist of material reasonably free from silt, loam, clay or organic matter. It shall be obtained from approved sources and shall meet the following gradation:

Sieve Designation	Percent by Weight Passing Square Mesh Sieves
No. 4	20 - 60
No. 100	0 - 12
No. 200	0 - 6

The stone portion shall be uniformly graded from coarse to fine, and the maximum size stone particles shall not exceed two-third the thickness of the layer being placed.

2.02 GRANITE BOLLARDS

B. Granite bollards shall have sawn/thermal finishing and will be as manufactured by Swenson Granite Works, 582 Bridgton Road, Route 302, Westbrook, Maine (207-797-4500) or approved equal and shall match existing granite bollards. Refer to drawings and details for additional information regarding size, shape and finishes for granite bollards.

PART 3 EXECUTION

3.01 INSTALLATION

A. Excavation: Excavation shall be made to the required depth and the base material upon which the granite bollard is to be set shall be compacted to a firm, even surface. All soft and unsuitable material shall be removed and replaced with suitable material which shall be thoroughly compacted.

B. Installation: the bollard shall be set so that the front is as close to the granite curb as possible. The space between the bollard and curb shall be filled with a layer of rigid foam capped with concrete. All space under the bollard shall be filled and thoroughly tamped with material meeting the requirements of the material for the bed course. In the event that existing granite bollards are damaged/broken during removal/relocation they shall be replaced at no charge by the contractor.

END OF SECTION

SECTION 02667

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing corporation stops, curb stops, curb boxes, fittings, and copper tubing where necessary to allow for hook-up to the water main.

B. Providing 24-hour notice to all water customers regarding any disruption of service.

C. Installation.

1.02 REFERENCE STANDARDS

A. ASTM B88 - Seamless Copper Water Tube.

1.03 QUALITY ASSURANCE

A. Provide thoroughly trained and experienced personnel who are completely familiar with and equipped for the Work required in this Section.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Specification: Based on products and materials of the following manufacturers:

1. Corporation stops - Ford or Mueller Company.
2. Curb stops - Ford or Mueller Company.
3. Adapter couplings - Mueller Company.
4. Brass plug - Mueller Company.
5. Service saddles - Ford or Rockwell.

B. Substitutions: Products of equal or better quality, detail, function and performance may be proposed for substitution by following the procedures in Section 01630 Substitution Request Form.

2.02 MATERIALS

A. Corporation Stops: Ford F1000 or Mueller H-15008.

B. Curb Stops: Ford B44-333 or Mueller H-10267.

C. Curb boxes shall be adjustable in lengths consistent with pipe depths.

D. Copper tubing shall be Type K, soft temper conforming to ASTM B88. The name or trademark of the manufacturer and type shall be stamped at intervals along the pipe.

E. Adapter couplings may be required for fitting new services to existing service lines. Such fittings shall be compression connections and provide electrical continuity. Fittings shall be Mueller H-15403.

F. Brass Plug: Mueller H-10033 for cc thread or H-10035 for IP threads.

G. Service Saddles: Ford FS 202 or Rockwell.

PART 3 EXECUTION

3.01 NOTICE

A. The CONTRACTOR shall notify users 24 hours in advance of when he proposes to interrupt water service.

3.02 INSTALLATION

A. Tapping pipe:

1. Tapping ductile iron pipe: Corporation stops shall be installed in ductile iron pipe with a direct tap except as indicated on the following table where a service saddle shall be installed.

Tapping Saddle Requirements vs Pipe Size and Class

Pipe Size	Saddle Requirements for Class 50 Pipe	Saddle Requirements for Class 51 Pipe	Saddle Requirements for Class 52 Pipe
6-inch	All taps	All taps	Taps > 3/4 inch
8-inch	All taps	Taps > 3/4 inch	Taps > 3/4 inch
10-inch	Taps > 3/4 inch	Taps > 3/4 inch	Taps > 1 inch
12-inch	Taps > 3/4 inch	Taps > 1 inch	Taps > 1-1/4 inches
16-inch	Taps > 1-1/4 inches	Taps > 1-1/2 inches	Taps > 2 inches
20-inch	Taps > 2-1/2 inches	Taps > 3 inches	Taps > 3 inches

2. Tapping PVC pipe: Corporation stops shall be installed in PVC pipe using a service clamp or saddle in accordance with the recommendations of the PVC pipe manufacturer.

B. Install corporation stops in the new water main either at the time of installation or later when service connections are constructed. Service connections shall be constructed after the new pipe has been tested and disinfected.

C. Corporation stops shall be installed in the pipe at the 10 o'clock or 2 o'clock position. The length of travel of the tap should be so established that when the corporation stop is inserted and tightened, a minimum of one thread and a maximum of three threads will be exposed on the outside. When a wet tapping machine is used, the corporation stop shall be inserted with the machine while it is still in place. Stops shall be tightened only sufficiently to be watertight.

D. All work on service connections shall be properly coordinated with the Portland Water District.

E. Install copper tubing from the corporation stop to the curb stop for a new service, or connect to the existing water service pipe for service changeover. Install to a depth of 6 feet minimum. A "goose neck" shall be installed in the new service pipe. Care shall be exercised in the placing and laying of copper tubing to be sure that the pipe does not have

any kinks and is not installed near sharp stones or ledge which would cause damage to the pipe. Place at least 12 inches of common fill with no stone greater than 2 inches in maximum dimension, adjacent to and above the tubing.

F. Install curb stop and curb box (new service installation) at the approximate property line or as otherwise directed by the ARCHITECT and connect with new copper tubing. Install curb box vertically, centered over the operating key, with the elevation of the top adjusted to conform to the finished grade. Adequately support the box during backfilling to maintain vertical alignment. Care must be taken to insure that the curb box does not rest on the curb stop.

END OF SECTION

SECTION 02720

STORM DRAINS, PERIMETER DRAINS, AND CULVERTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing pipe for storm drains, perimeter drains, and culverts.

B. Installing and/or removing and replacing storm drains, perimeter drains, and culverts as shown on the drawings.

1.02 REFERENCE STANDARDS

A. AASHTO M252 - HDPE piping 3 to 10-inch.

B. AASHTO M294 - HDPE piping 12 to 48-inch.

C. AASHTO TYPE S - Full circular cross section, without corrugated pipe wall and essentially smooth inner wall. Corrugations and annular.

D. AASHTO TYPE O - Smooth waterway braced circumferentially with circular ribs which are formed simultaneously with an essentially smooth outer wall.

E. ASTM D3350.

F. ASTM D2321.

G. ASTM F405.

H. ASTM 667.

1.03 SUBMITTALS

A. Submit manufacturer's certifications, shop drawings and product data in accordance with 01300 Submittals.

B. Submit manufacturer's recommendations for pipe joining and laying.

1.04 QUALITY CONTROL

A. The quality of all materials, the process of manufacture and the finished pipe shall be subject to inspection by the ARCHITECT. Such inspection may be made at the place of manufacture, and or on the work site after delivery. Pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipe may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All pipe which have been damaged after delivery will be rejected, or if already installed, shall be repaired or removed and replaced by the CONTRACTOR, as directed by the ARCHITECT, with no additional cost to the OWNER.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Storm drain, perimeter drain, underdrain, and culvert piping shall be HDPE pipe manufactured by Advanced Drainage Systems (ADS) or approved equal.

B. Pipe size and material shall be as shown on the Drawings and described herein.

2.02 MATERIALS

A. Each length of pipe shall be marked or tagged with the nominal diameter, the name of the manufacturer or his trademark, and, the date of manufacture.

B. Backfill material shall be as specified in Section 02225 - Excavating, Backfilling and Compacting.

C. Perimeter drain and underdrain (4 to 8-inch)

1. Provide perimeter drain and underdrain piping at locations shown on drawings.
2. Perimeter drain and underdrain piping shall conform to AASHTO M252.
3. Perimeter drain and underdrain piping shall be ADS, N-12 pipe with CD perforation configuration or approved equal.
4. Perforations when specified on the drawings shall be as recommended by manufacturer.

D. Storm drains and culverts (4- to 10-inch)

1. Provide storm drain piping at locations shown on the drawings.
2. Storm drain piping shall conform to AASHTO M252.
3. Storm drain piping shall be ADS, N-12, AASHTO Type S.
4. Perforations when specified on the drawings shall be as recommended by manufacturer.

E. Storm drains and culverts (12- to 24-inch)

1. Provide storm drain and culvert piping at locations shown on the drawings.
2. Storm drain and culvert piping shall conform to AASHTO M294.
3. Storm drain and culvert piping shall be ADS, N-12, AASHTO Type S.
4. Perforations when specified on the drawings shall be as recommended by manufacturer.

PART 3 EXECUTION

3.01 HANDLING PIPE

A. Pipe shall be unloaded and inspected in accordance with the manufacturer's instructions.

B. Pipe and fittings stored on the site shall be stored in the protective unit packages provided by the manufacturer. If packages need to be opened, the pipe shall be stored above ground and on a flat surface and not in direct contact with the ground. Do not stack higher than four feet. Keep inside of pipe and fittings free from dirt and debris. Care shall be exercised to avoid compression damage or deformation to the pipe.

C. All pipe and fittings that are stored shall be covered to provide protection from the sunlight.

D. Handle all material carefully at all times. Any pipe or fitting having a crack or which has received a severe blow shall be marked rejected and immediately be removed from the work.

3.02 CONTROL OF ALIGNMENT AND GRADE

A. Easement and property and other control lines necessary for locating the Work as well as elevations and bench marks used in the design of the Work are shown on the Drawings. The CONTRACTOR shall use this information to set line and use a level or transit to set grade.

B. The CONTRACTOR may use laser equipment to assist in setting the pipe provided he can demonstrate satisfactory skill in its use.

C. The use of string levels, hand levels, carpenter's levels or other similar devices for transferring grade or setting pipe will not be permitted.

D. During construction provide the ARCHITECT, at his request, all reasonable and necessary materials, opportunities, and assistance for setting stakes and making measurements, including the furnishing of one or two rodmen as needed at intermittent times.

E. CONTRACTOR shall not proceed until he has made timely request of the ARCHITECT for, and has received from him, such controls and instructions as may be necessary as Work progresses. The Work shall be done in strict conformity with such controls and instructions.

F. The CONTRACTOR shall carefully preserve bench marks, reference points and stakes, and in case of willful, careless, or accidental destruction by his own men, he will be responsible for the resulting cost to re-establish such destroyed control data and shall be responsible for any mistakes or delay that may be caused by the loss or disturbance of such control data.

G. Maintain the proper alignment in laying pipe.

3.03 EXCAVATING TRENCH AND INSTALLING PIPE

A. Pipe shall be laid in dry trench conditions. Provide for temporary diversion of water.

B. Excavate a trench to required depth sufficiently wide to allow for jointing of the pipe and compaction of the material under and around the pipe. Excavation shall conform to Section 02225 - Excavating, Backfilling, and Compacting. If ledge rock, rocky soil, hard pan or other unyielding foundation material is encountered at the normal grade of the pipe bed, excavate to 6 inches below invert grade and one foot on each side of the interior face of the pipe wall and refill with compacted crushed gravel. Blocking is not permitted.

C. Compact disturbed trench bottom and shape to fit pipe for a depth of not less than 10 percent of the total diameter of the pipe. The pipe shall rest firmly on the shaped bottom for the entire length of pipe barrels. Excavate troughs to accommodate bells or couplings to provide ample space for jointing pipe.

D. Begin laying pipe at outlet and make sure that the lower segment of the pipe is in contact with the shaped trench bottom throughout its full length. Each pipe section shall be placed into position on the pipe bed in such a manner and by such means required to avoid injury to persons, any property or the pipe.

E. Allow time for inspection and approval before any backfill is placed. Relay any pipe out of alignment and remove any damaged pipe.

F. After placing pipe on shaped trench bottom, backfill material shall be placed and compacted to the spring line (horizontal center line) of the pipe in continuous layers not exceeding 6 inches loose depth. Additional backfill material shall then be placed from the spring line to 12 inches above the crown of the pipe. This material shall be placed and compacted in continuous layers not exceeding 6 inches loose depth.

G. After placement of the material around and over the pipe, alignment and grade of the pipe shall be checked. If the pipe has been properly installed, the CONTRACTOR may refill or backfill the remainder of the trench in conformance with Section 02225 - Excavating, Backfilling, and Compacting, and details shown on the Drawings.

H. At the end of each day's work or at other intervals, the ARCHITECT, with the CONTRACTOR, may inspect the pipe installation. Unsatisfactory work shall be dug up and reinstalled to meet the requirements of the Contract Documents with no additional time for completion of the Work and at no additional cost to the OWNER.

I. Installation of pipe shall be in accordance with ASTM D2321 and as recommended by the manufacturer.

END OF SECTION

SECTION 02830

CHAIN LINK FENCE AND GATES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing fence framework, fabric and accessories.

B. Excavation for post bases.

C. Concrete footings for posts and center drop for gates.

D. Furnishing temporary security fence, gates, and related accessories .

F. Installation and removal of temporary chain link fence, gates and accessories.

1.02 REFERENCE STANDARDS

A. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.

B. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.

C. ASTM A428 - Weight of Coating on Aluminum - Coated Iron or Steel Articles.

D. ASTM A585 - Aluminum-Coated Steel Barbed Wire.

E. ASTM C94 - Ready-Mixed Concrete.

F. ASTM F567 - Installation of Chain-Link Fence.

1.03 SUBMITTALS

A. Submit Shop Drawings and product data in accordance with Section 01300 Submittals. Include plan layout, grid, spacing of components, details of accessories, fittings, hardware, anchorages; and, schedule of components.

B. Submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. All steel pipe, wire and accessories shall be galvanized and shall match details shown on the Drawings. Galvanized steel pipe shall conform to ASTM A120.

B. Substitutions: Materials of equal quality, detail, function, and performance may be proposed for substitution by following the procedures in Section 01600 Materials and Equipment.

2.02 CONCRETE MIX

A. Concrete: ASTM C94; Portland Cement Type II; minimum compressive strength 4500 psi at 28 days.

2.03 COMPONENTS

A. Line Posts: Nominal 2.5-inch diameter steel pipe.

B. Corner and Terminal Posts: Nominal 4-inch diameter steel pipe.

C. Gate Posts: Nominal 4-inch diameter steel pipe.

D. Top and Brace Rail: Nominal 1.63-inch diameter, plain end, sleeve coupled steel pipe.

E. Gate Frame: 1.63-inch diameter steel pipe for fittings and truss rod fabrication.

F. Fabric: 2-inch diamond mesh steel wire, interwoven, 9-gauge wire, top selvage twisted tight, bottom selvage knuckle end closed.

G. Caps: Cast steel or malleable iron, sized to post dimension, set screw retained.

H. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings shall be steel.

I. Tension Wire: 7-gauge steel, single strand.

J. Extension Arms: Cast steel, to accommodate three (3) strands of barbed wire, single arm sloped to 45 degrees on fence, single arm installed vertically on gates.

K. Barbed Wire: 12-gauge wire, 3 strands, 4 points at 5 inches O.C. aluminum coated steel conforming to ASTM A585 or zinc-coated steel.

L. Gate Hardware: Center gate stop and drop rod; three (3) 180-degree gate hinges per leaf and hardware for padlock.

M. Wind screen/Privacy screen fabric: A polyethylene wind screen/privacy screen fabric will be installed on the chain link fencing at the location shown on the plans or as depicted on the drawing details. Fabric will be dark green in color and will be designed specifically for this use.

2.04 FINISHES

A. Galvanized: ASTM A123; 2.0 oz/sq ft coating.

B. Aluminum Coating: ASTM A428; 0.40 oz/sq ft.

C. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Space line posts at intervals not exceeding 10 feet.

C. Set terminal gate and line posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff. Footing depth below finish grade: 36 inches for line posts, 48 inches for corner and gate posts.

D. Provide top rail through line post tops and splice with 7 inch long rail sleeves.

E. Brace each gate and corner post back to adjacent line post with horizontal center brace rail and diagonal bracing. Install brace rail, one bay from end and gate posts.

F. Install center and bottom brace rail on corner and gate leaves.

G. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

H. Position bottom of fabric 2 inches above finished grade.

I. Fasten fabric to top rail, line posts, braces, and bottom tension wire with wire ties maximum 15 inches on centers.

J. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

K. Install bottom tension wire stretched taut between terminal posts.

L. Install barbed wire support arm sloped outward and attach barbed wire; tension and secure.

M. Install gates with fabric and barbed wire overhang to match fence. Install three (3) hinges per leaf, latch, catches, drop bolt, retainer and locking clamp.

N. Provide concrete center drop to foundation depth and drop rod retainers at center of double gate openings.

O. After erection of fence, apply two (2) coats of zinc-rich paint to any galvanized parts or fittings which have been abraded so that the base metal is exposed.

END OF SECTION

SECTION 02900

LANDSCAPE WORK

PART 1-GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes provisions for the following items:

Trees.
Shrubs.
Plants.
Ground Covers.
Lawns.
Soil Amendments.
Initial Maintenance of Landscape Materials.

1.03 CONTRACTOR RESPONSIBILITY

A. General: The Contractor shall furnish all labor, equipment and material to complete the work as shown on the drawings or specified herein. The preparation of new planting excavations, disposal of unusable plants, plant debris and left-over soil on or off the site as directed by the Architect/Landscape Architect; furnishing topsoil, peat moss, fertilizers and wood chips; watering and maintenance of work until final acceptance.

B. Debris: Removal and disposal off the site of roots, stumps, excess soil and other debris resulting from excavations for planting or contractor's operations. Debris shall be hauled to locations designated by the owner.

C. Excavation: Excavation for all new plant materials and immediate disposal of all excavated subsoil on or off site as directed by Architect/Landscape Architect.

D. Materials: Furnishing topsoil, peat moss, plant materials, fertilizers, wood chips, stakes and wire to guy or support trees and performing all necessary planting operations including guying.

E. Warranty: Watering and maintenance of work until final acceptance of the contract. Replacement of dead, dying or sickly plants throughout a period of two years as required under replacement

1.04 QUALITY ASSURANCE

A. General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.

B. Do not make substitutions. If specified landscape material is not attainable, submit proof of non-availability to Architect/Landscape Architect, together with proposal for use of equivalent material. Architect/Landscape Architect reserves the right to determine material equivalency.

3. Plant List: The species, size, manner in which to be furnished the number required to complete the planting as indicated on the Landscape Plan Drawings are given in the Plant schedule.

4. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemist, wherever applicable.

5. Errors and Omissions: Quantities given in plant list are provided for the convenience of the Contractor. Contractor takes care to check quantities and area to be covered from planting plan to insure completion of the project.

6. Topsoil: Before delivery of topsoil, furnish Architect/Landscape Architect with written statement giving location of properties from which topsoil is to be obtained, names and addresses of owners, depth to be stripped, and crops grown during past two years. Further requirements and descriptions for Topsoil in Part 2, Products.

7. Trees, Shrubs, and Plants: Provide trees, shrubs, and plants of quantity, size, genus, species, and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock", Standardized Plant Names", latest edition, as adopted by the American Joint Committee on Horticultural Nomenclature, "Principles and Practice of Planting Trees and Shrubs", and "Grades and Standards for Landscape Materials", latest edition. Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae, and defects such as knots, sun-scald, injuries, abrasions, or disfigurement. Plant material to be grown in this zone.

8. Label: At least one tree and one shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

   Where formal arrangements or consecutive order of trees or shrubs are shown, select stock for uniform height and spread, then label with number to assure symmetry in planting.

9. Inspection: The Architect/Landscape Architect may inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for genus, species, variety, size, and quality. Architect/Landscape Architect retains right to further inspect trees and shrubs for size and condition of balls and root system, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from project site

1.05 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division One Specification Sections.

B. Plant and Material Certifications:

   1. Certificates of Inspection as required by governmental authorities.

   2. Manufacturer's or Vendor's Certified Analysis for soil amendments and fertilizers materials.

   3. Label Data substantiating that plants, trees, shrubs and planting materials comply with specified requirements, including place of growth.

C. Planting Schedule: Proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as

approved in writing, after documentation of reasons for delays. Coordinate with general Contractor and all other applicable trades.

D. Maintenance Instructions: Typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for two full years. Submit prior to expiration of required maintenance periods.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Sod: Time deliver so that sod will be placed within twenty-four (24) hours after stripping. Protect sod against drying and breaking of rolled strips.

C. Trees and Shrubs: Provide freshly dug trees and shrubs. Do not prune prior to delivery unless otherwise approved by Architect/Landscape Architect. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches, or destroy natural shape. Provide covering during delivery. To protect against wind and sun, plants shall be securely covered with tarpaulin, canvas or other cover to minimize wind whipping and drying. The roots shall be kept moist at all times until planted.

D. Do not drop balled and burlapped stock during delivery. A suitable method of handling shall be employed to preclude cracked or mushroomed plant balls at the point of delivery. All plant material shall be protected from freezing at all times. Trees installed in the fall must have trunk wrap.

E. Deliver trees and shrub after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.

F. Do not remove container-grown stock from containers until planting time.

1.07 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

B. Water: Will be available for the work, Contractor to verify. Coordinate with Architect/Landscape Architect and General Contractor for sources. A hose or other watering equipment required for the work shall be furnished and operated by the Landscape Contractor at his expense.

C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect/Landscape Architect before planting. See "Excavation for Trees and Shrubs-Obstructions Below Grade" for further description.

1.08 SEQUENCING AND SCHEDULING

A. Planting Time: Proceed with, and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required. Coordinate with other trades.

1. Plant or install materials between April 1 and June 1 or after August 15 during normal planting seasons for each type of plant material required. Contractor to submit by Written Request stating special conditions to extend planting time. Permission will be given if warranted in the opinion of City Engineer or Architect/Landscape Architect to extend planting time.

2. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion, for two years.

3. Excavations to receive plants, digging and replanting of plants shall be done in a closely related operation so that plants are replanted in the shortest time span possible after digging.

B. Coordination with Lawns: Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to Architect/Landscape Architect. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

1.09 SPECIAL PROJECT WARRANTY

A. Warranty trees and shrubs and all other Plant material, including sod, for a period of two years. The Contractor shall be responsible for maintaining all plants in a live, healthy and presentable growing condition until acceptance of the completed contract. Maintenance may include, but is not limited to, watering, cultivating, weeding, fertilizing, control of insects and diseases, remulching and other horticultural practices as may be necessary.

B. Remove and replace trees, shrubs or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period. Replace trees and shrubs which are in doubtful condition at end of warranty period; unless, in opinion of Architect/Landscape Architect it is advisable to extend warranty period for a full growing season. Contractor to replace material meeting the identical specifications. Another warranty inspection will be conducted at end of extended warranty period, if any, to determine acceptance or rejections.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil to be stockpiled for re-use in landscape work, Contractor to verify. If quantity of stockpiled topsoil is insufficient, provide additional topsoil as required to complete landscape work.

2.02 FINISHED GRADING

A. It shall be the CONTRACTOR'S responsibility to do whatever additional fine grading as may be required to bring areas to be planted back up to the existing finished grades or to grades specified on the Drawings or these specifications. This shall also apply to existing slopes, berms or lawn area damaged during the work herein and the CONTRACTOR shall replace or repair any such existing area to return it to its original grade or existing area to return it to its original grade or condition. This will include all mounds as shown on plans.

B. CONTRACTOR shall estimate depth and suitability of topsoil on site to be reused. Unless otherwise directed, contractor shall estimate that four-inches of topsoil now exists in lawn and plant bed areas within the contract limits and may be stockpiled or kept in tack for proposed lawn areas. Coordinate topsoil work with excavation contractor(s).

C. Provide new topsoil that is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger that 3/4 inches in any

dimension, and other extraneous or toxic matter harmful to plant growth. Topsoil furnished shall be loam or sandy loam with greater than 2% organic matter (not more than 20%) pH between 6 and 7, minimum P205 level/acre of 10#, minimum K20 level/acre of 100#.

1. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than four inches. Do not obtain from bogs or marshes.

2. The mechanical analysis of the topsoil shall be as follows:

Passing	Retained On	Percent
1" screen		100
1/4" screen (gravel)		3 (max)
No. 100 USS		40 to 60
Mesh sieve (sand)		
(Very fine sand, silt and clay)		40 to 60

D. Topsoil shall not be delivered until representative samples proposed for use have been furnished by the Contractor and approved by the Architect/Landscape Architect, when requested to do so, the Contractor shall furnish at his own expense, a certified analysis of the topsoil made by an approved soil testing laboratory.

2.03 SOIL AMENDMENTS

A. Lime: Natural dolomitic limestone containing not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve. Limestone shall be furnished in standard bags of the manufacturer showing weight and analysis.

B. Peat Humus: Peat shall be a natural product of either sphagnum moss, reed or sedge peat obtained from a fresh water site. Peat shall be free from lumps, roots, woody material, stones and other foreign matter. Peat shall be shredded or granulated and able to pass a ½ inch mesh screen so that it can be readily mixed with topsoil. Peat shall contain not less than ninety (90) percent organic matter by weight on an overdry basis.

C. Bonemeal: Bonemeal shall be commercial steamed bonemeal, finely ground with a minimum of 2.0% nitrogen and a minimum of 20% phosphoric acid, delivered in standard packages of the manufacturer, showing weight, analysis and name of manufacturer.

D. Superphosphate: Soluble mixture of treated minerals; 20 percent available phosphoric acid.

E. Sand: Clean, washed sand, free of toxic materials.

F. Perlite: Conforming to National Bureau of Standards PS 23.

G. Vermiculite: Horticultural grade, free of toxic substances.

H. Mulch: Organic mulch free from deleterious materials and suitable for top dressing of trees, shrubs, or plants and consisting of one of the following:

Bark chip mulch shall consist of pine or spruce bark chips, 1/8 inch to 1/4 inch nominal thickness, with 50 percent having an area of not less than one square inch or more than two square inches. All bark chip mulch shall be free from leaves, twigs, shavings or other deleterious material.

I. Pre-emergence Herbicide: Shall be a weed poisoning or sterilizing agent, and shall be snapshot or approved equal used in amounts prescribed by the Manufacturer.

J. Planting Soil Mixture:

5 parts topsoil
3 parts pine bark mulch/peat moss
2 parts course sand
Add fertilizer as specified
Add pre-emergence herbicide as specified.

K. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

1. For Trees and Shrubs: Option (A) shall be a Osmocote 14-14-14 and a 3-4 month slow release for bed areas, and Agriform Planting Tablets 20-10-5, 21 gram for trees and shrubs outside of bed area. Fertilizer shall be delivered to the site in standard size unopened containers, which show weight, analysis and name of manufacturer. It shall be stored in a weatherproof storage place in such a manner that it will be kept dry. Fertilizer for trees, shrubs and ground cover areas shall be a slow release type and shall be applied as follows:

Trees & Shrubs	Rate of Application	
March - May	10-10-10	Trees: 1 lb/inch in caliper
May - October	6-10-10	Shrubs: ½ oz/feet in height
October - March	4-12-12	

2. For Trees and Shrubs: Option (B), fertilizer shall be approved, dewatered sewage sludge mixed with 50% wood chips and composed until temperature change is complete, such as milorgranite. Fertilizer shall be carefully stored and shall be dry and free-flowing at the time of application. Sludge must be deodorized.

3. For Lawns, shall be 12-12-12, applied at a rate of 600 pounds per acre, and shall be a commercial lawn starter fertilizer conforming to all applicable State Fertilizer Laws, delivered in original;, unopened containers, each bearing the manufacture's guaranteed analysis, and be uniform in composition, dry and free flowing.

2.04 PLANT MATERIALS

A. Quality: Provide trees, shrubs, and other plants of size, genus, species, and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".

B. Deciduous Trees: Provide trees of height and caliper scheduled or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.

1. Provide balled and burlapped (B&B) deciduous trees.

2. Container grown deciduous trees will be acceptable in lieu of balled and burlapped deciduous trees subject to specified limitations of ANSI Z60.1 for container stock.

C. Coniferous and Broadleafed Evergreens: Provide evergreens of sizes shown or listed. Dimensions indicate minimum spread for spreading and semi-spreading type evergreens and height for other types, such as globe, dwarf, cone, pyramidal, broad upright, and columnar. Provide normal quality

evergreens with well balanced form complying with requirements for other size relationships to the primary dimension shown.

1. Provide balled and burlapped (B&B) evergreens.

2.05 GRASS MATERIALS

A. Sod: Provide strongly rooted sod, not less than two years old, free of weeds and undesirable native grasses, and machine cut to pad thickness of 3/4-inch (plus or minus 1/4-inch), excluding top growth and thatch, and shall not have been stacked for more than twenty-four (24) hours between the time of cutting and delivery to the job site. Provide only sod capable of vigorous growth and development when planted (viable, not dormant). Mineral base only.

1. Provide sod of uniform pad sizes of 12 inch wide strips with maximum 5 percent deviation in either length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10 percent of pad will be rejected.

2. Provide sod composed principally of the following:

Seed: shall be fresh, clean seed of the latest crop which meets the standards of the Federal Seed Act including percent pure seed, percent germination and percent weed content listed below. All seed shall be furnished in sealed standard containers of the vendor with each container showing name of vendor, weight, percent of each grass seed, percent pure seed, percent germination, percent weed content, date of seed crop and date of test. Seed shall have the following analysis:

Percent by Weight	Kind of Seed
10.5	Kentucky Bluegrass, 98/80 - PA free
17.5	Creeping Red Fescue (Canadian Origini)
13.0	Patriot Perennial Ryegrass
12.0	Annual Ryegrass
43.5	Kentucky 31 Tall Fescue

Seed which is wet, moldy or otherwise damaged will not be acceptable.

B. Hydroseed: Flat areas Hydro-mulched areas shall be addressed as follows:

1. 700 gallons fresh water

2. 1,500 lbs Conwed fiber much with tackifier or refiber mulch with tack at a rate of 1,500 lbs per acre minimum, slurry will be applied from two angles to insure complete coverage and soil protection.

3. Fertilizer: 300 lbs per acre of 13-13-13 fertilizer shall be incorporated into and applied with the hydroseed slurry mix.

4. Lime: 50 lbs per 1,000 sq. ft.

5. Seed: Planting Schedule

a. April 1 - June 1
b. August 15 - September 15
c. Rate of 5 lbs per 1,000 sq. ft.

C. Hydromulch Slurry for Erosion Control: 3,000 lbs Hydro Blanked manufactured by Refiber or 2,000 lbs. Conwed 2,000 Hydromulch per acre with 40 lbs of Tackifier per acre shall be applied to all slopes and ditch banks.

1. Planting Schedule:

a. April 1 - June 1
b. August 15 - September 15
c. Rate of 5 lbs per 1,000 sq. ft.

2.06 GROUND COVER

A. Provide plants established and well rooted in removable containers or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the pot size shown or listed.

2.07 MISCELLANEOUS LANDSCAPE MATERIALS

A. Steel Edging: Commercial steel edging of size shown on drawings fabricated in sections with loops pressed from or welded to face of sections at 2' - 6" o.c. to receive stakes. Provide tapered steel stakes 16 inches long. Finish edging sections and stakes with manufacturer's standard green paint. Taper all corners.

B. Anti-Desiccant: Emulsion type, film-forming agent designed to permit transpiration, but retard excessive loss of moisture from plants. All stems and leaves of plant materials shall be uniformly covered, using an approved low pressure power sprayer to apply an adequate film over trunks, branches, twigs and/or foliage. The spray material shall not be applied at temperatures below 32 degrees F. And shall be protected from freezing at all times.

C. Wrapping: Tree-wrap tape of burlap or special crepe weatherproof tree wrapping tape, not less than four inches wide, designed to prevent borer damage and winter freezing. Contractor required to remove all tree wrap in the spring of the year.

D. Stakes and Guys: Provide stakes and deadmen of sound new hardwood, treated softwood, or redwood, free of knot holes and other defects. Provide wire ties and guys of two-strand, twisted, pliable galvanized iron wire, not lighter than 20 gage with zinc-coated turnbuckles. Provide not less than ½ inch diameter rubber or plastic hose, cut to required lengths and of uniform color, material, and size to protect tree trunks from damage by wires. Wrap wires around tree trunk 40-50% of the distance up trunk from grade. All staking or guying shall be done immediately after planting and stakes and wire maintained until acceptance of the contract. Plants shall stand plumb after staking.

PART 3 - EXECUTION

3.01 PREPARATION - GENERAL

A. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure Architect/Landscape Architect's acceptance before start of planting work. Make minor adjustments as may be required.

3.02 PREPARATION OF PLANTING SOIL

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.

B. Mix specified soil amendments and fertilizers with topsoil at rates specified from soil tests. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.

C. For annuals, perennials, and ground covers, mix 15# fertilizer per cubic yard of backfill mix, or broadcast 15# per 100 sq. ft. of bed area: mix thoroughly into top four inches of soil.

D. For pit and trench type backfill, mix planting soil prior to backfilling, and stockpile at site.

E. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

1. Where lime is required, mix lime with dry soil prior to mixing of fertilizer.

2. Prevent lime from contacting roots of acid-loving plants.

3. Where phosphoric acid is required, apply phosphoric acid fertilizer (other than that constituting a portion of complete fertilizers) directly to subgrade before applying planting soil and tilling.

F. pH Requirements:

1. pH Factor Readings: The Landscape Contractor shall test (by using a pH analyzer meter) the pH readings of the soil for all tree pits and ground cover beds, and shall test all other areas as required by the Architect/Landscape Architect. The soil shall be neutralized to a pH reading of not less than five and of not more than six (unless otherwise noted).

2. pH Factor Adjustments: Such tests or readings shall be used as a measure by which to make adjustments to the soil acidity or alkalinity related to the benefit of the prescribed plants. The Landscape CONTRACTOR is required to maker the necessary pH adjustments to the soil.

3. To Raise the pH Level: In an average loamy soil, add 100 pounds ground dolomitic limestone per 1,000 square feet, turn over and mix to a depth of six inches. This will raise the pH level one unit. Note: Neutral pH level is seven.

4. To Lower the pH Level: Mix or turn the soil thoroughly and water. In a medium loam, mix one-half cup of dusting sulfur to 9 square feet, then spade and water. This will lower to pH rating about one (1) point. Other substances such as iron sulfate, cottonseed meal, manure and composts are to be used to make the soil less alkaline.

3.03 PREPARATION FOR PLANTING LAWNS

A. Provide 4-inch topsoil depth in all areas to receive lawns.

B. Loosen subgrade of lawn areas to minimum depth of 4-inches. Remove stones measuring over 3/4-inches in any dimension. Remove sticks, roots, rubbish, and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.

1. Spread top soil to minimum depth required to meet lines, grades, and elevations shown, after light rolling and natural settlement. Add specified soil amendments and mix thoroughly into upper 4-inches of topsoil.

2. Place approximately one-half of total amount of topsoil required. Work into top loosened subgrade to create a transition layer and then place remainder of planting soil. As specified soil amendments and mix thoroughly into upper 4-inches of topsoil.

3. Allow for sod thickness in areas to be sodded.

4. Apply specified commercial fertilizer at rates specified and thoroughly mix into upper 2-inches of topsoil. Delay application of fertilizer if lawn planting will not follow within a few days.

C. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.

E. Restore lawn areas to specified condition, if eroded or otherwise disturbed, after fine grading and prior to planting.

3.04 PREPARATION OF PLANTING BEDS

A. Provide six inch topsoil depth in all plant beds unless otherwise noted.

1. General Notes: Before the start of any bed preparation, all areas to be prepared shall be stripped of any grass, weeds, etc., to minimum depth of one inch. Cultivate to six inch depth.

2. Fine grade to remove all trash, rocks, debris, etc.

3. Spread four inches of soil mixture uniformly over entire ground cover area.

4. Spread Osmocote 14-14-14 fertilizer at the rate of 50 pounds per 1,000 square feet uniformly over entire ground cover area.

5. Rotor mix or by other method approved by the Architect/Landscape Architect to a depth of six inches. A second time until amendments are thoroughly mixed and mixture has fine texture and loose expanded appearance.

6. Regrade to the finished grade before planting.

7. Ground covers that have a spacing of plants that is twelve inches or less may be top dressed with mulch before planting.

8. Thoroughly water and firm the plants into the ground cover mixture.

9. Once planting is completed, add uniformly over entire bed area light application of Snapshot at ½# per 100 sq. ft. plus two inches top dressing of fine texture bark mulch, as per PART 2 - PRODUCTS, SOIL ADMENDMENTS-MULCH.

3.05 EXCAVATION FOR TREES AND SHRUBS

A. Excavate pits, beds, and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.

1. For balled and burlapped (B&B trees and shrubs), make excavations twice as wide as the ball diameter and equal to the ball depth, plus following allowance for setting of ball on a layer of compacted backfill. Allow for nine inch setting layer of planting soil mixture.

2. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth. Allow for three inch thick setting layer of planting soil mixture.

B. Dispose of excess subsoil removed from planting excavations. Re-use excavated subsoil as backfill if acceptable, by Architect/Landscape Architect.

C. Obstructions below ground: If underground construction, obstructions ledge rock or large boulders are encountered in excavation of planting areas, other locations for the planting will be selected by the Architect/Landscape Architect. When the location of utility lines is shown on the drawings, or has otherwise been made known to the CONTRACTOR in manner approved by the Architect/Landscape Architect at no additional cost to the OWNER.

D. Fill excavations for trees and shrubs with water and allow water to percolate out prior to planting. If water does not percolate out within 24 hours, notify Architect/Landscape Architect for further instructions.

3.06 PLANTING TREES AND SHRUBS

A. Set balled and burlapped (B&B) stock on layer of compacted planting soil mixture, stand plumb and in center of pit or trench with top of ball at same elevation as adjacent finished landscape grades. Remove wire basket and all twine. Remove burlap from upper half of balls; retain on bottoms. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately two-thirds full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill. Remove all trunk wrap if planted in spring. Wrap trunk if planted in fall only.

B. Set container grown stock, as specified, for balled burlapped stock, except cut cans on two sides with an approved can cutter; remove bottoms of wooden boxes after partial backfilling so as not to damage root balls.

C. Dish top of backfill to allow for mulching.

D. Mulch pits, trenches, and planted areas. Provide not less than following thickness of mulch, and work into top of backfill and finish level with adjacent finish grades.

E. Provide three inch thickness of mulch.

F. Apply anti-desiccant, using power spray, to provide an adequate film over trunks, branches, stems, twigs and foliage.

G. If deciduous trees or shrubs are moved when in full-leaf, spray with anti-desiccant at nursery before moving and spray again two weeks after planting.

H. Prune, thin out, and shape trees and shrubs in accordance with standard horticultural practice. Pruning shall be done with sharp tools which make a clean cut, care shall be taken to preserve the natural appearance of the plant. Pruning shall consist of removal of selected small branches rather than a general cutting back of all branches. The pruning shall be limited to removal of damaged branches and cutting back of longer lateral branches. The central leader shall not be cut under any circumstances, unless otherwise directed by Architect/Landscape Architect. Prune shrubs to retain natural character.

I. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

J. Wrap tree trunks promptly after planting, the trunks of all deciduous trees are to be spirally wrapped starting at the base with burlap or approved tree wrap. The wrap shall overlap half the width of the tape and be securely tied around the tree stem at two foot intervals, the bandage shall cover the entire surface of the trunk to a height of six feet or the first main branches. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures before wrapping.

K. Guy and stake trees immediately after planting, as indicated, remove after one growing season or restake, if necessary, as determined by Architect/Landscape Architect.

L. All plants shall be carefully and thoroughly watered during planting and as often as necessary thereafter to provide the best growing conditions until acceptance of the Work.

3.07 SODDING NEW LAWNS

A. Lay sod within 24 hours from time of tripping. Do not plant dormant sod or if ground is frozen.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to aroid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.

1. Anchor sod on slopes with wood pegs to prevent slippage.

2. Water sod thoroughly with a fine spray immediately after planting.

C. Seeding new Lawns:

1. Loosen or scarify soil to a depth of two (2) to four (4) inches using a tractor disc or other approved method. Areas to be seeded shall be cleared of any weeds, sticks or other debris; then dress out entire area, grade out eroded area and unreasonable roughness in surface.

2. Seeding may be done immediately thereafter, provided the bed has remained in a good friable condition and has not become wet. Uniformly broadcast the seed mixtures at the specified rates.

3. Broadcast lawn starter fertilizer specified rates and works seeds and fertilizer into surface by lightly harrowing.

4. Water all seeded areas immediately after seeding using spray nozzles only, to prevent washing away soil or seed.

5. During the winter months after initial occupation of site by the owner, establish a protective covering of mulch material in all unplanted lawn area shown on plans. In the spring, removal all mulch material and plant seed or sod in unplanted lawn areas where shown on plans.

a. Mulch material shall be dried marsh hay or fresh straw containing no viable seed of noxious weeds or other objectionable material. The mulch material shall not contain moldy or decomposed material and it shall not exceed 15 percent moisture content.

6. All seeding work shall be done between April 1 and June 1 or between August 15 and September 15.

7. Lime shall be applied at the rate of 50 lbs per 1,000 sq. ft., fertilizer at the rate of 20 lbs per 1,000 sq. ft. and mulch at the rate of 50 lbs per 1,000 sq. ft. Seed shall be applied at the rate

of 5 lbs per sq. ft. and shall be uniform in placement. Seeding shall not be done during windy weather. The seed shall be planted no deeper then 1/4-inch. After seeding, the seeded areas shall be compacted with a light roller.

3.08 PLANTING GROUND COVER

A. Space ground cover plants as indicated or scheduled.

B. Dig holes large enough to allow for spreading of roots and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils. Remove peat pot containers.

C. Mulch areas between ground cover plants; place not less than three-inches thick.

3.09 MISCELLANEOUS LANDSCAPE WORK

A. Tree planting at grate:

1. Expand soil mix for tree planting beyond grate area, to an additional four feet or to the plaza paving slope line. See Landscape Plan for areas highlighted and Detail Sheet for planting.

2. Landscape Contractor to coordinate with Paving Contractor along with any earthwork to stabilize pavement from cracking or sinking.

3. It is the intent to allow tree growth to extend beyond the grate area.

4. The CONTRACTOR is to verify detail with City Engineer or Architect/Landscape Architect for approval, inspection, or alteration to this specification.

3.10 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain trees, shrubs, and other plants until final acceptance, but in no case, less than following period:

1. Maintain trees, shrubs, and other plants by pruning, cultivating, and weeding as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports and rest trees and shrubs to proper grades or vertical position as required. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease, at the expense of the CONTRACTOR.

2. Maintain lawns for not less than two (2) years from substantial completion by water, fertilizing, weeding, mowing, (2-inch height), trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas at the expense of the CONTRACTOR.

3.11 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. The CONTRACTOR shall be responsible for all damage by his operations on or adjacent to the site and shall repair, replace or otherwise make good any damage caused by

him. Upon completion of the work, and before final payment is made, the CONTRACTOR shall remove all equipment, surplus material, rubbish or other debris from the site and shall leave the site in a clean, neat and orderly condition satisfactory to the Architect/Landscape Architect.

3.12 INSPECTION AND ACCEPTANCE

A. When landscape work is completed, including maintenance, CONTRACTOR is to notify Architect/Landscape Architect will, upon request, make an inspection to determine acceptability.

   1. Landscape work may be inspected for acceptance in portions as agreeable to Architect/Landscape Architect, provided each portion of work offered for inspection is complete, including maintenance.

B. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Architect/Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

END OF SECTION

SECTION 02990

MISCELLANEOUS WORK AND CLEANING UP

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing all labor, materials, equipment and incidentals required to do all miscellaneous work and cleaning up not otherwise specified, including, but not limited to, the following:

1. Cleaning up the construction site.

2. Disposing of material and debris.

3. The extra work of crossing existing drains, electrical and telephone conduits and water mains.

4. Miscellaneous work associated with connecting to existing utilities.

5. Cleaning of all storm drain structures at completion of work and at the discretion of the ARCHITECT to maintain proper drainage.

6. Furnishing, installing and removing project signs.

7. All other work incidental to completing the project.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 CLEANUP

A. Remove all construction material, excess excavation, equipment or other debris remaining on the construction site as a result of construction operations and shall render the site of the work in a neat and orderly condition at least equal to that which existed prior to the start of construction.

B. Dispose of all materials and debris off-site in accordance with local, state and federal regulations.

3.02 INCIDENTAL WORK

A. Do all incidental work not otherwise specified but obviously necessary to the proper completion of the Contract as specified and as shown on the Drawings and detailed in the specifications.

END OF SECTION

SECTION 03300

CAST -IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Work included: Provide labor, materials, and equipment necessary to complete the work of this Section and, without limiting the generality thereof, furnish and include the following:

1. The extent of cast-in-place concrete work is shown on drawings and includes (but not by way of limitation) formwork, reinforcing, cast-in-place concrete, accessories, finishing, and casting in of items specified under other Sections of the Specifications or furnished by Owner that are required to be built-in with the concrete.

2. Equipment support pads indicated on mechanical drawings to be installed by the Building Contractor.

3. Cast-in-place retaining walls, exterior slabs on grade and other concrete shown on site drawings.

1.03 RELATED WORK:

A. Metal Fabrications: Section 05500

1. Expansion Anchors - Section 05120

2. Embedded Items - Section 05500

B. Anchor Bolts: Section 05120

C. Joint Sealants: Section 07900

D. Structural Precast Concrete: Section 03410

E. Traffic Membrane: Section 07180

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the latest edition of the following except where more stringent requirements are shown or specified:

1. ACI "Manual of Concrete Practice".
2. ACI 117 "Standard Specifications for Tolerances for Concrete Construction and Materials".
3. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."
4. ACI 212.3R "Chemical Admixtures for Concrete."
5. ACI 301 "Specifications for Structural Concrete for Buildings."
6. ACI 302.1R "Guide for Concrete Floor and Slab Construction."
7. ACI 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete."
8. ACI 304.2R "Placing Concrete by Pumping Methods."
9. ACI 306 R "Cold Weather Concreting."
10. ACI 308 "Standard Practice for Curing Concrete."
11. ACI 309R "Guide for Consolidation of Concrete."
12. ACI 315 "ACI Detailing Manual."
13. ACI 318 "Building Code Requirements for Reinforced Concrete."
14. ACI 347R "Guide to Formwork for Concrete."
15. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars."
16. AISC "Code of Standard Practice for Steel Buildings and Bridges."

17. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

1.05 SUBMITTALS:

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Reinforcement certified mill reports covering chemical and physical properties and yield strength.

2. Patching products.

3. Non-shrink grout.

4. Curing compounds, where applicable.

5. Admixtures.

6. Expansion/Adhesive Anchors.

H. Shop Drawings:

1. Shop Drawing Preparation: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of the Construction Documents, in part or in full, is strictly prohibited. Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315, showing bar schedules, stirrup and tie spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete elements. Include supplemental reinforcing and bar supports necessary to support reinforcing steel at proper location within forms or slabs.

   a. Review of the shop drawings will be made for the size and arrangement of reinforcement. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility. Submit one print and one reproducible. Print will be reviewed and a reproducible will be returned to Contractor for printing and distribution. Multiple copies will not be marked by Engineer.

   b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided all items listed prior. **Incomplete submittals will not be reviewed.**

I. Mix designs: Submit all laboratory test reports and materials for each mix design listed within. Prepare mixes by the field experience method and/or trial mixtures per the requirements of chapter 5 of ACI 318. Include the calculation of average strength and standard deviation. Proportioning by water cement ratio method will not be permitted.

J. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

K. Curing Methods: Submit documentation of curing methods to be used for review. Account for anticipated project temperature ranges and conditions in curing methods.

L. Contraction/Construction Joints: Submit plan indicating proposed location of contraction and construction joints in walls and slabs.

M. Test Reports: Test reports shall be submitted to the Owner, Architect and Engineer within 48 hour after completion of each test.

PART 2 PRODUCTS

2.01 FORM MATERIALS:

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Provide welded wire fabric in flat sheets.

C. Diamond Dowels/Load Plates: PNA Construction Technologies, Inc.; Manufacturer's representative: (508) 238-6775

D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use plastic, wire bar type supports or concrete block supports complying with CRSI recommendations, unless otherwise specified. Wood, clay brick and other unspecified devices are not acceptable.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS:

A. Portland Cement: ASTM C 150, Type I or Type II, unless otherwise approved Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Normal Weight Aggregates: ASTM C 33. Provide from a single source for exposed concrete. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, or ochre which can cause stains on exposed concrete surfaces.

C. Light Weight Aggregates: ASTM C 330.

D. Water: Potable.

E. Air-Entraining Admixture: ASTM C 260.

F. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G containing not more than 1% chloride ions.

1. Fiber reinforcing shall be added and distributed prior to incorporation of Super Plasticizer.

G. Normal range water reducing admixture: ASTM C 494 Type A containing no calcium chloride.

H. Accelerating Admixture: ASTM C 494, Type C or E.

I. Blast Furnace Slag: ASTM C989

J. Fly Ash: ASTM C618, Class C or F

K. Calcium Chloride is not permitted.

2.04 RELATED MATERIALS:

A. Non-Shrink Cement-based Grout: Provide grout consisting of pre-measured, prepackaged materials supplied by the manufacturer requiring only the addition of water. Manufacturer's instructions must be printed on the outside of each bag.

1. Non-shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.

2. Compressive strength: A minimum 28 day compressive strength of 5000 psi when tested in accordance with ASTM C-109.

3. Setting time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.

4. Composition: Shall not contain metallic particles or expansive cement.

B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.

C. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

D. Liquid Membrane-Forming Curing Compound: Liquid type membrane forming curing compound complying with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Curing compound shall not impair bonding of any material, including floor finishes, to be applied directly to the concrete. Demonstrate the non-impairment prior to use.

E. Preformed Expansion Joint Formers:

1. Bituminous Fiber Type, ASTM D 1751.

2. Felt Void, Poly-Styrene Cap with removable top as manufactured by SUPERIOR.

F. Slab Joint Filler: Multi-component polyurethane sealant (self-leveling type).

G. Waterstops shall be Bentonite/Butyl Rubberbased product. Use in conjunction with manufacturer's approved mastic. Acceptable products include:

1. "Waterstop Rx," by American Colloid Co.

2. "Adeka Ultra Seal MC-2010," by Asahi Denka Koeyo, Kik MN.

2.05 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 318. Use material, including all admixtures, proposed for use on the project. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete. Do not begin concrete production until mixes have been reviewed by Architect.

C. Proportion design mixes to provide concrete with the following properties:

1. Footings and foundation walls

a. Strength: 3000 psi at 28 days.

b. Aggregate: 3/4"

c. W/C Ratio: 0.54 maximum

d. Entrained Air: 6% +/- 1.5%

e. Slump: 4" maximum

2. Slabs, Washes and all other exposed Site Concrete not specified elsewhere:

a. Strength: 5000 psi at 28 days

b. Aggregate: 3/4" (3/8" for washes and stair pans)

c. W/C Ratio: 0.45 maximum

d. Entrained Air: 6% +/- 1.5%

e. Slump: 4" maximum

3. Garage Piers/Pilasters

a. Strength: 5000 psi at 28 days

b. Aggregate: 3/4"

c. W/C Ratio: 0.50 maximum

d. Entrained Air: 6% +/- 1.5%

e. Slump: 4" maximum

4. Elevated Decks & Stairs

a. Strength: 5000 psi at 28 days

b. Aggregate: 3/8" minimum

c. W/C Ratio: 0.40 maximum

d. Entrained Air: 6% +/- 2%

e. Slump: 4" maximum

5. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.

6. Additional slump may be achieved by the addition of a mid-range or high-range water reducing admixture. Maximum slump after the addition of admixture shall be 6 or 8 inches for mid-range or high range water reducing admixtures, respectively.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor, when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Structural Engineer before using in work.

1. Water may be added at the project only if the maximum specified slump and design mix maximum water/cement ratio is not exceeded.

2. Additional dosages of superplastisizer should be used when delays occur and required slump has not been maintained. A maximum of two additional dosages will be permitted per ACI 212.3R recommendations.

2.06 CONCRETE MIXING:

A. Job-Site Mixing will not be permitted.

B. Ready-Mix Concrete: Must comply with the requirements of ASTM C 94, and as herein specified. Provide batch ticket for each batch discharged and used in work, indicating project name, mix type, mix time and quantity.

1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required by Structural Engineer.

2. When the air temperature is between 85 degrees F. and 90 degrees F., reduce the mixing and delivery time from 1 1/2 hours to 75 minutes, and when the air temperature is above 90 degrees F., reduce the mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 FORMS:

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design, construct, erect, maintain, and remove forms for cast-in-place concrete work in compliance with ACI 347.

C. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

D. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.

F. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

G. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated, provide ties for concrete surfaces to be exposed in the final condition so portion remaining within concrete after removal is 1" (minimum) inside concrete.

2. Form ties shall not leave holes larger than 1" diameter in concrete surface. Repair holes left by form ties after removal of formwork.

I. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

J. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT:

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

1. Subgrade tolerance shall conform to a tolerance of +0/-1 1/2". Base tolerance (fine grading) for slabs shall conform to a tolerance of +0"/-3/4" in. Confirm compliance of above tolerances with surveyed measurements taken at 20 ft. intervals in each direction.

2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

3. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

4. Place reinforcement to obtain specified coverage for concrete protection within tolerances of ACI-317. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

5. Install diamond dowels at construction joints and load plates at contraction joints in slab-on-grade per manufacturer's recommendations and as indicated on Drawings.

6. Install welded wire fabric in flat sheets in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS:

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect. Submit plan indicating proposed location of construction joints for review prior to beginning work.

1. Provide keyways at least 1-1/2" deep in construction joints in walls, and slabs; bulkheads reviewed by the Engineer, designed for this purpose may be used for slabs.

2. Roughened surfaces shall be used between walls and footings unless shown otherwise on the drawings. The footing surface shall be roughened to at least an amplitude of 1/4" for the width of the wall before placing the wall concrete.

3. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

4. Joints in slabs on grade shall be located and detailed as indicated on the drawings. If saw-cut joints are required, the early-entry dry-cut process shall be used. Refer to ACI 302, section 8.3.12.

3.04 INSTALLATION OF EMBEDDED ITEMS:

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Notify other trades to permit installation of their work. Templates to be utilized for setting of anchorage devices shall be constructed in a manner to allow mechanical consolidation of concrete. "Wet Setting" of embedded items into plastic concrete will not be permitted without special permission from the Engineer.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.

C. Provide PVC sleeves where pipes and/or conduit pass through exterior concrete or slabs. Sleeves or penetrations shall not be placed through footings, piers, pedestals, drop caps, columns or pilasters unless specifically noted.

D. Tolerances: Tolerances for Anchor Bolts/Rods, bearing surfaces and other embedded items shall meet the requirement set forth in the latest edition of the American Institute of Steel Construction "Code of Standard Practice for Steel Buildings and Bridges," and ACI 117. The more stringent criteria from these documents shall apply.

3.05 INSTALLATION OF GROUT

A. Place grout for base plates in accordance with manufacturer's recommendations.

B. Grout below setting plates as soon as practicable to facilitate erection of steel and prior to removal of temporary bracing and guys. If leveling bolts or shims are used for erection grout shall be installed prior to addition of any column load.

C. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

3.06 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating material manufacturer's directions. Do not allow excess form coating to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.07 CONCRETE PLACEMENT:

A. Preplacement Review: Footing bottoms are subject to review by the Geotechnical Engineer. Reinforcement and all concrete preparation work shall be subject to review by the Structural Engineer. Verify that reinforcing, ducts, anchors, seats, plates and other items cast into concrete are placed and securely held. Notify Engineer/Project Special Inspector 48 hours prior to scheduled placement and obtain approval or waiver of review prior to placement. Be sure that all debris and foreign matter is removed from forms.

B. Concrete shall be placed in the presence of an approved testing agency.

C. General: Comply with ACI 304, and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.

2. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

3. Conveying equipment shall be approved and shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:

a. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.

b. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long, and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

c. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete.

d. Concrete shall not be conveyed through pipe made of aluminum alloy. Standby equipment shall be provided on the site.

e. Tined rakes are prohibited as a means of conveying fiber reinforced concrete.

4. Do not use reinforcement as bases for runways for concrete conveying equipment or other construction loads.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment. Hand-spading, rodding or tamping as the sole means for the consolidation of concrete will only be permitted with special permission from the Engineer. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

2. Use vibrators designed to operate with vibratory equipment submerged in concrete, maintaining a speed of not less than 8000 impulses per minute and of sufficient amplitude to consolidate the concrete effectively. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine, generally at points 18 inches maximum apart. Place vibrators to rapidly penetrate placed layer and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion maintain the duration of vibration for the time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operation.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete using internal vibrators during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on plastic surface.

3. Maintain reinforcing in proper position during concrete placement operations.

4. Slab thicknesses indicated on the drawings are minimums. Provide sufficient concrete to account for structure deflection, subgrade fluctuations, and to obtain the specified slab elevation at the flatness and levelness indicated here within.

5. Finish: See "Monolithic Slab Finishes" in this specification for slab finish requirements.

F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F (27degrees C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators.

4. All temporary heat, form insulation, insulated blankets, coverings, hay or other equipment and materials necessary to protect the concrete work from physical damage caused by frost , freezing action, or low temperature shall be provided prior to start of placing operations.

5. When the air temperature has fallen to or is expected to fall below 40 degrees F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 degrees F.

G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3. Wet forms thoroughly before placing concrete.

4. Do not use retarding admixtures without the written acceptance by the Architect.

3.08 FINISH OF FORMED SURFACES:

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This concrete surface shall have texture imparted by form facing material, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 in. in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This as-cast concrete surface shall be obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment. Combine one part Portland cement to 1-1/2 parts fine sand by volume and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.

1. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

D. Related Unformed Surfaces: At tops of walls and grade beams, horizontal offset surfaces occurring adjacent to formed surfaces, strike-off, smooth and finish with a texture matching adjacent uniformed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.09 FLOOR FLATNESS AND LEVELNESS

A. Floor flatness/levelness tolerances: Tolerances for various floor uses shall conform to the requirements set forth in ACI 117 and ACI 302 for "flat" floor profile.

1. Minimum Test Area Flatness/Levelness: F_F30/F_L20

2. Minimum Local F Number: F_F15/F_L10

B. Levelness criteria shall be applied to **non-parking** slabs-on-grade only.

C. Contractor shall measure floor finish within 72 hours after slab finishing and provide corrective measures for finishes not within tolerance. Corrective procedures shall be reviewed by the Architect prior to implementation.

3.10 MONOLITHIC SLAB FINISHES:

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds, and as otherwise indicated.

1. After placing slabs, plane surface to a tolerance not exceeding 1/2 in. in 10 ft. when tested with a 10-ft. straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, and as otherwise indicated.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces indicated, including slab surfaces to be covered with carpet, resilient flooring, paint or other thin-film finish coating system.

D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, washes and ramps, and elsewhere as indicated.

E. Slab finishes for floor coverings not indicated shall be coordinated with the Architect prior to slab placement.

F. Slab Joints: Where indicated, sawn slab contraction joints shall be "soft cut", immediately after concrete surface is firm enough not to be torn or damaged by the blade.

3.11 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 as herein specified.

B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified unless noted otherwise. Curing shall commence as soon as concrete surfaces are sufficiently hard as to withstand surface damage. Slabs-on-grade shall be cured by moist curing methods.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Protection From Mechanical Injury: During the curing period and duration of construction, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

3.12 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as joints, slabs and other structural elements, may not be removed in fewer than 14 days or until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and support.

3.13 REUSE OF FORMS:

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and latency, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.14 MISCELLANEOUS CONCRETE ITEMS:

A. Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.15 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Architect.

1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, form tie holes, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, and other projections on surface and stains and other discolorations that cannot be removed by cleaning.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. Testing Agency/Project Special Inspector shall verify reinforcement, including foundation reinforcement and slab reinforcement (WWF or reinforcing bar). Agent shall verify WWF or reinforcement has been chair/placed with proper clearances.

B. The Owner shall employ a Testing Laboratory to inspect, sample and test the materials and the production of concrete and to submit test reports. Concrete testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board and/or ACI Concrete Field Testing Technician Grade I.

C. Concrete shall be sampled and tested for quality control during placement. Quality control testing shall include the following, unless otherwise directed by the Architect.

D. See Submittals section for report requirements.

E. Sampling Fresh Concrete: ASTM C 172.

1. Slump: ASTM C143; one test for each concrete load at point of discharge and one test for each set of compressive strength test specimens. Sample shall be taken from middle third of the load per ASTM C172. A slump test must be run prior to the incorporation of the CFP fibers per recommendations of ACI 544. A slump test must be run prior to and following the addition of a water reducer (superplasticizer) per recommendations of ACI 301.

2. Air Content: ASTM C231 "Pressure method for normal weight concrete." One test for each concrete load, measured at point of discharge and one test for each set of compressive strength specimens.

3. Concrete Temperature: Per ASTM C-1064; One test for each load and one test each time a set of compression test specimens are made.

4. Compression Test Specimen: ASTM C31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

   a. An insulated Cure Box for specimen curing shall be supplied by Testing Agency for initial curing as defined in ACI C31.

   b. Means of heating or cooling the Cure Box shall be provided by the Inspection Agency if required in order to maintain a temperature between 60 and 80 degrees F. Contractor shall provide an electrical source to the Testing Agency when required for temperature control.

   c. A maximum-minimum thermometer shall be provided in the Cure Box by the Testing Agency to record the temperature range of the Cure Box during specimen curing. The Testing Agency shall record the maximum/minimum temperature of the Cure Box when transferring the specimens to the laboratory.

   d. Test Specimens shall be moist cured.

   e. Refer to ACI C31 for additional requirements for Test Specimens.

5. Compressive Strength Tests: ASTM C39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 4,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, 1 specimen retained in reserve for later testing if required.

6. Pumped concrete shall be tested at point of discharge per ACI 301.

F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods, as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 03411

STRUCTURAL PRECAST CONCRETE PLANKS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Extent of structural precast concrete work is shown on drawings and in schedules.

B. The extent of Structural Precast Concrete is shown on drawings and includes (but not by way of limitation) 8-inch prestressed concrete planks, all bearing materials, embedded items, accessories and grouting of plank joints.

1.03 RELATED WORK:

A. Section 03300 - Cast in Place Concrete

B. Section 05120 – Structural Steel

C. Section 05500 - Metal Fabrications

D. Section 07900 - Joint Sealants

E. Section 03410 – Structural Precast Concrete

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with the provisions of the latest edition of the following except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings."

2. ACI 318 "Building Code Requirements for Reinforced Concrete."

3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

4. Precast/Prestressed Concrete Institute, "PCI Design Handbook, Precast and Prestressed Concrete."

5. Precast/Prestressed Concrete Institute MNL 116, "Manual for Quality Control for Plants and Production of Precast Concrete Products."

6. AWS D1.1 - 2004 "Structural Welding Code" - Steel

7. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Fabricator Qualifications:

1. Fabricator must be an active producer member of the Prestressed Concrete Institute (PCI) and participate in its Plant Certification Program. Manufacturer shall be certified at time of bidding and for duration of project in Category C2. Certificate shall be submitted for record purposes.

2. Firms must have a minimum of 5 years successful experience in fabrication of precast concrete units similar to units required for this project.

3. Fabricator must have sufficient production capacity to produce required units without causing delay in work.

C. Erector's Qualifications:

1. Regularly engaged for at least 5 years in the erection of precast structural concrete similar to requirements of this project.

2. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."

   a. Provide certification that welders to be employed in work have satisfactorily passed AWS D1.1 qualification tests and maintained a current certification. Current certification and/or continuity log shall be submitted and be available in the shop and field at all times.

   b. If re-certification of welders is required, retesting will be the Contractor's responsibility.

1.05 SUBMITTALS:

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Product Data:

   1. Submit a copy of the fabricator's certificate indicating participation in the PCI Plant Certification Program.

2. Submit producer's or manufacturer's specifications and installation instructions for the proprietary products and bearing materials. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

H. Shop Drawings: Submit shop drawings showing complete information for fabrication and installation of precast concrete units. Reproduction of the Construction Documents, in part or in full, is strictly prohibited.

1. Indicate member dimensions and cross section

2. Indicate location, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection.

3. Indicate layout, dimensions, and identification of each precast unit corresponding to sequence and procedure of installation. Indicate all openings in units.

4. Indicate welded connections by AWS standard symbols.

5. Detail inserts, connections, and joints, including accessories and construction at openings in precast units.

6. Anchorage: Provide location and details of anchorage devices that are to be embedded in other construction. Furnish templates if required for placement.

7. Openings: Provide size and location of plant cast openings in the plank.

8. Erection Sequencing: Include erection procedure for precast units and sequence of erection.

I. Performance Design: Design Calculations:

1. Provide complete design calculations prepared and stamped and signed by a registered Professional Engineer licensed in the State of Maine.

2. Calculations submitted without affixed stamp and signature will be rejected and returned without review.

3. Plank Design Criteria:

a. Design Loads: As indicated on the drawings

b. Code: Comply with ACI 318, Latest Edition

c. Maximum Superimposed Live Load Deflection:

Floors: Span/480

Roofs: Span/360

d. Where possible, design planks to be non-composite. Notify the Architect and Engineer if planks are to be designed as composite with the concrete topping.

e. Camber: Indicate camber in design calculations. See installation tolerances for additional information on anticipated camber.

f. Structural Steel Plank Headers: Design where required or indicated.

g. Holes and openings: Design planks to accommodate field cored holes as indicated within. See Architectural Drawings for opening layout information.

J. Certificate of Compliance: At completion of fabrication, the precast plank fabricator shall submit a Certificate of Compliance stating that the work was performed in accordance with the construction documents.

K. Plant Concrete Mix Design:

1. Trial Batch Method: Submit laboratory test reports for concrete materials and mix design tests.

2. Field Experience Method: Submit required records of strength tests.

L. Field Grout Mix Design: Minimum Strength 4000 psi. Submit all laboratory test reports and materials. Prepare mixes by the field experience method and/or trial mixtures per the requirements of chapter 5 of ACI 318. Include calculation of average strength and standard devotion.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver precast concrete units, accessories and bearing materials to project site in such quantities and as such times to assure continuity of installation. Coordinate deliver with Structural Steel erection. Store units on appropriate dunnage at project site to prevent cracking, distortion, staining, or other physical damage, and so that markings are visible. Lift and support units at designated lift points.

B. Deliver anchorage items which are to be embedded in other construction before start of such work. Provide setting diagrams, templates, instructions and directions as required for installation.

PART 2 PRODUCTS:

2.01 FORMWORK

A. Provide forms and, where required, form facing materials of metal, plastic, wood, or other acceptable material that is non-reactive with concrete and will produce required finish surfaces.

B. Accurately construct forms, mortar-tight, of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and when prestressed, pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified in the PCI manual referenced above.

C. Unless forms for plan manufactured prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or to movement during detensioning.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.

B. Tendons:
   1. Uncoated, 7 wire stress relieved strand complying with ASTM A 416. Use grade 250 unless Grade 270 is required by design and has been indicated on shop drawings.

   2. Strand similar to the above, but having the size and ultimate strength of wires increased so that the ultimate strength of the strand is increased

approximately 15%, or strand with increased strength but with fewer number of wires per strand, may be used at the manufacturer's option.

C. Steel Wire: ASTM A 82, plain, cold-drawn, steel.

D. Welded Wire Fabric: ASTM A 185.

E. Deformed Welded Wire Fabric: ASTM A 497.

F. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI recommendations.

2.03 CONCRETE AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III: Use only one brand and type of cement throughout project, unless otherwise acceptable to Architect.

B. Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source. Local aggregates not complying with ASTM C 33, but which have shown by special test or actual service to produce concrete of adequate strength and durability, may be used when acceptable to Engineer.

C. Water: Potable and free from foreign materials in amounts harmful to concrete and embedded steel.

D. Air-Entraining Admixture: Not Required.

E. Water-Reducing Admixture: ASTM C 494, Type A. Types B, C, D or E may be used, subject to the Architect's approval.

F. Calcium Cloride, chloride ions or other salts are not permitted.

G. Cement Grout: Portland cement, ASTM C 150, Type 1, and clean, natural sand, ASTM C 404. Maximum ratio of 3.0 parts sand to 1.0 part cement, by volume, or as required to attain specified strength. Grout mix requires verification indicated in Submittals section.

2.04 RELATED MATERIALS

A. Steel Shapes: ASTM A 36.

B. Bearing Pads: Provide bearing pads for precast hollow slab units in accordance with manufacturer's recommendations and as indicated. Bearing pads shall not stain or leach to adjacent construction.

1. Plastic: Multi-monomer plastic strips, non leaching, and shall support construction loads with no visible overall expansion. Korolath or equal reviewed by Architect.

2. Frictionless Pads: Terrafluorethylene (TFE), with glass fiber reinforcing as required for service load bearing stress.

3. Tempered Hardboard Pads: PS 58, smooth both sides.

C. Accessories: Provide clips, hangers, weld plates, embedded items, anchor rods and other accessories required for installation of project units and for supports of subsequent construction or finishes.

2.05 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type of concrete required.

B. Design mixes may be prepared by independent testing facility or by qualified precast manufacturing plant personnel, at precast manufacturer's option.

C. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. Use material, including all admixtures, proposed for use on the project.

D. Produce standard-weight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:

1. Compressive strength: 5000 psi minimum at 28 days.

2. Release strength for prestressed units: 3500 psi minimum or per PCI requirements (which ever is more stringent).

E. Cure compression test cylinders using same methods as used for precast concrete work.

F. Admixtures:

1. Use water-reducing admixtures in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Architect's acceptance.

2. Use amount as recommended by admixture manufacturer for conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

2.06 FABRICATION:

A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of the PCI Manual referenced above and as specified for types of units required.

B. Plant-Mix Concrete: Comply with requirements of ASTM C 94, and as modified below:

1. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to batch will not be permitted.

C. Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorage where they do not affect position of main reinforcement or placing of concrete. Do not relocate bearing plates in units unless acceptable to Architect.

D. Holes and Openings: Cast holes and/or openings for openings larger than 10" diameter or 10" square in accordance with final shop drawings. Smaller holes will be field cut by trades requiring them, as acceptable to Architect. Planks shall be designed to allow cutting of strands anticipated with this requirement.

E. Form Coating: Coat surfaces of forms with bond breaking compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bound with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.

F. Surface Preparation: Clean reinforcement of loose rust and mill scale, earth and other materials which reduce or destroy bond with concrete.

G. Reinforcement:

1. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations.

2. Locate and support reinforcing the metal chairs, runners, bolsters, spacers and hangers, as required.

3. Place reinforcement to obtain the specified coverages for concrete protection.

4. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.

5. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

H. Tendon Pretensioning: Pretensioning of tendons for prestressed concrete may be accomplished either by single strand tensioning method or multiple-strand tensioning method. Comply with PCI MNL-116 requirements.

I. Concrete Placement: Place concrete in a continuous operation to prevent formation of seams or planes of weakness in precast units, complying with requirements of ACI 304. Thoroughly consolidate placed concrete by internal and external vibration without dislocation or damage to reinforcement and built-in items.

J. Identification: Provide permanent markings to identify pick-up points and orientation in structure, complying with markings indicated on final shop drawings. Imprint date of casting on each precast unit on a surface which will not show in finished structure.

K. Concrete Curing: Curing by low-pressure steam, steam vapor, radiant heat and moisture, or other similar process may be employed to accelerate concrete hardening and to reduce curing time.

L. Detensioning: Delay detensioning of prestressed units until concrete has attained at least 70% of design stress or per PCI requirements, as established by test cylinders.

1. If concrete has been heat-cured, perform detensioning while concrete is still warm and moist, to avoid dimensional changes which may cause cracking or undesirable stresses in concrete.

2. Detensioning of pretensioned tendons may be accomplished either by gradual release of tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

M. Finish of Formed Surfaces: Provide finishes for formed surfaces or precast concrete as indicated for each type of unit, and as follows:

1. Standard Finish: Normal plant run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal form joint marks, and minor chips and spalls will be tolerated, but no major or unsightly imperfections, honeycomb, or structural defects will be permitted.

2. Finish of Unformed Surfaces: Apply trowel finish to unformed surfaces unless otherwise indicated. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish. Apply scratch finish to precast units which will receive a topping after installation. Following initial strikeoff, transversely scarify surface to provide ridges approximately 1/4" deep.

N. Adequately reinforce slab units to resist transporting and handling stresses.

O. Provide headers of structural steel shapes for openings larger than one slab width in accordance with hollow slab unit manufacturer's recommendations.

PART 3 EXECUTION

3.01 INSTALLATION

A. Bearing Pads: Install bearing pads where indicated, as precast units are being erected. Set pads on level, uniform bearing surfaces and maintain in correct position until precast units are placed.

B. Welding:

1. Perform welding in compliance with AWS D 1.1, including qualification of welders.

2. Protect units from damage by field welding or cutting operations and provide noncombustible shield as required.

C. Damaged Coated Surfaces: Repair damaged coating surfaces by cleaning and applying a coat of liquid galvanizing repair compound to galvanized surfaces and compatible primer and paint to painted surfaces.

D. Powder-Actuated Fasteners and Field Installed Mechanical Fasteners: Powder-actuated fasteners and field installed mechanical fasteners may be used for surface (top or bottom) attachment of accessory items in precast, prestressed unit. Precast manufacturer shall provide guidance documentation to Contractor indicating special instructions for the use of these fasteners in the field.

E. Installation Tolerances:

1. Tolerances shall be verified at time of erection, and prior to joint grouting or attachment of permanent connections.

2. Replacement or correction of structural precast members, fabricated and supplied out of tolerance shall be the responsibility of the Fabricator, and at the Fabricator's expense in a manner that shall not inhibit the progress of the project.

3. Tolerances not indicated within shall comply with PCI's "Tolerance Manual for Precast and Prestressed Concrete Construction", MNL-135.

4. Install precast units without exceeding following tolerance limits at time of or following erection:

a. Camber: Deviation from theoretical level line at supports (positive indicates upward camber) :

Maximum Camber: 1" or the span length divided by 360 (least value applies)

Minimum Camber: -1/4"

b. Variations from Level or Elevation: 1/4" in any 20' run; 1/2" in any 40' run; total plus or minus 1/2" at any location.

c. Variation from Position in Plan: Plus or minus 1/4" maximum at any location.

d. Offsets in alignment of Adjacent Members at Any Joint: 1/16" in any 10' run; 1/4" maximum.

F. Temporary Shoring and Bracing: This is the sole responsibility of the Contractor. Provide temporary shoring and bracing members with connections of sufficient strength to support imposed construction loads. Contractor shall provide all shoring necessary to erect precast plank on steel supporting structure. Contractor shall employ the services of a Specialty Engineer Registered in the State of Maine to design such shoring. Shoring design shall account for all construction loads, unbalanced loading, torsional loading and temporary lateral effects on the steel frame and precast concrete elements. The design shall account for all loadings until such time that the construction is completed. Comply with OSHA Standard referenced previous.

G. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at connection and joints as follows:

1. Provide forms or other acceptable method to retain grout in place until sufficiently hard to support itself. For Girder Slab construction, break out cores and dam per the manufacturer's recommendations. Alternatively, core openings and dams may be provided in the plant.

2. Provide reinforcement in joints were indicated.

3. Pack spaces with grout material consolidating until voids are completely filled.

4. Place grout to finish smooth, plumb, and level with adjacent concrete surfaces.

5. Keep grouted joints damp and warm for not less than 7 days after initial set.

6. Promptly remove grout material from exposed surfaces before it hardens.

7. Grout shall attain the specified 28-day strength prior to application superimposed loads including topping for the Girder Slab System.

3.02 PLANT QUALITY CONTROL EVALUATIONS DURING FABRICATION:

A. Fabricator Requirements:

1. Fabricator is responsible to provide testing to indicate compliance of plank materials and tensioning stresses with manufacturing requirements. Any plank not meeting the requirements of manufacturer shall be repaired or replaced at no cost to the Owner.

2. Fabricator must be an active producer member of the Prestressed Concrete Institute (PCI) and participate in its Plant Certification Program.

B. The Owner reserves the option to employ a separate testing laboratory to evaluate precast manufacturer's quality control and testing methods.

1. The precast manufacturer shall allow Owner's testing facility access to materials storage areas, concrete production equipment, and concrete placement and curing facilities. Cooperate with Owner's testing laboratory and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.

2. Dimensional Tolerances: Units having dimensions smaller or greater than required, and outside specified tolerance limits will be subject to additional testing as herein specified.

3. Precast units having dimensions greater than required will be rejected if appearance or function of the structure is adversely affected, or if larger dimensions interfere with other construction. Repair or remove and replace rejected units as required to meet construction conditions.

4. Strength of Units: The strength of precast concrete units will be considered potentially deficient if the manufacturing processes fail to comply with any of the requirements which may affect the strength of the precast units, including the following conditions:

5. Failure to meet compressive strength tests requirements.

6. Reinforcement, and pretensioning and detensioning of tendons of prestressed concrete, not conforming to specified fabrication requirements.

7. Concrete curing, and protection of precast units against extremes in temperature, not as specified.

8. Precast units damaged during handling and erection.

9. Testing Precast Units: When there is evidence that strength of precast concrete units does not meet specification requirements, the concrete testing service shall take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C 42 and as follows:

   a. Take at least 3 representative cores from precast units of suspect strength, from locations directed by Architect.

   b. Test cores in a saturated-surface-dry condition per ACI 318 if concrete will be wet during use of completed structure.

   c. Test cores in an air-dry condition per ACI 318 if concrete will be dry during use of completed structure.

   d. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 85% of 28-day design compressive strength.

   e. Test results will be made in writing on same day that test is made, with copies to Architect, Contractor, and precast manufacturer. Include in test reports the project identification name and number, date, name of precast concrete manufacturer, name of concrete testing service, identification letter, name, and type of member or members represented by core tests, design compressive strength compression breaking strength and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plan of concrete as placed, and moisture condition of core at time of bearing.

10. Patching: Where core test results are satisfactory and precast units are acceptable for use in work, fill core holes solid with patching mortar, and finish to match adjacent concrete surfaces.

11. Defective Work: Precast concrete units which do not conform to specified requirements, including strength, tolerance, and finishes, shall be replaced with precast concrete units that meet requirements of this section. Contractor shall also be responsible for cost of corrections to

other work affected by or resulting from corrections to precast concrete work.

3.03 FIELD QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. Testing Agency/Project Special Inspector shall verify reinforcement (WWF or reinforcing bar), including joint reinforcement. Agent shall reinforcement has been chair/placed with proper clearances.

B. The Owner shall employ a Testing Laboratory to inspect, sample and test the materials and the production of grout and to submit test reports. Testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board and/or ACI Concrete Field Testing Technician Grade I.

C. Grout shall be sampled and tested for quality control during placement. Quality control testing shall include the following, unless otherwise directed by the Architect.

D. See Submittals section for report requirements.

E. Sample fresh Grout: ASTM C-172, except modified slump to comply with ASTM C-94

F. Slump: ASTM C-143: One test for each grout load at point of discharge and one test for each set of compressive strength specimens.

G. Air Content: ASTM C-173: volumetric method or ASTM C-231 pressure method, one for each set of compressive strength specimens.

H. Temperature: For each load, at time of arrival at point of discharge.

I. Compression Test Specimens: ASTM C-31: one set of four cylinders. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

J. Compressive Strength Tests: ASTM C39; one set for each 5 cu. yds. or fraction thereof, of grout placed in any one day or for each 4,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, 1 specimen retained in reserve for later testing if required.

K. Refer to Section 03300, "Cast-in-Place Concrete" for additional requirements. Substitute therein the word "grout" for the word "concrete.

END OF SECTION

SECTION 03480

PRECAST CONCRETE MANHOLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing precast concrete manholes and appurtenant materials.

B. Installation.

C. Leakage testing.

1.02 REFERENCE STANDARDS

A. AASHTO - Standard Specifications for Highway Bridges.

B. ASTM C32 - Sewer and Manhole Brick (Made from Clay or Shale).

C. ASTM C91 - Masonry Cement.

D. ASTM C109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50 mm Cube Specimens).

E. ASTM C270 - Mortar for Unit Masonry.

F. ASTM C387 - Packaged Dry Combined Materials for Mortar and Concrete.

G. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

H. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

I. ASTM C827 - Early Volume Change of Cementitious Mixtures.

1.03 SUBMITTALS

A. Submit Shop Drawings showing details of construction, pipe penetrations, reinforcing, joints, embedded appurtenances and method of sealing pipe penetrations in accordance with Section 01300 Submittals.

B. Provide certification from brick manufacturer that brick conforms to ASTM C32, Grade SS.

1.04 QUALITY ASSURANCE

A. Design Criteria:

1. Design of manhole structure and components shall conform to ASTM C478.

2. Manhole sections shall be capable of withstanding AASHTO H-20 loading without failure or leakage.

3. Manhole base shall be a minimum of 8 inches thick and walls shall be a minimum of 5 inches thick.

4. Concrete: Minimum compressive strength of 4,000 psi at 28 days.

B. The quality of all materials, the process of manufacture and the finished sections shall be subject to inspection by the ARCHITECT. Such inspection may be made at the place of manufacture, and/or on the work site after delivery. Sections shall be subject to rejection due to failure to meet any of the Specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged after delivery will be rejected, or if already installed, shall be repaired or removed and replaced entirely at the CONTRACTOR'S expense as directed by the ARCHITECT.

C. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close-textured and free of blisters, cracks, roughness and exposed reinforcement.

D. Imperfections may be repaired, subject to acceptance by the ARCHITECT, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Concrete grout shall be used for repairs. Epoxy grout may be used for repairs, subject to acceptance by the ARCHITECT.

1.05 SOURCE QUALITY CONTROL

A. Test concrete in accordance with ASTM C478.

B. Retain plant records and quality control program used during production of precast concrete manholes and make such records and test results available to ARCHITECT if requested.

C. All precast concrete manhole sections shall have the date of manufacture and name or trademark of the manufacturer indelibly marked on the inside of the wall.

1.06 DELIVERY, STORAGE AND HANDLING

A. Precast manhole sections shall not be shipped until the concrete has attained a compressive strength of 3000 psi or until 5 days after fabrication and/or repair, whichever time is longer.

B. Conform to manufacturer's instructions for delivery and handling.

C. Protect edges of manholes to prevent chipping or spalling.

D. Lift and support manhole sections from lifting points using lifting or handling devices.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Specification includes references to designated manufacturers to illustrate minimum acceptable requirements for products.

B. Substitutions: Products of equal or better quality, detail, function and performance may be proposed for substitution by following the procedures in Section 01300.

2.02 MATERIALS

A. Concrete: ASTM C478, Portland Cement Type II.

2.03 PRECAST MANHOLE SECTIONS

A. Cone sections shall be eccentric.

B. In lieu of a cone section, when manhole depth is less than 6 feet, a reinforced concrete slab cover shall be used having an eccentric entrance opening and capable of supporting AASHTO H-20 loads.

C. The base section shall be monolithic to a point at least 6 inches above the openings cast to receive the sewer lines. For drop man- holes, any opening shall be a minimum of 6 inches from any joint.

2.04 MANHOLE JOINTS AND PIPE SEALS

A. Horizontal joints between precast manhole sections shall be tongue and groove and shall have a mastic-like sealant such as Ram-Nek, Kent Seal No. 2 or a butyl rubber joint gasket (O-ring) conforming to ASTM C443. All horizontal joints shall be watertight in accordance with the testing requirements of this Section.

B. Pipe to manhole joints shall be an embedded flexible rubber boot or as shown on the Drawings. Nonshrinking mortar or grout is not acceptable. Pipe to manhole connections and joints shall be watertight in accordance with the testing requirements of this Section.

2.05 WATERPROOFING

A. All manholes shall be waterproofed, at the factory, with two seal coats applied to the exterior of the manhole in accordance with the seal coating manufacturer's recommendations. Waterproofing shall be masonry seal MSP-1 waterproofing material as made by the Masonry Seal Corporation, 7500 West Ridge Road, Elyria, Ohio, or Foundation Coating 47-461 as made by TNEMEC.

B. Exterior of all joints shall be coated with waterproofing after setting.

2.06 BRICK

A. Brick Masonry for Inverts and Grade Adjustment: ASTM C32, Grade SS.

2.07 MORTAR

A. Masonry Cement: ASTM C91.

B. Mortar for Unit Masonry: ASTM C270, Type S.

C. Premixed Materials: ASTM C387.

2.08 MISCELLANEOUS COMPONENTS

A. Manhole rungs shall be steel reinforced copolymer, polypropylene plastic installed at the place of manufacture.

1. Manhole rungs shall comply with all dimensional and structural requirements of OSHA (most recent publication).

   a. Setting: 12 inches center to center vertical distance, unless otherwise indicated on the Drawings.

   b. Integral foot stops and nonslip treads.

   c. Live Load: 300 lb. point load applied to produce maximum stress.

   d. Pull-out: 2,500 lb. point load applied at center of rung.

2. Rungs shall be level and aligned vertically.

3. Manhole Rung Manufacturer: M. A. Industries Inc., East Point, Georgia; or Improved Construction Methods Inc., Jacksonville, Arkansas.

B. Manhole frames and covers shall comply with the Drawings and City of Portland requirements.

C. Bedding material shall consist of crushed stone as specified in Section 02225 Excavating, Backfilling and Compacting.

2.09 CONCRETE GROUT

A. Concrete grout shall be premixed, prepackaged nonshrink cement based grout such as Five Star Grout manufactured by U.S. Grout Corporation.

B. Nonshrink when tested in accordance with ASTM C827.

C. Minimum compressive strength of 5000 psi at 28 days when tested in accordance with ASTM C109.

PART 3 EXECUTION

3.01 INSTALLATION OF MANHOLE BASES AND SECTIONS

A. Precast bases shall be placed on a layer of compacted bedding material. The excavation shall be properly dewatered to allow placing of bedding material and setting the manhole base on complete drained subgrade. Manhole sections and cones shall be placed using manufacturer's recommended procedure for sealing the horizontal joints. Manhole sections shall be set vertical with sections in true alignment within 1/4 inch maximum tolerance.

B. Inlet and outlet pipes shall be connected and sealed in accordance with the manufacturer's recommended procedure, and as shown on the Drawings.

C. A leakage test shall be made as described below in this section.

D. Upon successful completion of the leakage test all joints shall be pointed.

E. The exterior waterproofing coat shall be touched up after installation and shall be applied to the exterior of all joints in accordance with manufacturer's recommendations.

F. The inverts and the shelf shall be constructed of brick.

G. The frame and cover shall be placed on the top of the manhole or some other means shall be provided to prevent accidental/ unauthorized entry until the CONTRACTOR is ready to make final adjustment to grade.

3.02 MIXING MORTAR

A. Mortar shall be mixed in accordance with ASTM C270 or the recommendations of the manufacturer.

3.03 BRICK MASONRY

A. Only clean bricks shall be used in brickwork for grade adjustment and manhole inverts. The brick shall be moistened by suitable means, until in a surface dry, saturated condition.

B. Each brick shall be laid in full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded.

C. Brick masonry shall be protected from too rapid drying. Use an approved cover and protect from the weather and frost.

D. All masonry joints which are exposed to view shall be examined to locate cracks, shall be pointed up and filled with mortar, if required. Where necessary, in the opinion of the ARCHITECT, the joints shall be cut out and repointed with mortar.

E. All brick masonry inverts shall allow unimpeded flow. Steps or puddles will be basis for rejection.

3.04 SETTING FRAMES AND COVERS

A. Frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the Drawings. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and sloped to shed water away from the frame.

B. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

3.05 LEAKAGE TESTS FOR SEWER MANHOLES

A. Leakage tests shall be made by the CONTRACTOR and observed by the ARCHITECT on each manhole. The test shall be an exfiltration test or vacuum test made as described below.

B. Water Test:

1. After the manhole has been assembled in place, all lifting holes shall be filled with nonshrinking concrete grout. The test shall be made prior to placing the shelf and invert and before filling and pointing the horizontal joints or pipe to manhole joints. If the ground water table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blowout.

2. The manhole shall then be filled with water to the top of the cone section. A period of time may be permitted if the CONTRACTOR so wishes to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least 6 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the test fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the ARCHITECT to bring the leakage within the allowable rate of 1 gallon per vertical foot per day. Leakage due to a defective section or joint or exceeding the 3 gallons per vertical foot per day, shall be cause for the rejection of the manhole. It shall be the CONTRACTOR'S responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the ARCHITECT at no additional cost to the OWNER. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

3. The test may be conducted before backfilling around the manhole. However, if the CONTRACTOR elects to backfill prior to testing, it shall be at the CONTRACTOR'S risk and it shall be incumbent upon the CONTRACTOR to determine the reason of any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the concrete. The CONTRACTOR shall take any steps necessary to assure the ARCHITECT that the water table is below the bottom of the manhole throughout the test.

4. Manholes within 75 feet of wells for individual homes and 125 feet of wells for two homes and 200 feet of wells for three or more homes shall be watertight with no infiltration/ exfiltration.

C. Vacuum test:

1. The vacuum test may be performed on manholes, completely constructed, with inlet and outlet pipes in place. Test shall be conducted before any backfilling begins. Any material around the base section shall be removed to expose the entire side of the manhole. Plug pinholes and horizontal seams with a non-shrinking concrete grout.

2. Brace the inlet and outlet pipes/plugs to prevent movement during the test. Use air inflated plugs in good condition.

3. The vacuum test shall be performed using equipment acceptable to the ARCHITECT. The equipment shall be in good operating condition. All gauges shall not have any broken glass or other visible abnormalities. The test shall be performed by trained personnel familiar with the equipment and the test.

4. The test shall have a minimum duration of two minutes. The vacuum shall be pumped down to 10 inches of mercury on an acceptable gauge, and held. At the time the removal of air is stopped, the test time shall begin.

5. Any manhole that has a vacuum drop to nine inches of mercury or less, within the following time intervals, shall have failed the test.

   0 - 10 ft. deep: less than 2 minutes.
   10 - 15 ft. deep: less than 2-1/2 minutes.
   15 - 20 ft. deep: less than 3 minutes.

over 20 ft. deep: less than T.

Calculations for manholes deeper than 20 feet:

T = 0.085 [DK/Q]
T = Time of pressure drop in seconds.
K = 0.000419 DL; but not less than 1.0.
Q = 0.0015 ft;/min/ft5 of area.
D = Nominal manhole diameter in inches.
L = Depth of manhole in feet.

END OF SECTION

SECTION 03481

PRECAST CONCRETE CATCH BASINS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing precast concrete catch basins and appurtenant materials.

B. Installation.

1.02 REFERENCE STANDARDS

A. AASHTO - Standard Specifications for Highway Bridges.

B. ASTM C32 - Sewer and Manhole Brick (Made from Clay or Shale).

C. ASTM C55 - Concrete Building Brick.

D. ASTM C91 - Masonry Cement.

E. ASTM C109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50 mm Cube Specimens).

F. ASTM C207 - Hydrated Lime for Masonry Purposes.

G. ASTM C270 - Mortar for Unit Masonry.

H. ASTM C387 - Packaged Dry Combined Materials for Mortar and Concrete.

I. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

J. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

K. ASTM C827 - Early Volume Change of Cementitious Mixtures.

1.03 SUBMITTALS

A. Submit Shop Drawings showing details of construction, reinforcing joints, embedded appurtenances, inlet capacity, grate load bearing strength, and dimensions in accordance with Section 01300 Submittals.

B. Submit certification from brick manufacturer that brick conforms to ASTM C32, Grade MS or ASTM C55, Grade N-I.

1.04 QUALITY ASSURANCE

A. Design Criteria:

1. Design of catch basin structure and components shall conform to ASTM C478.

2. Catch basin sections shall be capable of withstanding AASHTO H-20 loading without failure.

3. Base of catch basin shall be a minimum of 8 inches thick and walls shall be a minimum of 5 inches thick.

4. Concrete: Minimum compressive strength of 4000 psi at 28 days.

B. The quality of all materials, the process of manufacture and the finished sections shall be subject to inspection by the ARCHITECT. Such inspection may be made at the place of manufacture, and/or on the work site after delivery. Sections shall be subject to rejection due to failure to meet any of the Specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged after delivery will be rejected, or if already installed, shall be repaired or removed and replaced entirely at the CONTRACTOR'S expense as directed by the ARCHITECT.

C. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close-textured and free of blisters, cracks, roughness and exposed reinforcement.

D. Imperfections may be repaired, subject to acceptance by the ARCHITECT, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Concrete grout shall be used for repairs. Epoxy grout may be used for repairs, subject to acceptance by the ARCHITECT.

1.05 SOURCE QUALITY CONTROL

A. Test concrete in accordance with ASTM C478.

B. Retain plant records and quality control program used during production of precast concrete catch basins and make such records and test results available to ARCHITECT, if requested.

C. All precast concrete catch basin sections shall have the date of manufacture and name or trademark of the manufacturer indelibly marked on the inside of the wall.

1.06 DELIVERY, STORAGE AND HANDLING

A. Precast catch basin sections shall not be shipped until the concrete has attained a compressive strength of 3000 psi or until 5 days after fabrication and/or repair, whichever time is longer.

B. Conform to manufacturer's instructions for delivery and handling.

C. Protect edges of catch basins to prevent chipping or spalling.

D. Lift and support catch basin sections from lifting points using lifting or handling devices.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Specification includes references to designated manufacturers to illustrate minimum acceptable requirements for products.

B. Substitutions: Products of equal or better quality, detail, function and performance may be

proposed for substitution by following the procedures in Section 01300 Submittals.

2.02 MATERIALS

A. Concrete: ASTM C478, Portland Cement Type II.

2.03 PRECAST CATCH BASIN SECTIONS

A. Precast reinforced concrete slab cover shall have an eccentric entrance opening and capable of supporting AASHTO H-20 loads.

B. The base section shall be monolithic to a point at least 6 inches above the openings cast to receive the storm sewer lines. Any opening shall be a minimum of 6 inches from any joint.

2.04 CATCH BASIN MANHOLE JOINTS AND PIPE SEALS

A. Horizontal joints between precast catch basin sections shall be tongue and groove and shall have a mastic-like sealant such as Ram-Nek, Kent Seal No. 2 or a butyl rubber joint gasket (O-ring) conforming to ASTM C443. All horizontal joints shall be watertight.

B. Pipe to catch basin joints shall be sealed with nonshrinking mortar or concrete grout. Pipe to catch basin connections and joints shall be watertight.

2.05 BRICK

A. Brick Masonry for Grade Adjustment: ASTM C32, Grade MS or ASTM C55, Grade N-I.

2.06 MORTAR

A. Masonry Cement: ASTM C91.

B. Mortar for Unit Masonry: ASTM C270, Type S.

C. Premixed Materials: ASTM C387.

2.07 MISCELLANEOUS COMPONENTS

A. Catch basin frames, grates and covers shall comply with the Drawings and City of Portland requirements.

B. Bedding material shall as specified in MDOT Standard Specifications Section 604.03.

2.08 CONCRETE GROUT

A. Concrete grout shall be premixed, prepackaged nonshrink cement based grout such as Five Star Grout manufactured by U.S. Grout Corporation.

B. Nonshrink when tested in accordance with ASTM C827.

C. Minimum compressive strength of 5000 psi at 28 days when tested in accordance with ASTM C109.

PART 3 EXECUTION

3.01 INSTALLATION OF CATCH BASIN BASES AND SECTIONS

A. Precast bases shall be placed on a layer of compacted bedding material. The excavation shall be properly dewatered to allow placing of bedding material and setting the catch basin base on completely drained subgrade. Intermediate sections and top slab shall then be placed, using manufacturer's recommended procedure for sealing the horizontal joints. All joints shall be pointed. Catch basin sections shall be set vertical with sections in true alignment within 1/4 inch maximum tolerance.

B. Inlet and outlet pipes shall be connected and sealed in accordance with the manufacturer's recommended procedure, and as shown on the Drawings.

C. Holes in the concrete sections and around pipe entrances shall be plugged with concrete grout.

D. The frame and grate shall be placed on the top of the catch basin or some other means shall be provided to prevent accidental/ unauthorized entry until the CONTRACTOR is ready to make final adjustment to grade.

3.02 MIXING MORTAR

A. Mortar shall be mixed in accordance with ASTM C270 or the recommendations of the manufacturer.

3.03 BRICK MASONRY

A. Only clean bricks shall be used in brickwork for grade adjustment. The brick shall be moistened until in a surface dry, saturated condition.

B. Each brick shall be laid in full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded.

C. Brick masonry shall be protected from too rapid drying. Use an approved cover and protect from the weather and frost.

D. All masonry joints which are exposed to view shall be examined to locate cracks, shall be pointed up and filled with mortar if required. Where necessary, in the opinion of the ARCHITECT, the joints shall be cut out and repointed with mortar.

3.04 SETTING FRAMES AND GRATES

A. Frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the Drawings. Frames shall be set concentric with the opening in the top slab of the and in a full bed of mortar so that the space between the top of the brick masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

B. Grates shall be left in place in the frames on completion of other work at the catch basins.

END OF SECTION

SECTION 03530

CONCRETE TOPPINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. Furnish and install gypsum concrete toppings on existing floors, as indicated on the Drawings and as specified herein. Include but do not limit to:

1. Topping of existing concrete floors.
2. Concrete fill at voids where existing partitions and equipment are removed.
3. All other concrete topping work indicated.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:

1. Section 02221, Selective Demolition.

1.04 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's specifications and installation instructions for all products in concrete, including certifications and other data as may be required to show compliance with the Contract Documents.

B. Manufacturer's Review: Submit written signed statement, that Contract Documents have been reviewed by qualified representatives of the materials manufacturer, and that materials and system to be used for floor underlayment are proper and adequate for the applications shown.

C. Samples: Submit duplicate 12 in. x 12 in. samples of cured concrete underlayment on 5/8 in. plywood backing.

D. Substrate Acceptability: Submit a certified statement issued by the manufacturer of concrete underlayment materials and countersigned by installer, attesting that surfaces designated to receive underlayment concrete are satisfactory warranty requirements. Application of materials will be construed as acceptance of surfaces.

E. Statement of Supervision: Submit signed statement that field supervision by manufacturer's representative was sufficient to ensure proper application of materials and that the installation is acceptable to manufacturer.

F. Certification: Furnish certificate accompanying each delivery of concrete topping material indicating compliance with the Contract Documents.

1.05 QUALITY ASSURANCE

A. Concrete topping work shall be performed by firm with at least five years experience on comparable Projects, certified by concrete topping materials manufacturer.

B. Concrete topping manufacturer shall provide evidence indicating that the specified materials have been used successfully utilized on work of similar scope to that shown and specified for this Project. Underlayment concrete examples cited shall have been completed and in use for two years without any evidence of failure.

C. The Owner reserves the right to retain an independent testing laboratory to inspect the work. Neither presence of the testing laboratory, nor any observations and testing performed by the laboratory shall relieve the Contractor of his responsibilities for the Work.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's unopened containers identified with brand, type, grade, date of manufacture, class, lot number, and other qualifying information.

B. Store materials in original sealed containers, in dry enclosed storage area, within temperature range recommended by manufacturer.

1.07 JOB CONDITIONS

A. Maintain manufacturer's current installation instructions at Project site.

B. Maintain interior building area above $50^{o}F$ before, during, and after installation of concrete underlayment until structure and subfloor temperatures are stabilized.

C. Provide and maintain adequate ventilation until underlayment cures completely.

D. Coordinate application of concrete underlayment with work of other Sections.

1.08 PROTECTION

A. Protect adjacent surfaces and repair, restore, or replace soiled or damaged in performance of underlayment work.

1.09 WARRANTY

A. Warrant work of this Section for five years from date of Substantial Completion; correct defects upon written notice at no additional cost to Owner. Warranty shall be signed by installer and materials manufacturer.

PART 2 PRODUCTS

2.01 CONCRETE UNDERLAYMENT

A. Concrete: Ardex SD-T Low-Gloss Self Leveling Underlayment Concrete, manufactured by Ardex, Inc., or approved equal, conforming to ASTM C 387 and as follows:

1. Underlayment concrete shall be Class B, 6100 psi minimum compressive strength, when tested in accordance with ASTM C 39.
2. ASTM E 286 Fire Rating: Flame spread, fuel contributed, and smoke density - 0.

2.02 SAND

A. Sand: clean, washed, uniformly graded masonry sand conforming to ASTM C 144 from single source.

2.03 PATCH AND PRIME MATERIALS

A. Patch Material: United States Gypsum Corporation Durabond 90, or approved equal.

B. Primer, Concrete Slab: Ardex P-51 Primer or approved equal.

C. Sealer: Ardex 200 Series, one coat.

2.04 MISCELLANEOUS MATERIALS

A. Aggregate Material: ASTM C 33 as recommended by manufacturer where underlayment thickness exceeds 1 in.

B. Reinforcement: Galvanized steel, 3.4 lb. diamond mesh metal lath conforming to ASTM C 847, as recommended by manufacturer.

C. Control Joint: Topping manufacturer's standard metal control joint.

D. Substrate preparation: Shotblasting, scarifying, grinding, scabbling (bush hammering), and/or chiseling with appropriate equipment by Blastrac, or equal.

PART 3 EXECUTION

3.01 CONDITION OF SURFACE

A. Examine the substrates, adjoining construction and conditions under which the Work is to be installed. Do not proceed with the Work until unsatisfactory conditions have been corrected.

1. Follow manufacturer's recommendations for thicknesses of ¼ inch to 2 inches.
2. Follow manufacturer's recommendations for thicknesses of 2 inches to 5 inches.

B. Pre-Installation Meeting: Prior to installation of concrete underlayment and at the Architect's direction, meet at the Project site to review the material selections, installation procedures, and coordination of the Work with work of other sections. Meeting shall include the Architect, Trade Contractor, Subcontractor, manufacturer's representatives, inspection and testing services (if any), and any other subcontractor whose work requires coordination with this work.

C. Surfaces to receive concrete underlayment shall be thoroughly dry and free of moisture.

D. Subfloor surfaces shall not contain any grease, oil, or any other contaminants which could affect the complete bonding of the underlayment concrete to substrates.

3.02 INSTALLATION - GENERAL

A. Concrete substrates must be solid. Overwatered, frozen or otherwise weak concrete must be removed mechanically to provide a sound base. Concrete should be evaluated for moisture, and be free of oil, grease, wax, dirt, asphalt, curing and sealing compounds, latex and gypsum compounds, dust, paint, or any other contaminant which might act as a bond breaker.

B. Topping is for interior use over dry substrates only. Do not use in areas of constant water exposure nor in areas exposed to permanent or intermittent substrate moisture, this may jeopardize the performance of the topping. Follow the directives of the floor covering manufacturer regarding the maximum allowable substrate moisture content and test the substrate prior to installing any products. Where substrate moisture exceeds the maximum allowed, use the ARDEX MC™ MOISTURE CONTROL SYSTEM.

1. Do not use forced drying, curing compounds, or heating in work area unless approved by Architect.

C. Any signs of spalling, scaling, delamination, crumbling or laitance must be removed down to solid, clean concrete. A hammer or heavy instrument should be used to sound out weak, hollow and unsound material.

D. At the start of the installation and periodically as work progresses, provide the services of the manufacturer's technical representative at the job site as often as deemed necessary by the manufacturer to advise on all phases of this Work.

E. All concrete substrate preparation shall use one or more of the following mechanical methods: shotblasting, scarifying, grinding, scabbling (bush hammering), and/or chiseling.

1. Use of water blasting, acid washing, sanding equipment, sweeping compounds, and all forms of solvents are not allowed.

2. Use a dry clean broom, and sweep and vacuum the surface prior to placing any underlayment or topping.

F. Install the system in accordance with manufacturer's published instructions, except where more stringent requirements are specified.

3.03 SURFACE PREPARATION

A. Fill non-moving cracks and joints as recommended by the concrete underlayment materials manufacturer.

B. Concrete Underlayment Over Concrete Slab: Prime porous surfaces of 11% (minimum) absorption with manufacturer's recommended primer. Comply with underlayment concrete manufacturer's recommendations.

3.04 INSTALLATION

A. Mix materials by methods and in proportions recommended by manufacturer.

B. Maximum depth of concrete underlayment shall be 2 in. Minimum depth shall be 1/4 in. Add aggregates as recommended by manufacturer for underlayment depth over 1 in.

C. Install control joints following manufacturer's recommendations in locations indicated on the Drawings.

D. Allow underlayment to cure properly. Block off traffic and protect floor underlayment from physical damage during curing.

E. Test for dryness by taping 24 x 24 in. sections of plastic to concrete underlayment surface. After approximately 16 hours of curing, if no condensation occurs, the installation shall be considered dry and ready to receive finish flooring.

3.05 CLEAN-UP

A. Upon completion of the concrete underlayment, clean all stains, remove all masking, protections, equipment, material, and debris from the work and storage area, and leave those areas in an undamaged condition acceptable to Architect.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide unit masonry work, as indicated on Drawings and as specified herein. Include, but do not limit to:

1. Concrete masonry unit (CMU) work.
2. Masonry reinforcing, anchors, and ties.
3. Reinforced unit masonry work.
6. Installation of access doors furnished elsewhere.
7. All other unit masonry work shown on Drawings or reasonably required to make work of this Section complete in all respects.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 03300, CAST-IN-PLACE CONCRETE; Concrete slabs and fills.
2. Section 05500, METAL FABRICATIONS; Miscellaneous metal including furnishing of loose steel lintels to be built into masonry.
3. Section 07210, BUILDING INSULATION; Batt insulation.
4. Section 07600, FLASHING AND SHEET METAL; Through wall flashing.
5, Section 07900, JOINT SEALERS; Sealing of expansion and control joints.
6. Section 08110, STEEL DOORS AND FRAMES.
7. Section 08305, ACCESS DOORS; Furnishing of metal access panels.

1.04 SUBMITTALS

A. Samples: Submit representative samples for each material as follows. Delivered materials shall closely match approved samples.

1. Concrete Unit Masonry: Submit one full size unit of each type, size, and color.
2. Expansion and control joint material: Submit duplicate samples of material, minimum 6 in. length.
3. Mortar: Submit cured mortar samples of each mortar color selected.
4. Reinforcing Anchors and Ties: Submit samples of each type, size, thickness, and finish specified.

B. Product Data: Submit product data of materials and systems. Include manufacturer's installation instructions, use limitations, and recommendations for each material used.

C. Shop Drawings: Submit shop drawings showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315.

D. Samples for initial selection of the following:

1. Unit masonry samples in small scale form showing the full range of colors and textures available for each different exposed masonry unit required.
2. Colored-masonry mortar samples showing the full range of colors available.

E. Samples for verification of the following:

1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored-masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on the Project. Label samples to indicate type and amount of colorant used.
3. Weep holes/vents in color to match mortar color.
4. Accessories embedded in the masonry.

F. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
2. Each material and grade indicated for reinforcing bars.
3. Each type and size of joint reinforcement.
4. Each type and size of anchors, ties, and metal accessories.

G. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

1.05 QUALITY ASSURANCE

A. Source: For each type of material required by work of this section, provide primary materials which are products of a single manufacturer. Provide secondary materials which are acceptable to manufacturers of primary materials.

B. Codes: Comply with State of Maine Building Code and ACI 530.

C. Preconstruction Testing: Employ and pay a qualified independent testing agency to perform the following preconstruction testing to establish compliance of proposed materials and construction with specified requirements:

1. Concrete Masonry Unit Test: For each different concrete masonry unit indicated, test units for strength, absorption, and moisture content per ASTM C 140.

2. Prism Test: For each type of wall construction indicated, test masonry prisms per ASTM E 447, Method B.
3. Test mortar properties per test methods of ASTM C 270.

D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

E. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

F. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.06 TESTS

A. Testing and inspection of mortar and masonry materials will be conducted by testing laboratory selected and paid for as described under Section 01410, TESTING LABORATORY SERVICES.

B. No materials shall be used on work without prior test and written approval of Testing Laboratory. Materials shall be submitted to Testing Laboratory at least three weeks in advance of proposed first use in structure for subjection to basic acceptance tests and determination of basic mixtures.

C. At start of field operations, and periodically during course of work, Testing Laboratory will test materials and mortar and conduct on-job inspections of measuring, mixing, laying, and curing of mortar and masonry materials, including prism tests, in conformance with ASTM C 952 and ASTM E 447 (Method B), to ensure compliance with these specifications and originally approved samples. Number and frequency of tests shall be determined by Testing Laboratory and Architect. Recommendations of Testing Laboratory shall be strictly followed.

D. Prepare seven-day and 28-day prisms for each 5,000 sq. ft. of CMU wall area installed, and deliver to testing laboratory as directed.

1. Height:thickness ratio for CMU prisms shall be no less than 1.33:1 and no more than 3:1.

1.07 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 in. down both sides and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain splashed mud and mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, curtain wall systems, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:
   a. 40 to 32 deg F: Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F.
   b. 32 to 25 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry.
   c. 25 to 20 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F if grouting. Use heat on both sides of walls under construction.
   d. 20 deg F and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg. Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F within the enclosures.
2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
   a. 40 to 25 deg F: Cover masonry with a weather-resistant membrane for 48 hours after construction.
   b. 25 to 20 deg F: Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mph.
   c. 20 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after construction.
3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg. F, and above.

E. Loading: Do not apply loads until work has set and cured and is ready to accept loading.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered, stored, and handled fully protected from wetting, staining, chipping, and other damage. Store masonry materials on raised timber or platforms, above ground, under weathertight covers or indoors, and kept clean and dry.

B. Deliver and store cement, lime, and other perishable materials in their original containers, plainly marked with brand name and manufacturer's name, indoors or in weathertight sheds.

C. Protect metal accessories and reinforcement from elements. Immediately before placing, remove loose rust, dirt, and other foreign materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. CMU: Provide moisture-controlled, normal weight, load bearing units of Portland cement, water, sand, and gravel. Provide hollow and/or solid configurations as indicated, and conforming to ASTM C 90. Provide concrete masonry units with following characteristics:

1. Moisture Content: Not more than 35% of total absorption when tested in accordance with ASTM C 140. Maintain moisture content within this limit throughout storage and construction.
2. Residual Linear Shrinkage: Not more than 0.01% when dried to equilibrium of 50% relative humidity at 73°F ambient temperature.
3. Provide block exposed in finished work with uniform light gray color and uniform medium-fine texture. Manufacture units in a single run, uninterrupted except at ends of normal working days, to assure uniformity of color and texture. Moderate "manufacturing range" of variation in color and texture will be permitted, but such variations shall not exceed those shown on approved sample panels.
4. Face: Standard, smooth face, split face, as selected by the Architect.
5. Size: Provide units, 4 in. by 16 in. , 6 in. by 16 in., and 8 in. by 16 in. nominal face size, and of indicated nominal thicknesses.
6. Provide special shapes of each type of block, including "soaps", as required to complete work as indicated at no additional cost to Owner. Carefully review Drawings to determine scope and varieties of special block shapes required. Provide lip stretcher block 100% solid.
7. Concrete Masonry Units for Fire-Resistive Construction: Provide concrete block for construction of fire-rated masonry block construction as listed by Underwriters' Laboratories, Inc. of Minimum Equivalent Thickness(es) defined and required by governing code.
8. Faces of units exposed in finished work shall be handled and stored with extreme care to prevent chipping or marring. Chipped or otherwise damaged faces will not be permitted in exposed work.
9. Provide half-blocks, lintel blocks, beam "U" blocks, other special blocks, and required special cutting. Provide jamb blocks, end blocks, control joint blocks, and lintel blocks with exposed ends closed.
10. Split Face Units: Provide standard aggregate, split face units where indicated. Provide colors as selected by Architect from manufacturer's standard choices. More than one color will be used on the Project. Provide units from one of the following manufacturers:

a. A. Jandris & Sons, Inc.
b. Plasticrete.
c. Southeastern - Foster Brothers.
d. Architect approved equal.

2.02 PREFACED CONCRETE MASONRY UNITS

A. Prefaced Concrete Block: Provide lightweight concrete masonry units with manufacturer's standard resinous tile facing, conforming to ASTM C 744, and the following:

1. Hollow Load Bearing Units: ASTM C 90, Grade N, Type I.
2. Solid Load Bearing Units: ASTM C 145, Grade N, Type I.
3. Size: Provide units 5-3/8 in. nominal face size with coved base, and of indicated nominal thicknesses. Provide inside and outside corner blocks glazed on exposed sides.
4. Color: Provide color as selected by Architect from manufacturer's standard choices.
5. Shapes: Provide special shapes where indicated or as required including bullnose units, stretcher units, and inside and outside corner units.
6. Acceptable Manufacturers: Provide one of the following products, or approved equal that conforms to these specifications:
   a. Astra-Glaze; Trenwyth.
   b. Spectra-Glaze II; Spectra Industries, Inc.

2.04 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I, free from water soluble salts and alkalies. Provide cement which exhibits no efflorescence when tested in conformance with these specifications.

B. Lime: ASTM C 207, hydrated, Type S.

C. Grout Aggregate: Complying with ASTM C 404.

D. Mortar Aggregate: Complying with ASTM C 144, well graded.

E. Water: Clean, potable.

2.05 REINFORCING TIES AND ANCHORS

A. Horizontal Joint Reinforcing and Masonry to Masonry Ties: Provide truss type, welded wire units fabricated from 3/16 in. ASTM A 82 cold-drawn galvanized steel wire, deformed side rods and smooth cross wires spaced 16 in. o.c. maximum equal to HB Lox All Adjustable Eye-Wire, Truss Type #170 or Ladder Type #270, manufactured by Hohmann & Barnard, Inc., Hauppauge, NY 11788-0270; or approved equal. Provide prefabricated corners and tees. Provide one side rod for each concrete masonry shell face. Provide two-piece adjustable eye and pintel type units for concrete masonry composite wall construction. Provide width as recommended by manufacturer for wall which gives minimum of 5/8 in. cover on exterior walls.

B. Masonry to Structural Steel Anchors: Provide two-piece, hot-dip galvanized flexible anchors that permit horizontal and vertical movement and that provide secure lateral restraint.

C. Miscellaneous Ties: Provide hot dip galvanized steel straps, bars, rods, and similar items which are fabricated from minimum 16 gage steel sheet or 3/16 in. diameter steel wire.

D. Reinforcing Bars: ASTM A 615, Grade 60, deformed rebars.

E. Galvanizing: Provide hot-dip galvanized, ASTM A 153, Class B, 1.5 oz./ft.^{2} zinc coating on ties, joint reinforcing, anchors, and similar items which extend into exterior wall assemblies.

2.06 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.

B. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated.

2.07 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:

1. Neoprene.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Styrene-Butadiene Rubber Compound: ASTM D 2000, Designation M2AA-805.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type II (No. 15 asphalt felt).

D. Weep Holes: Provide the following:

1. Rectangular Plastic Tubing: Clear butyrate, 3/8 diameter, by 1-1/2 by 3-1/2 inches with cotton rope.

E. Cavity Drainage Material: 1 inch thick, reticulated, nonabsorbent mesh, made from polyethylene strands and shaped to maintain drainage at weep holes without being clogged by mortar droppings.

1. Product: Subject to compliance with requirements, provide "Mortar Net" by AA Wire Products Co.

F. Bituminous Dampproofing at CMU Cavity Walls: Provide bituminous dampproofing materials for application to masonry back-up that comply with requirements specified in Section 07160, BITUMINOUS DAMPPROOFING.

G. Through Wall Flashing: Provide through wall flashing materials for installation in masonry walls that comply with requirements specified in Section 07600, FLASHING AND SHEET METAL.

H. Rigid Insulation: Provide rigid, closed cell, extruded polystyrene foam boards, conforming to ASTM C 578, with following characteristics:

1. k-Value: 0.2 maximum when aged at 50% relative humidity and 73°F for 180 days.
2. Thickness: As indicated on Drawings.

I. Job-Mixed Detergent Solution: Solution of 1/2 cup dry measure tetrasodium polyphosphate and 1/2 cup dry measure laundry detergent dissolved in 1 gallon of water.

2.08 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:

1. Limit cementitious materials in mortar for exterior use to Portland cement and lime.
2. For nonload-bearing partitions, and for other applications where another type is not indicated, use Type S mortar with a minimum 28 day compressive strength (cubes or cylinders) of 1800 psi.

C. Grout for Unit Masonry: Comply with ASTM C 476, with a minimum 28 day compressive strength of 2500 psi. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.

1. Use fine grout in grout spaces less than 2 in. in horizontal dimension, unless otherwise indicated.
2. Use coarse grout in grout spaces 2 in. or more in least horizontal dimension, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.02 INSTALLATION, GENERAL

A. Thickness: Build walls to the actual thickness of the masonry units, using units of thickness indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.

C. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 fee, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in running bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

E. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

J. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:

1. Install compressible filler in joint between top of partition and underside of structure above.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

C. Cut joints flush for masonry walls that are to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.06 HORIZONTAL-JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12 inches beyond opening.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

D. Reinforced Unit Masonry: Reinforce work according to the Structural Drawings.

3.07 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.08 FLASHING AND WEEP HOLES

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashing as follows:

1. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Unless otherwise indicated, space weep holes 16 inches o.c.
2. Place cavity drainage material immediately above flashing in cavities.

E. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.09 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 24 inches for block size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 in. at each jamb, unless otherwise indicated.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05030

GALVANIZING AND METAL COATINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. This Section specifies hot-dip galvanizing and factory-applied coatings for structural steel and metal fabrications as specified and as follows:

1. All structural steel, except those members enclosed in fireproofing and members not exposed to view (enclosed in masonry, ceilings, walls, etc.) shall be hot-dip galvanized and color coated.
2. All hot-dip galvanized steel shall be factory color coated, <u>except</u> as indicated on the Drawings.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 01030, ALTERNATES.
2. Section 05120, STRUCTURAL STEEL.
3. Section 05210, STEEL JOISTS.
4. Section 05500, METAL FABRICATIONS.
5. Section 09900, PAINT.

1.04 SUBMITTALS

A. Samples: Submit two 3 inch by 6 inch samples of factory-applied coatings and colors proposed for use for approval prior to coating application.

1. Verification Sample: Provide verification sample to Architect for approval of surface texture prior to full fabrication and production. Direct fabricator to provide galvanizer with sample of actual material to receive hot-dip galvanizing and shop applied primer.

B. Certificate of Compliance from Galvanizer: Submit notarized Certificate of Compliance with application for payment for galvanizing, signed by galvanizer, indicating compliance with requirements of specifications. Include scope of services provided, and quantity and itemized description of items processed.

1. Include galvanizer's certification that shop applied primer is completely compatible with field-applied topcoats provided under Section 09900 - Painting.

C. Shop Drawing Certification: Submit galvanizer's certification that shop drawings have been reviewed as required by Par. 1.05B and that fabrications are acceptable to galvanizer for proper application of galvanizing and metal coatings.

D. Visual Stamp: The galvanizer shall mark all lots of material with a clearly visible stamp or tag indicating the name of the galvanizer, the weight of the coating, and the applicable ASTM Specification Numbers.

1.05 QUALITY ASSURANCE

A. Pre-Construction Conference for Metal Fabrications: Contractor shall schedule a meeting to be attended by Contractor, Architect, fabricator, product representative, and galvanizer. Agenda shall include the following: Project schedule, scope of services, coordination between fabricator and galvanizer, finish of surfaces, application of coatings, submittals, and approvals.

B. Coordination Between Fabricator and Galvanizer: Prior to fabrication and final submittal of shop drawings to Architect, direct fabricators to submit shop drawings to the galvanizer for all fabrications. Direct galvanizer to review fabricator's shop drawings for suitability of materials for galvanizing and coatings and coordinate any required modifications to fabrications required to be done by the fabricator.

C. Fabricator: Engage the services of a galvanizer who has demonstrated a minimum of five (5) years experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coating within the same facility as outlined herein.

PART 2 - PRODUCTS

2.01 ACCEPTABLE SYSTEMS

A. Basis-of-Design: For the purpose of establishing a standard of quality and performance, the Deltagalv®, Primergalv® and Colorgalv® systems as provided by Duncan Galvanizing of Everett, MA are referenced.

2.02 HOT-DIP GALVANIZING

A. For steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain high grade zinc and other earthly materials.

1. Deltagalv® by Duncan Galvanizing.
2. TNEMEC.
3. Or Equal.

2.03 FACTORY-APPLIED PRIMER OVER HOT-DIP GALVANIZING

A. For steel indicated to be galvanized and shop primed for field topcoating, provide factory-applied polyamide epoxy primer, 2.0 to 4.0 mils dry film thickness, certified VOC compliant <2.9 lbs/gal. and conform to all environmental and EPA standards and requirements. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting

applicable environmental regulations and as recommended by the coatings manufacturer.

1. Primergalv® by Duncan Galvanizing.
2. TNEMEC, Series 27.
3. Or Equal.

2.04 FACTORY-APPLIED ARCHITECTURAL FINISH OVER HOT-DIP GALVANIZING AND PRIMER

A. For steel indicated to be galvanized, shop primed and topcoated, provide factory-applied architectural coating over primed galvanized steel as previously referenced. Apply coating at the galvanizer's plant, in a controlled environment meeting applicable environmental regulations. Apply the galvanizing and coating within the same facility as outlined herein and provide single-source responsibility for galvanizing, priming and finish coating.

1. Colorgalv® by Duncan Galvanizing.
2. TNEMEC.
3. Or Equal.

2.05 TOUCH UP REPAIR PAINT

A. Galvanizing repair paint shall have 95 percent zinc by weight.

1. ZiRP by Duncan Galvanizing.
2. TNEMEC
3. Or Equal.

PART 3 - EXECUTION

3.01 APPLICATION OF GALVANIZING AND METAL COATINGS

A. Galvanizing Application: Galvanize materials in accordance with specified standards and this specification. Galvanizing shall provide an acceptable substrate for applied coatings. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material.

B. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material. Prior to galvanizing, the steel shall be immersed in a pre flux solution (zinc ammonium chloride). The pre flux tank must be 12° to 14° Baumé and contain less than 0.4% iron. The wet kettle process shall be prohibited.

C. To provide the galvanized surface required, the following procedures shall be implemented:

1. A monitoring recorder shall be utilized and inspected regularly to observe any variances in the galvanizing bath temperature.
2. The pickling tanks shall contain hydrochloric acid with a constant range between 10 - 14%, iron content less than 8% and zinc content less than 3%. Titrations shall be taken weekly at a minimum.
3. Rinse tanks, for the removal of cleaning chemicals, shall contain water.
4. Water quenching of galvanized steel shall be prohibited.

D. Apply primer over hot-dip galvanizing within 12 hours after galvanizing in the galvanizer's facility in accordance with specified requirements and recommendations of galvanizer.

E. The primer and topcoat shall be applied under the following conditions:

1. Minimum air temperature shall be 65° F. Surface temperature of steel shall be 60° - 95° F and, in any event, be 5° F higher than the dew point. Humidity shall be 85% maximum.
2. Surface of steel shall be dry and free from dust, dirt, oil, grease or other contaminants. Coating and cure facility shall be maintained free of airborne dust and dirt until coatings are completely cured.
3. The primer shall be applied by way of airless spray over a consistent surface profile, 1.5 mil minimum. The profile shall be measured and permanently recorded with Test-Tex tape.
4. The use of iron or steel shot and sand and aluminum oxide grit as a blast medium, and power wire brushes are not permitted.

F. Installation: Comply with fabricator's and galvanizer's requirements for installation of materials and fabrications, including use of nylon slings or padded cables for handling factory-primed materials. Product representative must be part of construction kick-off meeting and first installation.

G. Touch-Up and Repair: For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas.

1. At galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A 780. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A 123 or A 153 as applicable. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, brite paint, or aluminum paints is not acceptable.
2. At factory-primed or factory-finished surfaces, touch-up finish in conformance with manufacturer's recommendations. Provide touch-up such that repair is not visible from a distance of 6 feet.
3. The galvanizer/galvanizing facility must have an ongoing touch-up and repair program acceptable to the Architect which has been in effect for a minimum of five years.
4. A touch up repair kit shall be provided to the Owner.
5. Touch-up application and surface preparation procedures shall be obtained through the manufacturer of the coating systems and the galvanizer/applicator. A mock-up showing the touch-up procedures shall be submitted to and approved by the Owner prior to the commencement of any touchup work.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.

1.03 RELATED WORK

1. Section 05200 – Open Web Steel Joists
2. Section 05300 – Metal Deck
3. Section 05500 - Metal Fabrications
4. Section 05030 – Galvanizing and Metal Coatings
5. Section 09900 - Painting

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges-March 7, 2000".

    a. The provisions of Section 10, "Architecturally Exposed Structural Steel", apply to all steel members for this project unless noted otherwise. In addition, exposed welds shall be ground to provide smooth surface.

    b. Exclude the word "structural" in reference to the "Design Drawings" in section 3.1 of the Code.

2. AISC "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design", June 1, 1989 including "Commentary" and Supplements issued thereto.

3. AISC "*Specifications for Structural Joints using ASTM A 325 or A 490 Bolts*" approved by the Research Council on Structural Connections of the Engineering Foundation.

4. AISC "*Seismic Provisions for Steel Buildings*".

5. AWS D1.1 - 2004 "Structural Welding Code" - Steel.

6. AWS D1.3 - 2004 "Structural Welding Code" - Sheet Steel.

7. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

8. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."

    1. Provide certification that welders to be employed in work have satisfactorily passed AWS D1.1 qualification tests and maintained a current certification. Current certification and/or continuity log shall be submitted and be available in the field.

    2. If re-certification of welders is required, retesting will be the Contractor's responsibility.

C. Fabricator Qualifications: Fabricator must be a member of the American Institute of Steel Construction (AISC), be certified for SBD – Conventional Steel

Building Structures, STD – Standard for Steel Building Structures. Fabricator shall be certified at time of bidding and for duration of project.

C. Paint Endorsement: Fabricator or party to apply paint to Structural Steel shall have the following AISC Paint Endorsement: P3 – Sophisticated Paint Endorsement – Outside

1.05 SUBMITTALS

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. INCOMPLETE SUBMITTALS WILL NOT BE REVIEWED.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel certified mill reports for each grade of steel covering chemical and physical properties and yield strengths.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint (where applicable).

4. Structural steel top coat paint (where applicable). (Refer to Section 09900.)

5. AWS D1.1 Welder certifications.

6. Expansion/Adhesive Anchors (coordinate with section 03300).

H. Fabricator's Quality Control Procedures: Fabricator shall submit their written procedural and quality control manuals, and evidence of periodic auditing of fabrication practices by an approved inspection Agency.

I. Fabricator's Certificate of Compliance: At completion of fabrication, fabricator shall submit a certificate of compliance stating that the work was performed in accordance with the construction documents.

J. Shop Drawings:

1. Shop Drawing Review: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of the Construction Documents, in part or in full, is strictly prohibited.

   a. Review of the shop drawings will be made for the size and arrangement of the members and strength of the connections. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility. Submit one print and one reproducible. Print will be reviewed and a reproducible will be returned to Contractor for printing and distribution. Multiple copies will not be marked by Engineer.

   b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings indicating all members, braced frames, moment frames and connections. <u>Incomplete submittals will not be reviewed.</u>

2. Connection Design: Connections for all beam, column, braced frame, and moment connections not tabulated in the AISC "Manual of Steel Construction" (ASD or LRFD) have been designed and detailed in the drawings. Alternate connection design shall be allowed only with prior approval of the Structural Engineer. If such approval is granted, all redesigned connections shall be designed by the fabricator's engineer, registered in the State of Maine. Calculations for redesigned connections shall signed and sealed.

3. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Steel materials shall be stored in a manner to avoid ponding of precipitation on members. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Structural Steel Shapes, Plates and Bars (U.N.O): ASTM A 36 minimum, higher strength steel is acceptable.

B. Structural Steel Hot Rolled Wide Flange Shapes: ASTM A 992 Grade 50 (ASTM A572 Grade 50 with special requirements per AISC Technical Bulletin #3, dated March 1997)

C. Steel Tube: ASTM A 500, Grade B, Fy = 46 ksi.

D. Steel Pipe: ASTM A 53, Grade B.

E. Anchor Bolts: ASTM F1554, Grade 36 weldable steel, unless noted otherwise on drawings. Anchor rods that are to be exposed to weather, located in unheated enclosures, or in contact with pressure treated lumber shall be hot dipped galvanized. <u>All anchor bolts shall be headed or double nutted. "J" or "L" type anchor bolts are not permitted.</u>

F. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.

G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325 or ASTM A490. Refer to drawings for diameter.

2. Direct tension indicator washers or bolts may be used at Contractor's option.

3. Provide hot-dipped galvanized fasteners. At locations where structural steel is painted field paint per section 09900 after installation and tensioning.

H. Steel Shear Studs: Headed type manufactured from steel conforming to ASTM A108 Grade C1015 by KSM or Nelson. Refer to Drawings for diameter and length.

I. Electrodes for Welding: E70XX and comply with AWS Codes with proper rod to produce optimum weld joint considering material, weld position and size of joint. All filler metal used for complete penetration groove welds shall have a minimum Charpy V Notch value of 20 ft-lbs. at 40 degrees F for enclosed and heated structures and 20 ft-lbs. at 0 degrees F for all other structures. Electrodes shall be compatible with steel of both connected elements.

J. Structural Steel Coatings shall be as specified in Sectio 05030.

K. Steel Coatings for Exterior Exposed Steel: See Section 05030.

L. Non Shrink Cement-Based Grout: See Section 03300.

M. Drilled Anchors: Expansion and adhesive by HILTI, SIMPSON or POWERS/RAWL as indicated on the drawings.

2.02 FABRICATION:

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.

B. Connections: Weld or bolt shop connections, as indicated.

1. Provide field bolted connections, except where welded connections or other connections are indicated.

2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.

C. High-Strength Bolted Connection: Install high-strength threaded fasteners in accordance with AISC "Specification for Structural Joints using ASTM A 325 or A 490 Bolts". Unless otherwise indicated, all bolted connections are to be tightened to the snug tight condition as defined by AISC.

D. Welded Construction: Comply with AWS Codes for procedures, appearance and quality of welds, and methods used in correcting welding work.

E. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

F. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

G. Camber, if any, is indicated on the drawings. Camber indicated is the required camber at time of erection. Contractor shall survey camber prior to placing metal deck.

2.03 STRUCTURAL STEEL COATINGS

A. Coordinate coating requirements with the Architect, and with Section 05030 of the specifications.

B. To the greatest extent possible, structural steel coatings shall be shop applied.

C. Galvanizing, priming and painting for structural steel permanently exposed to view shall meet the requirements of Section 10 of the Code of Standard Practice, "Architecturally Exposed Structural Steel".

D. Provide venting/drainage holes in sealed tubular members to be hot-dipped galvanized. Holes shall be provided in a location hidden from view in the final condition and in a manner that will not reduce the strength of the member. Hole locations shall be clearly indicated on the Shop Drawings and are subject to review by the Architect.

E. Follow manufacturer's installation and safety instructions when applying coatings. Adhere to recoat time recommendations set forth by manufacturer.

PART 3 EXECUTION

3.01 ERECTION:

A. General: Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

B. Erection Procedures: Comply with "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

C. Surveys: Employ a Registered Land Surveyor elevations of concrete bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect and Structural Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been approved by Structural Engineer of Record. Additional surveys required to verify out-of-alignment work and/or corrective work shall be performed at the contractor's expense.

D. Temporary Shoring and Bracing: This is the sole responsibility of the Contractor. Provide temporary shoring and bracing members with connections of sufficient strength to support imposed loads. Remove temporary members and connections when all permanent members are in place, and all final connections are made, including the floor and roof diaphragms. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Comply with OSHA Standard referenced previous. Retain the services of a Specialty Structural Engineer (Not the Engineer of Record) to design specialty shoring and bracing.

E. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

1. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

2. Welding to anchor bolts for corrective measures is strictly prohibited without prior written approval from the Engineer.

F. Setting Plates and Base Plates:

1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations. Refer to division 3 of the project Specifications for anchor bolt installation requirements in concrete.

2. Clean concrete bearing surfaces of bond-reducing materials. Clean bottom surface of setting and bearing plates.

3. Set loose and attached base plates for structural members on wedges or other adjusting devices.

4. Pack non-shrink grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

G. Concrete slabs that are part of elevated floors framing systems shall achieve 28-day design strength prior to the application of any superimposed loads such as curtain walls, masonry veneer, mechanical equipment and stairs. Additional testing beyond that specified in division 3 required to verify the concrete strength prior to application of superimposed loads shall be done at the Contractor's expense.

H. When installing expansion bolts or adhesive anchors, the contractor shall take measures to avoid drilling or cutting any existing reinforcement or damaging adjacent concrete. Holes shall be blown clean with compressed air and/or cleaned per manufacturer's recommendations prior to the installation of anchors.

I. Field Assembly:

1. Set structural frames accurately to lines and elevations indicated.

2. Align, adjust, level and plumb members of complete frame in to the tolerances indicated in the AISC Code of Standard Practice and in accordance with OSHA regulations.

3. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

4. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

5. Splice members only where indicated and accepted on shop drawings.

6. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

7. Composite shear studs shall be installed using stud welding process with an appropriately sized insulating ferrule. Fillet welding of shear studs is not permitted. Ferrules shall be removed and discarded prior to concrete placement.

J. Coat columns, base plates, and brace elements encased in concrete and/or below grade with coal tar epoxy. Coordinate coating with concrete work and Section 05030.

K. Erection bolts: Remove erection bolts. On exposed welded construction fill holes with plug welds and grind smooth at exposed surface.

L. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as accepted by the Engineer of Record. Finish gas-cut sections equal to a sheared appearance when permitted.

M. Coating Damage: Touch up shop applied paint or galvanizing whenever damaged or bare. See Division 9 sections for additional requirements.

N. Welders shall have current evidence of passing and maintaining the AWS D1.1 Qualifications test available in the field.

O. Welding electrodes, welding process, minimum preheat and interpass temperatures shall be in accordance with AISC and AWS specifications. Any structural steel damaged in welding shall be replaced.

P. Field Welded Moment Connections: Backing materials for top and bottom flanges for field welded moment connections shall be removed, backgouge the weld root, and apply a reinforcing fillet weld. Where top flange steel backing materials are utilized, the backing may be left in place and shall be welded with a continuous fillet.

3.02 QUALITY CONTROL:

A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.

1. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.

B. Testing: Owner shall engage an Independent Testing Agency to inspect all high-strength bolted and welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.

1. Testing agency shall conduct tests and state in each report which specific connections were examined or tested, whether the connections comply with requirements, and specifically state any deviations therefrom.

2. Contractor shall provide access for testing agency to places where structural steel work is being fabricated, produced or erected so that required inspection and testing can be accomplished. Testing agency may inspect structural steel at plant before shipment. The Engineer, however, reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

C. Inspection Requirements (to be performed by the Independent Testing Agency):

1. Bolted Connections: Inspect all bolted connections in accordance with procedures outlined in the AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts.

2. Snug Tight Bolted Connections:

a. The inspector shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.

b. If the inspector does not monitor the installation of bolts, he shall visually inspect the connection to determine that all plies of connected material have been drawn together and conduct tests on a sampling connection bolts to determine if they have been tightened to the snug tight condition. The test sample shall consist of 10% of the bolts in the connection, but not less than two bolts, selected at random. If more than 10% of the tested bolts fail the initial inspection, the engineer reserves the right to increase the number of bolts tested.

3. Slip Critical Bolted Connections:

a. The inspector shall monitor the calibration of torquing equipment and the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.

b. If the inspector does not monitor the calibration or installation procedures, he shall test all bolts in the affected connection using a manual torque wrench to assure that the required pretension has been reached.

4. Field Welded Connections: inspect and test during fabrication of structural steel assemblies, and during erection of structural steel all welded connections in accordance with procedures outline in AWS D1.1. Record types and location of defects found in work. Record work required and performed to correct deficiencies.

a. Certify welders and conduct inspections and tests as required. Submit welder certifications to Engineer of Record. Perform visual inspection of <u>all welds</u>. Primary and secondary welds, including fillet welds, full penetration welds, and deck puddle welds, applied in the field and/or shop, shall be visually inspected.

b. Welds deemed questionable by visual inspection shall receive non-destructive testing. In addition, all partial and full penetration welds, and any other welds indicated on the drawings are to receive non-destructive testing. Non-destructive testing methods include the following:

1. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".

2. Ultrasonic Inspection: ASTM E 164.

c. All welds deemed unacceptable shall be repaired and retested at the Contractor's expense.

D. Composite Shear Studs/Deformed Bar Anchors:

1. Verify shear stud quanity and arrangement.

2. Visually inspect stud weld. A weld less than 360 degrees is cause for further testing by bending to 15 degrees per item 2 below. Strike all studs with a 3 pound sledge hammer with moderates force. Studs shall make a

ringing sound when struck with the hammer. If a stud or studs breaks free, or fails to make a ringing sound, further testing shall be performed per item 3.

3. One stud in 100 shall be tested by bending to 15 degrees from vertical, and one stud in 200 shall be tested by bending to 30 degrees from vertical. Single bent studs may be left bent. Failure of stud weld during bend testing is cause for further testing per item 3.

4. When failure occurs during bend testing, additional bend testing shall be performed on 10 studs to either side of failed stud. Bend studs to 30 degrees from vertical. If failure occurs during additional testing, continue testing in series of 10 studs beyond failed stud until no failure occurs.

5. Straighten all studs that were bent in multiple stud testing. Replace all studs that fail.

6. Inspector shall verify that all ferrules are removed and that composite metal deck is free of debris prior to concrete placement.

E. Testing and inspection reports shall be submitted to the Owner, Architect and Engineer within 48 hours of completion of each test or inspection.

F. Nonconforming Work: Contractor shall be responsible for correcting deficiencies in structural steel work which inspections laboratory test reports have indicated to be not in compliance with requirements. Additional tests and/or surveys shall be performed, at the Contractor's expense, as may be necessary to show compliance of corrected work. Any costs associated with the Engineer's review and disposition of faulty works shall be borne by the Contractor.

END OF SECTION

SECTION 05300

METAL DECKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. Extent of metal floor and roof deck is shown on the drawings and includes all floor deck, roof deck, cell closures, end plates, pour stops with vertical leg return lip, metal lath column closures, composite finish strips, welding washers and sump plates or pans.

1.03 RELATED WORK

1. Section 05120 - Structural Steel
2. Section 05500 - Metal Fabrications
3. Section 05030 – Galvanizing and Metal Coatings

1.04 QUALITY STANDARDS

A. Codes and Standards: Comply with provisions of the following codes and standards, except where more stringent requirements are indicated or specified:

1. AISI "Specification for the Design of Cold Formed Steel Structural Members".

2. AWS D1.1 "Structural Welding Code" - Steel

3. AWS D1.3 "Structural Welding Code" - Sheet Steel

4. Steel Deck Institute (SDI) " Design Manual for Floor Decks and Roof Decks".

5. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Qualification of field welding: Qualify welding process and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."

1.05 SUBMITTALS

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these specifications.

H. Shop Drawings:

1. Shop Drawing Review: Electronic files of structural drawings **will not** be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings and/or Erection Drawings is prohibited. Shop drawings and/or Erection drawings created from reproduced Construction Documents will be returned without review.

   a. Submit detailed drawings showing layout and types of deck panels, galvanizing, shop paint, anchorage details, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing, and all other accessories. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility. Submit one print and one reproducible. Print will be reviewed and a reproducible will be returned to Contractor for printing and distribution. Multiple copies will not be marked by Engineer.

   b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings. Incomplete submittals will not be reviewed.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Store materials to permit easy access for inspection and identification. Keep deck sheets off ground, using pallets, platforms, or other supports. Protect deck sheets and packaged materials from corrosion and deterioration.

C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Materials shall be stored in a manner to avoid ponding of precipitation on members. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.01 GENERAL:

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. United Steel Deck
2. Wheeling Corrugating Co.
3. Epic Metals Corporation
4. Vulcraft

B. Materials:

1. Steel for Metal Deck Units:

a. Roof Deck Units: ASTM A611, Grade C, D, or E, or ASTM 653-94, Structural Quality, grade 33 or higher.

2. Miscellaneous Steel Shapes: ASTM A36 minimum.
3. Sheet metal Accessories: ASTM A526, commercial quality, galvanized.

C. Galvanizing: Reference Section 05030– Galvanizing and Metal Coatings.

D. Paint: Reference Section 05030– Galvanizing and Metal Coatings.

E. Flexible closure Strips: Manufacturer standard vulcanized, closed-cell, synthetic rubber.

2.02 FABRICATION:

A. General: Form deck units in lengths to span 3 or more supports, unless otherwise noted on the drawings, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated. For roof deck units, provide deck configurations complying with SDI "Roof Deck Specifications," of metal thickness, depth and width as shown.

B. Metal Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6" wide.

C. Metal Closure Strips: Fabricate metal closure strips, cell closures, "Z" closures, column closures, pour stops, girder fillers and openings between decking and other construction, of not less than 0.045" min. (18 gage) sheet steel or as indicated on the drawings. Form to provide tight fitting closures at open ends of cells or flutes and sides of decking.

D. Pour Stops: Minimum material thickness shall be 20 gage. Fabricate vertical leg to accommodate specified slab thickness. Fabricate horizontal leg to minimize field cuts. Provide welded attachment sufficient to resist forces during concrete placement.

E. Roof Sump Pans: Fabricate from a single piece of 0.071" min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to the drains, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1 1/2" below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

F. Provide all pour stops and accessories necessary to contain concrete for poured concrete surfaces.

PART 3 EXECUTION

3.01 INSTALLATION:

A. Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.

B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before permanently fastened. Deck shall be in full contact with members parallel to ribs and attached as indicated. Do not stretch or contact side lap interlocks.

C. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

D. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.

E. Coordinate and cooperate with the structural steel erector in locating decking bundles to prevent overloading of structural members.

F. Do not use decking units for storage or working platforms until permanently installed.

3.02 FASTENING:

A. Floor Deck: Fasten metal deck to supporting steel members as indicated on the Design Drawings: Each deck is to be fastened with a minimum of 5/8" diameter puddle welds spaced not more than 12" o.c. with a minimum of 2 welds per unit at each support. Secure deck units at 6" oc along brace lines, edge of building or at the edge of openings or deck discontinuity. Secure deck to each supporting member in ribs where sidelaps occur. Use welding washers where recommended by the deck manufacturer. Deck units shall bear over the ends of supports by a minimum of 1.5. Sidelaps: #10 Tek screws, 5/8" arc puddle welds or 1" long fillet welds, intervals not exceeding 36 inches. Crimped or button punched sidelaps are not permitted.

B. Roof Deck: Each deck is to be fastened with a minimum of 5/8" diameter puddle welds spaced in a 24/4 pattern (3N deck) or 36/7 pattern (1.5B deck) with a minimum of 2 welds per unit at each support if incomplete sheet is utilized. Where deck runs parallel to support, at edge of building, at brace lines, at edge of opening or deck discontinuity provide puddle welds at 6" o.c. Secure deck to each supporting member in ribs where sidelaps occur. Deck units shall bear over the ends of supports by a minimum of 1.5". Sidelaps: #10 Tek screws, 6 per span.

C. Welding: Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

D. Uplift loading: Floor deck units are not required to resist uplift loads. Decking units used at the roof level shall be designed for a net uplift of 15 psf.

E. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.

F. Reinforcement at openings: Provide additional metal reinforcement and closures pieces as required for strength, continuity of decking and support of other work shown.

1. Deck penetrations affecting no more than (1) deck rib need not be reinforced.

2. For deck penetration affecting more than (1) deck rib, but less than 10", reinforce the opening with a 0.057" thick plate spanning between unaffected ribs, unless otherwise shown on the Design Drawings or supporting a piece of mechanical equipment (see item 3).

3. Reinforce deck penetrations larger than 10" with the structural frame described in the Design Drawings.

G. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units.

H. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12" on center with at least 1 weld in each corner. Cut opening in roof sump bottom to accommodate drain size indicated.

I. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

J. Touch-Up Painting:

1. Painted Deck: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

a. Touch up painted surfaces as per Section 05030.

b. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces as per Section 05030.

3.03 QUALITY CONTROL:

A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.

B. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.

C. Testing: Owner shall engage an Independent Testing Agency to inspect all puddle welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.

D. Deck Testing Requirements (to be performed by the Independent Testing Agency):

1. Deck and accessory welding and/or attachments subject to inspection and testing. Work found to be defective will be removed and replaced at the Contractor's expense.

2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, re-testing will be the Contractor's responsibility.

END OF SECTION

SECTION 05410

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Furnish and install light gauge steel framing, as indicated on the Drawings and as specified herein.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01410, TESTING LABORATORY SERVICES; Inspection and testing.
2. Section 05120, STRUCTURAL STEEL; Structural steel framing.
3. Section 05500, METAL FABRICATIONS; Miscellaneous metal.
4. Section 07410, METAL WALL PANELS.

1.04 SUBMITTALS

A. Shop Drawings and Design Computations:

1. Engage the services of a Professional Engineer registered in the State of Maine to prepare complete shop drawings and structural design computations for work of this Section. Drawings shall bear the engineer's professional seal and signature.

   Note: Manufacturer's shop drawings stamped by the engineer are acceptable instead of those actually prepared by the engineer.

2. The shop drawings shall show all pertinent details of construction, installation, and anchorage of the light gauge steel framing work. Show sizes, gages, types and spacings.
3. The structural design computations shall provide a complete structural analysis of all typical and special conditions of construction, and shall certify conformance to the governing laws and building code.

B. Samples: Submit representative samples of all light gauge steel framing components to Architect for approval.

C. Product Data: Submit manufacturer's product data for all components to be used in the construction and anchoring of the light gauge steel framing. Include specifications, installation instructions, and data substantiating that the materials comply with specified requirements.

D. Do not order materials or begin fabrication or installation until Architect approves submittals.

E. Mock-Ups: Prior to commencing the primary work of this Section, provide materials as required for mock-ups at locations acceptable to Architect. Obtain Architect's acceptance of visual qualities. Protect and maintain accepted mock-ups throughout the remainder of the work of this section to serve as criteria for acceptance of the work.

1.05 QUALITY ASSURANCE

A. All work shall comply with the governing laws and building code and applicable provisions of the following standards:

1. AISC Specification.
2. AISC Code.
3. AWS D1.3.
4. AISI Specifications.
5. SSPC Manual.

B. Materials and workmanship shall be subject to inspection and testing in mill, shop, and/or field by the Architect or a designated independent testing laboratory, selected and paid by the Owner in accordance with the requirements of Section 01410, TESTING LABORATORY SERVICES.

1.06 QUALIFICATIONS OF SUBCONTRACTOR

A. The light gauge steel framing subcontractor shall have at least three years experience in the fabrication and erection of light gauge steel framing systems of scope and design similar to the required work.

1.07 DESIGN

A. The information shown on the Drawings is intended to establish the sizes of framing members, their points of attachment, the materials to which they are to be attached, and materials which are to be attached to them. Within these limitations it is the responsibility of the Subcontractor to design the framing to withstand the applied loading required by Maine State Building Code except where more stricter requirements are specified herein. The maximum allowable deflection of the steel stud backup system under full lateral load shall be L/360. Structural properties of members shall be computed in accordance with AISI Specifications. No composite action is to be considered between the studs and any collateral wall material.

1.08 STORAGE AND HANDLING

A. Protect metal framing units from weather and damage. Deliver to the fabrication site in manufacturer's unopened containers or bundles, fully identified with name, brand, type, and grade. Store off the ground in a dry ventilated space or protect with suitable waterproof coverings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Provide products by one of the following:

1. Marino Ware Industries.
2. Inryco Architectural Products.
3. United States Gypsum Company.
4. Dietrich Industries, Inc.

2.02 FRAMING COMPONENTS

A. Studs shall be 16 gauge or heavier punched C-studs of sizes indicated on the Drawings, unless larger sizes are required to meet structural performance requirements specified. Studs shall be manufactured from steel meeting the requirements of ASTM A 446, Grade D with a minimum yield strength of 50,000 psi. Studs shall be hot dip galvanized in accordance with ASTM A 525, G 60 Coating Designation. Maximum spacing of studs at exterior wall shall be 16 in. o.c.

B. Tracks shall be 18 gauge or heavier unpunched tracks manufactured of commercial quality steel sheet meeting the requirements of ASTM A 446 with a minimum yield strength of 50,000 psi. Tracks shall be hot dip galvanized in accordance with ASTM A 525, G 60 Coating Designation. Provide special shaped tracks with one 4 in. high leg where indicated on Drawings.

C. Bridging shall be manufacturer's recommended type as required to meet the design criteria set forth in Paragraph 1.08 of this Section.

D. Attachment angles, closure angles, and other miscellaneous components shall be manufactured of commercial quality steel sheet meeting the requirements of ASTM A 446 with a minimum yield strength of 50,000 psi and shall be formed to profiles as required. All components shall be hot dip galvanized in accordance with ASTM A 525, G 60 Coating Designation.

2.02 FASTENERS

A. Framing components shall be fastened to each other by screws. Provide corrosion-resistant coated, self-drilling, self-threading steel drill screws, with low-profile head beneath sheathing.

B. Fastening to structural steel shall be done with powder activated fasteners, self-drilling screws, or bolts of size and spacing as required to resist the shear and pullout forces generated by the loads listed in Paragraph 1.08 of this Section.

2.03 ZINC RICH PAINT

A. Zinc rich paint for touch up repair of galvanized coatings damaged during handling and erection shall conform to ASTM A 780 for zinc-rich primer. Paint shall be equal to one of the following:

Product	Manufacturer
ZRC Cold Galvanize Compound	ZRC
ZIRP	Duncan Industries

PART 3 EXECUTION

3.01 FABRICATION

A. Light gauge steel framing shall be field assembled.

B. Prior to commencement of fabrication, subcontractor shall submit fabrication and erection drawings for Architect's approval as specified under Paragraph 1.04 of this Section.

C. Subcontractor shall coordinate stud locations with the following:

1. Mechanical trades.
2. Gypsum sheathing subcontractor to insure proper interface between light gauge steel framing and gypsum sheathing and to insure proper support .
3. Exterior metal panel subcontractor to insure proper interface between light gauge steel framing and exterior metal panels to insure proper support .

D. Metal framing shall be fabricated in accordance with manufacturer's printed or written instructions, unless otherwise indicated.

E. Framing components shall be straight and true prior to fabrication. Flattening or straightening of components shall be done by a process not injurious to materials.

F. Framing components shall be cut squarely (or on an angle as with bracing) to fit squarely against abutting members.

G. No splices will be allowed in studs. Stud tracks shall be continuous, with splices butt joined and fastened.

H. Provide lateral bracing and bridging to manufacturer's specifications and recommendations as required by design loads specified in Paragraph 1.08 of this Section.

I. Provide all angles, clips, and other miscellaneous pieces necessary to attach light gauge framing panels to building structure or to attach other materials to light gauge framing panels.

J. Cut all openings in light gauge framing required for ducts, grilles, pipes, etc.

K. Components shall be set square and in line and shall be held firmly in position until properly fastened.

L. Panel components shall be joined by fasteners.

M. Finished assemblies shall be free from twists, bends, or open joints with all members straight, square, and true to line.

3.02 ERECTION

A. Light gauge steel framing shall be erected by approved methods using equipment of adequate capacity to safely perform the work.

B. Any damage to other building materials caused by erection of light gauge steel framing shall be repaired or replaced as directed by Architect at this Subcontractor's expense.

C. Subcontractor shall be responsible for checking dimensions and assuring fit of all members and panels before erection begins.

D. Work shall be erected plumb, level, and to dimensions and elevations indicated.

E. Do not install any member or panel which is bent or racked. Such panels shall be replaced.

F. During erection, install steel cables with turnbuckles in sufficient number to prevent distortion and damage to framing due to wind or erection forces until erection is complete. These cables may be used to plumb and line the work.

G. Bottom tracks which bear on concrete shall be set in a heavy trowel coat of mastic.

H. Tracks providing anchorage for studs shall be anchored to steel or concrete as required by design loads but not over 2 ft.- 0 in. No piece of track shall have less than two anchors.

I. Where panels are attached to steel with a continuous attachment angle, the attachment angle shall be fastened to each stud and shall be fastened to structural steel support as required by design loads, but not less than 2 ft.- 0 in. o.c.

J. Provide build-up of studs at corners as required for sheathing attachment.

K. Provide nested studs and tracks at openings, as indicated on Drawings.

L. Provide supplementary framing, blocking, and bracing as required where walls are indicated to support fixtures, equipment, and accessories.

3.03 FIELD TOUCH UP

A. Touch up all abrasions of galvanized materials with zinc rich paint in accordance with ASTM A 780, Annex A2.

B. Touch up work shall be complete prior to attachment of the work of any other sections to the light gauge steel framing.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. The work of this Section includes, but is not limited to the following:

1. Loose steel lintels.
2. Miscellaneous bearing and leveling plates.
3. Elevator subsill angles and guide rail brackets.
4. Concrete filled metal pan stair systems.
5. Steel handrails, railings and guardrails, including perforated railing infill panels.
6. Steel pipe bollards.
7. Pipe guards.
8. Ladders, including elevator pit ladder.
9. Miscellaneous framing and supports for the following:
   a. Penetration framing.
   b. Stainless steel canopy
10. Steel crash guards.
11. Canopy.
12. Rough hardware.
13. Metal column covers.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 01420, MOCK-UPS; Requirements for constructing mock-up.
2. Section 03300, CAST-IN-PLACE CONCRETE; Placing of inserts and anchors.
3. Section 03410, PLANT PRECAST STRUCTURAL CONRETE.
4. Section 04200, UNIT MASONRY; Placing of angles, lintels, inserts and anchors.
5. Section 05030, GALVANIZING AND METAL COATINGS.
6. Section 05800, EXPANSION CONTROL.
7. Section 06100, ROUGH CARPENTRY; Rough hardware for rough carpentry work.
8. Section 09900, PAINTING; Field painting.
9. Section 10220, METAL GRILL PANELS AND PRIVACY SCREENS.
9. Division 15, MECHANICAL and Division 16, ELECTRICAL; hangers, brackets, troughs, guards, and other steel items for support or protection of Mechanical and Electrical work.

1.04 SUBMITTALS

A. Shop Drawings: Submit shop drawings of work showing size and thickness of each member, type of material, method of connection and assembly. Show dimensions, clearances, anchorages, relationships to surrounding work, coatings, and other pertinent details of fabrication and installation.

1. Show profiles, reinforcing, fasteners, and any accessories.
2. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

B. Product Data: Provide manufacturer's product data, installation instructions, use limitations, and recommendations for each material used. Provide certifications that materials comply with requirements.

C. Calculations: Where installed metal fabrication work is indicated to comply with certain design loadings, provide professionally prepared calculations, material properties, certification, and other information required for structural analysis of performance of work.

D. Welders Certification: Provide certifications, signed by Contractor, certifying that welders employed at project comply with requirements specified under AWS D1.1 and AWS D1.2.

E. Mock-Ups: Prior to commencing the primary work of this Section, provide materials as required for mock-ups at locations acceptable to Architect. Comply with requirements specified under Section 01420, MOCK-UPS. Obtain Architect's acceptance of visual qualities. Protect and maintain accepted mock-ups throughout the remainder of the work of this section to serve as criteria for acceptance of the work.

1.05 QUALITY ASSURANCE

A. Engineering: Provide services of a professional engineer, registered in State of Maine, to design and certify that work of this Section meets or exceeds performance requirements specified.

B. Shop fabricate work to greatest extent possible. Label each piece in shop to facilitate field assembly.

C. Welding: Perform welding in conformance with AWS D1.1 and D1.3. as applicable.

D. Architectural Exposed Structural Steel: For all items indicated on the Drawings, or specified herein as "Architectural Exposed Structural Steel", comply with all requirements of AISC Specification for Architecturally Exposed Structural Steel.

1. For Architectural Steel, and items exposed to view in the completed work, take special care in choosing materials that are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform, hairline tight joints. Form joints and seams welded continuously and grind flush and smooth so that welds are invisible after painting.

E. The Architect retains the right to inspect the fabrication plant where metal fabrications are being fabricated. Architect will review materials proposed for use by fabricator, and may, to extent

necessary, inspect fabrication operations from time to time.

1.06 PRODUCT HANDLING AND STORAGE

A. Store work off ground and under cover. Protect from damage. Repair and clean work before erection.

1.07 PROJECT CONDITIONS

A. Do not permit use of stairs, ladders, handrails, or other work until work is completely and fully installed and ready to assume intended design loads. Do not permit overloading of metal fabrication systems. Do not permit use of concrete filled metal pan stair systems until concrete is placed and cured.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Provide products and materials of new stock, free from defects, and of best commercial quality for each intended purpose.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: ASTM A 500 or A 501, hot or cold rolled, as required for design loading.

D. Steel Pipe: ASTM A 53, schedule 40, Type S (seamless), black except where galvanized is indicated, Grade A for cold-bending.

E. Steel Pipe for Bollards: ASTM A 53, schedule 80, Type S (seamless), galvanized, Grade A for cold-bending.

F. Steel Sheet: ASTM A 366, A 570, or A 611, grade required for design loading.

G. Architectural Exposed Structural Steel: Where Architectural Exposed Structural Steel is indicated on Drawings, provide Architectural Steel that conforms to requirements of the AISC Specification for Architecturally Exposed structural Steel.

H. Iron Castings: ASTM A 47, or A 48, grade and class are manufacturer's options.

I. Bolts and fasteners: ASTM A 307 and A 325.

J. Steel Bars for Gratings: ASTM A 569 or ASTM A 36.

K. Wire Rod for Grating Cross Bars: ASTM A 510.

L. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required:

1. Extruded Bars and Shapes: ASTM B 221 (ASTM B 221M), 6063-T6.
2. Extruded Pipe and Tubes: ASTM B 429, 6063-T6.

3. Drawn Seamless Tubes: ASTM B 483 (ASTM B 483M), 6063-T832.
4. Plate and Sheet: ASTM B 209 (ASTM B 209M), 6061-T6.
5. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), 6061-T6.
6. Castings: ASTM B 26/B 26M, A356-T6.

M. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

N. Stainless Steel Bars and Shapes: ASTM A 276, Type 304.

O. Stainless Steel Rods: ASTM A276.

P. Concrete: Concrete fill for steel pan stair systems is specified in Section 03300, CAST-IN-PLACE CONCRETE.

Q. Inserts: Threaded or wedge type, galvanized ferrous castings; either ASTM A 47 malleable iron, or ASTM A 27 cast steel. Provide threaded inserts and wedge inserts manufactured by one of the following or Architect approved equal:

1. Hohmann and Barnard.
2. Gateway Erections, Inc.
3. Richmond Screw Anchor Co.

R. Provide anchors, bolts, sockets, sleeves, and other parts required for securing each item of work to other construction. Furnish inserts and sleeves to be set into concrete formwork and concrete under Section 03300, CAST-IN-PLACE CONCRETE. Furnish anchors, bolts, and other items required to be built-into masonry under Section 04200, UNIT MASONRY.

1. Anchor bolts, bolts smaller than 5/8 in., and fasteners shall be steel castings conforming to ASTM A 307. Bolts larger than 5/8 in. shall conform to ASTM A 325.

S. Provide exposed fastenings of same material and finish as metal to which applied, unless otherwise noted.

T. Welding Rods: Conform to AWS Standards and recommendations of welding rod manufacturer.

U. Grout for Interior Applications: Pre-mixed, non-staining, non-corrosive, non-shrink, non-metallic complying with CE CRD-C-621, Type D.

V. Grout for Exterior Applications: Provide Factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating. Provide Super Por-Rok, Erosion-Resistant Anchoring Cement, manufactured by Minwax Construction Products Division, or equal as approved by Architect.

2.02 FABRICATION - GENERAL

A. Fabricate work of this Section to be straight, plumb, level and square, and to sizes, shapes and profiles indicated on approved shop drawings. Ease exposed edges. Cut, reinforce, drill and tap metal work as required for proper assembly.

1. Fabricate miscellaneous supports, brackets, braces and the like required to fully complete

the work.

2. Obtain loading requirements from suppliers of work to be supported. Design and support systems with a safety factor of at least 5 unless otherwise indicated.
3. Allow for thermal movement resulting from 100°F change in ambient temperature.
4. Shear and punch metals accurately. Remove burrs.
5. Ease exposed edges to a radius of approximately 1/32 in., unless indicated otherwise. Form bent corners to smallest radius possible without causing grain separation or impairing work.
6. Remove sharp or rough areas on exposed traffic surfaces.
7. Weld seams continuously. Spot welding is permitted for temporary welding only.

B. Work Exposed to View: For work exposed to view, select materials with special care. Provide materials which are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform hairline joints. Form welded joints and seams continuously. Grind welds flush to be smooth after painting. For exposed fasteners, use hex head bolts or Phillips head counter-sunk machine screws.

C. Galvanizing: Hot-dip galvanize exterior metal fabrications, items located in exterior wall assemblies, and other items indicated to be galvanized, in compliance with ASTM A 123, ASTM A 153, or ASTM A 386. Provide minimum 1.5 oz./ft.^{2} zinc coating. Galvanize after fabrication.

D. Loose Steel Lintel Fabrication: Fabricate lintels from angles or shapes for openings, recesses in walls, where shown, and elsewhere where needed. Provide for minimum of 8 in. bearing at each end. Weld individual angles or shapes together to form composite members where indicated or required.

E. Miscellaneous Bearing and Leveling Plate Fabrication: Provide miscellaneous loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Fabricate units flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts as required.

F. Elevator Subsill Fabrication: Provide continuous, concealed support angle for elevator sills. Coordinate requirements for size, load, and anchorage with elevator supplier. Space anchors no more than 2 ft. - 0 in. o.c.

G. Stair Fabrication: Design and fabricate metal pan and formed metal tread stair systems, conforming to size and arrangements shown and required. Comply with NAAMM Ref. 1, except where more stringent requirements are specified. Comply with applicable codes and ordinances relating to fire exit stairs. Provide pre-engineered stair systems equal to American Stair Corporation.

1. Design stair systems to support minimum live uniform load of 100 lb./sq. ft. and a concentrated load of 300 lbs. located so as to cause greatest stress. Design anchors, connections, support brackets and accessories.
2. Verify dimensions in field before fabrication. Accurately determine actual floor-to-floor height so that risers in each run are equal in height within ±1/16 in., and so that average height of risers in two adjacent runs do not vary by more than 3/16 in.
3. Fabricate stringers from structural steel channels. Provide closures for exposed ends of stringers and wells. Construct platforms of structural steel channel headers and intermediate framing 'Z' members as required. Fully weld headers to stringers, newels, and framing members.

4. Form metal treads, subtreads, and landings from 12 gage minimum steel sheet. Fully weld treads and platforms to supporting frames. Where indicated form treads of steel checkered plate.
5. Shop weld and assemble stair system to greatest extent possible. Locate bolted connections in inconspicuous areas.
6. Include architect approved heavy-duty abrasive nosings as part of riser construction.

H. Steel and Stainless Steel Handrails and Guardrails and Pipe Guards: Conform to ASTM E 985 for design and engineering for structural performance based on testing performed in accordance with ASTM E 894 and ASTM E 935, using load and deflection values specified below. Design and fabricate handrails and guardrails to support 50 lb. per linear foot uniform load and 300 lb. concentrated load, located at any point to cause greatest stress horizontally or vertically. Load conditions do not act concurrently. Design maximum deflection of any member under load conditions shall not exceed L/360.

1. Provide members of type, size, style and profile indicated, unless otherwise required to support loads. Provide standard steel pipe rails to greatest extent possible to meet applicable design load requirements.
2. Provide fully welded construction, using internal slip connectors. Grind joints smooth and flush so that joints are invisible after painting.
3. Provide coped joints at member intersections, fully welded all around. Provide mitered connections at square turns unless radius turns are indicated.
4. Provide smooth radii at bends and maintain uniform cross-section throughout with no kinks, cracks, buckling or twisting.
5. Return ends to walls with concealed anchors, except where detailed not to return to wall.
6. Close ends with 1/8 in. steel plate, or hemispherical fittings.
7. Provide toe boards fabricated to dimensions and details indicated.
8. Provide brackets, flanges, fittings and anchors for connecting railings to railing, railings to floors, landings, stringers, and walls.
9. For railing posts set in concrete, fabricate sleeves from steel pipe not less than 6 in. long, and with an inside diameter not less than 1/2 in. greater than outside diameter of post with a steel plate closure welded to bottom of sleeve. Provide friction fit, removable covers designed to keep sleeves clean and hold top edge of sleeve 1/2 in. below finished surface of concrete.
10. Where removable railing posts are indicated, provide slip-fit sockets fabricated from steel pipe, lined with plastic, with an inside diameter sized for a close fit with posts, so that deflection of post at top is limited to 1/12 of post height.
11. Architectural Steel Fabrication: Fabricate work to be truly straight, plumb, level and square and to sizes, shapes, and profiles indicated on approved shop drawings. Ease exposed edges. Cut, reinforce, drill and tap metalwork as necessary for proper assembly and use.

    a. Fabricate all miscellaneous metal supports, brackets, braces and the like required to fully complete the architectural steel handrails and guardrails.
    b. Welding: Any welds at steel connections shall be performed in the shop to the greatest extent possible.
    c. Design bolted connections to allow for field adjustment.
    d. Take special care in choosing materials that are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform, hairline tight joints. Form joints and seams welded continuously and grind flush and smooth to be invisible after painting.
    e. Use full length pieces. Minimize all splices. Locate splices at locations as approved

by Architect.

f. Ends of rods shall align at either side of posts.
g. Ends of all handrails shall be rounded as indicated.

I. Ladder Fabrication: Comply with requirements of ANSI A14.3. Provide 1/2 in. x 2-1/2 in. steel bar side rails spaced 18 in. apart. Provide 1/2 in. round steel rungs at 12 in. o.c. vertically. Provide extended side rails 42 in. above top rung, returned to wall or structure. Fit rungs into holes drilled in side rails. Weld and grind smooth.

1. Anchor ladders at top, bottom and intermediate points with clip angles, spaced not greater than 5 ft. - 0 in.
2. Size clip angles to support dead and live loads specified in ANSI A14.3.
3. Provide 7 in. clearance from wall or structure to centerline of rungs.
4. Provide non-slip surface on top of each rung.

J. Miscellaneous Framing and Supports: Fabricate miscellaneous framing and supports to adequately support live and dead loads with a safety factor of 5. Provide necessary anchors, inserts, and fasteners. Fabricate support system to carry entire load of work being supported to structure above. Do not transfer any loads to ceiling systems.

1. Cut, drill, and tap units to receive hardware, hangers and similar items.
2. Coordinate loading and attachment requirements for miscellaneous framing and supports with manufacturers of items being supported.

K. Perforated Metal: Perforated Metal: Provide 16 gage steel sheet with 5/8"-diameter holes, staggered pattern, at stair railing and 11 gage steel sheet with 3/4"-diameter holes, staggered pattern, at garage guardrail by Ametco or approved equal.

1. Panels shall be factory-coated with primer and shop applied polyester powder coating. Color will be selected by the Architect.
2. Panel Heights and Widths: As indicated.

L. Stainless Steel Crash Guards: Fabricate from ASTM A 666, Type 314 stainless steel with ANSI No. 4 finish, as indicated on the Drawings.

M. Canopies: Provide canopy as indicted on the Drawings equal to "Lumishade" manufactured by Mapes Industries, Inc. Provide fascia as indicated on the Drawings. Provide finish as selected by the Architect.

N. Rough Hardware: Provide standard and custom fabricated bolts, anchors, hangers, dowels and other miscellaneous metal items as needed to properly complete the work of the project.

1. Fasteners and Fittings: Provide exposed fasteners and fittings as indicated on the Drawings and as selected by the Architect. Exposed fasteners and fittings shall be finished as indicated.

O. Concrete Filled Pipe Bollard Fabrication: Provide 8 in. diameter Schedule 80 steel pipe of length to extend from at least 3 ft. below grade to at least 30 in. above grade, unless otherwise indicated.

P. Column Covers: Aluminum prefabricated column covers by Gordon Inc. or approved equal.

Shape and dimensions as indicated on the drawings. Covers fabricated with flanges and clips at factory. Finish as selected by Architect.

2.03 FINISHING

A. General: Shop prime work to greatest extent possible, except those items indicated to be embedded in concrete, and those items indicated to receive fireproofing. Field touch-up shop applied coatings after installation.

B. Prepare work for shop priming in compliance with SSPC SP6.

C. Provide 1 mil dry film thickness of rust inhibitive primer over properly prepared, non-galvanized and/or non-fireproofed surfaces. Provide two coats with 2 mils total dry film thickness for surfaces which are inaccessible after assembly or erection.

D. Primer for Non-Galvanized Ferrous Surfaces (except interior handrail and railing assemblies and interior steel stairs): Provide high-quality, lead-free, rust-inhibitive primer, equal to one of the following:

1. Series 10 Metal Primer, Tnemec.
2. Bar-ox Quick Dry Universal Primer; Devoe and Raynolds.
3. Ironclad Retardo; Benjamin Moore.

E. Interior Handrail and Railing Assemblies and Interior Steel Stairs: Provide one of the following shop primers:

1. No. 69 Hi-Build Epoxoline; Tnemec.
2. Approved equal by International Protective Coatings.
3. Approved equal by Valspar.

F. Touch-Up for Galvanized Surfaces: Touch-up damaged or abraded galvanized surfaces with products equal to one of the following:

1. Cold Galvanizing Compound; ZRC.
2. Speedhide Galvanized Steel Paint; PPG.
3. Series 90-93 Zinc-Rich Primer; Tnemec.

G. Shop Primer for Galvanized Fabrications: Exterior galvanized handrails, ladders, exhaust lintels, shelf angles, pipe bollards, and other items as indicated or directed by Architect to be painted, shall be primed with one of the following shop primers within 12 hours of the galvanizing process. Provide one coat of the following at 3.0 to 4.0 mils DFT for galvanized items indicated to be painted:

1. No. 69 Hi-Build Epoxoline; Tnemec.
2. International Protective Coatings equal.
3. Valspar equal.

H. Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

I. Bituminous-based paint for electrolytic isolation shall be cold applied black asphaltic mastic conforming to SSPC Paint 12, with no asbestos fibers

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorage devices, setting drawings, diagrams, templates, instructions, and directions for installation of concrete inserts, sleeves, anchor bolts, and miscellaneous items to be embedded or attached to concrete work, masonry work, or structural steel work.

3.02 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners necessary for securing work of this Section to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors required.

1. Provide chemical epoxy-type anchors for stair installation.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of work of this Section.

C. Erect work square, plumb and true, accurately fitted, and with tight joints and intersections. All anchors, inserts and other members to be set in concrete or masonry shall be furnished loose by this trade to be built-into concrete and masonry by those trades. Avoid field cutting or drilling to greatest extent possible.

D. Brace work rigid and secure to surrounding construction. Provide temporary bracing or anchors where required.

E. Fit exposed connections accurately together to form hairline joints. Shop weld connections, except when work cannot be shop welded due to shipping size or galvanizing limitations.

F. Field Welding: Comply with AWS D1.1 and D1.2 for procedures of manual metal-arc welding, appearance and quality of welds, and correction methods for defective welds.

G. Where members other than expansion bolts or inserts are fastened into concrete, set such members in proprietary-type expanding grout manufactured specifically for such purpose. Use grouts strictly in accordance with manufacturer's directions. Form to receive members with galvanized metal sleeves, or other approved method to provide at least 1/2 in. clearance around entire perimeter. At exposed applications, hold expanding grout back 1/2 in. from finish surface and fill voids with Portland cement grout to match color and texture of surrounding concrete surface.

H. Electrolytic Isolation: Where dissimilar metals are to come into contact with one another, isolate by application of a heavy coating of bituminous paint on contact surfaces in addition to shop coat specified above. Do not permit the bituminous paint in any way to remain on surfaces to be exposed or to receive sealant.

3.03 INSTALLATION

A. Loose Steel Lintels: Furnish loose steel lintels required at masonry openings throughout project to Masonry trade for installation.

B. Miscellaneous Bearing and Leveling Plates: Clean concrete and masonry surfaces of bond reducing materials. Roughen surfaces if required to improve bond to surface. Clean bottom surface of leveling plates immediately prior to installation.

1. Set loose leveling and bearing plates on wedges or other adjustable devices. Tighten anchor bolts after plates have been positioned plumb and level. Pack voids between plates and bearing surfaces solidly with specified grout.

C. Elevator Metal Work: Fabricate and install the following metal work at elevators, properly coordinated with work of Elevator trade, and in accordance with approved elevator shop drawings.

1. Steel guide rail brackets at interface with building structure.
2. Steel subsill angle at each hoistway entrance.

D. Handrails and Guardrails: Install handrail and guardrail systems as indicated on approved shop drawings. Adjust handrails and guardrails prior to final anchoring and grouting. Plumb posts in all directions. Provide 1-1/2 in. of clearance between walls and handrails, unless otherwise indicated. Provide wall brackets and/or posts as required at spacings indicated, or if not indicated, not more than 6 ft. - 0 in. o.c., or as required to support specified loads.

E. Ladders: Install ladders at elevator pits and elsewhere as indicated. Anchor ladders to substrates with proper anchorage and fastening devices to support intended loads.

F. Miscellaneous Items: Carefully review Drawings for miscellaneous metal items required by various trades but not specifically listed above, such as miscellaneous clip angles, miscellaneous steel bracketing, and other miscellaneous metal items as indicated on Drawings, reasonably implied therefrom, or reasonably necessary for thorough completion of work.

G. Steel Pipe Bollards: Install steel pipe bollards as indicated on Drawings. Set bollards in concrete. Concrete shall be as specified in Section 03300, CAST-IN-PLACE CONCRETE. Provide temporary bracing to accurately plumb bollards until concrete base has set. Fill pipe with concrete and form a smooth, rounded crown on top to shed water.

3.04 REPAIRING, CLEANING, AND PROTECTION

A. Non-Galvanized Surfaces: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed surfaces with same material as used for shop painting. Comply with SSPC PA 1.

B. Galvanized Surfaces: Clean welds, bolted connections and abraded areas and apply galvanizing repair paint in compliance with ASTM A 780.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide all rough carpentry work, as indicated on the Drawings and as specified herein. Rough carpentry shall include but not be limited to:

1. Rough hardware, inserts, and related metal components.
2. Plywood sheathing.
3. Rough carpentry sleepers, blockings, curbs, cants, edgings, grounds, nailers, and furring.
4. Wood preservative treatments and applications.
5. Plywood backing panels for electrical and telephone equipment.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 03300, CAST-IN-PLACE CONCRETE; Installation of inserts and anchor bolts.
2. Section 04200, UNIT MASONRY; Installation of inserts and anchor bolts.
3. Section 06402, INTERIOR ARCHITECTURAL WOODWORK.
4. Section 07411, PREFORMED METAL ROOFING PANELS.

1.04 QUALITY ASSURANCE

A. Provide lumber and plywood bearing the grade-trademark of the association under the rules or standards of which it was produced. Grade-trademarks shall conform to the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.

1. Grades specified are the minimum acceptable. Lumber grades shall be determined in accordance with ASTM D 245.
2. Lumber shall bear the grade mark of an American Lumber Standards Committee, Board of Review-approved agency. Lumber shall conform to USDC PS 20.
3. Lumber shall bear a mark of mill identification.
4. Plywood shall comply with APA Ref. 1 grading requirements, USDC PS 1, and ANSI A199.1.
5. Fasteners shall comply with CABO NER-272.

1.05 SUBMITTALS

A. Shop Drawings: Submit shop drawings of wood blocking installation and other rough carpentry work. Describe proposed methods of installation and anchorage to structure showing sizes, types, thicknesses, connections of wood blocking and related items, including adjoining work by other trades.

B. Samples: Submit representative samples of all materials for use under this Section.

C. Product Data: Submit product data consisting of manufacturers product description and specifications.

D. Certificates: Submit certificates of grading, treatment, and conformance to specified standards. Certifications shall state date of treatment, conformance with Specifications, and agency grading of wood.

1.06 COORDINATION

A. Coordinate the work of this Section with the work of other Sections to assure the steady progress of all the work of the Contract.

1.07 PRODUCT DELIVERY AND STORAGE

A. Stack and store materials above ground under protective coverings, or indoors in such a manner to insure proper drainage, ventilation, and protection. Do not place kiln dried materials in the building until concrete and masonry work have been completed, and are sufficiently dry.

B. Store rough carpentry materials stickered in elevated piles to allow for air circulation below. Wrapped lumber completely, including bottoms, in waterproof tarps. Tie tarps down to protect against wind blow-off. Stored lumber in covered storage trailers during project delays.

PART 2 PRODUCTS

2.01 LUMBER AND PLYWOOD

A. Lumber: Provide lumber for miscellaneous wood framing, blocking, cant strips, nailers, etc. for all work of the Project, including, but not limiting to, handrails, railings, roofing, flashing, sheet metal work, and the like.

B. Provide new lumber of consistent size, free of stains and mildew, kiln dried to a moisture content of not more than 19% by weight. Where exposed or semi-exposed, provide wood members selected for best possible appearance from the grade of stock specified.

C. Provide lumber in longest practical lengths. Use single length pieces wherever possible.

D. Plywood shall conform to the requirements of APA Design/Construction Guide, Residential and Commercial, and be Structural 1 rated sheathing.

E. General Carpentry Material Schedule shall be as follows:

Item	Grade	Species

Lumber 2 in. nominal thickness or greater	Construction Grade	Douglas-Fir
Lumber less than 2 in. nominal thickness	Construction Grade	Douglas-Fir or Spruce
Plywood roof sheathing	APA Rated sheathing Exposure 1, APA C-D plugged, exterior glue	Group 1 Species
Plywood sheathing	CDX	

E. Pressure Preservative Treated Lumber: Pressure preservative treat lumber above ground and in contact with roofing, flashing, sheet metal, masonry, concrete, dampproofing, and waterproofing in conformance with AWPA C2. Provide pressure preservative treated lumber with a minimum net retention of 0.25 pcf. Dry lumber to maximum moisture content of 19% after treatment. Use only waterborne preservatives which conform to AWPA P5. Creosote preservatives are not acceptable.

1. Pressure preservative treat lumber in contact with ground in compliance with AWPA C2 with a minimum net retention of 0.40 pcf.

F. Fire Retardant Treated Lumber: Provide lumber located at interior of building fire retardant treated complying with AWPA C20, Type A. Provide fire retardant treatment which, yields a flame spread rating of not more than 25 when tested in accordance with ASTM E 84 kiln dried after treatment to maximum moisture content of 19%.

2.02 CONSTRUCTION PANELS

A. Scope: Construction panels required to complete the work of this Section include, but is not limited to the following:

1. Electrical and telephone equipment backing panels.

B. Comply with USDC PS 1 and APA Ref. 1 as applicable. Factory mark each panel with APA trademark showing compliance with requirements.

C. Plywood Backing Panels for Telephone and Electrical Equipment: Provide APA trademarked, Performance-Rated sheathing, UL fire-retardant treated, C-D Plugged, Exposure 1 panels, not less than 5/8 in. thick. Provide fire-retardant treatment which yields a flame spread rating of not more than 25 when tested in conformance with ASTM E 84, and conforms to AWPA C 27, Interior Type A. Kiln dry after treatment to a maximum moisture content of 15%.

2.03 MISCELLANEOUS MATERIALS

A. Inserts, Anchors, and Fasteners: Provide inserts, anchors, anchor bolts, lag bolts, screws, washers, nuts, nails, and other rough hardware. Assist other trades as necessary in the placement of inserts and anchor bolts in concrete and masonry. Furnish full instructions

regarding locations, sizes, and other requirements to ensure proper preparation. Provide rough hardware which complies with requirements of the governing laws and codes.

B. Rough Hardware: Provide rough hardware items for use at roof and other exterior uses hot-dip galvanized in accordance with ASTM A 153. Provide other concealed items cadmium plated or zinc chromate plated.

C. Provide hammer drive anchors and fasteners for securing wood framing, blocking or plywood into masonry of sufficient length to penetrate the receiving member a minimum of 1-1/2 in.

D. Building Felts: Provide 15 lb. asphalt saturated felts, non-perforated, conforming to ASTM D 226, Type I.

PART 3 EXECUTION

3.01 ROUGH CARPENTRY WORK, GENERAL

A. Refer to Drawings to determine the major extent of the rough carpentry work required.

B. The Contractor shall be responsible for structural integrity, connections, and anchorage of rough carpentry work.

C. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned, or too small to fabricate.

D. Set rough carpentry work to required levels and lines, with members plumb and true to line, cut and fitted.

E. Provide wood sleepers, blockings, curbs, cants, edgings, grounds, nailers, and furring where required for screeding or attachment to other work. Coordinate locations with other work to be supported.

F. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces.

G. Provide permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1-1/2 in. wide, and of thickness required.

H. Unless indicated otherwise, blockings, nailers, etc., of 2 in. nominal thickness or greater shall be bolted to back-up material with 1/2 in. bolts (galvanized at exterior locations and at roofs) located 4 in. from ends and splices, and spaced not greater than 32 in. on center along lengths of the members. Provide nails of sufficient length to penetrate receiving member a minimum of 1-1/2 in.

I. Unless indicated otherwise, secure 2 in. thick or smaller wood framing, nailers, furring, etc., to back-up material by use of appropriate fasteners located 4 in. from ends and spaced not greater than 16 in. on center along lengths of the members. Provide type and length of fastening devices to develop positive and secure anchorage to the back-up material.

J. Refer to FM Data Sheet 1-49 concerning anchorage spacing and size requirements for perimeter blocking. Spacings shall be halved in the zone from building corner to eight feet from corner, both directions from corner.

K. Butt joints in wood shall be flush to provide smooth, uniform line with no irregularities. Built-up blocking shall have butt joints staggered 4 in. minimum layer to layer. The minimum length of any individual piece of lumber shall be 12 in. Lengths of lumber shall have a minimum of four fasteners.

L. Construct all rough carpentry work plumb, level, and true with tight, close fitting joints, securely attached and braced to surrounding construction. Counterbore for bolt heads, nuts, and washers where required to avoid interference with other materials.

M. Install all wood grounds at gypsum wallboard work, including those required by other trades, to properly attach their work, such as grounds to assure proper lines and levels and for attachment of fixtures, louvers, grilles, registers, diffusers, etc. Do not include fixture support blockings at steel stud framed or furred gypsum finished walls or partitions as work of this Section.

N. Repair all damage caused by puncturing of conduits, pipes, ducts, etc. When nailing, drilling, or powder-driving into concrete or masonry.

3.02 FASTENING OF WOODWORK

A. Fasten wood to masonry with hammer driven anchors through predrilled holes spaced 8 in. on center maximum. Predrill the hole, insert fastener sleeve, and secure in place with nail.

B. Install plywood on masonry surfaces hammer driven anchors through predrilled holes spaced 12 in. on center along the top and bottom edges. Keep fasteners 3 in. minimum from the board edge. Drive fastener heads flush with surface. Secure plywood to wood substrate with nails at same spacing as hammer driven anchors. Secure plywood to metal studs with screws approved by metal stud manufacturer.

3.03 FASTENING OF SHEATHING

A. Wood shall be secured to wood substrates and other wood to wood connection with nails spaced 12 in. on center maximum staggered along the centerline of the member being installed. All nail heads must be flush with the top surface.

B. Wood to masonry connections shall be completed using non-impact drilled anchors through predrilled holes spaced 8 in. on center maximum. Predrill the hole, insert fastener sleeve, and secure in place with nail.

C. Installation and nailing of performance-rated construction panels and sheathing shall be in strict accordance with the published specifications and recommendations of the American Plywood Association (APA), including APA Ref. 1. Unless otherwise indicated on the Drawings, all sheathing shall be nailed at 3 in. o.c. at edges and 12 in. o.c. for panel field nailing, with 10d galvanized steel nails.

3.04 CLEANING

A. Upon completion of rough carpentry work in any given area, remove all rubbish and debris from the work area and leave in broom clean condition.

END OF SECTION

SECTION 06160

SHEATHING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Glass-mat gypsum sheathing attached to cold-formed metal framing members at exterior wall.
2. Vapor barrier.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 042000 - UNIT MASONRY for masonry-veneer anchors and insulation in cavity wall construction.
2. Section 054000 - COLD-FORMED METAL FRAMING for metal framing at exterior wall.
3. Section 076200 - SHEET METAL FLASHING AND TRIM for flashing applied to gypsum sheathing.

1.03 DEFINITIONS

A. Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum sheathing board construction not defined in this Section or in other referenced standards.

1.04 SUBMITTALS

A. Product Data: For each product specified.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each gypsum sheathing product through one source from a single manufacturer.

B. Fire-Resistance-Rated Assemblies: Where gypsum sheathing boards are part of fire-resistance-rated assemblies, provide assemblies as follows:

1. Assemblies comply with requirements of fire-response-tested assemblies indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual"; or by design designations in UL's "Fire Resistance Directory" or in certification listings of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Fire-resistance ratings were determined by fire-response testing assemblies according to ASTM E 119.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles, each bearing brand name and identification of manufacturer.

B. Store materials protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Neatly stack gypsum sheathing board flat on leveled supports off the ground, under cover, and fully protected from weather.

1.07 SEQUENCING AND SCHEDULING

A. Sequence installing sheathing with installing exterior cladding to comply with requirements indicated below:

1. Do not leave glass-mat gypsum sheathing board exposed to weather for more than 180 days.

PART 2 - PRODUCTS

2.01 GLASS-MAT GYPSUM SHEATHING BOARD

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177.

1. Type and Thickness: Type X, 5/8 inch thick.
2. Size: 48 by 96 inches.
3. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Dens-Glass Gold" by Georgia-Pacific Corp.

B. Vapor Barrier: 6 mil. Polyethylene.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.

C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.

D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

F. Vertical Installation: Install 48-inch- wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud:

1. Perimeter: 6 inches on center.
2. Field: 8 inches on center.

END OF SECTION

SECTION 07129

TRAFFIC-BEARING WATERPROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Furnish and install surface waterproofing as shown, specified or both shown and specified, including, but not limited to:

1. Vehicular traffic-bearing waterproofing over ledger beams and at floor drains.

B. System: A reparable seamless polyurethane elastomer waterproof coating for concrete, fluid surface-applied, suitable for type of traffic applicable and rated Class A by UL per ASTM E108/UL790.

C. Apply the waterproofing in stages where the construction sequence requires. Coordinate the application with work of other trades.

D. Related work specified in other sections:

1. Concrete curing and smooth textured finish: See CONCRETE WORK #03300.

2. Sealer for traffic decks: See CONCRETE SURFACE SEALER, #03480.

1.03 SUBMITTALS

A. Product data: Submit manufacturer's product literature and installation instructions. Include copies of manufacturer's standard warranty form.

B. Samples: Submit cured samples showing finish color and applied thickness.

C. Certification: Before beginning construction, submit a current certificate or letter issued by the manufacturer approving the applicator and verifying the applicator's qualifications.

D. Coordination: Forward copies of reviewed submittals for others whose work is related.

1.04 QUALITY ASSURANCE

A. Applicator qualifications: Certified by the manufacturer.

B. System: Fluid-applied waterproofing shall match approved samples.

C. Materials: Compatible with the materials of related work with which they come into contact.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials to site in original, unopened containers, bearing the following information:

1. Name of product.
2. Name of manufacturer.
3. Date of preparation.
4. Lot or batch number.

B. Store materials under cover and protect from the weather. Replace packages or materials showing sign of damage with new material at no additional cost to the Owner.

C. At no time shall the weight of the stored material placed on a slab area exceed 50 psf or 2,000 lbs. over 20 sq. inches.

1.06 WARRANTY

A. Furnish to the Owner with a written total responsibility warranty that the system will be free of defects, water penetration and chemical damage related to design, material deficiency, or workmanship, consisting of:

1. Surface crazing or other weathering deficiency.
2. Abrasion or tear failure resulting from traffic use.
3. Defective installation.

B. If the concrete surface shows any of the defects listed above, supply labor and material to repair all defective areas and to repaint all damaged line stripes.

C. The warranty period shall be five years commencing with the date of acceptance of the work by the Owner and shall be joint by licensed applicator and manufacturer.

D. Perform repair necessary under this warranty at no cost to the Owner.

E. Vandalism. abrasive maintenance equipment, truck traffic and construction traffic are not normal traffic use and are exempted from the warranty. Also, any subsequent floor cracking in excess of l/l6" width is reason for exemption from warranty.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION:

A. The system shall prevent penetration of the concrete by water, gasoline, oils, greases, salts, deicer chemicals and acids.

B. Vehicular Traffic Surfaces: Dry film thickness not less than 50 mils for medium duty (parking areas) and 70 mils (traffic aisles) for heavy duty coatings, excluding substrate primer and sand aggregate applied at manufacturer's recommended rate.

C. Source: Approved Deck coatings are:

1. "Noval" System by Harris Speciality Chemical Co. Jacksonville, Fl.
2. "Scotch-Clad Deck Coating System HDV" by the 3M Company, St. Paul, Minnesota.
3. "Auto Guard II" by Neoguard
4. "Vulkem" System by Mameco International Cleveland, Ohio
5. "Sonoguard" by Sonneborn Building Products

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect surfaces to receive the work and report immediately in writing to the Architect any deficiencies in the surface which render it unsuitable for proper execution of the waterproofing work.

B. Coordinate and verify that related work meets the following requirements:

1. Concrete surfaces are finished as specified for the system installed.
2. Concrete surfaces have completed the proper curing period for the system selected.
3. Concrete surfaces are properly prepared for the system in accordance with the manufacturer's recommendations.
4. Compatible materials have been used in previously executed work.

3.02 PREPARATION

A. Remove all oil and grease spots according to the manufacturer's recommendations. The surface shall then be thoroughly rinsed and allowed to dry.

B. Before applying materials, apply the system to a small area to assure that it will adhere and dry properly.

3.03 APPLICATION

A. Perform all work in accordance with manufacturer's written instructions and contract requirements.

B. Do not apply the coating material until the concrete has been air dried at temperatures at or above 40 degrees F. for at least 30 days after the curing period specified in Section 03300.

C. Complete work on parking decks before line stripes are painted.

3.04 FURTHER REQUIREMENTS

A. The fluid applied vehicular coating system shall be designed for use on concrete surfaces and provided a continuous, seamless, waterproof, non slip durable membrane.

B. The thickness of the application shall be appropriate for the location within the structure and within use of the material limitations (considering the warranty).

C. The manufacturer/Installer shall accept the substrate (in writing) before start of work.

D. Minor cracks and other imperfections (l/l6" and less in width) shall be repaired by this trade prior to application.

E. This trade shall provide elastomeric sheet vertical flashing at juncture of p.c. concrete spandrels, concrete columns, etc. a minimum of 6" in height.

END OF SECTION

SECTION 07145

CEMENTITIOUS WATERPROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide cementitious waterproofing as indicated on the Drawings and as specified herein. Cementitious waterproofing shall be provided for the following:

1. Elevator pits.
2. At other areas indicated to receive cementitious waterproofing.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01410, TESTING LABORATORY SERVICES; Inspection and testing.
2. Section 03300, CAST-IN-PLACE CONCRETE; Concrete pits and sumps to be waterproofed.

1.04 SUBMITTALS

A. Samples: Submit samples of completed cementitious waterproofing on 1/4 in. plywood backing, 12 in. x 12 in.

B. Manufacturer's Review: Submit written statement, signed by Contractor and waterproofing installer stating that the Drawings and Specifications have been reviewed by qualified representatives of the waterproofing manufacturer, and that they are in agreement that the waterproofing system specified is proper and adequate for the applications shown.

C. Manufacturer's Data: Submit manufacturer's specifications and installation instructions for all products in the waterproofing system, including certifications and other data required to show compliance with the Contract Documents.

D. Substrate Acceptability: Submit a certified statement issued by the manufacturer of waterproofing materials and countersigned by applicator, attesting that all areas and surfaces designated to receive waterproofing have been inspected and found satisfactory for the reception of the Work covered under this Section; and are not in conflict with the "Guarantee" requirements. Application of materials will be construed as acceptance of surfaces.

E. Statement of Supervision: Upon completion of the Work, submit a written statement signed by the manufacturer stating that the field supervision of the manufacturer's representative was sufficient to insure proper application of the materials, that the Work was installed in accordance with the Contract Documents, and that the installation is acceptable to the manufacturer.

F. Certification: Furnish certificate accompanying each delivery of waterproofing material indicating compliance with the Contract requirements.

1.06 QUALITY ASSURANCE

A. Source: For each material type required for the work of this section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to the manufacturers of the primary materials.

B. Installer: A firm with a minimum of three years experience in type of work required by this section and which is acceptable to the manufacturers of the primary materials.

C. An inspection laboratory may be engaged by the Owner to inspect the work specified herein in accordance with Section 01410, TESTING LABORATORY SERVICES.

1.07 GUARANTEE

A. Provide cementitious waterproofing manufacturer's standard four (4) year warranty.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's unopened containers or bundles fully identified with brand, type, grade, date of manufacture, class, lot number, and other qualifying information.

B. Store materials in original tightly sealed containers or unopened packages. Materials shall be stored out of weather, off the ground, in dry area, in compliance with manufacturer's maximum storage temperature range.

1.09 JOB CONDITIONS

A. Maintain manufacturer's current installation instructions at the job site at all times for waterproofing material to be used on the Project.

B. Maintain material storage area at 60°F or above, for 48 hours prior to application.

C. Proceed with work of this section only after substrate construction and penetrating work have been completed.

D. If waterproofing application must be performed in cold weather, provide continuous heat at a minimum temperature of 55°F, for 24 hours prior to start up, during installation, and 24 hours following completion.

E. Do not proceed with exterior work during inclement weather. Comply with manufacturer's recommendations for application and curing under specific climatic conditions.

F. Coordinate application of cementitious waterproofing with work of other Sections.

1.10 PROTECTION

A. Protect the finish surfaces from damage, resulting from spillage, dripping, and dropping of materials. Prevent materials from entering and clogging drains. Repair and restore or replace work which is soiled or damaged in connection with the performance of the Work.

PART 2 PRODUCTS

2.01 CEMENTITIOUS WATERPROOFING

A. Provide horizontal and vertical grade cementitious waterproofing for application to concrete and masonry surfaces, and as follows:

1. Manufacturer/Product: Five Star Waterproof Cement Membrane; U. S. Waterproofing, Inc.
2. Shrinkage, Moist State: 0.0%; ASTM C 157 and ASTM C 827.
3. Shrinkage, Cured State: 0.0003%; ASTM C 596.

B. Where patching is necessary, provide Five Star Waterproofing, manufactured by U. S. Waterproofing, or approved equal patching material.

PART 3 EXECUTION

3.01 CONDITION OF SURFACE

A. Examine the substrates, adjoining construction and the condition under which the Work is to be installed. Do not proceed with the Work until unsatisfactory conditions have been corrected.

B. Pre-Installation Meeting: Prior to installation of cementitious waterproofing, meet at the Project site to review the material selections, installation procedures, and coordination of the Work with work of other Sections. Meeting shall include the Contractor, Subcontractor, manufacturer's representatives, inspection and testing services (if any), and any other subcontractor whose work requires coordination with this work.

C. Surfaces to receive waterproofing shall be broom-clean, thoroughly dry and free of moisture. Mortar and grout shall have cured thoroughly.

D. Floors and walls of pits and sumps shall be wire brush cleaned, and then washed to ensure proper bonding surfaces for the waterproofing application.

E. Surfaces shall not contain any grease, oil, or any other contaminants which could affect the complete bonding of the waterproof membrane to the concrete surface.

3.02 INSTALLATION

A. Install and complete the system to ensure that no water leakage occurs.

B. At the start of the installation and periodically as work progresses, provide supervisory, inspection, and advisory services of the manufacturer's technical representative at job site as often as deemed necessary by manufacturer.

C. Fill non-moving cracks and joints with sealant or other compounds as recommended by the waterproofing materials manufacturer for compatibility with the waterproofing.

D. Allow waterproofing to cure properly before backfilling. During this period, block off traffic and protect waterproofing from physical damage.

E. Mix and apply materials in accordance with manufacturer's instructions and recommendations for appropriate substrate. Use mortar mixer or electric drill mixer.

F. Apply waterproofing to horizontal and vertical surfaces of pits, sumps, and header trench with trowel or plaster sprayer in single coat 1/8 in. thick as recommended by the waterproofing materials manufacturer, completely filling voids, holes, and cracks, leaving no pinholes or uncovered areas.

G. Apply waterproofing at minimum dimensions of 1 in. x 1 in. strips for cants, coves, fillets, construction joints, and penetrations.

H. Proper curing and protection of waterproofing: For hot weather or windy conditions and for maximum wear resistance, as soon as waterproofing will not be damaged by recommended curing material and water, cure surface as recommended by waterproofing materials manufacturer.

I. Protect waterproofing from non-pedestrian traffic for 24 hours. Protect waterproofing from freezing, rain and hydrostatic pressures until it reaches its normal 24 hour strength.

3.03 FIELD QUALITY CONTROL

A. Inspect cementitious membrane waterproofing 24 hours after application to ensure that coating has cured to hard finish, without softness and dusting.

B. Chip and patch cured membrane to determine whether or not required minimum thickness has been applied in those areas where inadequate coverage is suspected.

C. Inspect for complete coverage to ensure that holes, cracks, and voids have been filled leaving no pinholes or uncovered areas, and that joints and cracks have been treated properly.

3.04 WATER TESTING

A. Perform water testing as required.

B. Do not water test within 48 hours after application of waterproofing or until waterproofing is fully cured.

C. Water testing shall include flooding of entire area of work to minimum depth of 1-1/2 in. above high points, either by section or for entire area, for 48 hours.

D. Where leaks occur, drain, thoroughly dry, repair, and retest.

E. Verify that portion of area tested has shown no evidence of leakage by signing Drawing that indicates areas tested.

3.05 CLEAN-UP

A. Upon completion of cementitious waterproofing, clean stains, remove masking, protections, equipment, material, and debris from work and storage areas, and leave areas in an undamaged and acceptable condition.

END OF SECTION

SECTION 07180

TRAFFIC COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract

1.02 DESCRIPTION OF WORK

A. Provide labor, materials, equipment and supervision necessary to install a traffic bearing deck coating system as outlined in this specification to new concrete surfaces as noted on drawings.

1.03 RELATED SECTIONS

A. Section 03300 CAST-IN-PLACE CONCRETE

B. Section 03410 STRUCTRAL PRECAST CONCRETE

E. Section 07920 JOINT SEALANTS

1.04 SUBMITTALS

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 10 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate the Owner for additional review cycles.

G. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Traffic-Bearing Membrane.

2. Warranty.

3. Applicator's qualifications.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated:

1. ICRI Guidelines No. 03732 "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays."

2. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Manufacturer qualifications: Company regularly engaged in manufacturing and marketing of products specified in this section.

C. Contractor qualifications: Qualified to perform work specified by reason of experience or training provided by product manufacturer. Contractor shall have a minimum of 5 years of experience with the installation of traffic membranes.

D. Mockup: Provide mockup of at least 100 square feet to include surface profile, sealant joint, crack, flashing, and juncture details and allow for evaluation of slip resistance of Traffic Deck Coating System.

1. Install mockup with specified coating types and with other components noted.

2. Locate where directed by Engineer.

3. Mockup may remain as part of Work if acceptable to Engineer.

D. Notify manufacturer's authorized representative at least two weeks before start of work. Schedule minimum of 3 job site inspections by manufacturer's authorized representative, first scheduled before application of product. Application of elastomeric Traffic Deck Coating System without prior notice will not constitute acceptance by manufacturer of five-year waterproofing inspection and guarantee procedure.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.

B. Store product in location protected from freezing, damage, construction activity, precipitation, and direct sunlight, in strict accordance with manufacturer's recommendations.

C. Condition products to approximately 60 to 70 degrees F for use in accordance with manufacturer's recommendations.

D. Handle all products with appropriate precautions and care as stated on Material Safety Data Sheet.

1.07 PROJECT CONDITIONS

A. Do not use products under conditions of precipitation or freezing weather or when such conditions are imminent. Use appropriate measures for protection and supplementary heating to ensure proper drying and curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.

B. Ensure substrate is dry.

C. Protect all adjacent work from contamination due to mixing, handling, and application of preparation and repair products and elastomeric Traffic Deck Coating System.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sonneborne.
B. Neoguard.
C. Approved Equal.

2.02 PERFORMANCE CRITERIA

A. Compliance: ASTM C957

B. Liquid properties of self-leveling Base Coat:

1.	Solids by weight:	ASTM D1259
2.	Weight per gallon:	ASTM D1475
3.	Viscosity:	ASTM D2393
4.	Specific Gravity:	ASTM D1475
5.	Flash point:	ASTM D56

C. Cured properties of self-leveling Base Coat:

1.	Hardness, Shore A:	ASTM D2240
2.	Tensile strength:	ASTM D412
3.	Elongation:	ASTM D412
4.	Tear strength:	ASTM D1004
5.	Crack bridging:	ASTM C836 modified
6.	Weight loss	ASTM C836

D. Liquid properties of self-leveling Top Coat:

1.	Solids by weight:	ASTM D1475
2.	Weight per gallon:	ASTM D1475
3.	Viscosity:	ASTM D2393
4.	Specific Gravity:	ASTM D1475
5.	Flash point:	ASTM D56
6.	Color:	Match Existing

F. Cured properties of self-leveling Top Coat:

1.	Hardness, Shore A:	ASTM D2240
2.	Tensile strength:	ASTM D412
3.	Elongation:	ASTM D412
4.	Tear strength:	ASTM D1004
5.	Crack bridging:	ASTM C836 modified
6.	Weight loss	ASTM C836
7.	Abrasion resistance	ASTM C501 modified

G. Physical properties of Reinforcing Fabric:

1.	Elongation:	ASTM D1682 Machine direction: Cross Direction:
2.	Grab breaking:	ASTM D1682 Machine direction: Cross Direction:
3.	Thickness:	FTM-5136

2.03 MATERIALS

A. Provide primers, base coats, wearing course and tie/top coats that are compatible and from single manufacture.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect all areas involved in work to establish extent of work, access and need for protection of surrounding construction.

B. Protect all surroundings from Primers, Patching Repair Compounds and Finish products and to include, but not be limited to, windows, roofs, walkways, drives, automobiles, and landscaping.

3.02 SITE VERIFICATIONS OF CONDITIONS

A. Conduct all pre-application inspections of site verification with authorized Manufacturer's Representative.

B. Inspect all expansion joints to ensure there is no deteriorated sealant, adhesion loss or non-elastomeric caulks installed in joints. Repair all deficient sealant.

C. Inspect all through deck penetrations, including electrical, lighting, signage, plumbing, HVAC, fire sprinkler piping for watertight seal. Repair all deficiencies.

3.03 SURFACE PREPARATION: CONCRETE

A. Power shotblast new and old concrete surfaces to remove previous coatings, laitance, and all surface contamination to provide profile for proper adhesion.

B. Remove all dust, dirt, and contaminants from surfaces that require detail work by vacuuming. Prime 3 inches beyond crack and joint details using short-nap roller with

C. Apply 25 wet mil (minimum) prestripe of base coat for nonmoving joints and cracks less than 1/16 inch wide. Fill and overlap joint or crack 3 inches on each side. Feather edges.

D. Rout cracks and joints over 1/16 inch wide to minimum of 1/4 inch by 1/4 inch and clean. Install bond breaker tape to prevent adhesion to bottom of joint. Prime and seal joint reference Section 07920. Allow sealant to cure.

E. Prime deck 3 inches on either side of sealant. Do not apply primer to sealant bead itself. Allow primer to dry. Apply 25 wet mil (minimum) prestriping of base coat over joint and adjacent 3 inches of pre-primed deck on either side. Feather edges.

F. Seal expansion joints exceeding 1 inch wide. Do not coat such joints, including primary wide expansion-joint system, so they can perform independently of deck coating system.

G. Cut 1/4 inch by 1/4 inch keyway into concrete deck where coating system will be terminated and no wall, joint, or other appropriate break exists. Fill and coat keyway as application progresses.

H. Wire brush or sandblast all metal details to bright metal condition. Prime before application of coating.

I. Remove dust, debris, and any other contaminants from vent, drain- pipe, and post penetrations. Clean metal surfaces to bright metal and prime. Install appropriate cant with Slope Grade Sealant.

J. Prime voids exceeding 1/16 inch and reglets. Seal with sealant and pre-stripe with 25 wet mils of base coating to minimum width of 4 inches after first priming same 4 inches. Do not apply Primer over sealant.

K. Provide sealant cants at rigidly connected wall and slab intersections. Form sealant cant into corner at junction of all horizontal and vertical surfaces (wall sections, curbs, columns). Allow sealant to cure.

L. Apply masking tape to vertical sections at appropriate height above sealant cant to provide clean termination of vertical detail coat.

M. Install sheet flashing at locations of potential high movement, such as wall and slab intersections that are not structurally connected. Sheet flashing: 0.050 inch thick uncured commercial-grade neoprene or an appropriate substitute.

3.04 APPLICATION:

A. Complete all preparatory work before application begins. Apply base coat, intermediate, and top coats with properly sized equipment to arrive at required mil thickness. Verify mil thickness of all coats by use of wet-mil thickness gauge.

B. Vacuum thoroughly all surfaces to be coated. Apply primer to all deck surfaces at manufacturers recommended application rate. Force primer into pores and voids to eliminate pinholes. Do not apply Primer over prestriping.

C. Allow primer to dry tack free. Apply base coat same working day.

D. Apply base coat to entire deck and ramp surface, overcoating properly prepared cracks, joints, and integral flashings. Use flashing/slope grade base coat for sloped areas. Do not coat expansion joints over 1 inch wide. Allow overnight cure (16 hour minimum) at 75 degrees F and 50 percent relative humidity. Extend curing time at temperatures less than 75 degrees F and relative humidity less than 50 percent.

E. Apply wearing course (intermediate coat) material to deck and ramp surfaces as noted on the Drawings. Broadcast aggregate while coating is wet at rate of 60 to 80 pounds per 100 square feet. Back roll immediately with short-nap roller lightly wetted initially with top coat. Apply sufficient pressure to encapsulate aggregate and distribute evenly. Allow to cure approximately 16 hours at 75 degrees F and 50 percent relative humidity. Extend curing time at temperatures less than 75 degrees F and relative humidity less than 50 percent.

F. Plan intermediate coat and aggregate placement to avoid unnecessary walking in freshly applied material. Work small sections on large areas to ensure aggregate is applied before membrane begins to skin over.

G. Apply tie/top coat to deck and ramp areas as noted on Drawings. Broadcast aggregate while coating is wet at rate of 10 to 25 pounds per 100 square feet. Back roll immediately with short-nap roller lightly wetted initially with top coat. Apply sufficient pressure to encapsulate aggregate and distribute evenly.

H. Cure 72 hours minimum before allowing vehicular traffic onto coating at 75 degrees F and 50 percent relative humidity. Extend curing time at temperatures less than 75 degrees F and relative humidity less than 50 percent.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service. Final inspection: Warranty request. Manufacturer's representative will inspect finished surface preparation, application, and finished coating and may require further preparation or application to achieve appropriate result. In no case will manufacturer's representative approve surface or finish if following conditions are found: pinholes, insufficient coating thickness, or any other conditions, that, in manufacturer's representative's opinion, may cause failure of installation.

3.07 CLEANING

A. Conform with specification Section 01710; Cleaning.

B. Clean all equipment, tools, and spillage with manufacturer's recommend solvent.

C. Clean up and properly dispose of all debris remaining on job site related to application.

END OF SECTION

SECTION 07210

BUILDING INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide building insulation work as indicated on Drawings, and as specified, including but not limited to:

1. Rigid insulation.
2. Fiberglas blanket/batt insulation.
3. Semi-rigid insulation.
4. Other building insulation work as may be called for on Drawings and not indicated or specified to be included under other Sections.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 04200, UNIT MASONRY; Insulation in CMU cores.
2. Section 05410, COLD FORMED METAL FRAMING.
3. Section 07270, FIRESTOPPING; Firestopping insulation.
4. Section 09250, GYPSUM DRYWALL; Acoustical insulation.
5. Division 15 - MECHANICAL; Pipe and duct insulation.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Verification Samples: Submit representative samples of each insulation material. Provide samples having minimum size of 100 sq. in.

C. Mock-Ups: Prior to commencing the primary work of this Section, provide materials as required for mock-ups at locations acceptable to Architect. Comply with requirements specified under Section 01420, MOCK-UPS. Obtain Architect's acceptance of visual qualities. Protect and maintain accepted mock-ups throughout the remainder of the work of this section to serve as criteria for acceptance of the work.

1.05 QUALITY ASSURANCE

A. Fire Performance: Provide products which meet or exceed flammability ratings indicated or required by authorities having jurisdiction.

B. Thickness: Where R values are indicated, provide thicknesses of insulation materials required to achieve value specified.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to site in original, unopened packages or containers bearing manufacturer's names, brand names, and types and thicknesses of contents.

B. Store off floor in interior spaces, adequately protected against damage from all sources.

PART 2 PRODUCTS

2.01 BOARD-TYPE INSULATION UNDER SLABS-ON-GRADE

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60 cu.ft. density, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

1. Manufacturer: Styrofoam SE by Dow Chemical or equal.
2. Compressive Strength, ASTM D 1621: 25 pounds per square inch, minimum.
3. Minimum Thicknesses: 2 inches under slabs-on-grade.
4. Board Edge: Square.

B. Adhesive for Bonding Insulation at Vertical Surfaces: Product recommended by insulation manufacturer with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation or substrates.

2.02 FIBERGLAS BLANKET/BATT INSULATION

A. NOT-USED

B. NOT-USED

2.03 SEMI-RIGID INSULATION

A. Foil-Faced Semi-Rigid Fiber Board Insulation: Thermal insulation produced by combining semi-refractory mineral fibers manufactured from slag with thermosetting resin binders to comply with ASTM C 612 for Class indicated; passing ASTM E 136 for combustion characteristics of unfaced board; foil-scrim-Kraft or foil-scrim-polyethylene vapor-retarder facing on one side with maximum flame spread and smoke developed values of 25 and 10, respectively; and as follows:

1. Semi-Rigid Board: Class 4, nominal density of 8.0 pcf, r-value of 4.35 at 75 deg F (23.9 deg C).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Insulating materials and installation shall be in strict accordance with manufacturer's printed instructions and specific recommendations, and health and safety precautions, for each of project conditions and in accordance with governing laws and building code.

3.02 RIGID INSULATION UNDER SLABS

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Apply single layer of insulation to produce thickness indicated.

3.03 FIBERGLAS BLANKET/BATT INSULATION

A. Install continuous application of fiberglas blanket/batt insulation directly above exterior stucco soffits to protect interior spaces of building, as indicated. Fit batts tightly together and to framing members, furring strips, penetrations, and abutting construction for positive thermal seal. Carry continuously behind light cans, junction boxes, etc.

B. Install blanket/batt insulation, fully filling spaces between steel stud curtain wall system members. Staple through insulation into rear face of sheathing with 9/16 in. long divergent point staples at center and near each corner of blanket/batt. Fit batts tightly together at joints. Pack tightly into corners, and fill double studs and box headers and sills, and other similar voids, with insulation to maintain insulation integrity across entire wall area.

C. Coordinate work with that of other Sections.

3.03 SEMI-RIGID INSULATION

A. General: Apply indicated thickness of rigid insulation to areas indicated.

B. Apply stick clips to metal deck using manufacturer's recommended adhesives.

C. Press insulation board firmly into place over stick clips. Stagger joints in insulation. Take special care to cut, fit, and position boards accurately so that joints within work, at perimeters of

work, and at projections through work, are tightly butted. Visible gaps will not be permitted. Take special care when fitting insulation around metal deck framing. Tape joints with aluminum foil faced tape. Leave insulation tight, plumb, and with flush surface.

3.04 CLEANING

A. Upon completion of building insulation work in any area, remove rubbish and debris from work area and leave in broom clean condition.

END OF SECTION

SECTION 07265

SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. The work of this section includes, but is not limited to, concealed sprayed-on fireproofing. Refer to Drawings for schedule of fireproofing requirements.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 05120, STRUCTURAL STEEL
2. Section 05300, METAL DECKING
3. Section 07270, FIRESTOPPING
4. Section 09250, GYPSUM DRYWALL; Drywall fire protection.

1.04 PERFORMANCE

A. Fireproofing Performance Schedule: Provide in-place fireproofing to achieve the fire protection levels required by code and as indicated on the Drawings. Comply with codes and requirements of authorities having jurisdiction. It is the Contractor's responsibility to verify construction types and to determine proper thicknesses before beginning fireproofing work.

1.05 QUALITY ASSURANCE

A. Installer: A firm which has at least three years experience in work of the type required by this section and which is acceptable to the manufacturer of the primary fireproofing materials.

B. Source: Provide fireproofing materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the fireproofing manufacturer.

1.06 TESTS

A. Fire-Resistance: Provide materials, density, and construction which are identical to assemblies whose fire-resistance rating has been tested in compliance with ASTM E 119 [UL 263, NFPA 251] by independent agencies acceptable to the Architect and authorities having jurisdiction. Provide systems with fire resistance ratings established by UL or another recognized testing agency acceptable to authorities having jurisdiction.

1. UL designation numbers are listed on Drawings.

B. Burning Characteristics: Provide materials whose surface burning characteristics, when tested in compliance with ASTM E 84 are Class A or Class 1.

C. Field Tests and Inspections: The Owner may engage an independent testing agency to sample and test completed work for density and thickness in compliance with ASTM E 605.

1.07 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide certifications stating that materials comply with requirements.

B. Test Reports: Submit manufacturer's certified reports on performances including, but not limited to, burning characteristics, fire-performance, densities, compressive strengths, bond strengths, hardness, water absorption, air erosion and corrosion resistance. Submit in-place density and thickness test results, if tests are performed.

C. Schedules: Submit detailed schedule of fireproofing activities.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage. Sequence deliveries to avoid delays, but minimize on-site storage.

1.09 PROJECT CONDITIONS

A. Weather: Perform work only when existing and forecasted weather conditions are within the limits established by manufacturers of the materials and products used. Maintain recommended ambient conditions throughout application and curing.

B. Substrates: Proceed with work only when substrate construction and penetrating work is complete.

C. Wind Control: Comply with manufacturer's requirements and recommendations. Avoid too quick drying.

1.10 SEQUENCING AND SCHEDULING

A. Conference: Attend a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Sequence: Perform work of this section in the optimum sequence that minimizes exposure to weather and the elements, minimizes exposure to abrasion and other possible damage due to subsequent construction operations, and which provides fireproofing protection for the structure at the earliest possible time. Coordinate installation to minimize need for other trades to remove installed fireproofing. Immediately patch cut-away fireproofing to comply with requirements for original work.

1.11 WARRANTY

A. Provide written warranty agreeing to repair or replace work which exhibits defects in materials or workmanship. "Defects" is defined to include, but is not limited to, cracking, flaking, peeling, excessive dusting, abnormal aging or deterioration, and failure to perform as required. Include requirement for removal and replacement of covering and connected adjacent work.

1. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS AND PRODUCTS

A. Sprayed-On Fireproofing: Provide cementitious fireproofing by W. R. Grace or approved equal for spray application to provide fire protection ratings indicated and required by authorities having jurisdiction. Mineral fiber fireproofing will not be considered equal.

1. Standard Density Fireproofing (at concealed areas): Provide MK-6/HY type as required to meet UL designs required.
2. Medium Density Fireproofing (at exposed areas): Provide Z-106/HY type as required to meet UL designs required.

B. Primers: Provide primers recommended by fireproofing manufacturer which are compatible with steel shop primer, if any.

2.02 PERFORMANCE CRITERIA

A. Materials, procedures for application, dry densities, and thicknesses necessary to provide the required protection shall be approved by UL for the uses indicated. Submit certification by an independent Testing Laboratory acceptable to the Owner that materials, dry densities, thicknesses, and application procedures satisfy the requirements of the governing laws and building code, and UL requirements, with respect to the minimum protection requirements below when tested in accordance with ASTM E 119.

B. Fireproofing Performance: Structural steel members throughout the project to receive fireproofing shall be protected under this Section with adequate fireproofing thicknesses and densities in accordance with UL Ref. 1. Provide fire resistance ratings at steel supporting rated enclosures as required per Wisconsin Building Code, ILHR 51.042(8).

C. Thickness and Density: Thickness of fire protection material for each condition for the specified fire resistance rating shall be according to manufacturer's data and UL requirements. Where required thickness is given as an average thickness the minimum thickness permitted shall be that given as average thickness. Acceptable minimum thickness of applied material shall be that measured at specified dry density.

D. Fire ratings interpolated or extrapolated from actual test data will not be acceptable. Provide evidence prior to application that proposed materials, and installation methods and materials have been approved by all authorities that have jurisdiction.

PART 3 - EXECUTION

3.01 INSPECTION

A. The Installer shall examine substrates and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.

3.02 PREPARATION & INSTALLATION

A. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section.

1. Mask and protect adjacent work which could be damaged by overspray or fallout.
2. Clean substrates of all substances which might be incompatible or inhibit bond.
3. Prime surfaces if recommended by fireproofing manufacturer.
4. Apply adhesive if recommended by fireproofing manufacturer.
5. Provide thickness and density required to obtain fire-resistance ratings required.
6. Provide reinforcement where movement is anticipated and at locations recommended by fireproofing manufacturer.

3.03 CLEANING, REPAIR AND PROTECTION

A. Clean non-fireproofed exposed surfaces of all overspray and fallout using materials and methods recommended by manufacturer. Remove and replace work that cannot be successfully cleaned.

B. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Reinspect work frequently until it is permanently enclosed. Immediately patch and repair damaged fireproofing to provide fire resistance ratings required.

END OF SECTION

SECTION 07270

FIRESTOPPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide firestop systems consisting of a material, or combination of materials, installed top retain the integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, or gases through penetrations in fire-rated barriers, in accordance with the State of Maine State Building Code.

B. Firestops shall be used in locations including, but not limited to, the following:

1. Penetrations through fire-resistance-rated floor construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
4. Sealant joints in fire-resistance-rated construction.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that relate directly to Work of this Section include, but are not limited to:

1. Section 03300, CAST-IN-PLACE CONCRETE.
2. Section 04200, UNIT MASONRY.
3. Section 07900, JOINT SEALERS.
4. Division 15 - MECHANICAL; Pipe and duct insulation.
5. Division 16 - ELECTRICAL; Conduit, cable trays, etc.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.

B. F - Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. T - Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:

1. Where firestop systems protect penetrations located outside of wall cavities.
2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
4. Where firestop systems protect penetrating items larger than a 4 in. diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 in. or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.05 SUBMITTALS

A. Submit product data for each type of product specified.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

B. Submit Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.

C. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

D. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of engineers and owners, and other information specified.

1.06 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:

   a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.

3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:

   a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
   b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

B. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

C. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.

D. Field-Constructed Mockup: Prior to installing firestopping, erect mockups for each different through-penetration firestop system indicated to verify selections made and to demonstrate qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final installations.

1. Locate mockups on site in locations indicated or, if not indicated, as directed by Architect.
2. Notify Architect one week in advance of the dates and times when mockups will be erected.
3. Obtain Architect's acceptance of mockups before start of final unit of Work.
4. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work.

a. Accepted mockups in an undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

E. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.08 PROJECT CONDITIONS

A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.09 SEQUENCING AND SCHEDULING

A. Notify Government's inspection agency at least one week in advance of firestopping installations; confirm dates and times on days preceding each series of installations.

B. Do not cover up those firestopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

PART 2 PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:
   a. Semirefractory fiber (mineral wool) insulation.
   b. Ceramic fiber.
   c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
   d. Fire-rated formboard.
   e. Joint fillers for joint sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.02 FIRE-SAFING BOARD INSULATION

A. Provide material tested, listed and labeled by UL and listed by UL in designs similar to applications indicated. Provide semi-rigid, non-asbestos mineral fiber board, rated noncombustible when tested according to ASTM E 136:

1. k-Value: 0.25 at 75°F.
2. Thickness: 4 in., unless otherwise indicated, and not less than thickness necessary to obtain required fire-rating.
3. Density: Nominal 4 pcf.
4. Product: U.S. Gypsum Co., Thermafiber Safing Insulation; Partek Insulation, Inc., Paroc Safing Insulation; Fibrex, Inc., FBX Fire Safing Insulation; or approved equal.

2.03 MINERAL WOOL

A. Provide loose mineral wool, rated noncombustible when tested in accordance with ASTM E 136, free of asbestos and glass fiber, and suitable for in-place density of 6 pcf to 12 pcf.

2.04 CAULK AND PUTTY

A. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:

1. Bio Therm; Bio Fireshield.

2. Fire-Barrier Series; 3M Fire Protection Products.
3. Flamesafe; International Protective Coatings Corp.
4. Flame Stop V Putty and Caulking; Flame Stop, Inc.
5. Fyre Putty; Standard Oil Engineered Materials Company.
6. Silicone Firestop Foam 2001, and Sealant 2000; Dow Corning Corp.
7. CLK Adhesive Firestop; Nelson Firestop.
8. STI SpecSeal S100.

B. Schedule: Provide fire-resistive sealants as follows:

1. Wall Precast Panel Joints (3/4"): System "Dynatrol II - Ultrablock" by Pecora Corp. and Backer Rod Mfg., Inc. or approved equal.
2. Floor Precast Joints (3/4"): System "Dynatrol II - Ultrablock" by Pecora Corp. and Backer Rod Mfg., Inc. or approved equal.
3. Floor expansion joint assembly (4"): System "AC-20FTR - Ultrablock" by Pecora Corp. and Backer Rod Mfg., Inc. or approved equal.

2.05 FIRESTOP MORTAR

A. Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogenous mortar.

B. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:

1. Novasit K-10; Bio Fireshield
2. KBS Mortar Seal; International Protective Coatings Corp.
3. CMP Firestop Compound; Nelson Firestop.
4. STI SpecSeal Mortar.

2.06 FIRESTOP COLLARS

A. Provide premanufactured fire protective pipe sleeves equal to one of the following products, or Architect approved equal, that meet or exceed specified requirements:

1. Bio-Fireshield Firestop Collars.
2. STI SpecSeal Firestop Collars.
3. Hilti CP 642 Firestop Collar.

2.07 FIRESTOP BAGS/PILLOWS

A. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

B. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:

1. Firestop Pillows; Bio Fireshield.
2. KBS Sealbags; International Protective Coatings Corp.

3. PLW Firestop Pillow; Nelson Firestop.
4. STI SpecSeal Pillows.

2.08 WRAP STRIPS

A. Single-component, elastomeric sheet with aluminum foil on one side. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:

1. SpecSeal Wrap Strip; STI.
2. Fire Barrier FS195 Wrap Strip; 3M.
3. CS2420 Intumescent Wrap, Hilti Construction Chemicals, Inc.

2.09 COMPOSITE BOARDS

A. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:

1. Barrier Sheet Material; 3M.

2.10 DAMMING/FORMING MATERIALS, FASTENERS, AND ANCHORAGE ACCESSORIES

A. Provide damming/forming materials in accordance with manufacturer's recommendations.

B. Provide fasteners and anchorage accessories complying with UL designs and other components and accessories as needed and as recommended by the firestopping material manufacturer.

2.11 MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.03 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool non-sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.05 FIELD QUALITY CONTROL

A. Inspecting agency employed and paid for by the Government will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.06 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION

SECTION 07410

METAL WALL PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. The work of this section includes custom metal panel systems for wall panels.

1. Aluminum composite panels.
2. Steel, uninsulated metal panels.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 10220 - METAL GRILL PANELS AND PRIVACY SCREENS; Metal grill panels and operable privacy screens at Garage façade perimeter.
2. Section 07900 - JOINT SEALERS; sealant requirements.
3. Section 08900 - GLAZED CURTAIN WALLS, SLOPED ROOF GLAZING AND GLAZED CANOPY.

1.04 QUALITY ASSURANCE

A. Installer: A firm which has at least three years experience in work of the type required by this section and which is acceptable to the manufacturer of the panel system.

B. Source: Provide panel systems which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the panel system.

C. Engineering: Provide the services of a Professional Engineer, registered in the State of Maine, to design, seal and certify that the work of this section meets or exceeds code requirements and the performance requirements specified in this section.

D. Subdivision of Work: To limit responsibility, assign the complete preformed metal panel system including, but not limited to, panels, framing, subframing, fasteners, flashings, counterflashings, wall caps, copings, gravel stops, joint sealers and fillers, to one manufacturer and one installer.

E. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1. Comply with roof manufacturer's and roof installer's requirements for protection of roof and flashings.

F. Mock-Up: Mock-up of exterior wall including metal panels is required. Provide full-size mock-up as approved by Architect, including structural steel backup to support mock-up. Include masonry, precast concrete, glazed aluminum framing systems, metal panels, sealants and flashings. Locate on-site at location approved by Architect. Coordinate with work of other sections to ensure that mock-up construction is coordinated. Remove mock-up at end of project as acceptable to Architect. Refer to Drawings for sketch of mock-up.

1.05 PERFORMANCE REQUIREMENTS

A. Thermal Movement: Provide metal panels which allow for expansion and contraction through ambient temperature range of 120 degrees F.

B. Structural Performance: Provide metal panels, anchors and attachments which resist loads required by code and loads as indicated on the Structural Drawings without permanent deflection or permanent deformation. Information on Drawings referring to specific design of attachment, panel stiffening, and structural systems is intended for information only. System performance, based on project conditions and compliance with all applicable codes and loading requirements, shall be the responsibility of the panel fabricator and installer.

1.06 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide certifications stating that materials comply with requirements.

B. Shop Drawings: Provide shop drawings for fabrication, installation and erection of all parts of the work. Provide large scale detailed plans, elevations, and details of anchorages, connections and accessory items. Distinguish between factory and field assembly work.

C. Field Measurements: Take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress.

D. Calculations: Provide calculations and certification of the performance of this work prepared and sealed by a Professional Engineer, registered in the State of Maine. Show how design load requirements and other performance criteria have been satisfied.

E. Verification Samples: Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected. Provide samples having minimum area of 144 square inches. Submit full range of standard and custom color samples of joint sealant material for selection by the Architect.

F. Test Reports: Submit certified reports for tests and performance required.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from all possible damage. Sequence deliveries to avoid delays, but minimize on-site storage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Composite Panel System: Alucobond aluminum panel, 4 mm, or approved equal by Alpolic/Mitsubishi or Reynolds.

1. Framing: Design, engineer, and provide complete assembly of internal framing components, studs, girts and the like. All framing members and components shall be fabricated from ASTM A525 G90 galvanized sheet steel. Provide all primary and secondary framing members not indicated on the structural drawings.

2. Finish: Valspar Fluoropon Coating or equal, 4-coat 70% Kynar fluoropolymer, color shall be Dark Gray 399A649 as approved by the Architect.

3. Fasteners: Provide Universe or Sobotek attachment system or approved equal. Provide series 300 stainless steel anchor clips, bolts, screws, and fasteners. Attachment clips shall permit expansion and contraction of the panel system throughout the specified temperature range. Provide fasteners with watertight washer gaskets and with heads finished to match panels.

4. Accessories: Provide all components necessary for a complete, functional, weatherproof assembly including, but not limited to, trims, copings at metal panels, flashings within systems and related items. Metal materials shall match panels, but temper may be reduced to facilitate forming.

5. Aluminum Stiffeners and Structural Members: Provide extruded aluminum stiffeners and cold-rolled aluminum channels laminated to panels backs as required for stiffening of larger panels in vertical orientation or to support snow loads and live loads on horizontal fins.

B. Steel Uninsulated Metal Panel System: Concealed fastener, uninsulated, steel metal panel, without liner. Centria Concept series or equal.

1. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
2. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
3. Exposed Coil-Coated Finish:

a. Fluoropolymer 4-Coat Finish System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 1.5 mil; complying with AAMA 2605.

4. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

5. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.

   a. VOC Content: For panel sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

6. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

PART 3 - EXECUTION

3.01 INSPECTION

A. The Installer/Erector shall examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.

3.02 INSTALLATION/ERECTION

A. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section. Strictly duplicate UL tested assemblies where fire-ratings are indicated.

1. Install work to be truly straight and square.
2. Provide work as indicated on approved shop drawings.
3. Install work with uniform, tight interlocking joints.
4. Provide flashings, sealers, fillers and gaskets as necessary to make assembly weathertight and watertight.
5. Comply with applicable requirements of Section 07900 - Joint Sealers and Fillers including testing and compatibility.
6. Comply with SMACNA Sheet Metal Manual for flashings and sheet metal work.
7. Install work to meet specified performance requirements.
8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
10. Field cutting of metal wall panels by torch is not permitted.
11. Shim or otherwise plumb substrates receiving metal wall panels.
12. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
13. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
14. Install screw fasteners in predrilled holes.
15. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
16. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
17. Fasteners, Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

18. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.
19. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
20. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.

3.03 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, c opings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feetwith no joints allowed within 24 inchesof corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inchdeep, filled with mastic sealant (concealed within joints).

3.04 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inchoffset of adjoining faces and of alignment of matching profiles.

3.05 TOUCH-UP AND REPAIR

A. Touch-up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

END OF SECTION

SECTION 07530

SINGLE PLY MEMBRANE ROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide thermoplastic sheet roofing work as indicated on the Drawings and as specified herein, including, but not limited to the following:

1. Fully adhered membrane.
2. Roof flashings.
3. Roof insulation.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 05310, STEEL DECK.
2. Section 06100, ROUGH CARPENTRY; Sheathing and wood blocking, cants and nailers.
3. Division 15 - MECHANICAL; Roof penetrations and installation of roof-mounted equipment.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Shop Drawings: Provide large scale shop drawings for installation of all parts of the work. Provide plans, and details of seams, connections and accessory items. Show layouts of tapered insulation and locations of drains. Show interfaces and relationships to work of other trades.

C. Test Reports: Provide certified reports for all specified tests.

1.05 QUALITY ASSURANCE

A. Source: For each material type required for the work of this section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of three years experience in type of work required by this Section and that is acceptable to manufacturers of primary materials.

C. UL Listing: Provide roof system that has been tested and listed by UL as Class A for roof deck, slope and application indicated.

D. Manufacturer's Representative: Make arrangements and pay costs to have manufacturer's authorized representative on roof at beginning of roofing work to advise installer of proper procedures and quality control techniques.

1.06 WARRANTY

A. Furnish manufacturer's warranty stating that manufacturer shall maintain roofing and thermoplastic membrane flashings in watertight condition at his own expense for fifteen years from date of Substantial Completion, provided that Owner gives manufacturer written notice of any leak within thirty days from the discovery of such leak. Warranty is solely intended to cover any condition caused by defective materials, installation, or ordinary wear and tear. Warranty shall not cover damage from lightning, full gales, hurricanes, or similar unusual natural occurrences or any condition caused by any deliberate act or by negligence in maintenance.

1.07 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within the limits established by manufacturers of the materials and products used.

B. Substrates: Proceed with work only when substrate construction and penetration work is complete.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

C. Adhesives, cements, mastics and sealers shall be stored between 60°F and 80°F should they be exposed to lower temperatures, restore to room temperature for three to five days prior to use. Do not use materials damaged in handling or storage.

D. Store insulation and provide full protection against dampness before laying. Insulation boards shall be dry when applied, and shall be protected from the weather during installation. Any materials damaged by exposure to the elements or other cause shall be rejected and removed promptly from site.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide materials and roofing systems from one of the following manufacturers that meet or exceed specified requirements:

1. Sarnafil Inc.
2. GenFlex Roofing Systems; GenCorp Polymer Products.
3. HPG Roofing Systems, div. of Johns-Manville

2.02 ROOF SYSTEM

A. Materials and installation shall conform to manufacturer's standard specifications, and work of this Section shall be executed by roofing installer licensed by manufacturer.

B. Provide thermoplastic roofing system consisting of adhered single-ply PVC sheet and mechanically-attached insulation over roof deck. Provide system conforming to UL Class A and Factory Mutual Class 1. Roof system shall conform to Factory Mutual Windstorm Resistance Classification 1-90.

2.03 MEMBRANE ROOFING MATERIAL

A. General: Virgin polyvinyl chloride (PVC) with plasticizers and modifiers, formed into uniform flexible sheets, complying ASTM D 4434, Type to suit project.

1. Thickness: 60 mils, nominal.
2. Membrane Reinforcing: Manufacturer's standard polyester scrim.
3. Exposed Face Color: Custom color as selected by the Architect.

B. Fully Adhered PVC Membrane: Manufacturer's standard installation.

C. Flashing Material: Manufacturer's standard system compatible with single-ply membrane.

D. Slip Sheet at Thermoplastic Flashing: Type recommended by membrane manufacturer for protecting membrane from incompatible substrates (thermoplastic flashing).

2.04 RIGID ISOCYANURATE INSULATION

A. Isocyanurate Board Insulation: Provide indicated thickness of rigid isocyanurate foam roof insulation consisting of isocyanurate integrally laminated on top and bottom with non-reflective facer. Provide insulation conforming to Fed. Spec. HH-I-1972, and that is acceptable to roofing system manufacturer.

1. Rigid isocyanurate shall have minimum density of 2 lb. cu. ft., minimum compressive strength (ASTM D 1621) of 25 psi, maximum moisture vapor transmission (ASTM E 96) of 2.0 perm, "C" factor of 0.16 (1 in.) or better, and "R" value of 6.67 (1 in.).
2. Steel Decks: Insulation shall be approved by Factory Mutual (FM) for Class 1 Insulated Steel Deck Construction and shall be UL listed Class A.
3. Provide tapered boards where indicated for sloping to drain. Fabricate with taper of 1/4 inch per foot, unless otherwise indicated.

B. Anchors for Insulation: Provide mechanical anchors at metal decks. Provide corrosion-resistant type as recommended by insulation manufacturer for deck type and complying with fire and insurance wind-uplift rating requirements. Provide system tested and approved for FM 1-90 wind-uplift rating.

2.05 RECOVERY BOARD

A. Barrier: Type X gypsum wall board, ASTM C 36, 5/8 inch thick.

2.06 VAPOR RETARDER

A. Provide Vaporstop 398, manufactured by Fortifiber Corp., Attlboro, MA 02703, or Architect approved equal.

B. Vapor Retarder Adhesive: Provide Pyro-Kure Roofing Adhesive 402, manufactured by Fortifiber Corp., Attlboro, MA 02703, or Architect approved equal.

2.07 RELATED MATERIALS

A. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, seam caulk, termination reglets, and other accessories recommended by roofing system manufacturer for intended use.

B. Bonding Adhesive: Provide bonding adhesive as recommended by manufacturer. Provide adhesive compatible with all materials and substrates.

C. Splicing Cement: Provide splicing cement and splice cleaners as recommended by membrane manufacturer.

D. Lap Sealant: Provide lap sealant for sealing exposed edge of splices of trowel on gun consistency, and as recommended by membrane manufacturer.

E. Miscellaneous Materials: Provide water cutoff mastic, night sealer, and pourable sealer as recommended by membrane manufacturer.

F. Prefabricated thermoplastic accessories (pipe seals, inside and outside corners, etc.) shall be as manufactured and recommended by membrane manufacturer.

G. Nailing Strips and Fasteners: Nailing strips shall be extruded rubber and mechanical fasteners approved by system manufacturer.

H. Roofing Nails: 11 gauge hot-dip galvanized, length to penetrate wood members at least 7/8 in., with 5/8 in. diameter heads, as recommended by membrane manufacturer.

I. Restraining and Termination Bars: Provide system manufacturer's recommended galvanized metal bars in shapes and configurations required to secure insulation at edges and at slope. Provide fasteners as required.

J. Reglets: Provide fabricated metal units of type and profile indicated, or if not indicated, as required to properly complete the work. Fabricate reglets from metal which is compatible with flashings used.

PART 3 EXECUTION

3.01 INSPECTION OF SURFACES TO RECEIVE MEMBRANE ROOFING

A. Carefully check roof deck areas for conditions affecting application and performance. Report defects in writing to Construction Manager. Do not proceed with roofing work until defects have been corrected.

B. Beginning work shall constitute acceptance of its conditions and any defects in roofing work resulting from such accepted surfaces shall be corrected without further expense to the Authority.

3.02 MEMBRANE ROOFING, GENERAL

A. Surfaces to receive roofing materials shall be rigid, tight, clean, dry, smooth, free of scale, dust, oil, or other foreign matter, and also free of frost or the effects of freezing. Thoroughly clean surfaces to remove loose particles immediately before application of subsequent materials. Do not apply roofing materials over wet subsurfaces.

B. Where surface joints at roof and wall substrates exceed 1/4 in. width, fill flush with surface with pourable sealer before proceeding with the installation.

C. Do not leave unfinished roof areas uncovered overnight or during inclement weather.

D. Work shall conform to manufacturer's published specifications, and the published standards of UL. Roof shall be made permanently weatherproof in continuous operation, including connection to flashing and gravel stops.

E. Comply with manufacturer's recommended details and adopt their principles of design. Provide manufacturer's recommended weatherproofing method at projections, connections to sheet metal gravel stops and flashings and at other special conditions.

F. Do not damage or stain surrounding work. Remove stains and repair damage immediately, as work progresses, as part of work of this Section.

G. Proceed with flashing work concurrently with roof installation to prevent water entry at flashing locations.

H. Cutting and Patching: Provide all cutting and patching of roofing work as required to make way for new work.

3.03 ROOF INSULATION

A. Install only as much insulation daily as can be covered with roofing by close of work. Do not expose materials to rain or snow, nor overnight. Replace material that becomes wet.

B. Attach insulation to roof deck with spots of cold adhesive and mechanical fasteners spaced according to Factory Mutual Loss Prevention Data Sheet 1-28 for 1-90 Windstorm Resistance Classification. Cut insulation to fit around roof penetrations and projections. Trim edges of insulation boards so that no edge is left unsupported. Stagger transverse joints in insulation 2 ft. in adjacent rows and butt edges tightly. Joints between boards shall be less than 1/4 in. wide.

C. Feather or taper insulation around drains for smooth transition between roof surface and drain clamp ring.

3.04 MEMBRANE ROOFING INSTALLATION

A. Install thermoplastic sheet over area to receive roofing according to roofing system manufacturer's written instructions. Unroll sheet and allow to relax for a minimum of 30 minutes.

1. Install sheet according to ASTM D 5082 and FM requirements.

B. Start installation of sheet in presence of roofing system manufacturer's technical personnel.

C. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Fully Adhered Membrane: Adhere membrane to insulation, and plywood where indicated, in conformance with approved submittals, including manufacturer's published instructions and details. Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer. Apply adhesive to surfaces to be bonded and roll into place when adhesive has properly cured. Provide heat welded seams. Install mechanical fasteners, flashings and counterflashings, and accessories at locations and as recommended by manufacturer.

E. Elastomeric Flashings Which Are Part of Roofing System: Provide elastomeric sheet flashings at elastomeric sheet roofing work, as indicated.

1. Use longest practical lengths and widths of elastomeric sheet flashing material to eliminate or minimize joints. Complete splices between flashings and main roof sheet before bonding flashings to vertical surfaces. Splices shall be sealed 3 in. beyond fasteners that attach membrane to horizontal nailer in same manner as splices within roofing membrane. Flashings shall be bonded 100% to subsurfaces, except at coves where movement is anticipated, where flexible tube shall be installed.
2. Apply bonding adhesive to flashing and surface to which it is being bonded. When bonding adhesive has dried to the point where it does not string or stick to a dry finger touch, roll flashing into adhesive. Do not bridge flashing at changes of direction.
3. Nail top of flashing 12 in. on center under sheet metal copings, counterflashing, and other sheet metal work.
4. Pipe Flashing: Flash penetrating pipe, conduit, and duct penetrations with prefabricated pipe seals where possible and field-fabricated seals were necessary.
5. Expansion Joints: Treat expansion joints as indicated in expansion joint manufacturer's standard details and published instructions for specific conditions.
6. Unusual Penetrations: Seal clusters of pipes and unusually shaped penetrations with pourable sealer, 2 in. deep in pitch pocket seal, as indicated in manufacturer's standard details and published instructions for specific conditions.
7. Roof drains: Install membrane into drain flange and seal between membrane and drain base with water cut-off mastic, as indicated in manufacturer's standard details and published instructions for specific conditions.

3.05 CLEANING

A. Keep surrounding surfaces clean as work progresses.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide all flashing and sheet metal work as required to complete the work of the Contract. Include, but do not limit to:

1. Exposed metal flashings.
2. Through wall flashings.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 04200, UNIT MASONRY; Installation of through wall flashing.
2. Section 06100, ROUGH CARPENTRY; Wood blockings, nailers, etc., and plywood backing for work of this Section.
3. Section 08920, GLAZED CURTAIN WALLS, SLOPED ROOF GLAZING, AND GLAZED CANOPY.
4. Division 15 - MECHANICAL; Sheet metal ductwork.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorages, connections and accessory items. Show sizes, material gages, profiles, splices and other details. Provide installation templates for work installed by others. Show all interfaces and relationships to work of other trades.

C. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each flashing material used.

D. Verification Samples: Submit representative samples of each material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials in manufacturer's sealed containers and rolls.

B. Store indoors or under cover, on raised platforms, fully protected from damage.

1.06 COORDINATION

A. Conference: Convene a preinstallation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Coordination: Perform work of this Section in coordination with other trades to provide the highest quality work.

PART 2 PRODUCTS

2.01 EXPOSED METAL FLASHING

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:

1. Copings: ASTM B 209, 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.
2. Scuppers: ASTM B 209, 3003-H14, with a minimum thickness of 0.050 inch, unless otherwise indicated.

2.02 THROUGH WALL FLASHING

A. Copper Fabric Flashing: Provide 5 oz. per sq. ft. copper sheet conforming to ASTM B 370, electrolytically deposited and bonded to two layers of asphalt saturated glass fiber fabric. Provide products of one of the following manufacturers that meet or exceed this Specification.

1. AFCO Products, Inc.
2. Phoenix Building Products.
3. York Manufacturing.

2.03 RELATED MATERIALS

A. Nails: Provide "Stronghold" type, with large flat heads, annular rings, and needle points. Provide nails no smaller than No. 12 Stubs gauge and of sufficient length to penetrate wood substrates no less than 7/8 in. Provide nails of same materials and finish as sheet metal with which used.

B. Provide screws, bolts, and other accessories of same material and finish as sheet metal with which used.

C. Solder: 40% lead, 60% tin, conforming to ASTM B 32.

D. Flux: Non-acid proprietary flux manufactured specifically for use with lead coated or terne coated materials, as applicable.

E. Sealant: Low-modulus sealant, silicone or urethane based, compatible and recommended by manufacturer for use with sheet metal types specified, equal to products of General Electric, Dow Chemical Co., or Pecora Co., and as approved by Architect.

F. Isolation Coating: SSPC Paint 12.

G. Roofing Cement: ASTM D 2822, asphaltic.

H. Accessories: Provide necessary clips, cleats, straps, anchors, and similar items to complete the work. Provide accessories compatible with sheet metal materials used.

I. Reglets: Provide fabricated metal units of type and profile indicated, or if not indicated, as required to properly complete the work. Fabricate reglets from metal which is compatible with flashings used.

2.04 FABRICATION

A. General: Shop fabricate work to the greatest extent possible. Fabricate work straight, plumb, level and square, and to provide the best watertight, weatherproof performance with proper expansion provisions in running work. Comply with referenced SMACNA Manual standards and details.

1. Minimize oil-canning, buckling, tool marks and other noticeable defects.
2. Fold edges to form hems.
3. Make joints watertight.
4. Form moving seams with 12 in. lapped, bayonet-type, sealant filled joints.
5. Isolate dissimilar materials with isolation coating.

B. Sizes and Profiles: Provide work to sizes, shapes, and profiles indicated.

PART 3 EXECUTION

3.01 INSPECTION OF SURFACES

A. Carefully inspect surfaces to receive sheet metal for all conditions affecting sheet metal application and performance. Carefully check wood blockings, inserts, nailers, etc., for adequate anchorage. Defects shall be reported in writing to the Architect and sheet metal work shall not proceed until defects have been corrected.

B. Beginning of work constitutes acceptance of conditions of surfaces to which this work is to be applied.

3.02 SHEET METAL WORKMANSHIP

A. Provide sheet metal flashing and trim, and other work required for various conditions as specified and shown on Drawings.

B. Provide accessory items essential to the completeness of each sheet metal installation, though not specifically shown or specified.

C. Clean surfaces to be covered with sheet metal of dirt and other foreign matter before sheet metal work is started. Portions of sheet metal in contact with dissimilar metal, concrete, or masonry shall be given a coat of bituminous paint. Take extreme care to prevent direct contact of dissimilar metals.

D. Except as otherwise shown on the approved shop drawings or specified herein, the workmanship of sheet metal work, method of forming joints, anchoring, cleating, provisions for thermal movement, etc., shall conform to the standard details and recommendations of the sheet metal producer and those of producer organizations and research institutions and associations governing the sheet metal used, in addition to the standards and details set forth in the SMACNA Manual.

1. To greatest extent applicable, fabricate sheet metal components in shop, and thoroughly clean joints on both sides of the sheet metal work.
2. Provide flat-locked seams, except where expansion provisions are required or where otherwise specified or detailed. Finish seams at least 1/2 in. in width.
3. Double back exposed edges 1/2 in. to provide stiffness.
4. Seal all working-joints in sheet metal work with low modulus sealant to assure positively weathertight conditions throughout, using materials as specified and with workmanship as specified under Section 07900, JOINT SEALERS.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Caulk and seal joints as indicated on the Drawings and as specified. Include, but do not limit to:

1. Sealing of joints between perimeter of exterior door frames, window frames, metal panels, vents, louvers, and other items occurring in openings in exterior masonry walls, and the surrounding construction, including bed sealing of thresholds.
2. Sealing of interior perimeter joints at door frames, window frames, vents, louvers, and other wall openings.
3. All other interior sealing called for, or reasonably inferred from the Drawings, and as required to provide weathertight conditions in exterior assemblies.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 07270, FIRESTOPPING; Fire resistive sealants and caulks.
2. Section 08800, GLASS AND GLAZING; Glazing sealants and gaskets.
3. Section 08920, GLAZED CURTAIN WALLS, SLOPED ROOF GLAZING, AND GLAZED CANOPY; Structural glazing.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each sealant material used. Provide certifications that sealant materials comply with specified requirements.

B. Initial Selection Samples: Submit samples manufacturer's color charts showing complete range of colors, textures, and finishes available for each material used.

C. Verification Samples: Submit actual representative samples of each sealant material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide sealant samples having minimum size of 4 in. long.

D. Test Reports: Provide certified reports for all specified tests.

1.05 COMPATIBILITY

A. Provide sealant and sealant joint backing materials suitable for the use intended and compatible with the materials with which they will be in contact. Compatibility of sealant and accessories shall be verified by the sealant manufacturer.

1.06 QUALITY ASSURANCE

A. Source: For each sealant material type required for the work of this section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to the manufacturers of the primary materials.

B. Installer: A firm with a minimum of five years experience in type of work required by this Section and which is acceptable to the manufacturers of the primary materials.

C. Mock-Ups: Prior to commencing the primary work of this Section, provide mock-ups at locations acceptable to Architect. Obtain Architect's acceptance of visual qualities. Protect and maintain accepted mock-ups throughout the remainder of the work of this section to serve as criteria for acceptance of the work.

1.07 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within the limits established by manufacturers of the materials and products used.

B. Substrates: Proceed with work only when substrate construction and penetration work is complete.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Materials under this Section shall be delivered to, and stored at, the job site in unbroken factory sealed containers with labels intact.

1.09 WARRANTY

A. Furnish joint sealant manufacturer's written single-source performance warranty that joint sealant work will be free of defects related to workmanship or material deficiency for five years from date of Substantial Completion of the Project.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Before installation check each sealant for compatibility with adjacent materials and surfaces and with indicated exposures. Select sealers which are recommended by manufacturer for each application indicated. Where exposed to pedestrian or vehicular traffic, provide sealants which are non-tracking and are strong enough to withstand the traffic without damage.

B. Provide colors as selected by Architect from manufacturer's standard and special (Tremco Fastpak) colors. Where specifically requested, provide custom color matches.

2.02 SELF-LEVELING POLYURETHANE SEALANT

A. Provide two or more part, self-leveling, polyurethane based elastomeric sealant, complying with ASTM C 920, Fed. Spec. TT-S-00227E Type 1 Class A, having Shore A hardness of not less than 30 when tested according to ASTM C 920, cured modulus of elasticity at 100% elongation of not more than 150 psi when tested according to ASTM D 412, and tear resistance of not less than 50 lbs./inch when tested according to ASTM D 624.

B. Where joint surfaces contain bituminous materials, provide modified sealants which are compatible with bituminous materials encountered.

C. Provide one of the following products that meet or exceed specified requirements:

1. Tremco THC 900.
2. Pecora Urexpan NR-200.
3. Tremco Vulkem 245 or 255.
4. Sika 2C, SL.
5. Sonneborn Sonolastic PvJtSt.

D. Extent: Provide self-leveling polyurethane sealant for floor joints not indicated to be sealed with another type of sealant.

2.03 NON-SAG POLYURETHANE SEALANT

A. Provide multi-part, non-sag, polyurethane based elastomeric sealant, complying with ASTM C 920 Type M, Grade NS, Class 25, Fed. Spec. TT-S-00227E Class A, having Shore A hardness of 20 to 30, cured modulus of elasticity at 100% elongation of not more than 75 psi, and tear resistance of not less than 50 lb./in. when tested according to ASTM D 624.

B. Provide one of the following products that meet or exceed specified requirements:

1. Tremco Dymeric.
2. Tremco Vulkem 227.
3. LymTal International Iso-Flex 881.
4. Sika Sikaflex 2c NS.
5. Sonneborn Sonolastic NP 2.

C. Where joint requires 50% movement capabilities, provide Tremco Dymeric Plus, or equal product approved by Architect.

D. Extent: Provide non-sag polyurethane sealant for all masonry to metal panel joints, masonry to masonry joints, masonry to granite joints, and other joints not indicated to be sealed with another type of sealant.

2.04 SILICONE RUBBER SEALANT

A. Provide one part, silicone rubber based elastomeric sealant, complying with ASTM C 920 Type S, Class 25, Grade NS, and Fed. Spec. TT-S-001543A Class A.

B. Provide mold and mildew resistant, sanitary interior type sealant.

C. Provide one of the following products that meet or exceed specified requirements:

1. Dow 786.
2. General Electric 1702 Sanitary.
3. Pecora 863.
4. Rhodorsil 6b White.
5. Sonneborn OmniPlus.
6. Tremco Proglaze.

D. Extent: Provide silicone rubber sealant for interior joints around plumbing fixtures and tile to tile joints in ceramic tile work.

E. Provide colors to match grout as approved by the Architect.

2.05 ACRYLIC LATEX SEALANT

A. Provide permanently flexible, latex rubber modified acrylic emulsion sealant, complying with ASTM C 834.

B. Provide one of following products that meet or exceed specified requirements:

1. Pecora AC-20.
2. Tremco Acrylic Latex 834.
3. Sonneborn Sonolac.

C. Extent: Provide acrylic latex sealant for use at mirrors, for exposed acoustical sealant, and for interior joints except where silicone rubber sealant is indicated.

D. At interior joints greater than 1/2 in. in width or subjected to periodic building movement, substitute exterior type sealant specified above.

E. Where surrounding wall surfaces are to be left unpainted, substitute exterior type sealant as specified above.

2.06 PREFORMED JOINT SEALER

A. Preformed Resilient Joint Sealer: Preformed Resilient Joint Sealer for use at building expansion joints in exterior concrete and masonry walls where specifically called for on Drawings shall be preformed, resilient, extruded polychlorophrene elastomeric joint sealer, conforming to ASTM D 2628 and AASHTO M 220 of indicated configuration(s), in continuous lengths, set in manufacturer's recommended primer-lubricating-adhesive consisting of moisture curing polyurethane and aromatic hydrocarbon solvent mixture (73% solid by weight) concrete gray color, equal to one of the following:

1. D.S. Brown Co.
2. Watson Bowman Acme Corp.

2.07 PREFORMED, PRECOMPRESSED, IMPREGNATED FOAM SEALANT

A. Provide manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; factory-produced in precompressed sizes in roll or stick form to fit joint widths indicated. Provide foam sealant permanently elastic, mildew-resistant, nonmigratory, nonstaining, compatible with substrates, and complying with the following requirements:

1. Impregnating Agent: Manufacturer's standard.
2. Density: 8 to 10 lb./cu. ft.
3. Backing: Manufacturer's standard pressure sensitive adhesive, factory applied to one side, with protective wrapping.

B. Provide one of the following products, or Architect approved equal:

1. Emseal Greyflex; Emseal Corp.
2. Will-Seal 150; Wil-Seal Construction Foams Div., Illbruck.
3. York-Seal 100; York Manufacturing, Inc.

2.08 MISCELLANEOUS MATERIALS

A. Primer: Provide primer recommended by sealant manufacturer for surfaces to be adhered to.

B. Bond Breaker Tape: Provide polyethylene or other plastic tape recommended by sealant manufacturer to prevent three-sided adhesion.

C. Backer Rod: Provide compressible rod of durable nonabsorptive material recommended by sealant manufacturer for compatibility with sealant. Provide products of one of the following manufacturers:

1. Backer Rod Manufacturing and Supply Co.
2. Dow Chemical Co.
3. Williams Products, Inc.
4. Woodmont Products, Inc.

D. Joint backing for general use at joints in horizontal surfaces shall consist of two rows of butyl rubber or neoprene foam rod in contact with one another, and each compressed to approximately 2/3 original width when in place.

E. Provide miscellaneous materials of type that will not bleed through sealant, discolor surface, or produce other deleterious effects. Select size to provide compression to approximately 2/3 original width when in place. Provide backing material profile concave to the rear of the sealant, and equipped with a bond-breaking film.

PART 3 EXECUTION

3.01 INSPECTION

A. The Installer shall examine substrates and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to proper completion of work. Do not

proceed with work until unsatisfactory conditions are corrected. Beginning of sealant work means Installer's acceptance of joint surfaces and conditions.

3.02 PREPARATION

A. Strictly comply with manufacturers' instructions and recommendations, except where more restrictive requirements are specified in this Section.

B. Clean joint surfaces immediately before installation of sealants, primers, tapes and fillers. Remove substances which could interfere with bond. Etch or roughen joint surfaces to improve bond. Surfaces which have been given protective coatings and those that contain oil or grease shall be thoroughly cleaned with xylol or MEK solvent, with due precautions taken to minimize hazards.

C. Unless otherwise indicated, use of sealants shall conform to the following: ASTM C 790 for latex sealants and ASTM C 962 for other sealants.

D. Tape or mask adjoining surfaces to prevent spillage and migration problems.

E. Prime surfaces as recommended by sealant manufacturer.

3.03 INSTALLATION

A. Schedule work as long as possible after completion of concrete work and finished brick masonry and granite work.

B. Provide backer rods for sealants except where specifically recommended against by sealant manufacturers.

C. Prevent three sided adhesion by use of bond breaker tapes or backer rods.

D. Force sealant into joints to provide uniform, dense, continuous ribbons free from gaps and air pockets. Completely wet both joint surfaces equally on opposite sides.

E. Except in hot weather, make sealant surface slightly concave. Install sealants so that compressed sealants do not protrude from joints. Dry tool sealants to form a smooth dense surface. At horizontal joints form a slight cove to prevent trapping water.

F. Provide sealants to depths indicated, or if not indicated, follow manufacturer's recommendations. For joints up to 3/8 in. width, depth of joint shall not exceed 1/2 in.; for joints larger than 1/2 in. width, depth of joint shall not exceed 5/8 in.

3.04 EXTENT OF SEALANT WORK

A. General Extent: Seal joints indicated, and all interior and exterior joints, seams, and intersections between dissimilar materials. Provide elastomeric sealant installation with backer rod in all interior and exterior control joints.

B. Exterior Sealing: Without limitation, the work of this Section includes sealing the following:

1. Masonry to masonry joints.

2. Masonry to other exterior wall materials, including concrete, metal, and wood.
3. Precast to precast joints.
4. Precast to other exterior wall materials, including concrete, metal, and wood.
5. Joints and cracks in paving and walks.
6. Joint fillers for all joints.

C. Interior Sealing: Without limitation, the work of this Section includes sealing the following:

1. Perimeters of door frames, window frames, and metal and wood frames.
2. Top of wall base along irregular walls.
3. Between acoustical ceiling edge angle and irregular walls.
4. Completely around plumbing fixtures, fittings, and trim to walls and floors.

D. Thresholds of exterior doors shall be set in full beds of exterior sealant, not less than 3/8 in. thick. At Contractor's option, a polybutene or polyisobutylene sealant by same manufacturer may be used at thresholds.

3.05 CURING

A. Cure sealants in strict compliance with manufacturers' instructions and recommendations to obtain highest quality surface and maximum adhesion. Make every effort to minimize accelerated aging effects and increase in modulus of elasticity.

3.06 CLEANING AND PROTECTION

A. Remove smears from adjacent surfaces immediately, as the work progresses. Exercise particular care to prevent smearing or staining of surrounding surfaces which will be exposed in the finished work, and repair any damage done to same as result of this work without additional cost to Owner.

B. Remove and replace work that is damaged or deteriorated.

C. Clean adjacent surfaces using materials and methods recommended by sealant manufacturer. Remove and replace work that cannot be successfully cleaned.

D. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protection immediately before final acceptance.

END OF SECTION

SECTION 07920

PRECAST DECK JOINT SEALANTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

1. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

2. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

3. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract

1.02 DESCRIPTION OF WORK

A. This Section includes joint sealants for the following locations:

1. All joints in Precast Concrete Deck including Double Tee joints, joint in Cast-In-Place Concrete Toppings, and joints between Cast-In-Place Concrete and Precast Concrete.

1.03 RELATED SECTIONS

A. Cast-in-Place Concrete: Section 03300.
B. Structural Precast Concrete: Section 03410.
C. Traffic Membrane: Section 07180.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.05 SUBMITTALS

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 10 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate the Owner for additional review cycles.

G. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Joint Sealant Material.
2. Backer Rod.
3. Certification by joint sealant product plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.
4. Warranty.
5. Applicator's qualifications.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated:

1. ACI 504R-90 " Guide to Sealing Joints in Concrete Strucutres."

2. SWR "Applying Liquid Sealants."

3. SWR " Sealants: The Professionals Guide."

4. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

5. PCI Committee Report "Joints in Precast Parking Structures".

B. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

C. Field-Constructed Mock-Ups: Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:

1. Joints in field-constructed mock-ups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants specified in this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver Materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg. F.

2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than or greater than that allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.08 WARRANTY

A. System Manufacturer: Furnish Owner with written total responsibility guarantee that system will be free of defects, water penetration and chemical damage related to system design, workmanship or material deficiency, consisting of:

1. Any adhesive or cohesive failures.
2. Weathering
3. Surface crazing.

B. If material surface shows any of defects listed above, supply labor material to repair all defective areas and to repaint all damaged line stripes.

C. Guarantee period shall be 5 yrs commencing with date of acceptable Work.

D. Perform any repair under this guarantee at no cost to Owner.

E. Before Construction, provide Engineer/Architect with sample of final guarantee. Guarantee shall be provided by manufacturer.

F. Vandalism and abnormally abrasive maintenance equipment are exempted from warranty.

PART 2- PRODUCTS

2.01 MATERIALS GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with 1 another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Match existing.

2.02 ELASTOMERIC JOINT SEALANTS

A. General building sealants: 2 or 3-component, Type II, non-sag, urethane sealant, conforming to ASTM C 920.

B. Accepted general building sealants:

1. "NP-2," Sonneborn, Minneapolis, MN.
2. "Sikaflex-2C NS/SL," Sika Corp., Lyndhurst, NJ.
3. Approved equal.

C. Packing and backer rod: See heading, "Joint Sealant Backing."

D. Sealants used shall not stain masonry or concrete. Aluminum pigmented compounds not acceptable.

2.03 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Polyethylene Backer Rod: preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible material and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint-surfaces at back

of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.04 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from

above cleaning operations by vacuuming or blowing out joints with oil-free compressor.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain, enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm surfaces, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, no exceptions. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond: do not allow spillage or migration onto adjoining surfaces. Remove any spillage or migration.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicted, except where more stringent requirements apply.

B. Reference PCI Committee Report "Joints in Precast Parking Structures".

C. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

   a. Do not leave gaps between ends of joint fillers.
   b. Do not stretch, twist, puncture, or tear joint fillers.
   c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Non sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.04 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 07970

EXPANSION JOINTS

1.01 RELATED DOCUMENTS

A. Attention is directed to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A The extent of the elastic expansion joints is shown on the drawings.

B. Expansion joints occur on supported levels, at the following locations:

1. Main garage floors: Between grids 6 & 7.
2. Between helix and garage floors: Along 4.7, 8.3 and along south perimeter of helix.
3. At entrances to stair towers.
4. At ramps to existing garage on ground level and level 4.
5. At roof top canopy covering helix.
6. At garage perimeter, between retaining wall and garage ground level.

1.03 SUBMITTALS

A. Shop drawings: Submit large scale details for all expansion joint conditions.

B. Product data: Submit manufacturer's literature for products furnished. Include sample form of warranty.

C. Applicator's certificate: Submit a copy of Certificate of License issued to systems applicator by the manufacturer.

D. Maintenance data: Prepare data for incorporation into project maintenance manual.

1. Include recommendations for periodic inspections, care and maintenance, including snow removal procedures.
2. Identify common causes of damage with instructions for temporary patching until permanent repair can be made.

1.04 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference prior to commencing work related to this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in original sealed, undamaged containers. Each container shall be identified with manufacturer's name, material name, date of manufacture and lot number.

B. Handle materials in accordance with manufacturer's written direction.

C. Store materials under cover and protect from the weather. Replace packages or materials showing sign of damage with new material at not additional cost to the Owner.

D. At no time shall the weight of the stored material placed on a slab area exceed 50 psf or 2,000 lbs. over 20 square inches.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Weather: Not raining. If slab is damp, prime surfaces with moisture-curing, compatible primer.

B. Ventilation: Provide during application and curing period. Prevent prolonged inhalation of vapors or continued contact with skin.

C Fire precautions: No smoking, sparks, welding or open flames.

D. Temperature: All treated surfaces must be 40 degrees F. or above.

1.07 WARRANTY

A. Furnish the Owner a written performance warranty signed by manufacturer, applicator and contractor that the expansion joint system will be free of defects related to design, materials and workmanship for a five-year period from the date of acceptance of the Work required under this Section against leakage or any adhesive or cohesive failure.

B. Repairs necessary under this warranty shall be done without additional cost to the Owner.

C. Vandalism, abrasive maintenance equipment, are not normal traffic use and damage therefrom is exempted from the warranty. The warranty does cover any damage to expansion joint system during all phases of the initial construction. Any repairs are to be made at no expense to owner.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Expansion joint: Between grids 6 & 7; Along 4.7 & 8.3; At stair tower entries; At ramps to existing garage.

1. System: A complete system of compatible materials designed by manufacturer to produce waterproof, vehicle traffic-bearing joint seals at locations shown.

2. WABO APX system expansion joints with stainless steel cover plates. As manufactured by Watson Bowman Acme Corporation, Amherst, N.Y. Movement capabilities as tabulated on drawings.

3. Alternate manufacturers and their products will be considered, provided they meet the design intent, and are produced of materials that are equal or superior to those specified. Acceptable alternate manufacturers are:

   a. Conspec Systems Inc., Muncy, PA
   b. LymTal International, Inc., Lake Orion, MI

B. Roof canopy expansion joints: SRJ-1200 joint and cover by Conspec Systems, Inc., or equal.

C. Ground level expansion joints at retaining walls: JEENE expansion control system, model 2W, by Watson Bowman Acme Corporation, or equal.

D. Fire Barrier: At all ground level joints, provide a 2-hour rated fire barrier as part of the overall assembly.

2.02 EXECUTION

A. Inspection:

1. Inspect surfaces to receive the work and report immediately in writing to the Engineer any deficiencies in the surface which render it unsuitable for proper execution of this work.

2. Coordinate and verify that related work meets the following requirements:

   a. Concrete surfaces are finished as specified for the system installed.
   b. Curing compounds have not been used on concrete surfaces.
   c. Concrete surfaces have completed the proper curing period for the system selected.
   d. Concrete surfaces are properly prepared for the system in accordance with the manufacturer's recommendations.
   e. Application of surface sealer is compatible with the expansion joint installation.

B. Preparation:

1. Correct unsatisfactory conditions in a manner acceptable to the Installer before installing sealant system.
2. Grind joint edges smooth and straight prior to sealing. All surfaces that are to receive sealant shall be dry and thoroughly cleaned of all loose particles, laitance, dirt, dust, oil, grease or other foreign matter. Remove all laitance and contaminants from the surface. Get written approval of the method from the system manufacturer prior to beginning cleaning.
3. Check preparation of substrate for adhesion of sealant.
4. Prime and seal joints according to the manufacturer's directions and protect as required until sealant is fully cured.
5. Cease installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.

C. Installation:

1. Perform all work according to the manufacturer's written instructions and contract requirements.
2. Avoid smearing of sealants and other materials on concrete surfaces.
3. All installation details, methods, sizes of seal, etc., shall meet manufacturer's printed directions. Temperature at time of construction shall be considered (with recommendations by Manufacturer.) before casting compression seal slot.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide steel doors and frames and related items as indicated on Drawings and as specified herein. Include, but do not limit to, the following:

1. Interior and exterior flush steel doors.
2. Interior and exterior steel frames.
3. Fire-rated frame system.
4. Door louvers.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 04200, UNIT MASONRY; Grouting and building in steel frames.
2. Section 07900, JOINT SEALERS.
3. Section 08710, FINISH HARDWARE; Templates and hardware schedules.
4. Section 08800, GLASS AND GLAZING.
5. Section 09900, PAINTING; Field finishing of steel doors and frames.

1.04 QUALITY ASSURANCE

A. Source: Provide doors and frames by a single manufacturer for the entire project.

B. For doors and frames installed in fire-rated assemblies and where indicated or required by authorities having jurisdiction, provide door and frame assemblies that comply with NFPA 80 and NFPA 101, and which have been tested, listed and labeled in compliance with ASTM E 152 by an independent agency acceptable to authorities having jurisdiction.

1. Temperature Rise Rating: Labeled fire doors within an interior exitway stairway shall have a label indicating a maximum transmitted temperature end point of not more than 450°F above ambient at the end of 30 minutes of standard fire test exposure.

1.05 SUBMITTALS

A. Shop Drawings: Submit large scale shop drawings showing profiles, gauges of metal, details of frame types, elevations, details of construction, provisions for finish hardware, glazing, shop

finish, and other pertinent information. Show anchors and anchor spacings and accessory items.

1. Provide schedule of doors and frames using same reference numbers used on Contract Documents.

B. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each door and frame product used. Provide certifications that products and assemblies comply with requirements.

1.06 PRODUCT STORAGE AND HANDLING

A. Provide doors, frames, and related items properly packaged and protected during shipping, handling, and storage to prevent damage.

B. Store materials indoors under cover on raised platforms, fully protected from dirt and moisture.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following:

1. American Steel Products
2. Amweld
3. Ceco
4. Curries
5. Kewanee
6. Meskar
7. Philips
8. Republic
9. Steelcraft

2.02 MATERIALS

A. Hot Rolled Steel: ASTM A 568 and ASTM A 569, commercial quality, pickled and oiled.

B. Cold Rolled Steel: ASTM A 366 and ASTM 568, commercial quality carbon steel.

C. Galvanized Sheet Steel: Roller leveled commercial quality zinc coated carbon steel sheets complying with ASTM A 525, G60, mill phosphatized.

D. Anchors and Fasteners: ASTM A 153, Class C or ASTM A 153, Class D, 18 gage hot dipped galvanized steel.

E. Primer: Thermosetting primer compatible with finish system specified in Section 09900, PAINTING.

2.03 FABRICATION - GENERAL

A. Provide doors and frames truly rigid, straight, plumb, level and square. Match sizes, shapes and profiles indicated on approved shop drawings.

B. Exterior Work: Fabricate exterior doors and frames from galvanized sheet steel with closed tops and bottoms.

C. Concealed Work: Fabricate concealed components from either hot or cold rolled steel.

D. Preparation for Hardware: Fabricate doors and frames to receive finish hardware as indicated on approved final hardware schedules. Comply with ANSI A115 Series specifications.

2.04 STEEL DOORS

A. Styles: Provide steel doors of types and sizes indicated on Drawings and Schedules.

B. Faces: Fabricate exposed faces from stretcher leveled cold rolled steel.

C. Interior Doors (Non-Rated): SDI-100, Grade II, Heavy Duty, 16 gage minimum face sheets, Model 3 or 4, seamless construction.

D. Interior Doors (Fire-Rated): SDI-100, Grade II, Heavy Duty, 16 gage minimum face sheets, Model 4, with seamless mineral fiberboard composite construction.

E. Interior Doors (Sound-Rated): SDI-100, Grade II, Heavy Duty, 16 gage minimum face sheets, seamless Model 4, STC 33 or better, ASTM E 413.

F. Exterior Doors: SDI-100, Grade III, Extra Heavy Duty, 16 gage minimum face sheets, seamless, Model 4, maximum U-factor of 0.24 BTU/HR/FT^2/°F, ASTM C 236.

G. Louvers: Sightproof Y or V profile, 24 gage steel blades, and 20 gage steel frame.

1. Provide self-closing, UL fire-rated louvers in rated assemblies.

H. Glazing Stops: Manufacturer's standard rolled steel shapes with mitered corners and countersunk, tamper proof fasteners. Locate fasteners on least public side of door.

2.05 STEEL FRAMES

A. Provide steel frames from cold rolled steel sheets for doors, transoms, sidelites borrow lights, and elsewhere as indicated.

B. Steel Gages: Provide frames and components from the following:

1. Plaster guards and mortar boxes: 26 gage.
2. Interior frames 5 ft. wide and smaller: 14 gage.
3. Interior frames over 5 ft. wide: 14 gage.
4. Exterior frames: 14 gage.
5. Floor anchors: 14 gage.
6. Strike reinforcement: 14 gage.
7. Closer reinforcement: 12 gage.
8. Head channel reinforcement for frames over 4 ft. wide: 12 gage.
9. Hinge reinforcement: 10 gage.

C. Anchors: Provide minimum of three anchors at each jamb; 'T' type for masonry, 'Z' type for metal studs. Provide floor anchors at each jamb.

1. Provide UL approved anchors at fire-rated assemblies.

D. Frame Construction: Fabricate frames with fully welded mitered corners and seams. Grind and dress welds and seams to be flush and invisible after priming.

E. Silencers: Prepare single-leaf interior door frames to receive three resilient silencers. Prepare double-leaf interior door frames to receive two resilient silencers.

F. Stops: Extend stops to bottom of frame and cut at 90°.

G. Fire-Rated Door and Vision Panel Frame System: "Heat Barrier" fire-rated steel door and vision panel frame system as manufactured by Herman Forster AG and supplied by Technical Glass Products.

1. Steel Vision Panel Framing System: 120 min.
2. Steel Frame: Profiled steel tubing permanently joined with steel bolts.
3. Insulation: Insulate framing system against effects of fire, smoke, and heat transfer from either side. Insulate profiled steel tubing using a shell construction that incorporates Promatect-H intermediate interlayer. Firmly pack perimeter of framing system to rough opening with mineral wool fire stop insulation or appropriately rated intumescent sealant.
4. Steel Door System: 90 min.
5. Door Hardware: Manufacturer's standard as selected by the Architect.

2.06 WALL ANCHORS

A. Wall Anchors: Provide concealed metal wall anchors appropriate for adjoining wall construction. Wall anchors shall be nonremoveable, welded on, and of same material and gauge as frame.

1. Frames 7 ft. - 6 in. in height and less shall be provided with three anchors per jamb.
2. One additional anchor shall be added per jamb for each additional 30 in. in height, or part thereof.
3. At UL labeled frames, wall anchors shall conform to requirements of Underwriter's Laboratories, Inc.

2.07 SHOP FINISH

A. Preparation: Dress all metal surfaces smooth after fabrication. Clean all surfaces of grease, rust, mill scale, and other impurities. Hot phosphate treat all surfaces prior to painting.

B. Shop Primer: Dip or spray coat all surfaces with baked-on, rust-inhibitive metallic oxide, zinc chromate, epoxy, or synthetic resin primer.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine walls and conditions under which this work is to be performed. Notify Contractor in writing of conditions detrimental to proper completion of the work. Beginning work means Installer accepts substrates and conditions.

3.02 INSTALLATION

A. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section. Comply with all referenced standards.

B. Frames: Where conditions allow, place frames prior to walls or ceilings. Accurately plumb, level, align, square and brace. Place frame anchors securely at three points near hinge locations on both jambs. Place anchors at both sides into floor.

1. Secure angle floor anchors with two, 3/8 in. tempered steel expansion bolts each. Set other anchors, except those built-in by other trades. Set exposed heads centered in holes and flush with frames.
2. Set heads of thru-type anchor bolts flush with frame.

C. Doors: Install hinges supplied under Section 08710, FINISH HARDWARE and hang doors accurately into frame openings with uniform tight clearances around jambs and head. Doors shall swing freely without binding or scraping and shall remain motionless at any location when released.

3.03 TOLERANCES

A. Fire Rated Doors: Install fire-rated doors and frames with clearances specified in NFPA 80 and SDI 118.

B. Non-Rated Doors: Install non-rated doors in frames with clearances and tolerances specified in SDI 100.

3.04 ADJUSTING, TOUCH-UP, AND REPAIR

A. After installation of doors, frames, and hardware, make adjustments and corrections to leave operating parts in perfect operating condition. Doors shall not rub frame, scratch primer, nor bind.

B. Touch-up damaged shop coatings and repair minor damage to eliminate all evidence of repair.

C. Remove and replace work which cannot be satisfactorily repaired.

END OF SECTION

SECTION 08305

ACCESS DOORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Furnish access doors for installation under work of other Sections as indicated on Drawings and as specified.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 04200, UNIT MASONRY; Installation of access doors.
2. Section 09250, GYPSUM DRYWALL; Installation of access doors.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorage, connections and accessory items. Provide installation templates for work installed by others. Show all interfaces and relationships to work of other trades.

1.05 QUALITY ASSURANCE

A. Source: For each material type required for the work of this section, furnish primary materials which are the product of one manufacturer. Furnish secondary or accessory materials which are acceptable to the manufacturers of the primary materials.

1.06 TESTS

A. Fire Resistance Ratings: Where fire resistant ratings are indicated or required by authorities having jurisdiction, provide materials and construction which are identical to assemblies whose fire resistance ratings have been tested in compliance by independent agencies acceptable to the Contracting Officer and authorities having jurisdiction. Provide U. L. labeled assemblies.

PART 2 PRODUCTS

2.01 METAL ACCESS DOORS AND PANELS

A. Furnish metal access doors and panels for access to valves, damper controls, pipes, conduits, switches, regulators, etc., to the proper trades for building into the work, except that any access panels specifically specified under the Mechanical or Electrical Sections of the Specifications to be furnished by those trades are excluded from the work of this Section.

B. Furnish flush-type access doors, 18 gage minimum thickness specially designed for each type of wall and ceiling finish and construction with which used, with factory-applied prime finish, as manufactured by Cierra Products, J. L. Industries, Karp Associates, Inc., Birmingham Ornamental Iron Co., Miami-Carey, Babcock-Davis, or equal approved by Contracting Officer. Refer to Architectural, Mechanical, and Electrical Drawings for locations, sizes, and materials with which used.

1. Where installed at fire-rated walls or ceilings access panels shall be of fire-resistive construction and shall bear the U. L. 2 hour label.
2. Where installed in toilet rooms, access panels shall be AISI Type 304 stainless steel with No. 4 finish.

C. Access Doors and Panels - Types: Unless otherwise indicated, provide the following access panel types:

1. Access Door Type 2 (For use in Masonry Partitions): Recessed access panel, 16 gage steel frame, 14 gage steel door, concealed piano hinge, and screw driver operated cam type latch, equal to J. L. Industries Model TM.
2. Access Door Type 4 (Fire Rated Panels for Service Access to Utilities in Fire-Rated Walls or Ceiling of Stairwells, Shafts, and Corridors): Recessed access panel, 16 gage steel frame, 18 gage steel door, concealed piano hinge, self-closing door, and universal latch mechanism, equal to J. L. Industries Model FDWB.

PART 3 EXECUTION

3.01 INSTALLATION

A. All items furnished under this Section shall be delivered to site and turned over to the Contractor for installation by other appropriate trades.

END OF SECTION

SECTION 08333

OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. The work of this section includes, but is not limited to, the following:

1. Overhead coiling doors and related items.
2. Complete operating assemblies including curtains, guides, counterbalance mechanism, hardware, operator, and accessories.
3. Fire Shutters.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that relate directly to Work of this Section include, but are not limited to:

1. Section 05500, Metal Fabrications; Metal framing and supports.
2. Section 08710, Finish Hardware; Key cylinders for locks.
3. Section 09910, Painting; Finish painting of overhead coiling door assemblies.
4. Division 16 - Electrical; Wiring for electric motor operators.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, rough-in diagrams, installation instructions, use limitations and recommendations for each material used. Provide operating instructions and maintenance manuals. Provide certifications stating that materials comply with requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work not fully described by manufacturer's product data. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Provide wiring diagrams for electrically operated doors.

C. Field Measurements: Take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress.

D. Label Certification: Submit UL certification for oversized fire-rated doors and frames (if any) that each assembly has been constructed with materials and methods equivalent to requirements for labeled construction.

E. Samples: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Curtain Slats: 12 inches long, including vision window secured to slat.

1.05 QUALITY ASSURANCE

A. Source: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.

B. Provide motorized assemblies bearing the UL seal.

C. Where fire-rated assemblies are indicated, provide fire door assemblies that comply with NFPA 80 and have been fire tested, rated, and labeled in accordance with ASTM E 152. Provide fire-rated doors with metal UL label indicating rating in hours of duration of exposure to fire, and letter designation of location for which assembly is designed.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with all standard construction requirements of tested and labeled fire-rated door assemblies except for size.

D. Wind Loading: Design and reinforce exterior overhead coiling door assemblies to withstand a 20 lb. per sq. ft. wind loading pressure.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.07 PROJECT CONDITIONS

A. Provide inserts and anchorages which must be built into other work at the time they are needed. Avoid project delays.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide products of one of the following, that meet or exceed requirements specified:

1. Atlas Door Corporation
2. Cornell Iron Works
3. Overhead Door Corporation
4. Raynor Door Co.

2.02 EXTERIOR STEEL COILING DOORS

A. Assemble door curtains with structural quality, cold-rolled galvanized steel sheets complying with ASTM A 446, Grade A, with G90 zinc coating complying with ASTM A 525. Slats shall consist of exterior and interior galvanized steel slat facing formed over a 3/4 in. thick solid expanded polyurethane insulation core providing a U-factor of 0.20 or better, and shall be equipped with combination weather and wind pressure malleable iron endlocks riveted to end of every second slat to guide curtain within the guides. Plastic cladding is not acceptable in lieu of sheet metal facing. Construction:

1. Bottom Bars: Provide single steel angle or two steel angles placed back to back, with loop type vinyl weatherstripping astragal. In addition, provide rubber air baffle inside hood and rubber weatherstripping at exterior side of guides to reduce air infiltration, to comply with manufacturer's weathertight specifications.
2. Counterbalance Barrel: Provide steel pipe barrel of sufficient size to carry curtain load with deflection not to exceed 0.015 in. per foot of opening, evenly balanced by helical torsion springs contained within the pipe. Anchor springs to single torsion rod and hold in position with single adjusting wheel from outside. Welding of plugs at ends of barrels will not be acceptable.
3. End Bracket: Fabricate end bracket plate to house ends of coils from high grade iron or steel.
4. Hoods: Form hoods to fit contour of end brackets. Fabricate from 24 gauge galvanized sheet steel, conforming to ASTM A 525, G90 zinc coating, reinforced as required.
5. Guides: Fabricate guides from structural steel to form a slot of sufficient depth to retain curtain in guides against design load. Include steel angle and plate jamb members, as indicated.
6. Gears shall be of best grade gray iron, cast teeth machine molded from machine cut patterns.
7. Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet or fire-protection rated glass as required for type of door; set in glazing channel secured to curtain slats.
8. Vision Panels: Approximately 10- by 1-5/8-inch openings spaced approximately 2 inches apart and beginning 12 inches from end guides; in three rows of slats at height indicated on Drawings; installed with insulated vision-panel glazing.

B. Shop Finish: Exposed parts of the installation shall be hot-phosphate treated at factory. Steel and galvanized steel parts shall then be given one coat of baked-on rust inhibitive shop primer ready to receive finish paint in field under Section 09910, PAINTING.

2.03 INTERIOR ROLLING FIRE SHUTTER

A. Label: Provide fire doors certified with 2 hour fire rating.

B. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.

1. Flat profile type for doors through 14' wide by 12' high, fabricated of 20 gauge galvanized steel.

C. Finish: Steel slats and hood shall be galvanized steel in accordance with ASTM A 525 and receive rust-inhibitive, roll coating process, including bonderizing, 0.2 mils thick baked-on prime

paint, and 0.6 mils thick powder coated top coat. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

1. Color: Powder coating finish in color as selected by Architect from manufacturers standard colors.

D. Bottom Bar: Two galvanized structural steel angles 1-1/2 by 1-1/2 by 1/8 minimum.

E. Guides: Roll-formed steel shapes attached to continuous steel wall angle for doors through 12' wide. Guides for between jamb doors shall be structural angles.

1. Fastening Guides to Non-Masonry Fire Walls: Comply with the manufacturers listing.

F. Brackets: Steel plate to support counterbalance, curtain and hood.

G. Counterbalance: Helical torsion spring type. Counterbalance shall be housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.

H. Hood: 24 gauge galvanized primed steel minimum for wall openings through 19' wide. Hood shall be equipped with thermally controlled, internal, galvanized steel flame baffle as required.

I. Locking: Interior slide lock for electric operation with interlock switch.

J. Wall Mounting Condition: As indicated on the Drawings.

K. Supports: Provide all support steel and framing required not otherwise supplied under Section 05500.

L. Automatic Closure: Provide automatic closing on alarm by electric operator with uninterruptible power supply for operator.

2.04 OPERATION

A. Electric Motor Operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Provide motor with electrical characteristics compatible with building service and available power, 120V or 277V as available in the building.

1. Sensing Edge Protection: Electric sensing edge at bottom rail.
2. Operator Controls: Push-button and key operated control stations with open, close, and stop buttons for flush mounting.
3. Comply with NFPA 70.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of work of this Section shall be by the manufacturer or his authorized representative, and in strict accordance with the manufacturer's printed installation instructions and specifications.

1. Install fire-rated doors to comply with NFPA 80.

B. Install units plumb, level and true, securely anchored, complete in all respects, and in perfect operating condition.

1. Provide drainage weeps at base of exterior doors.

END OF SECTION

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. The work of this section includes, but is not limited to, the following:

1. Aluminum entrance door assemblies.
2. Exterior and interior aluminum-framed storefronts.

1.03 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements which affect the work of this section.

B. Other specifications sections which directly relate to the work of this Section include, but are not limited to, the following:

1. Section 07900, JOINT SEALANTS; Metal seam sealant.
2. Section 08700, FINISH HARDWARE; Hardware; cylinders; coordination with security system.
3. Section 08800, GLASS AND GLAZING; Glass types, quality and requirements.
4. Section 08920, GLAZED CURTAIN WALLS, SLOPED ROOF GLAZING, AND GLAZED CANOPY.
5. Division 15, MECHANICAL and Division 16, ELECTRICAL; Coordination with security, fire alarm systems.

1.04 INTENT

A. A major intent of the work of this section is to provide heavy-use public entrances that meet or exceed specified performance requirements. A major intent of the work of this section is to provide doors which match the window system for entrance doors.

1.05 QUALITY ASSURANCE

A. Installer: A firm which has at least five years experience in work of the type required by this section and which is acceptable to the manufacturers of the primary products.

B. Source: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.

1.06 PERFORMANCE REQUIREMENTS

A. Movement: Allow for expansion and contraction throughout ambient temperature range of 120°F.

B. Wind Loading: Provide system tested according to ASTM E 330 to be capable of withstanding wind velocity and lateral loads prescribed by code for this project site.

C. Air Leakage: Provide fixed framing with not more than 0.06 cfm infiltration per square foot fixed area when tested according to ASTM E 283 at pressure differential of 6.24 psf. Provide entrance doors with not more than 0.50 cfm infiltration for single doors and 1.0 cfm infiltration for double doors when tested according to ASTM E 283 at pressure differential of 1.567 psf.

D. Water Leakage: Provide fixed framing with no uncontrolled water penetration when tested according to ASTM E 283 at pressure differential of 6.24 psf.

E. Condensation Resistance Factor: Not less than 50 per AAMA 1502.7.

F. Testing Certification: Provide manufacturer's test data indicating compliance with performance requirements specified.

1.07 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each product used. Provide test reports and certifications stating that products comply with requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide final hardware schedules and mounting locations and heights. Provide installation templates for work installed by others.

C. Field Measurements: Take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress.

D. Verification Samples: Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected. Provide samples having minimum area of 144 square inches.

E. Test Reports: Submit certified reports for performance tests required.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in wrapped, labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.09 WARRANTY

A. Total Entrance System Warranty: Provide a written warranty assuming full responsibility for the satisfactory performance of the total entrance system including, but not limited to, doors, framing, hardware, glass, glazing, anchorage, setting, perimeter sealing, flashing, and other work as it relates to the performance required by the Contract Documents. Repair or replace all work not meeting specified performance requirements including removal and replacement of covering or connected adjacent work.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS AND PRODUCTS

A. Standard Entrance Door Assemblies: Kawneer Entara Entrance Doors or approved equal with the following characteristics:

1. Glass: 1 inch thick clear insulating glass as specified in Section 08800; tempered glass; Viracon VE1-2M; refer also to Section 08800.
2. Door Style: Medium Stile Door.
4. Door Hardware: Refer to Section 08710.
5. Finish: Match finish specified in Section 08900 for adjacent framing.

B. Storefront, Thermal Break, 2 inch by 4-1/2 inch profile :

1. EFCO Corporation, S-403.
2. Kawneer, VG451T.
3. Tubelite Inc., E14000 IO.
4. Traco, TR-7850.
5. United States Aluminum, IT451.
6. Vistawall Architectural Products, 3000T.
7. YKK AP America Inc., YES 45 FT.

C. Fasteners: Comply with referenced standards. Provide non-magnetic stainless steel fasteners. Conceal fasteners wherever possible; provide Phillips flat head screws for exposed fasteners. Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Flashing: Provide 26 gage stainless steel or 0.062" extruded aluminum flashings.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

G. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

H. Glazing: As specified in Section 088000 - GLAZING.

I. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

J. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.03 FABRICATION

A. Fabricate work to be truly straight, plumb, level and square. Shop assemble to the greatest degree possible. Prepare work to receive hardware indicated on approved final schedules.

B. Provide work to sizes, shapes, and profiles indicated on approved shop drawings.

C. Make work with uniform, hairline tight joints. Weld in compliance with AWS recommendations. Grind and polish welds and restore mechanical finishes to eliminate evidence of weld.

D. Reinforce work as necessary. Separate dissimilar metals with SSPS paint 12 or other bituminous paint.

E. Fabricate doors to be 1-3/4" thick with stile design as indicated on approved shop drawings. Fabricate and reinforce framing system as necessary to properly support doors system.

F. Fabricate system with integral thermal barrier which eliminates metal to metal contact.

2.04 FINISHES

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Anodized Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.01 INSPECTION

A. The Installer/Erector shall examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.

3.02 INSTALLATION/ERECTION

A. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section.

B. Set work true to line, accurately plumb, level and square and free from rack and warp. Anchor securely in place, isolating dissimilar metals to prevent corrosion.

C. Fasten with concealed fasteners wherever possible. Set sills and thresholds in full bed of sealant and seal metal to metal joints with sealants specified in Section 07900 - Joint Sealers and Fillers.

D. Comply with applicable requirements of Section 08800 - Glass and Glazing for installation of glass.

3.03 TOLERANCES

A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Document and shall not be added to allowable tolerances indicated for other work.

1. Allowable Variation from True Plumb, Level, & Line: ±1/8" in 20'-0".
2. Allowable Variation from True Plane of Adjacent Surfaces: ±1/16".

3.04 ADJUSTING, CLEANING, TOUCH-UP, & PROTECTION

A. Adjust operating parts and hardware to work easily, smoothly, and correctly.

B. Touch-up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

C. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned.

D. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.

END OF SECTION

SECTION 08460

AUTOMATIC ENTRANCE DOORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. The work of this section includes, but is not limited to, the following:

1. Automatic entrance doors as indicated on Drawings and as specified herein.
2. Provide complete units fabricated, assembled, and tested for proper operation at the factory. Include storefront door and transom frames, wings, enclosure, lights, hardware (except lock cylinder), weatherstripping, collapsing mechanism, speed control, and other components standard with manufacturer.

B. Sustainable Design Intent: Comply with project requirements intended to achieve certification, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 03300, CAST-IN-PLACE CONCRETE; Concrete.
2. Section 04200, UNIT MASONRY.
3. Section 07100, WATERPROOFING, DAMPPROOFING AND CAULKING; Joint sealants.
4. Section 08410, ALUMINUM ENTRANCES.
5. Section 08710, FINISH HARDWARE; Lock cylinder for automatic doors.
6. Section 08800, GLASS AND GLAZING; Glass for work of this Section.
7. Section 08900, GLAZED ALUMINUM FRAMING SYSTEM.
8. Division 16 - ELECTRICAL.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, recommendations and standard details for automatic entrance doors, including fabrication, finishing, hardware, accessories and other components of work.

B. Shop Drawings: Submit shop drawings for fabrication and installation of automatic entrance doors and associated components of work. Show anchors, enclosures, speed control units, and other components not included in manufacturer's standard data. Include glazing details.

C. Samples: Submit samples of each required metal finish, on 12 in. long extrusions of 6 in. square sheets, of alloys to be used for work. Where normal color and texture variations are to be expected, include two or more units in each sample, to show range of such variations.

D. Maintenance Instructions: Submit manufacturer's written instructions for adjustment, operation, and maintenance of automatic entrance door units, including maintenance of metal finishes.

E. LEED Certification Documentation: Submit documentation from the manufacturer highlighting LEED requirements for materials and products of this Section. Comply with requirements of Section 01315, LEED Submittals.

1.05 QUALITY ASSURANCE

A. Manufacturer: Provide units produced by a firm with not less than ten years of successful experience in fabrication of automatic doors, of type required for this Project.

B. Installer Qualifications: Employ only factory-trained and approved installers for installation of automatic entrance doors.

C. Coordinate installation of automatic entrance doors with work of other trades. Provide installation templates, inserts, and anchorage devices so as to avoid delays in other work.

D. Comply with requirements of CDA Manual.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver automatic entrance doors and related components to the Project in manufacturer's original, unopened protective packaging. Use padded blankets or other approved protective wrapping for glass, decorative metal work, and other exposed elements.

1. Do not deliver automatic entrance doors until work is ready for their installation.
2. Inspect components for damage upon delivery. Unless minor defects can be repaired to the Architect's satisfaction, remove and replace damaged components as directed at no additional cost.

B. Storage: In the event temporary storage becomes necessary, store automatic doors inside building in a dry protected area apart from general construction traffic, in manufacturer's original shipping containers with protective wrapping or packaging securely in place.

C. Protect finish surfaces from damage during handling and installation.

PART 2 PRODUCTS

2.01 AUTOMATIC SLIDING AND BI-PARTING DOORS

A. Acceptable Product: Provide automatic sliding doors and frames which shall be Doromatic 96K Series O-SO-SX , interior slide surface mount; or approved equal.

B. Entire assemblies shall be supplied as complete units including sensor type operators, header, track, jamb, sliding door, sidelite, threshold, lock and two crash bars on the approach side of the doors.

C. Assemblies shall be constructed of 6063-T5 aluminum alloy in finish to match other doors.

D. Frames for jambs and transoms shall be similar to Kawneer Tri-Fab 451. Door frames, including transom frames, shall be provided by the Automatic Entrance Door Subcontractor.

E. Opening control shall be BEA Eagle bi-directional Microwave Door Actuator Motion detector for opening and safety controls. Mount sensors overhead at center of sliding door frame with fixed anti-vandal cover. Each sliding door package shall have two motion sensors per unit, one unit for exterior door actuator and one for interior door safety.

F. Operator shall be concealed in the header that includes the track. Header shall be designed to include antiderailment means.

G. Checking of the door movement shall be within the operator to allow controlled deceleration of the doors.

H. Doors shall be adequately weatherstripped and shall have a threshold width not to exceed 2".

I. Closing force of door shall not exceed 30 lbs. to stop the door.

J. All control circuits shall be low voltage.

K. Operator master switch shall have an adjustable time delay of 1 to 28 seconds.

L. Operator shall instantly convert to manual operation when power is off.

M. Doors shall include Adams-Rite MS 1853A-505 Hookbolt lock and Best cylinder keyed to the store locking system with a #6410 thumb turn on the inside.

N. Doors shall be swing slide type, constructed to allow the entire siding door assembly to swing out from any point of travel and sliding door to the exterior of the sidelite or wall, to qualify as a legal means of egress.

O. Door shall be UL listed as an exitway.

P. Bi-Parting doors shall be equipped with automatic recycle feature.

Q. Glass and Glazing: Specified in Section 08800, GLASS AND GLAZING and provided by Glazing Subcontractor.

2.02 FINISHES

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Anodized Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install automatic entrance doors in accordance with manufacturer's printed instructions and recommendations, and approved shop drawings, unless otherwise indicated.

B. Cut and trim framing during installation only with the approval of manufacturer and in accordance with manufacturer's recommendations.

1. Restore finish and remove and replace members as directed where cutting and trimming has impaired strength or appearance.
2. Do not install members which are warped, bowed, deformed, or otherwise damaged or defaced to such extent as to impair strength or appearance. Remove and replace members, as directed, which have been damaged during installation.

C. Set units level, plumb, and true to line, with uniform hairline joints. Support on metal shim and secure in place by bolting to clip angles and supports anchored to supporting structure.

D. Paint concealed contact surfaces of dissimilar material, including metal in contact with masonry or concrete work, with a heavy coating of bituminous paint, or provide other separation as recommended by manufacturer.

1. Adjust automatic entrance doors to operate smoothly with hardware and operators functioning properly.

3.02 PROTECTION AND CLEANING

A. Upon completion of installation of automatic entrance doors, glass, and other contiguous components, clean and protect door units as recommended by manufacturer.

B. Prior to Final Completion, adjust all operating mechanisms and hardware for a smooth operating door system acceptable to the Owner and Architect.

END OF SECTION

SECTION 08520

ALUMINUM WINDOWS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. Provide fixed and jalousie aluminum windows and accessories as indicated on the Drawings and specified herein.

1.03 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements which affect the work of this section.

B. Other specifications sections which directly relate to the work of this Section include, but are not limited to, the following:

1. Section 04200, UNIT MASONRY.
2. Section 07900, JOINT SEALERS.
3. Section 08410, ALUMINUM ENTRANCES.
4. Section 08800, GLASS AND GLAZING.
5. Section 08920, GLAZED CURTAIN WALLS, SLOPED ROOF GLAZING, AND GLAZED CANOPY.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that windows comply with specified requirements. Product data for each type of window required, shall include:

1. Construction details and fabrication methods.
2. Profiles and dimensions of individual components.
3. Data on hardware, accessories, and finishes.
4. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Show all interfaces and relationships to work of other trades. Include information not fully detailed in manufacturer's standard product data and the following:

1. Layout and installation details, including anchors.

2. Elevations of continuous work at 1/4 inch scale and typical window unit elevations at 3/4 inch scale.
3. Full-size section details of typical composite members, including reinforcement.
4. Glazing details.
5. Accessories.

C. Certification: Provide certification by a recognized independent testing laboratory or agency showing that each type, grade, and size of window unit complies with performance requirements indicated.

D. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

E. Verification Samples: Submit representative samples of each material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

1.04 QUALITY ASSURANCE

A. Source: For each material type required for the work of this section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to the manufacturers of the primary materials.

B. Installer: A firm with a minimum of five years experience in type of work required by this section and which is acceptable to the manufacturers of the primary materials.

C. Design Requirements: Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA GS-001 for type, grade, and performance class of window units required.

1. Optional Performance Class Requirements: Where the required design pressure exceeds the minimum for the specified window grade, comply with requirements of AAMA GS-001, Section 3, "Optional Performance Classes" for higher than minimum performance class.
2. Heights of window units above grade at the window centerline are indicated or can be determined from the Drawings. Consult with the Architect for clarification needed to confirm required loading and test pressures.
3. Design wind velocity at the project site is as required by Ohio State Building Code.

D. Indications of section sizes and reinforcement on the Drawings are for design intent only. Require manufacturer to provide proper structural design and anchorage.

1.05 TESTS AND PERFORMANCE REQUIREMENTS

A. Manufacturer's Standard Tests: Provide manufacturer's standard test data showing compliance with specified requirements. Provide specified tests if manufacturer's standard windows have been modified, or when custom windows are used.

B. Test Units: Provide window units for testing fully glazed and assembled in accordance with Contract Documents. Provide test unit sizes at least as large as the largest window used on this project, and in no case smaller than unit sizes listed in Chart A of AAMA 101.

C. Test Sequence: Test sequence is optional, except that air infiltration tests shall precede water resistance tests.

D. Air Infiltration Test: With window sash and ventilators closed and locked, test unit in accordance with ASTM E 283, as follows:

1. Static Air Pressure Difference: 5% of specified Design Wind Pressure, but never less than 6.24 pounds per square foot.
2. Air Infiltration: Air infiltration shall not exceed value specified in Par. 2.01 herein when tested at 6.24 psf (50 mph wind speed equivalent) in accordance with ASTM E 283.
3. Performance: Maximum air leakage shall not exceed amount shown in Section 2.1 of AAMA GS-001.

E. Water Leakage Test: Test unit in accordance with ASTM E 547, with four test cycles, each cycle consisting of five minutes with pressure applied, and one minute of pressure released, during which time the water spray will be continuously applied.

1. Test Pressure: 15% of specified Design Wind Load, but never less than 15 pounds per square foot.
2. Performance: No leakage as defined in the test method at the specified test pressure.
3. Water Infiltration: Window shall allow no water penetration when tested in accordance with ASTM E 331 at test pressure.

F. Uniform Load Deflection Test: Test units in accordance with ASTM E 330, at the following static air pressure difference (Design Wind Pressure), or the loads prescribed by code for this project site, whichever is greater. Apply pressure first to the exterior side (positive) and then the interior side (negative).

1. Design Wind Pressure: As required by code.
2. Test Procedure: Procedure A as specified in ASTM E 330.
3. Performance: Deflection in each member measured at locations of greatest deflection shall not exceed L/175 of member span at 1.5 times the specified Design Wind Pressure.
4. All intermediates, vertical, and horizontal members, including meeting rails must handle Design Wind Pressure at L/175 deflection with no change in sightline or system depth to that which is detailed.

G. Condensation Resistant Factor: Per AAMA 1503.1, value as specified in Par. 2.01 herein.

H. Thermal Movement: Provide window systems that allow for expansion and contraction of members throughout an ambient temperature range of 120°F.

I. Thermal Transmittance: Provide window units that have a U-value maximum specified in Par. 2.01 herein rated in BTU/hour/sq. ft./degrees F at 15-mph exterior wind velocity, when tested in accordance with AAMA 1503.1. Test unit to be 4 ft. x 6 ft.

J. Field Leakage Test: Contractor shall employ an independent testing agency to perform in-place field tests for water leakage. Complete on-site window mock-up and surrounding wall construction at earliest possible date in order that any problems or failures can be identified before majority of windows have been installed. Field test will include a prolonged water spray test. Any uncontrolled water leakage will be considered a failure. Contractor shall pay for all remedial work and all retesting due to failures.

1.06 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within the limits established by manufacturers of the materials and products used.

B. Substrates: Proceed with work only when substrate construction and penetration work is complete.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.08 WARRANTIES

A. Aluminum Windows and Related Materials: Provide a written warranty, signed by the manufacturer agreeing to repair or replace work which exhibits defects in materials or workmanship, including all extrusions, weatherstripping, panning, and trim, and all hardware. Defects" is defined to include, but not limited to, leakage of water, abnormal aging or deterioration, abnormal deterioration or fading of finishes, and failure to perform as required. Include requirement for removal and replacement of windows and connected adjacent work.

1. Warranty period: Five years from date of Substantial Completion.

B. Finish Warranty: Provide a written warranty, signed by the manufacturer agreeing to repair or replace metal finishes which have deteriorated from chalking, fading, cracking, peeling, and chipping.

1. Warranty period: Ten years from date of Substantial Completion.

C. Factory Glazing Warranty: Provide a written warranty, signed by the manufacturer agreeing to repair or replace glazing units which have failed.

1. Warranty period: Ten years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/TYPE

A. Provide units of one of the following manufacturers that meet or exceed specified requirements:

1. EFCO Corporation.
2. Kawneer Company.
3. Moduline.
4. Wausau Metals Corp.

B. Drawings and specifications are based on "Series 590", fixed and jalousie windows, manufactured by EFCO.

2.02 MATERIALS AND PRODUCTS

A. Frames shall be thermally broken. Windows shall meet the performance requirements defined in this paragraph and shall incorporate permanently watertight corners; sill flashing; and an internal weep system in sash and frame. Weep system shall be composed of at least three concealed 1/4 inch diameter holes per sill of each sash and frame. Windows shall have weatherstripping as required; concealed fasteners; flush, hairline metal-to-metal joints; accommodate 5/8 in. insulating glass with clearances as recommended in FGMA Glazing Handbook, current edition, and allow anchorage of frame without penetrating horizontal portion of flashing below window sill. The window construction shall meet or exceed the performance requirements of ANSI/AAMA 101-85 and shall comply with the following:

1. Frame Construction: No frame or sash component, including glazing stops, shall be offset from the plane of the adjacent section by more than plus or minus 1/32 in. All surfaces to receive sealant shall have solid metal return edges and end caps, perpendicular to the face of the window frame, at least 1 in. deep, to provide a smooth, solid surface for securement of backer rod and sealant. All metal to metal joints, glazing seals, and perimeter joints shall have secondary drainage capacity to collect penetrating water and weep it back to the outside.
2. Thermal Transmittance: The units shall have a conductive thermal transmittances (U-value) of not more than 0.65 when tested in accordance with AAMA 1503.1.

B. Profiles: Provide windows closely matching window profiles and appearances shown.

C. Aluminum Extrusions: Provide extruded 6063-T5 aluminum with minimum thickness of 0.094 inches for frame sill members, and 0.062 in. for all other frame and sash members. Each main frame extrusion and sash frame member shall have a cavity filled with a high density urethane compound which, upon curing, forms a solid structural connector. The aluminum bridge of the cavity pocket shall be removed to produce an insulated extrusion. This continuous integral structural barrier shall reduce through-metal conduction of outside surface temperature to the interior surface of the windows. The thermal barrier shall be permanently bonded to the extrusions, providing a solid, continuous, integral, non-conducting area of at least 0.250 in. by 0.312 in. in frame and sash members. Window frame shall be a nominal 4" minimum. Depth of sash members to be a minimum of 1-9/16".

D. Fasteners: Comply with referenced standards. Provide non-magnetic stainless steel fasteners. Provide concealed fasteners to the greatest extent possible. Provide Phillips flathead screws for exposed fasteners.

1. Fasteners for structural clip angle to window frame: No. 8 stainless steel pan-head self-tapping sheet metal screws at 12 in. on center.
2. Fasteners for structural clip angle and window frame to wood blocking: No. 12 stainless steel pan head self-tapping sheet metal screw, of sufficient length to provide 1-1/2 in. penetration into wood, at 12 inches on center.

E. Anchors, Clips, and Window Accessories: Fabricate anchors, continuous clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with requirements of ASTM B 633; provide sufficient strength to withstand design pressure indicated.

1. Provide snap-on cover at clip angle as indicated on drawings.

F. Glass: Glass shall be insulated glass units complying with requirements of Section 08800, GLASS AND GLAZING.

1. Provide obscure glass #4 at Toilet Rooms.

G. Screens: Provide manufacturer's standard 18 x 16 stainless steel wire, 0.009 in. diameter mesh with frame finish to match windows.

H. Hardware: Provide manufacturer's standard hardware fabricated from stainless steel, bronze, or other corrosion-resistant metal, of strength to perform intended function for size of window indicated and as follows:

2.03 FABRICATION

A. Fabricate windows to be truly straight, plumb, level and square, within tolerances permitted by reference standards. Manufacturer shall allow and facilitate inspection of production process by the Architect, for all units.

B. Fabricate work to sizes, shapes, and profiles indicated on Contract Documents and approved shop drawings.

C. Fabricate work with uniform, tight hairline joints, free from sharp edges.

D. Glazing: Units shall be "wet glazed" with a snap-in aluminum extruded glazing bead and PVC bulb on the interior of the glass. The exterior of the glass shall be set in a continuous bead of silicone backbed compound.

2.04 FINISH

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Anodized Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 2607.

PART 3 EXECUTION

3.01 INSPECTION

A. The Installer/Erector shall examine substrates, supports, and conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of installation will be construed as installer accepting substrates and conditions.

3.02 INSTALLATION

A. General Installation Requirements: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section.

B. Installation: Install window units plumb, level, in alignment and plane without warp or rack. Anchor securely in place.

C. Dissimilar Materials: Isolate all dissimilar metals. Comply with ANSI/AAMA 101, Appendix.

D. Sealants: Install sills and subframes in a thick bed of sealant. Comply with applicable requirements of Section 07900, JOINT SEALERS.

E. Flashing: Coordinate with flashing installation to ensure weathertight construction and assembly. Thoroughly seal all penetrations through flashings with thick bed of sealant. Comply with applicable requirements of Section 07600, FLASHING AND SHEET METAL.

F. Glass and Glazing: Comply with applicable requirements of Section 08800, GLASS AND GLAZING.

3.03 TOLERANCES

A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Documents. Do not add these tolerances to any allowable tolerances indicated for other work.

1. Allowable Variation from True Plumb, Line and Level: $\pm$ 1/8 in. in 20 ft.-0 in.

3.04 ADJUSTING, CLEANING, TOUCH-UP, AND PROTECTION

A. Clean exposed surfaces using manufacturer recommended materials and methods. Remove and replace work which cannot be successfully cleaned.

B. Touch-up damaged coatings and finishes. Eliminate all visible evidence of repair.

C. Provide temporary protection at all times during the course of the work, and immediately after completion to ensure the work of this Section is not damaged or deteriorated in any way at time of final acceptance. Remove temporary protections and reclean as necessary immediately prior to final acceptance.

END OF SECTION

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. The work of this section includes, but is not limited to the following:

1. Providing hardware for all doors, except doors provided with their own hardware.
2. Providing lock cylinders for all work requiring cylinders.
3. Providing the services of a qualified hardware consultant to prepare detailed schedules of hardware required for the project.

1.03 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements, which affect the work of this section. Other specifications section which directly relate to the work of this section include, but are not limited to the following:

1. Section 08110 – STEEL DOORS AND FRAMES; work requiring template coordination, metal astragals for fire-rated doors.
2. Section 08305 – ACCESS DOORS; work requiring lock cylinders.
3. Section 08920 – GLAZED CURATIN WALLS, SLOPED ROOF GLAZING AND GLAZED CANOPY; work requiring lock cylinder.

1.04 INTENT

A. A major intent of the work of this section is to provide hardware for every door in the project, except as indicated, so that each door functions correctly for its intended use. Provide only hardware that complies with applicable codes and requirements of authorities having jurisdiction including requirements for barrier-free accessibility.

1.05 QUALITY ASSURANCE

A. Hardware supplier shall have in his employ one or more members of the Door and Hardware Institute to include at least one Certified Architectural Hardware Consultant in good standing, who shall be responsible for preparation of the Finish Hardware Schedule. This Consultant shall be acceptable to the Architect and is to ensure that the intent requirement of this specification is fulfilled, and to certify that the work of this section meets or exceeds the requirements specified in this section and the requirements of authorities having jurisdiction.

B. Hardware supplier shall warrant guarantee, in writing, that hardware supplied is free of defective material and workmanship. Supplier shall further warrant and guarantee for a period of one year from Owner's Use and Occupancy that the hardware shall function in a satisfactory manner without binding, collapse, or dislodging of its parts, provide the installation is made to the manufacturer's recommendations.

C. The hardware supplier shall repair or remedy, without charge, any defect of workmanship or material for which he is responsible hereunder.

1.06 SUBMITTALS

A. Submit the following in accordance with Section 01300 - SUBMITTALS:

1. Schedule: Submit to the Architect six (6) copies of the complete hardware schedule within fourteen (14) days after receipt of contract award. Submit therewith-complete catalog cuts and descriptive data of all products specifically scheduled therein. No materials shall be ordered or templates issued until the hardware schedule has been approved by the Architect. Form and details of hardware schedule shall be in vertical format in conformance to the door and hardware industry standards. All hardware sets shall be clearly cross-referenced to the hardware set number listed in this specification.

2. Samples: If requested, submit to the Architect for approval, a complete line of samples as directed. Samples shall be plainly marked giving hardware number used in the specification, the manufacturer's numbers, type and size. The Architect will deliver approved samples to the project site to be stored. Samples will remain with the Architect until delivery of all hardware to the project is complete, after which time they will be turned over to the General Contractor for incorporation into the work.

3. Keying System Submission: Before cylinders are ordered, submit a complete proposed keying system for approval. This should be done after keying meeting has been held with the owner's representative.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of hardware shall be made to the project by the Hardware Supplier in accordance with the instructions of the General Contractor.

B. The finish hardware shall be delivered to the jobsite and received there by the General Contractor. The General Contractor shall prepare a locked storage room with adequate shelving, for all hardware. The storage room shall be in a dry, secure area, and shall not include storage of other products by other trades.

C. The General Contractor shall furnish the Hardware Supplier with receipts for all hardware and accessory items received, and shall send copies of these receipts to the Architect, if requested.

1.08 REGULATORY REQUIREMENTS

A. Conform to all applicable codes. Provide all throws, projections, coatings, knurling, opening and closing forces, and other special functions required by State and Local Building Codes, and all applicable Handicap Code requirements.

B. For fire rated openings provide hardware complying with NFPA 80 and NFPA 101 without exception. Provide only hardware tested by UL for the type and size of door installed and fire resistance rating required.

1.09 SPECIAL REQUIREMENTS

A. Hardware Supplier shall determine conditions and materials of all doors and frames for proper application of hardware.

B. The Hardware Schedule shall list the actual product series numbers. Bidders are required to follow manufacturers' catalog requirement for the actual size of door closers, brackets and holders. All opening sizes are as noted on the Door Schedule and all hardware shall be in strict accordance with requirements of height, width, and thickness.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

Hinges	McKinney Stanley Bommer	Scaranton, PA New Britain, CT Landrum, SC
Geared Hinges	Pemko McKinney Select	Memphis, TN Scaranton, PA Kalamazoo, MI
Locksets	Sargent (No Substitution)	New Haven, CT
High Security Cylinders	Medeco (No Substitution)	Salem, VA
Exit Devices	Sargent (No Substitution)	New Haven, CT
Door Closers	Sargent LCN	New Haven, CT Princeton, IL
Flush Bolts	Glynn Johnson Door Controls Rockwood	Indianapolis, IN Dexter, MI Rockwood, PA
Door Stops	Glynn Johnson Ives Rockwood	Indianapolis, IN New Haven, CT Rockwood, PA
Push/Pulls	Rockwood Burns Ives	Rockwood, PA Erie, PA New Haven, CT
Protective Plates	Rockwood Burns Ives	Rockwood, PA Erie, PA New Haven, CT
Thresholds / Weather-stripping / Rain Drips	NGP Pemko Reese	Memphis, TN Memphis, TN Rosemount, MN
Silencers	Ives Glynn Johnson Rockwood	New Haven, CT Indianapolis, IN Rockwood, PA
Key Cabinet	Telkee Key Control Systems Lund	Glen Riddle, PA Bechtelsville, PA Bath, OH

2.02 MATERIALS AND QUALITY

A. All hardware shall be of the best grade of solid metal entirely free from imperfections in manufacturer and finish.

B. Quantities, weight, and sizes given herein are the minimum that will be accepted. It is the responsibility of the Hardware Supplier to supply the specified size and weight of hardware and the proper function of hardware in each case and to provide UL approved hardware at all fire-rated doors.

C. Provide, as far as possible, locks of one lock manufacturer and hinges of one hinge manufacturer. Modifications to hardware that are necessary to conform to construction shown or specified shall be provided as required for the specified operation and functional features.

2.03 HARDWARE DESIGNATIONS

A. All items of hardware are referenced by manufacturer's names and numbers. The manufacturer's names and numbers are used to define the function, design, and quality of the material to be supplied.

Substitution of products other than those listed shall be submitted to the Architect at least ten (10) days PRIOR to the bid date. The Architect shall be the sole judge of any proposed substitution.

2.04 TEMPLATES

A. Hardware supplier shall immediately, but not later than three (3) days after approval of his Schedule by the Architect, furnish the General Contractor with complete template information necessary for the fabrication of doors, frames, etc. No templates shall be furnished prior to the approval of the hardware schedule.

2.05 HARDWARE FOR LABELED FIRE DOORS, EXIT DEVICES AND SMOKE DOORS

A. Hardware shall conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Labeling and listing by UL Building Materials Directory, for class of door being used will be accepted as evidence of conformance to these requirements. Install minimum latch throw as specified on label of individual doors. Provide hardware listed by UL except where heavier materials, larger sizes, or better grades are specified herein under paragraph entitled "Hardware Sets". In lieu of UL labeling and listening, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements. Specific hardware requirements of door or frame manufacturers, which exceed size, or weight of hardware herein listed shall be provided with no additional charge.

2.06 KEYS AND KEYING

A. The hardware supplier shall review the specific hardware functions with the Architect and owner at the time of the keying review, to assure the appropriateness of each of the hardware functions. Failure to make this review does not relieve the hardware supplier from providing the proper functions.

B. Key System: All cylinders shall be Masterkeyed and/or Grandmaster Keyed to the existing Medeco RBA security key system.

1. Master Keys, Grandmaster Keys: Furnish six (6) keys for each set, if required.

2. Furnish three (3) change keys for each cylinder keyed differently; six (6) change keys for each set keyed alike. And in sets where only (2) cylinders are keyed alike, four (4) change keys will be required.

3. Master Keys shall be sent to the Owner by registered mail, return receipt required.

4. All lock cylinders shall be set to a Construction key for use by the Contractor during the construction period. Furnish ten (10) temporary cylinders keyed alike with ten (10) keys to be used as construction keys.

2.07 FASTENERS

A. Manufacture hardware to conform to published templates, generally prepared for machine screw installation.

B. Furnish screw for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish exposed screws to match the hardware finish, or, if exposed in surfaces of other work, to match the finish of such other work closely as possible, except otherwise indicated.

C. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard manufactured units of the type specified are available with concealed fasteners. Do not use thru-bolts unless specially approved by the Architect.

D. All hardware shall be installed only with fasteners supplied by manufacturers of specific products.

2.08 PACKING AND MARKING

A. All hardware shall have the required screws, bolts and fastenings necessary for proper installation and shall be wrapped in the same package as the hardware item for which it is intended and shall match finish of hardware with which to be used.

B. Each package shall be clearly labeled indicating the portion of the work for which it is intended.

2.09 ENVIRONMENTAL CONCERN FOR PACKING

A. The hardware shipped to the jobsite is to be packed in biodegradable packs such as paper or cardboard boxes and wrapping. If non-biodegradable packing such as plastic, plastic bags or large amounts of Styrofoam is utilized, then the Contractor will be responsible for the disposal of the non-biodegradable packing to a licensed or authorized collector for recycling of the non-biodegradable packing.

2.10 FINISH HARDWARE DESCRIPTION

A. Hardware items shall conform to respective specifications and standards and to requirements specified herein.

B. MATERIALS AND FINISHES: Materials and finished shall be:

1. Interior Butts: US26D (BHMA 652)

2. Exterior Geared Hinges: US28 (BHMA 628)

3. Door Closers: Sprayed to match hardware finish

4. Exit Devices: US32D (BHMA 630)

5. Kick, Push Plates: US32D (BHMA 630)

6. All other Hardware shall be: US26D (BHMA 626) or as scheduled

C. HINGES AND PIVOTS:

1. Number of hinges or pivots per door: two (2) hinges or pivots are intended to be provided for doors up to and including five (5) feet in height, and an additional hinge for each two-and-one-half (2-1/2) feet or fraction thereof, of the height of the door. Dutch doors are to be provided with four hinges.

2. All hinges on exterior doors shall be full-mortise Continuous Geared Hinges. Geared Hinges shall be manufactured of extruded 6063-t6 aluminum alloy temper. Hinges shall consist of three interlocking extrusions in a pin-less assembly applied to the full height of the door and frame. All hinges shall be manufactured non-handed. Door leaf and jamb leaf shall be geared together for the entire length of the hinge and joined by a cover channel. All Geared Hinges shall be heavy duty (HD).

3. Geared Hinges shall be Pemko, McKinney or Select as follows:

Pemko	CFM SLFHD Series
McKinney	MCK-12HD
Select	SL11HD

4. Hinges on interior doors shall be oil-impregnated bearings, steel and sized as follows, unless otherwise specified in the hardware sets below:

Door thickness	Door width	Hinge weight	Hinge
1-3/4"	40" and under	Regular	4-1/2"
1-3/4"	Over 40"	Extra heavy	5 x 4-1/2"

Width of hinges shall be determined by trim conditions

5. All bearing hinges shall have flush bearings and button tips. Plain bearing hinges shall be furnished only on doors so noted in Hardware Sets.

6. Hinges shall be McKinney, Stanley or Bommer as follows:

McKinney	Stanley	Bommer
T2714	F179	5000
TA2714	FBB179	BB5000
T4A3786	FBB168	BB5004

D. DOOR CLOSERS:

1. Door closers shall have fully hydraulic, full rack and pinion action. Cylinder body shall be one-and-one-half (1-1/2) inches in diameter, and double heat-treated pinion shall be eleven-sixteenth (11/16) inches in diameter.

2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from one hundred twenty (120) degrees Fahrenheit to minus thirty (-30) degrees Fahrenheit.

3. Spring power shall be continuous adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and hybrid back-check.

4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).

5. Closer arms (and metal covers when specified) shall have a powder coating finish.

6. Provide drop, mounting plates where required.

7. Do not locate closers on the side of doors facing corridors, passageways or similar type areas. Where it is necessary, due to certain conditions and approval of the Architect, to have closers in corridors, provide such closers with parallel or track type arms.

8. All door closers shall be adjusted by the installer in accordance with the manufacturer's templates and written instructions. Closers with parallel arms shall have back-check features adjusted prior to installation.

9. Closers shall conform to all applicable code requirements relative to setting closing speed for closers and maximum pressure for operating interior and exterior doors.

10. Door closers meeting this specifications are as follows:

	LCN	Sargent
Exterior	4111S-CUSH	281-CPS
	4111S-H-CUSH	281-CPSH
Interior	4011	281-0
	4111	281-P10
	4040SE	2407 Series
	4000T	281-OT x spec. Temp.
	4310ME-SF	2980
	4040SE-DE	2477

E. EXIT DEVICES:

1. Shall be Sargent as follows: (No Substitutions)

Function	Sargent
A	16-8804
B	16-8810
C	12-8815 - ETL

NOTE: Lever design shall match lock trim

F. FLUSH BOLTS:

1. Shall be self-latching or automatic type at label door, manual flush bolts at non-label doors.

	Glynn Johnson	Door Controls	Rockwod
Manual	HM FB6	780	555
	WD FB6W	790	557
Self Latching	HM FB51P	845	1845
	WD FB61P	945	1945
Automatic	HM FB31P	842	1842
	WD FB41P	942	1942

2. Dust Proof Strikes shall be furnished at all floor locations.

G. LOCKSETS, LATCH SETS:

1. Mortise type shall be heavy-duty ANSI A156.13, Series 1000, Grade 1 Operational, 2-3/4" backset, six pin cylinder with lever handles

Manufacturer	Series	Lever Design	
Sargent	8200	LNL	(No Substitutions)

2. Lock functions as indicated in the hardware schedule shall be as follows:

Function	Sargent
A (Storefront)	04
B (Storefront)	04
C (Office)	05
D (Passage)	15
E (Vestibule)	16
F (Classroom)	37
G (Spec Classroom)	38
H (Privacy)	65

H. MORTISE DEADLOCKS:

1. Shall be as mortise type, ANSI A115.5, Grade 1:

Function	Sargent	(No Substitutions)
A	4874	
B	4875	
C	4876	
D	4877	

I. PUSH PLATES, DOOR PULLS, PUSH/PULL BARS:

1. Shall be as manufactured by Rockwood, Burns or Ives.

a. Push plates shall be 4" x 16" x 0.050 thickness unless otherwise listed in hardware sets.

Rockwood 70 Series

Burns	50 Series
Quality	40 Series

b. Door pulls shall be 1" x 10"

Type A:	
Rockwood	BF111
Burns	BF26C
Quality	BF163-10"

Type B:	
Rockwood	157
Burns	39c
Quality	521

c. Push/Pull bars

Type A:	(Wide Stile Doors)
Rockwood	BF11147 x T1006 Mounting
Burns	BF26C x 442 x Similar Mounting as Above
Quality	BF482 x Similar Mounting as Above

Type B:	(Narrow Stile Doors)
Rockwood	15747 x T1006 Mounting
Burns	39C x 442 x Similar Mounting as Above
Quality	484 x 10" Similar Mounting as Above

J. KICK PLATES, ARMOR PLATES, MOP PLATES:

1. Kick plates shall be eight (8) inches high. Armor plates shall be thirty-four (34) inches high. Mop plates shall be four (4) inches high. All plates shall be two (2) inches less the width of the door. Plates shall be 0.050 thicknesses, bevel four (4) edges, screws shall be oval head counter-sunk.

K. STOPS:

1. Shall be furnished at all doors. Wherever an opened door or any item of hardware thereon strikes a wall, at 90 degrees. Provide wall bumpers, unless otherwise indicated in hardware sets.

2. Where wall bumpers cannot be effectively used, a floor stop shall be furnished and installed.

3. Provide roller bumpers for each door where two doors interfere with each other in swinging.

Manufacturer	Wall Bumpers	Floor Stops	Roller Bumpers
Rockwood	409	440, 442	456
Ives	407 1/2	436B, 438B	470 Series
Glynn Johnson	WB 50XT	FB13, FB14	RB-3

4. Where overhead stops are listed they shall be the surface mounted type as follows:

Manufacturer	Series

ABH	4400
Glynn Johnson	GJ450
Sargent	540

L. THRESHOLDS, WEATHERSTRIP, SEAL:

1. Thresholds shall be as detailed and furnished on all doors where shown on drawings. Thresholds shall be aluminum unless otherwise indicated. Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7, Section 07900 (Joint Sealants)

2. Weather-stripping shall be furnished on all exterior doors unless otherwise indicated

Product	Pemko	Reese	NGP
Threshold	As detailed		
Brush Seal	45062AP	970	A626A
Automatic Door Bottom	430CR	330	420
Door Sweep	345AV	353	101AV
Set Astragals	351C x 351CP	95 x 95P	140 x 140P
Astragal	357SP	183S	139SP
Rain Drip	346C	R201A	16AD

M. SILENCERS:

1. Provide silencers on all metal and wood frames. Silencers shall be Ives 20/21, Glynn Johnson 64/65 or Rockwood 608/609.

N. KEY CABINET:

1. Furnish one (1) Aristocrat wall cabinet as manufactured by Telkee, Inc., Key Control Systems, Lund or approved equal. Cabinet shall be complete with all hooks, tags, index cards and other accessories for a complete Dual System.

2. Cabinet size shall be sufficient to accommodate all locks related to this Contract, based on two keys per lock, with an allowance for expansion of not less than 50%.

3. Key systems which are construction keyed shall have all permanent keys affixed to hooks with all index cards filled out for the complete cross references. The cabinet shall be delivered to the Contractor only when requested and shall be completely set up.

O. BIFOLD DOOR HARDWARE:

1. Furnish bifold door hardware set 40-2264 as manufactured by Stanley Hardware.

2. Provide bifold door pulls No. 102 as manufactured by Rockwood Mfg. Co.

PART 3 - EXECUTION

3.01 INSPECTION

A. It shall be the general contractors responsibility to inspect all door openings and doors to determine that each door and door frame has been properly prepared for the required

hardware. If errors in dimensions or preparation are encountered, they are to be corrected by the responsible parties prior to the installation of hardware.

3.02 PREPARATION

A. All doors and frames, requiring field preparation for finish hardware, shall be carefully mortised, drilled for pilot holes, or tapped for machine screws for all items of finish hardware in accordance with the manufacturers templates and instructions.

3.03 INSTALLATION/ADJUSTMENT/LOCATION

A. All materials shall be installed in a workmanlike manner following the manufacturer's recommended instructions.

B. Exit Devices shall be installed so as to permit friction free operation of crossbar, touch bar, lever. Latching mechanism shall also operate freely without friction or binding.

C. Door Closers shall be installed in accordance with the manufacturer's instructions. Each door closer shall be carefully installed, on each door, at the degree of opening indicated on the hardware schedule. Arm position shall be as shown on the instruction sheets and required by the finish hardware schedule.

D. The adjustments for all door closers shall be the installer's responsibility and these adjustments shall be made at the time of installation of the door closer. The closing speed and latching speed valves shall be adjusted individually to provide a smooth, continuous closing action without slamming. The delayed action feature or back check valves shall also be adjusted so as to permit the correct delayed action cycle or hydraulic back check cushion of the door in the opening cycle. All valves must be properly adjusted at the time of installation. Each door closer has adjustable spring power capable of being adjusted, in the field, from size two (2) thru six (6). It shall be the installer's responsibility to adjust the spring power for each door closer in exact accordance with the spring power adjustment chart illustrated in the door closer installation sheet packed with each door closer.

E. Installation of all other hardware, including locksets, push-pull latches, overhead holders, door stops, plates and other items, shall be carefully coordinated with the hardware schedule and the manufacturer's instruction sheets.

F. Locations for finish hardware shall be in accordance with dimensions listed in the pamphlet "Recommended locations for Builders' Hardware" published by the Door and Hardware Institute.

3.04 FIELD QUALITY CONTROL

A. Upon completion of the installation of the finish hardware, it shall be the responsibility of the finish hardware suppliers to visit the project and to examine the hardware of each door on which he has provided hardware not operating properly, he should make a report, in writing, to the general contractor, advising him of the problem and the measures required to correct the problem.

3.05 PROTECTION

A. All exposed portions of finish hardware shall be carefully protected, by use of cloth, adhesive backed paper or other materials, immediately after installation of the hardware item on the door. The finish shall remain protected until completion of the project. Prior to acceptance of the project by the Architect and owner, the general contractor shall remove the protective material exposing the finish hardware.

3.06 CLEANING

A. It shall be the responsibility of the general contractor to clean all items of finish hardware and to remove any remaining pieces of protective materials and labels.

3.07 INSTRUCTIONS AND TOOLS

A. It shall be the responsibility of the finish hardware supplier to provide installation and repair manuals and adjusting tools, wrenches, etc... for the following operating products:

1. Locksets (all types)
2. Exit Devices (all types)
3. Door Closers

3.08 HARDWARE SETS

A. Each Hardware Set listed below represents the complete hardware requirements for one opening (single door or pair of doors). Furnish the quantities required for each set for the work.

HW Set #1	Hinges (8) Exit Devices (2) Door pulls Lockset (Function D) Door Closer (heavy duty) Kick Plates Door Stops Silencers (3) Threshold Coordinator

HW Set #2	Hinges (3) Exit device Door handles Lockset (Function B) Door Closer Silencers (2) Threshold

HW Set #3	Hinges (3) Exit Device Door handles Lockset (Function C) Door Closer Kick Plate Door Stops Silencers (2) Threshold Auto door bottom Gasketing

HW Set #4	Hinges (3) Door handles Lockset Door Closer Kick Plate Door Stops Silencers (2) Threshold

HW Set #5	Hinges (3) Door pulls and bar Door Closer Kick Plate Silencers (2) Threshold Auto door bottom Gasketing

END OF SECTION 08710

SECTION 08800

GLASS AND GLAZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Furnish and install glass and glazing, as indicated on Drawings and as specified herein. Include, but do not limit to glass and glazing for the following:

1. Windows.
2. Doors.
3. Entrances.
4. Curtain walls.
5. Canopy.
6. Mirrors.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 08110, STEEL DOORS AND FRAMES; Doors and sidelights to be glazed.
2. Section 08410, ALUMINUM ENTRANCES.
3. Section 08920, GLAZED CURTAIN WALLS, SLOPED ROOF GLAZING, AND GLAZED CANOPY; Curtain walls, sloped roof, and canopy to be glazed.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Initial Selection Samples: Submit samples of each glass and glazing material showing complete range of colors, textures, and finishes available for each material used.

C. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials.

D. Calculations: Provide glass manufacturer's wind load charts, calculations and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied.

E. Test Reports: Provide certified reports for specified tests.

1.05 QUALITY ASSURANCE

A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of three years experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.

C. Mock-Ups: Prior to commencing primary work of this Section, provide mock-ups at locations acceptable to Contracting Officer. Obtain Contracting Officer's acceptance of visual qualities. Protect and maintain accepted mock-ups throughout remainder of work of this Section to serve as criteria for acceptance of work. Approved mock-ups may be incorporated into finished work. Provide full size mock-ups of following types of glass:

1. Insulating glass.
2. Laminated glass.

D. Glass Thickness: Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section. Provide units with proper thickness, edge clearance and tolerance to comply with recommendations of glass manufacturer.

1.06 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within limits established by manufacturers of materials and products used.

B. Temperature Limits: Install sealants only when temperatures are within limits recommended by sealant manufacturer, except, never install sealants when temperatures are below 40°F.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and FGMA Manual.

1. Protect materials from moisture, sunlight, excess heat, sparks and flame.
2. Sequence deliveries to avoid delays, but minimize on-site storage.

1.08 WARRANTIES

A. Provide a written warranty, signed by the manufacturer, installer, and Contractor, agreeing to repair or replace work which exhibits defects in materials or workmanship. "Defects" is defined to include, but not limited to, leakage of water, abnormal aging or deterioration, failure of hermetic seals, edge separation or delamination of laminated glass, peeling, cracking, or

crazing of metallic coatings, and failure to perform as required. Include requirement for removal and replacement of covering and connected adjacent work. Provide warranty periods standard with manufacturer, but never less than the following:

1. Laminated Glass: Four years after Substantial Completion.
2. Insulating Glass: Ten years after Substantial Completion.
3. Mirror Glass: Ten years after Substantial Completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/FABRICATORS

A. Provide glass products of one of the following manufacturers/fabricators that meet or exceed the requirements of these specifications:

1. Advanced Coating Technology.
2. AFG Industries.
3. Ford Glass Division.
4. Guardian Industries.
5. Interpane Coatings, Inc.
6. Pilkington Libbey Owens Ford.
7. PPG Industries.
8. Solar Seal Company.
9. Spectrum Glass Products.
10. Viracon, Inc.

2.02 GLASS MATERIALS AND PRODUCTS

A. Clear Float Glass: ASTM C 1036 ,Type I - Transparent, Flat, Class 1-Clear, Quality q3.

B. Clear Heat Strengthened Glass: ASTM C 1048, Condition A-Uncoated, Type I - Transparent, Flat, Class 1-Clear, Quality q3, Kind HS.

D. Clear Tempered Glass: ASTM C 1048, Condition A-Uncoated, Type I - Transparent, Flat, Class 1-Clear, Quality q3, Kind FT.

E. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer, and as follows:

1. Interlayer Color: Clear.
2. Interlayer Material: Provide Monsanto "Saflex" or DuPont "Butacite", 0.060 in. thick.

F. Wire Glass: ASTM C 1036, UL Listed, Fire Rated polished transparent wire glass complying with ANSI Z97.1. Provide Type II - Patterned and Wired Glass, Class 1 - Clear, Quality q8 - Glazing, Form 1 - Polished Both Sides, and as follows:

1. Thickness: 1/4 in. unless otherwise indicated as required.
2. Square Pattern: Mesh M2.

G. Mirrors: 1/4 in. thick laminated safety glass, Quality q2, clear float glass with silver, copper, and organic coating, and as follows:

1. Edges: Uniformly ground and polished.
2. Predrilled holes as required.

H. Vertical Insulating Glass: Provide factory assembled units, by Viracon, of organically sealed panes of glass with low-e coating on face appropriate to assembly enclosing a hermetically sealed dehydrated air space filled with Argon gas, complying with ASTM E 774, Class A, and as follows:

1. Sealing System: Dual Seal.
2. Primary Sealant: Polyisobutylene.
3. Secondary Sealant: Silicone, General Electric IGS 3204 or IGS 3100, Rhodorsil Rhodortherm 542 or 543, or Dow Corning 982.
4. Spacer: Clear finish aluminum with welded, soldered, or bent corners.
5. Desiccant: Molecular sieve, silica gel, or blend of both.
6. Shading Coefficient: Minimum 0.55.
7. Vertical Units: Nominal 1" thick insulating units. Provide tempered units where required by code and as indicated on the Drawings.

I. Ceramic Coated Spandrel Glass: Provide ASTM C 1048, Heat Strengthened, Condition B - Ceramic Coated Spandrel Glass, Type I - Transparent, Class 1 - Clear or Class 2 - Heat Absorbing and Light Reducing, Quality q3, with ceramic frit coating applied to second surface, and as follows:

1. Adhered Backing: Provide adhered scrim to ceramic-coated surface to keep broken glass in opening in compliance with Federal General Services Administration Construction Program for Public Building Service.
2. Color: Provide spandrel glass matching color/tint of transparent glass used on this product. Match Architect's sample.

2.03 GLAZING MATERIALS AND PRODUCTS

A. General: Provide sealants and gaskets with performance characteristics suitable for applications indicated. Ensure compatibility of glazing sealants with insulated glass sealants, with laminated glass interlayers, and with any other surfaces in contact.

B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A hardness of 50. Provide one of the following:

1. Dow Corning 795.
2. General Electric Silglaze N 2500 or Contractors SCS-1000.
3. Rhodorsil 3B, 5C, or 6B.
4. Tremco Proglaze.

C. Setting Blocks: Provide neoprene or silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants.

1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.

D. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55±5.

E. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.

F. Mirror Adhesive: Palmer's Mirro-Mastic.

PART 3 EXECUTION

3.01 INSPECTION

A. The Installer/Glazier shall examine substrates, supports, and conditions under which this work is to be performed. Notify Contractor in writing, outlining conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of installation will be construed as glazier accepting substrates and conditions.

3.02 INSTALLATION

A. General Installation Requirements: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section. Comply with FGMA Manual. Do not glaze when ambient temperature is below 40°F.

1. Prior to installing glass, clean glazing channels and framing members.
2. Remove coatings not completely bonded to substrates.
3. Remove lacquer from metal surfaces where in contact with sealants.
4. Protect glass from edge damage at all times. Use roller blocks and suction cups.
5. Replace glass with edge damage or other imperfections which could weaken glass.
6. Install setting and side blocks in locations recommended by referenced standards, and as required to prevent glass displacement.
7. Center glass in openings. Provide 1/2 in. minimum glass bite and 1/8 in. edge clearances.
8. Install glass and glazing in such a manner as to allow for easy replacement of glass and glazing without dismantling of frames.
9. Prevent metal to glass contact at all times. Protect edges of insulated units from moisture and solvents.
10. Clean, prime, and install stops.

B. Mirrors: Adhere mirrors to walls plumb and level. Support mirror bottoms with stainless steel clips spaced at quarter-points.

3.03 CLEANING AND PROTECTION

A. Clean exposed surfaces using manufacturer recommended materials and methods. Remove and replace work which cannot be successfully cleaned. Clean glass and framing members frequently to protect from build-up of harmful construction contaminants.

B. Touch-up damaged coatings and finishes. Eliminate visible evidence of repair.

C. Re-clean glass within one week of final acceptance.

D. Provide temporary protection at all times during course of work, and immediately after completion to ensure work of this Section is not damaged or deteriorated in any way at time of final acceptance. Remove temporary protections and reclean as necessary immediately prior to final acceptance.

E. Remove and replace broken, chipped, cracked, or otherwise damaged glass.

END OF SECTION

SECTION 08920

GLAZED CURTAIN WALLS, SLOPED ROOF GLAZING AND GLAZED CANOPY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Work Included: Provide pre-engineered glazed curtain walls, sloped roof glazing and glazed canopy systems, as indicated on Drawings and as specified herein. Include, but do not limit to:

1. Design and engineering of glazed curtain walls.
2. Design and engineering of sloped roof glazing.
3. Design and engineering of glazed canopy.
4. Steel support frames and hangers.
5. Factory finished framing and components.
6. Aluminum closure plates, panning, and other miscellaneous aluminum work as detailed.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01410, QUALITY CONTROL; Inspection and testing
2. Section 01420, MOCK-UPS.
3. Section 05120, STRUCTURAL STEEL; Support at sloped glazing.
4. Section 07900, JOINT SEALERS.
5. Section 08410, ALUMINUM ENTRANCES.
6. Section 08800, GLASS AND GLAZING; Glass and glazing requirements.
7. Appendix B, Snow and Wind Loads.

1.04 SUBMITTALS

A. Product Data: Submit complete manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Shop Drawings: Submit large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorages, connections, component reinforcements, glazing sealants, flashings, weeps, and accessory items. Show manufacturers names on each component. Provide installation templates for work installed by others. Show all interfaces and relationships to work of other trades.

1. Include setting drawings, templates, and directions for the installation of anchor bolts and

other anchorages installed as a unit of work under other sections.

2. Indicate where and how the system deviates from contract drawings and specifications. Show section moduli of wind-load-bearing members and calculations of stresses and deflections. Provide material properties and other information needed for structural analysis including computations, prepared, signed, or, and sealed by a professional engineer licensed to practice in the State of Maine.

C. Field Measurements: Take all necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of the job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.

D. Verification Samples: Submit representative samples of each material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide samples as follows:

1. Glass: As specified under Section 08800, GLASS AND GLAZING.
2. Sealants: 4 in. long beads of each type and color.
3. Aluminum Extrusions: 12 in. long pieces of each profile.
4. Aluminum Framing Intersection: Submit four-way intersection of framing members, with specified glass and glazing cut-away and glazed into sample, minimum size 3 ft. by 3 ft..

E. Structural Glazing Sealants: Sealant compatibility and adhesion test reports from sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with sealants; include sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

F. Calculations: Submit professionally prepared calculations and certifications for the performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied. Provide calculations and certifications stamped and sealed by a professional engineer registered in the State of Maine.

G. Test Reports: Provide certified reports for all specified tests.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide glazed aluminum curtain wall, sloped roof glazing and glazed canopy systems for the project from one source from a single manufacturer.

B. Installer Qualifications: Engage an experienced Installer who has successfully completed installation of glazed curtain wall, sloped roof glazing, and glazed canopy systems similar in material, design, and extent to that indicated for the Project and who is acceptable to the curtain wall and structural glazed canopy manufacturer.

C. Engineering: Provide the services of a Professional Engineer, registered in the State of Maine, to design and certify that the work of this section meets or exceeds performance requirements specified.

D. Design Criteria for Sloped Roof Glazing: The Drawings indicate size, profiles, and dimensional requirements of the sloped roof glazing and are not based on a specific type or model. Sloped roof glazing systems by other manufacturers having equal performance characteristics may be

considered provided deviations in dimensions and profiles are acceptable to the Architect and do not change the design concept or intended performance, as judged by the Architect.

E. Subdivision of Work: To limit responsibility, assign the complete curtain wall, sloped roof glazing and glazed canopy system, including all framing, glass and glazing, sealing, anchoring, and all other related components and accessories to one manufacturer and installer.

1. The inclusion of structural steel support framing for the slope roof glazing system, as specified in Section 05120, with the work of this Section is acceptable to the Owner.

F. Preinstallation Conference: Convene a preinstallation conference at the project site to establish procedures for maintaining optimum working conditions and to coordinate curtain wall, sloped roof glazing, and glazed canopy work with all adjacent work.

G. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by system.

1. Test a minimum of 12 samples of each metal, glazing, and other material.
2. Prepare samples using techniques and primers required for installed system.
3. Perform tests under environmental conditions that duplicate those under which system will be installed.
4. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

1.06 TESTS AND PERFORMANCE REQUIREMENTS

A. Manufacturer's Standard Tests: Provide specified test data showing compliance with specified requirements.

B. Design Pressures: Design pressures act perpendicular to flat surfaces and perpendicular to tangents of curved surfaces. Design pressures shall be those prescribed by code, or the following, whichever is greater:

1. Design Wind Pressure: Comply with requirements indicated on WSK-2, Wind Loads on Glass Roof; WSK-3, Wind Loads on Glass Wall; attached in Appendix D.
2. Snow Loads: Comply with requirements indicated on WSK-1, Snow Loads on Glass Roof; attached in Appendix D.

C. Structural Performance: Test curtain wall system, sloped roof glazing and glazed canopy system in accordance with ASTM E 330 at the following static air pressure difference.

1. Comply with requirements indicated on WSK-1, Snow Loads on Glass Roof; WSK-2, Wind Loads on Glass Roof; WSK-3, Wind Loads on Glass Wall; attached in Appendix D.
2. Static Air Pressure Difference: At least 1.5 times the Design Wind Pressure.
3. Permanent Deformation in Any Member: Not to exceed 0.1% of member span.
4. Deflection in Each Member: Not to exceed 1/175 of member span (1/2 in. maximum).
5. Deflection at Anchors: Combined movement of framing members relative to anchors and anchors relative to building structure shall not exceed 1/8 in. in any direction.

6. Stress Limitations: Do not exceed stress limitation values established by referenced standards. Allowable stresses shall not exceed yield stresses.
7. Structural Glazed Canopy System: In addition to requirements stated hereinabove, the system shall comply with the following:
   a. Glazing-to-glazing joints accommodate thermal and mechanical movements of glazing and system, prevent glazing-to-glazing contact, and maintain required edge clearances.
   b. Revise tensile or shear stress indicated below to suit Project.
   c. Tensile or shear stress in structural silicone sealant joints is less than 20 psi.
   d. Structural silicone sealant does not carry gravity load of glazing.

D. Thermal Movement: Provide curtain wall, sloped roof glazing and glazed canopy systems that allow for expansion and contraction of members throughout an ambient temperature range of 100°F above and 100°F below temperature at which the curtain wall and structural glazed canopy is installed.

E. Steel Truss Deflections: Provide curtain wall, sloped roof glazing and glazed canopy systems that allows for vertical deflections of L/360 where L represents the horizontal span for each truss.

F. Air Leakage: Test curtain wall, sloped roof glazing, and glazed canopy system in accordance with ASTM E 283 as follows:

1. Static Air Pressure Difference: 15% of specified Design Wind Pressure, but never less than 6.24 pounds per square foot.
2. Performance: Maximum air leakage shall not exceed amount shown in Section 2.1 of ANSI/AAMA 101.

G. Water Leakage Test: Test curtain wall, sloped roof glazing, and glazed canopy system in accordance with ASTM E 547, with four test cycles, each cycle consisting of five minutes with pressure applied, and one minute of pressure released, during which time the water spray will be continuously applied.

1. Test Pressure: 20% of specified Design Wind Load, but never less than 10 pounds per square foot.
2. Performance: No leakage as defined in the test method at the specified test pressure.

H. Additional Water Leakage Test: Perform additional test in accordance with ASTM E 331 as follows:

1. Test Pressure: 20% of specified Design Wind Load, but never less than 15 pounds per square foot.

I. Condensation Resistant Factor: Not less than C55 per AAMA 1502.7.

J. Structural Sealant: Provide structural silicone sealant that withstands tensile and shear stresses imposed by system without failing adhesively or cohesively.

1. Provide sealant that fails cohesively before sealant releases from substrate when tested for adhesive compatibility with each substrate and joint condition required.
2. Adhesive failure occurs when sealant pulls away from a substrate cleanly, leaving no

sealant material behind.

3. Cohesive failure occurs when sealant breaks or tears within a joint but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

1.07 FIELD TESTS

A. Field Testing: Owner may employ an independent testing agency to perform tests on in-place curtain wall, sloped roof glazing and glazed canopy systems and components. Cooperate with testing agency at all times during field tests.

1. Leakage: Tests will generally include a prolonged water spray test similar to AAMA 501.3. Any uncontrolled leakage within the systems or between the systems and adjacent construction will be considered a failure.
2. Failures: Contractor shall pay for all remedial work and all retesting required because of failures.

1.08 SEQUENCING AND SCHEDULING

A. Schedule installation of the glazed aluminum curtain wall, slope roof glazing and glazed canopy system in sequence with related elements of the Work specified in other Sections to ensure that assemblies, including flashing, trim, and joint sealers, are protected against damage from effects of weather, age, corrosion, and other causes.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.10 WARRANTIES

A. Curtain Wall, Sloped Roof Glazing, and Structural Glazed Canopy System Warranty: Provide written warranty agreeing to repair or replace work which exhibits defects in materials or workmanship. "Defects" is defined to include, but not limited to, leakage of water, abnormal aging or deterioration, and failure to perform as required. Include requirement for removal and replacement of covering and connected adjacent work.

1. Warranty period: 5 year manufacturer's warrantee from date of substantial completion for materials; 3 year installer warranty from date of Substantial Completion for workmanship.

B. Finish System Warranty: Provide written warranty, signed by both manufacturer and finisher, agreeing to repair or replace work which exhibits defects in material finishes or workmanship. "Defects" is defined to include, but not limited to, peeling, chipping, chalking, fading or abnormal aging or deterioration, and failure to perform as required.

1. Warranty Period: 5 years from the date of substantial completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide curtain wall, sloped roof glazing, and glazed canopy systems of one of the following manufacturers that meet or exceed the requirements of these specifications:

1. Architectural Skylight Co.
2. ASI.
3. Vistawall.
4. Architect approved equal

2.02 MATERIALS AND PRODUCTS

A. General: Provide engineered, assemblies complying with design and performance requirements. Provide custom assembly of structural framing and supporting members, insulated glass, laminated single glazing, structural sealant, and glazing stops.

B. Extruded Aluminum Framing and Glazing Caps: Custom profiles of sizes required, fabricated from alloy 6063, temper as recommended by manufacturer for use condition.

1. Thickness: Provide members of size and thickness as engineered to resist all loads, except provide minimum 0.125 in. wall thickness for framing, and 0.062 in. for glazing caps.

C. Aluminum Sheet: ASTM B 209, alloy 3003 with temper as recommended by manufacturer for use condition.

1. Thickness: Minimum 14 gage for exposed flashings; minimum 26 gage for concealed flashings; minimum 12 gage for formed members.

E. Stainless Steel: ASTM A 666, Type 316; ANSI No. 6 finish.

1. Thickness: Provide members of size and thickness as engineered to resist all loads, except provide minimum 0.125 in. wall thickness for framing, and 0.062 in. for glazing caps.

F. Steel Reinforcing: ASTM A 36.

G. Steel Tubes: ASTM A 500, Grade B.

H. Aluminum Brake Metal: Provide all aluminum brake metal work in conjunction with curtain wall and structural glazed canopy framing. Fabricate brake-metal work from minimum 0.062 in. thick aluminum sheet, finished to match framing.

I. Fasteners: Provide non-magnetic counter-sunk stainless steel counter-sunk fasteners. Provide concealed fasteners at all exterior locations. Provide Phillips flat head screws at interior locations. Match finish of screw heads with finish of aluminum framing members.

J. Bituminous Coatings: SSPC paint 12.

K. Glass and Glazing: Provide glass and glazing that complies with all applicable requirements of Section 08800, GLASS AND GLAZING.

L. Miscellaneous Items: Provide all gaskets, curbs, clips, framings, brackets, angles and supports as required to complete the work. Provide end caps and closure pieces as required to fully trim and conceal tops, bottoms, edges, and terminations of members.

2.03 SEALANTS

A. General: Use neutral-cure silicone sealants with insulating glass units.

B. Structural Silicone Sealant: Type recommended by sealant and system manufacturers that complies with ASTM C 1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural sealant.

1. Color: As selected by Architect from manufacturer's full range of colors.
2. Tensile Strength: 100 psi minimum.
3. Provide sealant with modulus of elasticity that will not allow movement of more than 25 percent of joint width, unless less movement is required by structural-sealant-glazed curtain wall system design.

C. Secondary Sealant: Compatible with structural silicone sealant and other system components with which it comes in contact and that accommodates a 50 percent increase or decrease in joint width at the time of application when measured according to ASTM C 719.

1. Color: As selected by Architect from manufacturer's full range of colors.

2.03 FABRICATION

A. Fabricate work to be truly straight, plumb, level and square. Provide work to sizes, shapes, and profiles indicated on approved shop drawings.

B. Provide complete curtain wall, sloped roof glazing, and glazed canopy system which collects moisture and condensation into horizontal gutters and which channel the water out of the building through weep holes.

C. Thermal Break Construction: Fabricate curtain wall, sloped roof glazing, and glazed canopy framing and glazing systems using cast or extruded thermal break material, designed in such a way so that there will be no metal-to-metal contact between exterior and interior metal members.

2.04 FINISHES

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Anodized Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm

or thicker) complying with AAMA 607.1.

PART 3 EXECUTION

3.01 INSPECTION/PREPARATION

A. The Installer/Erector shall examine substrates, supports, and conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of installation will be construed as installer accepting substrates and conditions.

B. Furnish inserts at proper times for setting in concrete formwork, masonry, and similar work indicated to support curtain wall and structural glazed canopy work.

3.02 INSTALLATION

A. General Installation Requirements: Comply with manufacturer's instructions for protecting, handling, and installing fabricated curtain wall and structural glazed canopy components, with particular care and attention to preservation of applied finishes. Discard or remove and replace damaged members.

B. Installation: Install units plumb, level, in alignment and plane without warp or rack. Anchor securely in place. Match profiles, sizes and spacings indicated on approved shop drawings.

C. Inspect all components of the curtain wall and structural glazed canopy system and remove any bent, twisted, marred or otherwise damaged materials from the site immediately.

D. Coordinate installation of curtain wall and structural glazed canopy with adjacent construction. Anchor all work securely to supporting structures. Allow for differential and thermal movement. Isolate dissimilar materials by application of heavy coats of bituminous paint, 40 mil neoprene sheeting, or other effective isolators approved by the Architect.

E. Anchor components securely in place in the manner indicated. Shim and allow for movement resulting from changes in thermal conditions. Provide separators and isolators to prevent corrosion, electrolytic deterioration, and freeze-up of moving joints.

F. Firestopping: Clean debris from behind curtain wall during erection and provide temporary closures to prevent accumulation of debris. Install firestopping to comply with governing regulations and AAMA TIR-A3. Install firestopping with securely anchored metal flanges or make equivalent provisions to prevent dislocation. Tape all joints. Comply with requirements of Section 07270, FIRESTOPPING.

E. Glazing: Comply with requirements specified in Section 08800, GLASS AND GLAZING.

F. Erection Tolerances: Install components plumb, level, accurately aligned, and located in reference to column lines and floor levels. Adjust work to conform to the tolerances indicated below. Tolerances indicated below are maximum and are not cumulative.

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment: Limit offset of member alignment to 1/16 inch where surfaces are flush or less

than 1/2 inch out of flush and separated by less than 2 inches by a reveal or protruding work; otherwise limit offsets to 1/8 inch.

4. Location: 3/8-inch maximum deviation from the measured theoretical location of any member at any location.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform testing indicated.

B. Testing Agency: Engage a qualified independent testing agency to perform testing indicated.

C. Structural Silicone Sealant Adhesion Test: Test installed structural silicone sealant according to field adhesion test method described in AAMA CW 13, "Structural Sealant Glazing Systems (A Design Guide)."

1. Test a minimum of 2 areas on each building face.

D. Air Infiltration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 783.

E. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft.

F. Water Spray Test: After completing the installation of 75-feet-by-2-story minimum area of structural-sealant-glazed curtain wall system, test system for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.

G. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.04 CLEANING, TOUCH-UP, AND PROTECTION

A. Clean exposed surfaces using manufacturer recommended materials and methods. Remove and replace work which cannot be successfully cleaned.

B. Touch-up damaged coatings and finishes. Eliminate all visible evidence of repair.

C. Provide temporary protection at all times during the course of the work, and immediately after completion to ensure the work of this Section is not damaged or deteriorated in any way at time of final acceptance. Remove temporary protections and reclean as necessary immediately prior to final acceptance.

END OF SECTION

SECTION 09215

GYPSUM VENEER PLASTER

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 Specification Sections, apply to the work of this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

A. Provide gypsum veneer plaster required to complete the work of the Contract, as indicated on the Drawings and as specified herein. Include, but do not limit to:

1. One-component gypsum veneer plaster finishes for interior walls, partitions, and ceilings, as indicated.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect the work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 06100, ROUGH CARPENTRY; Wood blocking, furring, grounds, etc., except fixture support blocking.
2. Section 09250, GYPSUM DRYWALL; Cementitious board base for veneer plaster; gypsum wallboard construction.
3. Section 09820, CEMENTITIOUS STUCCO COATING.
4. Section 09900, PAINTING; Painting.

1.04 QUALITY ASSURANCE

A. Reference Standards: Conform to governing laws, building code, and manufacturer's printed standards.

B. Obtain veneer plaster products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of veneer plaster and gypsum base.

1.05 SUBMITTALS

A. Shop Drawings: Furnish complete shop drawings of all work of this Section to Architect for approval, showing all pertinent details of construction and installation, and sizes, gauges,

configurations, and connections of all components; including control joints. Confirm on shop drawings that deflection will not exceed L/270.

B. Samples: Furnish to Architect for approval samples of materials to be furnished under this Section which are specifically requested by Architect.

C. Product Data: Submit manufacturer's product specifications and installation instructions for each component of veneer plaster systems, including test data and other pertinent data as may be required to show compliance with these specifications.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver all manufactured materials to site in original packages, containers, or bundles bearing the manufacturer's name and brand names, type of material, and contents.

B. Store materials in interior spaces, above floors, under cover, away from sweating walls and other damp surfaces, and with good ventilation.

1.07 PROJECT CONDITIONS

A. Environmental Requirements, General: Comply with requirements of ASTM C 843 and recommendations of veneer plaster manufacturer, for environmental conditions before, during and after application of veneer plaster.

B. Cold Weather Protection: When ambient outdoor temperature is below 55 degrees F. maintain continuous, uniform, comfortable building working temperatures of not less than 55 degrees F. for a minimum period of one week prior to and during veneer plastering, and for a minimum period of one week after veneer plaster has set; unless otherwise indicated.

C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for hydration of veneer plaster, immediately after its application and set.

PART 2 PRODUCTS

2.01 VENEER PLASTER

A. One Coat Veneer Plaster: Provide one component veneer plaster for application directly to cement board base conforming to ASTM C 587 and equal to one of the following:

1. Georgia Pacific Corp.; Dens-Cote.
2. National Gypsum Co.; Uni-Kal Plaster.
3. United States Gypsum Co.; Diamond Interior Finish.

2.02 ACCESSORIES

A. General: Provide accessories conforming to ASTM C 840.

B. Corner Beads: 1 in. by 1 in. perforated flange, standard type, 26 gauge, galvanized steel, for plaster veneer finish.

C. Metal Trim: 24 gauge, galvanized steel, with perforated flanges, for plaster veneer finish.

D. Control Joint: 26 gauge, galvanized steel, "Vee" type, with perforated flanges, for plaster veneer finish.

PART 3 EXECUTION

3.01 INSPECTION AND COORDINATION

A. Inspect job conditions and related work and report to Contracting Officer in writing, all conditions interfering with the proper installation of work of this Section. Commencement of work in any given area shall constitute acceptance of conditions in that area as acceptable to receive work of this Section.

B. Make all changes and adjustments in work of this Section as needed to accommodate the work of other trades, providing all cutting and patching until it has been inspected.

3.02 GENERAL REQUIREMENTS

A. Work shall conform to the printed specifications and installation instructions of each of the manufacturers, the approved shop drawings, above-referenced quality assurance standards, the governing laws and building codes. Refer to Drawings to determine location of fire-resistive, fire-protective, and acoustically-rated work, and construct this work to conform to the specifications and installation instructions of UL or other testing agency(ies). Provide thickness as recommended by manufacturer, also refer to the Drawings to determine the thickness of plaster, etc., for each of the installations.

B. Do veneer plaster work only after all windows and door openings are enclosed and a temperature of not less than 55 degrees F. is maintained during and up to completion of the plaster work.

3.03 INSTALLATION OF TRIM AND ACCESSORIES

A. Install trim and accessories at gypsum base installations, as follows, in strict accordance with manufacturer's instructions. All trim shall be "mudded in" type.

1. Install joint reinforcement tape at all joints, and at all internal corners where abutting surfaces are both gypsum construction.
2. Install corner beads at all external gypsum base corners.
3. Install casing bead wherever finish gypsum plaster abuts dissimilar materials and other places where specifically called for on the Drawings.
4. Install control joints generally over all door frames, over control joints in back-up materials, and at maximum distance of 30 ft. in walls; 60 ft. or to limit areas to not more than 2400 sq. ft., at ceilings (except where lesser distance is indicated); and other places specifically called for on the Drawings. Interrupt furring and/or framing behind the control joints. In all cases, specific locations of control joints shall be as indicated or as directed by the Contracting Officer, and this information must be in hand before control joint installation is begun.

3.04 GYPSUM VENEER PLASTER APPLICATION

A. Gypsum veneer plaster application shall conform to ASTM C 843 and the recommendations of the gypsum veneer plaster manufacturer.

3.05 CLEANING

A. Protect the work of other trades and work of this Section already installed against soiling and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged or soiled.

END OF SECTION

SECTION 09250

GYPSUM DRYWALL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. The work of this section includes, but is not limited to, the following:

1. Metal framing and trimming systems for drywall systems.
2. Gypsum boards and cementitious boards for wall, ceiling and soffit applications.
3. Sound attenuation insulation.
4. Concealed acoustical sealants.
5. Miscellaneous metal framing and blocking.
6. Installation of access panels.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 06100, ROUGH CARPENTRY; Blocking and wood studs.
2. Section 07270, FIRESTOPPING; Firesafing insulation and sealant.
3. Section 07900, JOINT SEALERS; Exposed acoustical sealant.
4. Section 08110, STEEL DOORS AND FRAMES; Built into gypsum construction.
5. Section 08305, ACCESS PANELS; Built into gypsum construction.
6. Section 09215, GYPSUM VENEER PLASTER.
7. Section 09900, PAINTING; Finishing of work of this section.
8. Division 15, MECHANICAL and Division 16, ELECTRICAL; Coordination of mechanical, electrical and plumbing requirements.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide certifications stating that materials comply with requirements.

B. Calculations: Provide professionally prepared calculations and certification of the performance of this work. Show how design load requirements and other performance requirements have been satisfied.

1.05 QUALITY ASSURANCE

A. Source: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.

B. Structural Performance: Provide the services of a Professional Engineer, registered in the State of Maine, to design and certify that the work of this section meets or exceeds the performance requirements specified in this section.

1. Limit deflection to L/240 for non-rigid finishes, L/360 for rigid finishes applied over drywall. Lateral load is 5 psf.

1.06 TESTS

A. Fire-Resistance: Where fire-resistance ratings are indicated or required by authorities having jurisdiction, provide materials and construction which are identical to assemblies whose fire-resistance rating has been tested in compliance with ASTM E119 by independent agencies acceptable to the Architect and authorities having jurisdiction.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturers' instructions and recommendations. Protect from damage. Adequately support stored gypsum panels to avoid sagging. Sequence deliveries to avoid delays, but minimize on-site storage.

1.08 PROJECT CONDITIONS

A. Weather: Perform work only when existing and forecasted weather conditions are within the limits established by manufacturers of the materials and products used. Comply with requirements of Gypsum Association publication 220.

B. Framing Tolerances: Proceed with work only when framing work is complete and within installation tolerances specified in ASTM C 754 and this specification section.

C. Ventilation: Comply with manufacturer's requirements and recommendations and Gypsum Association publication 216. Avoid too rapid drying in hot weather.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Gypsum Board and Related Products: Provide products by USG, Goldbond or equal meeting requirements specified.

B. Metal Framing and Support: Provide products of one of the following manufacturers if they meet or exceed the requirements of these specifications:

1. Allied Industries
2. Bostwick Steel Framing

3. National Gypsum Co.
4. Milcor/Inryco
5. Marino Ware Industries
6. U. S. Gypsum Co.

2.02 METAL FRAMING SYSTEMS FOR SUSPENDED AND FURRED CEILINGS

A. General: Provide components that conform to ASTM C 754 for materials and sizes, unless indicated otherwise. Provide all metal runners, hangers, studs, and channels hot-dip galvanized conforming to ASTM A 525, G60, unless noted otherwise.

B. Concrete Inserts: Provide inserts designed for attachment to concrete forms, and for embedment in concrete, fabricated from corrosion resistant material, with holes and loops for attachment of hanger wires, and capable of sustaining a load equal to 3 times that imposed by ceiling construction, as tested per ASTM E 488.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, 12 gauge minimum.

D. Hanger Rods: Where required for loading or by local authorities, provide mild-steel rods, sized as required, hot-dip galvanized.

E. Flat Hangers: Where required for loading or by local authorities, provide mild-steel flat hangers, sized as required, hot-dip galvanized.

F. Angle-Type Hangers: Provide steel angles with legs not less than 7/8 in. wide, formed from 0.0635 in thick galvanized steel sheet conforming to ASTM A 446, G 90, with bolted connections.

G. Channels: Provide cold-rolled steel channels, minimum 16 gauge with 7/16 in. wide flanges, protected with corrosion-resistant coating, and as follows:

1. Carrying Channels: 1-1/2 in. deep, 475 lb. per 1,000 lin. ft., hot-dip galvanized.
2. Furring Channels: 25 ga. hot-dip galvanized, screwable, pressed steel furring channels, 7/8 in. thick, hat section.
3. Steel Studs for Furring Channels: ASTM C 645, minimum 25 gage, hot-dip galvanized, with flange edges bent back 90 degrees and doubled over to form minimum 3/16 in. lip, depth as indicated.
4. Clips for attachment of steel furring channels to steel carrying channels shall be proprietary clips as recommended by manufacturer.
5. Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 653 or ASTM A 568 to form 1/2 in. deep channel.

H. Ceiling Suspension System: Provide a complete, mechanical suspension system conforming to ASTM C 645, consisting of cold-rolled steel channel main runners, screwable steel furring channels hangers and anchors and all required clips and other components, required for complete installation.

2.03 METAL FRAMING AND SUPPORTS

A. Studs: ASTM A 446, A 527, and C 645, 20 gage, unless otherwise recommended by manufacturer for conditions, span and deflection constraints indicated. Provide galvanized steel studs with not less than ASTM A 525 G60 coating.

1. Depth: 3-5/8" , unless otherwise indicated on drawings or by span and deflection constraints.

B. Runners: Match studs. Provide type as recommended by stud manufacturer.

C. Deflection Track: Manufacturer's top runner complying with the requirements of ASTM C 645 and with 2 inch deep flanges.

D. Deflection and Firestop Track: Top runner designed to allow partition heads to expand and contract with movement of structure above while maintaining continuity of the assembly. Comply with requirements of ASTM C 645 except configuration, of thickness indicated for studs and width to accommodate depth of studs indicated with flanges offset at midpoint to accommodate gypsum board thickness.

1. Offset Configuration: As indicated.
2. Product: Subject to compliance with requirements, provide "Fire Trak" manufactured by Fire Trak Corp.

E. Furring: ASTM C645, 25 gage, except 20 gage where span exceeds 4'; hat shaped or Z-shaped as indicated or appropriate. Provide galvanized steel furring with not less than ASTM A525 G60 coating. Where indicated as "resilient", provide special sound transmission reducing type similar to U. S. Gypsum RC-1.

F. Cold Rolled Channels: 16 gage steel with factory applied black asphaltum paint coating.

G. Hanger Wire: ASTM A 641, soft, class 1 galvanized, 9 gage minimum.

2.04 GYPSUM BOARD

A. Wallboard: ASTM C36.

1. Types: Fire-resistant type X. Refer to Wall Partition Schedule on the Drawings.
2. Edges: Tapered.
3. Thicknesses: 3/8", and as indicated.

B. Cementitious Board: ANSI A 118.9, cement-coated Portland cement, USG Durock or Modulars Wonderboard or approved equal, nominal 5/8 inch thick.

C. Gypsum Soffits: USG Exterior Soffit Board. ASTM C 931, thickness as indicated on the Drawings. Provide manufacturer's recommended water-resistant joint compound.

D. Water Resistant Gypsum Backer Board: Provide water resistant type gypsum backing board conforming to ASTM C 630 at areas as scheduled.

2.05 METAL TRIMS AND ACCESSORIES

A. Provide the following United States Gypsum trim and accessory types or Architect approved equals from a specified manufacturer:

1. Corner Bead: USG No. 800.
2. Control Joint: USG No. 093.
3. Edge Trim: USG No. 200-A and 200-B for drywall. Series 400 trim is not acceptable.

B. Interior Work: Galvanized steel trim units of types specified.

C. Reveals: Factory-primed extruded aluminum reveal by Pittcon or approved equal, sizes as indicated on the Drawings.

D. Control Joints: Provide control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Steel sheet coated with aluminum or rolled zinc.
2. Type: One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

E. Accessory for Curved Edges: Cornerbead formed of metal, plastic, or metal combined with plastic, with either notched or flexible flanges that are bendable to curvature radius.

2.06 JOINT MATERIALS

A. General: Comply with ASTM C 475.

B. Tape: Provide perforated, cross-fiber paper or fiberglass reinforcing.

C. Joint Compound: Provide ready mixed vinyl compound.

2.07 MISCELLANEOUS MATERIALS

A. Concealed Acoustical Sealant: Non-drying, non-hardening, non-bleeding, non-staining sealant complying with ASTM C 919. Provide one of the following:

1. Pecora BA-98.
2. Tremco Acoustical Sealant
3. USG Acoustical Sealant

B. Sound Attenuation Insulation: At acoustical partitions, provide U.S.Gypsum Thermafiber sound attenuating fire blanket or approved equal with 2.5 lbs/cu.ft density meeting fire characteristics of Thermafiber. Provide clips or wires to hold insulation in place as applicable.

C. Laminating Adhesive: Use joint compound or adhesive that is recommended by gypsum board manufacturer for laminating gypsum boards.

D. Screws: Comply with ASTM C 646 and C 514. Type S, bugle head, for attaching gypsum panels to steel framing. Provide other types as recommended by gypsum board manufacture. Provide cadmium plated fasteners for all fasteners in wet or humid areas.

E. Anchors: Provide screws, bolts, powder actuated fasteners, inserts and other fasteners that are customarily used in standard construction practices and which are proven capable of supporting at least 3 times design load.

F. Blocking: Provide steel sheet metal blocking, minimum 20 gauge thick at shaft walls and other areas as indicated.

PART 3 - EXECUTION

3.01 INSPECTION

A. The Installer/Erector shall examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.

3.02 INSTALLATION

A. General Requirements: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section.

1. Furniture Layout: Coordinate and guarantee dimensions required for custom millwork items fitting into wall construction.

B. Framing: Install/erect framing to comply with ASTM C 754. Provide framing to comply with published details and recommendations of gypsum board manufacturer, or if not available, comply with U. S. Gypsum, Gypsum Construction Handbook.

1. Do not bridge building joints; frame separately on both sides and allow for movement.
2. Isolate framing system from structural loading both horizontally and vertically.
3. Provide slip or cushioned joints at top of walls. Maintain lateral stability and acoustical performance.
4. Terminate partitions [framing and wallboard] at structural deck above, except as noted otherwise.
5. Where gypsum wallboard is noted to terminate above ceilings, continue framing to deck above.
6. Space framing members at 16"o.c., unless indicated otherwise. Meet deflection requirements.
7. Provide metal blocking at areas to receive rails, cabinets, window treatment, furnishings, shelving, and similar items requiring support unless indicated to receive wood blocking.
8. Ensure maintenance of fire rating and acoustical rating at areas with built-in or recessed items such as fire extinguisher cabinets, furnishings and similar items.

C. Gypsum Board Installation: Install gypsum board in strict compliance with ASTM C 840 and Gypsum Association publication 216, Recommended Specifications for the Application and Finishing of Gypsum Board. Refer to partition schedule and details on the drawings. Unless indicated otherwise, between offices one layer of gypsum board shall extend to structure above on each side of metal stud. Unless indicated otherwise, between offices and corridors, one layer of gypsum board shall extend to structure above.

1. Locate joints between boards as far from center of walls and ceilings as possible.

2. Stagger vertical joints on opposite sides of walls and in multiple layer work.
3. Do not align joints with door, window, or other opening corners.
3. Install gypsum boards with face side out and with joints over framing members.
4. Do not butt dissimilar board edges.
5. Provide one-piece boards around door and window frames.
6. Cover both faces of stud partitions.
7. Attach boards to metal framing with self-tapping, bugle head screws.
8. Space fasteners as recommended by gypsum board manufacturer.
9. Install drywall ceilings prior to gypsum board walls, to the greatest extent possible.
10. Do not use water-resistant gypsum board on ceilings.
11. In multiple layer walls, provide backing board or multiple layers of face board.
12. Form control joints by preparing space between edges to receive metal control joint trim.
13. Provide materials to maintain acoustical and fire rating of walls at built-in items such as fire-extinguisher cabinets.

D. Metal Trim: Strictly comply with manufacturer's instructions and recommendations for installation of metal trims and accessories. Meet installation tolerance requirements.

1. Provide corner bead trim at all external corners. Provide joint reinforcing tape at all internal corners.
2. Provide control joints where shown and at less than 30' o.c. at locations approved by Architect.
3. Provide edge trim wherever edge of gypsum board is exposed, revealed, or sealant filled, or as noted on Drawings.

E. Acoustical Insulation Work: Provide sound attenuation insulation where indicated and where required to obtain STC ratings indicated. Use clips or wires to hold insulation in place. Stuff flutes in metal deck with acoustical insulation, except stuff flutes with firesafing insulation for fire-rated partitions.

F. Acoustical Sealing Work: Provide continuous bead of concealed acoustical sealant at both faces of top and bottom runner tracks, wall perimeters, openings, expansion and control joints. Close off all sound flanking paths and openings, including those above ceilings.

G. Joint Finishing: Provide 3 coats joint compound treatment at all joints, flanges of trim accessories, penetrations, fastener heads and surface defects. Sand before and after second and third coats. Provide joint reinforcing tape at joints between boards, except where trim accessories are indicated.

1. Extend joint finishing to floor behind wall base to provide a smooth flat surface for installation of wall base.
2. For water-resistant board applications, use special water-resistant joint compound to seal joints, cover fastener heads, fill surface defects and seal cut edges.

H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

3.03 STEEL CEILING FRAMING AND FURRING

A. Suspended Ceilings: Install complete suspended steel ceiling framing system in accordance with ASTM C 754, and the following:

1. Install hangers at ends of, and 48 in. on center along lengths of main runners, securing to ceiling structure above with appropriate anchors. Provide all additional secondary framing as required to provide support by primary framing members or structural ceiling deck above. Do not anchor hangers to pipes, ducts, or other overhead non-structural elements.
2. Install steel runner channels 48 in. on center maximum and within 6 in. of walls.
3. Install screwable steel furring channels perpendicular to main runners and spaced 24 in. on center along length of, and within 6 in. of walls without wall angles, and within 8 in. of ends of panels and clipped to, the main runners.
4. Entire installation shall be level and true, with maximum variation from level 1/8 in. when measured with a 10 ft. straightedge, and with accumulation of variation of level not to exceed 1/2 in. per room or area.

3.04 TOLERANCES

A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Documents and shall not be added to allowable tolerances indicated for other work.

1. Allowable Variation from True Plumb, Level, & Line: ± 1/8" in 20'-0".

B. After finishing joints and screw heads shall be flush and not visible. Surfaces shall appear truly flush, smooth, seamless and uniform. Planes shall be truly flat. Corners shall be crisp and at true angles. Where gypsum drywall work butts dissimilar materials, joints shall be tight and shall be accurately scribed to adjacent construction without gaps.

3.05 REPAIR

A. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired. Clean up all joint compound splatters.

END OF SECTION

SECTION 09300

TILE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Floor tile.
2. Wall tile.
3. Stone thresholds installed as part of tile installations.
4. Waterproofing and crack-suppression membrane for thin-set tile installations.
5. Surface preparation for tile and accessories.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for monolithic slab finishes specified for tile substrates.
2. Section 079200 - JOINT SEALANTS for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
3. Section 092116 - GYPSUM BOARD ASSEMBLIES for cementitious backer units.

1.3 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Stone thresholds in 6-inch lengths.
4. Metal edge strips in 6-inch lengths.

D. Qualification Data: For Installer.

E. Material Test Reports: For each tile-setting and -grouting product.

1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid additives in unopened containers and protected from freezing.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 TILE SCHEDULE

A. Ceramic Floor Tile: Interior floor installation on concrete; thin-set mortar; TCA F113 and ANSI A108.5.

1. Tile Type: Unglazed ceramic mosaic as selected by Designer.
2. Thin-Set Mortar: Latex-portland cement mortar.
3. Grout: Polymer-modified unsanded grout.
4. Joint Width: 1/16 inch.

B. Paver Floor Tile: Interior floor installation on concrete; thin-set mortar, epoxy grout; TCA F115 and ANSI A108.5.

1. Tile Type: Unglazed paver tile as selected by Designer.
2. Thin-Set Mortar: Latex-portland cement mortar.
3. Grout: Chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.
4. Joint Width: 1/8 inch.

C. Ceramic Floor Tile: Interior floor installation on waterproof membrane over concrete; thin-set mortar; TCA F122 and ANSI A108.5.

1. Tile Type: Unglazed ceramic mosaic tile as selected by Designer.
2. Thin-Set Mortar: Latex-portland cement mortar.
3. Grout: Polymer-modified unsanded grout.
4. Joint Width: 1/16 inch.

D. Ceramic Wall Tile Installation: Interior wall installation over gypsum board; thin-set mortar; TCA W243 and ANSI A108.5.

1. Tile Type: Glazed ceramic tile as selected by Designer.
2. Thin-Set Mortar: Latex-portland cement mortar.
3. Grout: Polymer-modified unsanded grout.
4. Joint Width: 1/16 inch.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

C. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

E. Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes selected from manufacturer's standard shapes.

F. Marble Thresholds: Uniform, fine- to medium-grained white stone with gray veining, ASTM C 503 with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish. Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

G. Fabric-Reinforced, Fluid-Applied Waterproofing and Crack Suppression Membrane: System consisting of liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), and fabric reinforcement.

1. Custom Building Products; Trowel & Seal Waterproofing and Anti-Fracture Membrane.
2. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.
3. MAPEI Corporation; PRP M19.
4. Summitville Tiles, Inc.; S-9000.

H. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

I. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

J. Organic Adhesive: ANSI A136.1, Type I, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

K. Standard Sanded Cement Grout for Joint Widths Wider Than 1/8 inch: ANSI A118.6, color as indicated.

L. Standard Unsanded Cement Grout for Joints Widths 1/8 inch or smaller: ANSI A118.6, color as indicated.

M. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.3 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Section 079200 - JOINT SEALANTS.

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Available Products:

a. Dow Corning Corporation; Dow Corning 786.
b. GE Silicones; Sanitary 1700.
c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
d. Tremco, Inc.; Tremsil 600 White.

D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

1. Available Products:

a. Bostik; Chem-Calk 550.
b. Mameco International, Inc.; Vulkem 245.
c. Pecora Corporation; NR-200 Urexpan.
d. Tremco, Inc.; THC-900.

2.4 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Designer.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.

H. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.
2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

3.4 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

B. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

B. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

C. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.6 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

3.7 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed. After seven days, cover areas subject to construction traffic with heavy cardboard.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

STANDARD SPECIFICATIONS

DCAM Standard Specifications are intended for use only on projects of the Division of Capital Asset Management in the Commonwealth of Massachusetts. The specifications are intended to assist the Designer with incorporating DCAM and MGL Chapter 149 filed sub-bid requirements in documents used for bidding and construction. Each section will require editing by a registered architect or engineer before issue.

NOTES TO THE DESIGNER

None for this section

RESOURCES

Bostik
Bostik World Headquarters
211 Boston Street
Middleton, MA 01949-2128
(800) 523-6530; (978) 777-0100
www.bostik.com
Rep: Dave Forgetta
(978)373-2742

Dow Corning Corporation
P.O. Box 994
Midland, MI 48686-0994
(800) 248-2481; (517) 496-4000
www.dowcorning.com
Rep: Garvin Construction Products
(617) 242-2525

GE Silicones
260 Hudson River Road
Waterford, NY 12188
(800) 255-8886; (518) 237-3330
www.gesilicones.com
Rep: Brenda Alpert
(857) 472-0463

Mameco
See Tremco

Pecora Corporation
165 Wambold Road
Harleysville, PA 19438
(800) 523-6688; (215) 723-6051
www.pecora.com
Rep: Shaun Wentworth
(508) 879-7338
(617) 513-1704, cell

Tremco, Inc.
3735 Green Road
Beachwood, OH 44122
(800) 321-7906; (216) 292-5000
www.tremcosealants.com
Rep: Kevin Rooney
(866)573-9641

END

SECTION 09510

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide suspended acoustical ceilings as indicated on Drawings and as specified. Work of this Section includes, but is not limited to:

1. Acoustical panel lay-in ceiling with exposed suspension system.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:

1. Division 15 - MECHANICAL and Division 16 - ELECTRICAL; Mechanical and electrical fixtures and appurtenances at acoustical ceilings, including independent suspension.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials comply with requirements.

B. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

C. Verification Samples: Submit representative samples of each material to be exposed in the finish work, showing full range of color and finish work, showing full range of color and finish variations expected. Provide minimum 12 in. x 12 in. samples of panels. Provide minimum 12 in. long samples of exposed suspension systems.

D. Test Reports: Submit certified reports for tests required.

1.05 QUALITY ASSURANCE

A. Comply with governing laws and building codes as well as to CISCA Handbook and the requirements of ASTM C 636.

B. Installer: A firm with minimum three years experience in work of type required by this Section, and which is authorized, certified or licensed by the manufacturers of the primary materials.

C. Source: For each type of material required for the work of this Section, provide primary materials which are the products of a single manufacturer. Provide secondary materials which are acceptable to the manufacturers of primary materials.

1.06 TESTS

A. Fire Resistance: Where fire-resistance ratings are indicated or required by authorities having jurisdiction, provide materials and construction which are identical to assemblies whose fire-resistance ratings have been tested in compliance with ASTM E 119 by independent agencies acceptable to the Architect/Engineer and authorities having jurisdiction.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-response tests are performed by a qualified testing and inspecting agency. Qualified testing and inspecting agencies include Underwriters Laboratories (UL), Warnock Hersey, or another agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
3. Acoustical panel ceilings indicated are identical in materials and construction to those tested for fire resistance per ASTM E 119.
4. Fire-resistance-rated, acoustical panel ceilings are indicated by design designations listed in the UL "Fire Resistance Directory," in the Warnock Hersey "Certification Listings," or in the listing of another qualified testing and inspecting agency.
5. Products are identified with appropriate markings of applicable testing and inspecting agency.

C. Noise Reduction Coefficient (NRC): Where NRC ratings are indicated or required by authorities having jurisdiction, provide materials and construction which are identical to assemblies whose NRC ratings have been tested in compliance with ASTM C 423 by independent agencies acceptable to the Architect/Engineer and authorities having jurisdiction.

D. Ceiling Sound Transmission Class (CSTC): Where CSTC ratings are indicated or required by authorities having jurisdiction, provide materials and construction which are identical to assemblies whose CSTC ratings have been tested in accordance with CISCA Test Method AMA-1-II and CSTC rating determined in accordance with ASTM E 413 by independent agencies acceptable to the Architect/Engineer and authorities having jurisdiction.

E. Light Reflectance (LR): Where LR rating is indicated or required by authorities having jurisdiction, provide materials and construction which are identical to assemblies whose LR rating has been tested in compliance with ASTM C 523 by independent agencies acceptable to the Architect and authorities having jurisdiction.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing manufacturer's name, brand names, type of material, and contents.

B. Store materials in interior spaces, above floors, under cover, away from sweating walls and other damp surfaces. Provide ventilation.

1.08 PROJECT CONDITIONS, SEQUENCING, AND SCHEDULING

A. Environment: Perform work only when temperature and humidity conditions are within the limits established by manufacturers of the materials and products used.

B. Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1. Proceed with installation of ceiling only when construction above ceilings and penetrating work is complete. Delay installation of ceiling panels until near time of Substantial Completion.
2. Perform work of this Section coordinated with the layout of light fixtures, HVAC equipment and fixtures, fire suppression system components and all other related work. In general, every penetration shall occur at the center of a ceiling panel.

1.09 EXTRA MATERIAL

A. Provide packaged, wrapped and labeled maintenance stock equal to 2% of the actual quantity installed for the following items of work:

1. Each type of ceiling panel.
2. Each type of suspension system component.

PART 2 PRODUCTS

2.01 SUSPENSION SYSTEM

A. Provide products of one of the following manufacturers that meet or exceed requirements specified:

1. Armstrong World Industries, Inc.
2. Chicago Metallic Corporation.
3. USG Interiors.

B. Exposed Suspension System, Non-Rated: Provide manufacturer's standard 15/16 in. and narrow 9/16 in. exposed "Tee", commercial quality cold-rolled, electro-galvanized steel grid system, complying with ASTM C 635; as scheduled at end of Section.

1. Provide "Intermediate-Duty System" conforming to ASTM C 635.
2. Provide grid modules to match ceiling panel sizes.
3. Provide manufacturer's standard white baked enamel finish on steel exposed surfaces.
4. Exposed fasteners, including pop rivets, will not be permitted for suspension system installation.

C. Attachment Devices: Provide attachment devices sized for five times design load indicated by ASTM C 635, Table 1, for Direct Hung.

D. Hanger Wire: ASTM A 641, galvanized, soft temper, prestretched, Class 1 Coating, minimum 12 gage. Size wire so that stress at three times hanger design load given in ASTM C 635, Table 1, Direct Hung, will be less than the yield stress of the wire but provide not less than 0.106 in. diameter wire.

E. Bracing: Provide manufacturer's standard stiffening braces.

F. Hold-Down Clips: Provide spring steel impact clips design to absorb impact forces.

G. Moldings and Trim: Except as otherwise indicated, provide manufacturer's standard profiles to suit edge conditions, panel profile and penetrations. Provide custom fabricated work as required to provide exact fit.

1. Provide steel angle edge support back bent to reinforce edge where ceiling panels meet walls.
2. Provide clean, aesthetically pleasing joints at corners.
3. Pop rivet fastening at connections and intersections of moldings and trim pieces will not be permitted.
4. All moldings and trim components of suspension system shall have hemmed edges.
5. Provide custom colors, shapes, bends and configurations as required. Provide continuous true round moldings at columns. Segmented molding will not be accepted.
6. Provide moulding equal to "Shadowline" by USG Interiors, Inc.; as approved by the Architect.

2.02 ACOUSTICAL PANELS

A. Provide ceiling panel products of one of the following manufacturers that meet or exceed requirements specified:

1. Armstrong World Industries, Inc.
2. Celotex Corporation.
3. United States Gypsum Co.

B. Acoustical Panel: Provide panels equal to “S800 with Overtone Finish” manufactured by Celotex and complying with ASTM E 1264 classifications. Panels shall have the following characteristics:

1. Light Reflectance: LR 0.75; according to ASTM E 1264.
2. Surface Burning Characteristics: ASTM E 1264, Class A; Fed. Spec. SS-S-118B Flame Spread 25 or under; UL labeled.
3. Noise Reduction Coefficient: Minimum 0.70; according to ASTM C 423.
4. High impact resistance and humidity resistance.
5. Panels Size: 24 in. by 24 in.

PART 3 EXECUTION

3.01 INSPECTION

A. The Installer shall examine substrates, supports, and conditions under which this work will be performed and notify Contractor in writing, of conditions detrimental to proper completion of the

work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.

3.02 PREPARATION AND INSTALLATION - GENERAL

A. General: Strictly comply with manufacturer's recommendations and instructions.

B. Conditioning: Condition acoustical ceiling materials to temperature and humidity conditions which approximate those that will be present when spaces are occupied by unpackaging and separating material at least 24 hours prior to installation.

C. Exterior doors and windows shall be in place and glazed prior to ceiling installation. Cleaning, concrete, masonry, plaster, and other "wet-work" shall be complete and dry. A minimum temperature of 65°F. shall be maintained before, during, and after the installation of acoustical work.

D. Coordination: Coordinate installation with other work to ensure proper locations of related work such as light fixtures, mechanical fixtures, fire protection systems and the like.

E. Layout: Measure each area and layout ceilings to balance panel widths on opposite edges of each ceiling in both directions. Avoid use of less than 1/2 width ceiling units wherever possible.

F. Suspension Installation: Erect suspension system in accordance with ASTM C 636, supported only from building structure. Level main suspension members to within tolerance of 1/8 in. in 10 ft. Splay hangers where necessary and countersplay to balance resulting horizontal forces. Cross brace suspension to prevent lateral sway and displacement during full seismic loads prescribed by code.

G. Install acoustical units flush and level with joints in perfect alignment. Maintain direction of pattern and "mill-run" of acoustical units in one direction.

H. Finish acoustical ceilings shall be level to within 1/8 in. in 10 ft. with total accumulated error not to exceed 1/2 in. or L/960 of overall ceiling dimension, whichever is smaller, in any room or area.

I. Use white, clean gloves when handling ceiling materials.

3.03 INSTALLATION OF SUSPENDED EXPOSED "TEE" LAY-IN PANEL SYSTEM

A. Install exposed "Tee" suspension system where indicated, in accordance with the requirements of ASTM C 636.

B. Secure hanger anchors symmetrically to structure above areas to receive "Tee" suspension grid, locating the hangers in rows directly above exposed main "Tees". Install main "Tees" at proper elevation with manufacturer's recommended ties. Install cross "Tees" 2 ft. on center, developing a 2 ft. by 4 ft. grid as indicated. Install wall moldings at perimeter walls and columns where main or cross "tees" do not occur, or as otherwise called for on the Drawings. Miter corners where wall molding intersect or install corner caps.

C. After installation of the exposed "Tee" suspension system, install acoustical panels flush and level, with panel grain in single direction.

3.04 CLEANING

A. Protect the work of other trades and work of this Section already installed against soiling and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged or soiled.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide resilient flooring and related items, as indicated on the Drawings and as specified herein. Work of this Section includes, but is not limited to:

1. Vinyl composition tile flooring.
2. Rubber flooring at elevator cabs.
3. Resilient wall base.
4. Mastics and leveling compounds.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that relate directly to Work of this Section include, but are not limited to:

1. Section 03300, CAST-IN-PLACE CONCRETE; Tolerances for concrete floor slabs and fills, ready to receive resilient flooring.
2. Section 14210, TRACTION ELEVATORS.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

C. Verification Samples: Submit representative samples of each material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

1.05 COORDINATION

A. Coordinate work of this Section with work of other Sections affecting, or affected by, this work, as necessary to ensure completion of work of the Contract on schedule.

1.06 WARRANTY

A. Provide manufacturer's warranty against excessive wear in accordance with the following:

1. Vinyl Composition Tile: Two year limited warranty.
2. Rubber Flooring: Five year limited warranty.

PART 2 PRODUCTS

2.01 GENERAL MATERIAL REQUIREMENTS

A. Resilient materials shall be uniform in thickness and size.

B. Resilient material shall be cut accurately with square, true edges.

C. Plain colors shall be uniform throughout.

D. Variegated colors and patterns shall be reasonably uniform so as not to mar appearance of floor.

E. Except as otherwise indicated or specified, all colors shall be as selected by the Architect from the full range of manufacturer's standard colors.

F. Resilient materials shall be free of objectionable odors, blisters, cracks, objectionable foreign material, or other physical defects affecting appearance or serviceability.

2.02 VINYL COMPOSITION TILE FLOORING

A. Acceptable Manufacturers: Provide products of one of the following manufacturers that meet or exceed specified requirements:

1. Mannington Commercial.
2. Armstrong World Industries, Inc.
3. Tarkett.
4. Azrock.

B. Vinyl Composition Tile: 1/8 in. thick, 12 in. by 12 in. tile meeting or exceeding Fed. Spec. SS-T-312B, Type IV, Comp. 1, and ASTM F 1066, Comp. 1, Class 2 - Through Pattern.

C. Edging: 1 in. wide, 36 in. long, tapered, maximum thickness same as flooring, solid vinyl, as selected from manufacturer's standard plain colors, as produced by manufacturer of floor tile used, or other manufacturer whose products meet all the Architect's requirements and are approved by him for use on the Project.

D. Feature Strips: 1 in. wide, 24 in. long, same thickness as flooring, solid vinyl or vinyl composition, as selected from manufacturer's standard plain colors, as produced by manufacturer of floor tile used, or other manufacturer whose products meet all the Architect's requirements and are approved by him for use on the Project.

E. Colors and Patterns:

1. Colors will be selected by the Architect from manufacturer's standard colors.
2. A maximum of three colors will be selected.

2.03 RUBBER FLOORING

A. Acceptable Manufacturers: Provide products of one of the following manufacturers that meet or exceed specified requirements:

1. Johnsonite
2. Endura, Division of Biltrite Corp.
2. Nora Flooring.

B. Floor Tile: Raised profile rubber tile flooring shall be 100% synthetic rubber, 1-1/4 in. raised beveled square with 0.025 in. profile pattern equal to "Roundel Rubber Flooring System" by Johnsonite.

1. Color: As selected by Architect.

C. Flooring shall have tensile strength of 1160 psi and elongation of at least 234% in accordance with ASTM D 638. Water absorption shall not exceed 0.27% according to ASTM D 570. Fire hazard rating for flame spread shall be 75, maximum, when tested in accordance with ASTM E 84. Materials shall exceed minimum standards for coefficient of friction specified in ASTM D 2047.

D. Rubber flooring shall have factory-applied paraffin coating.

2.04 WALL BASE

A. Vinyl Wall Base: Provide vinyl wall base by Johnsonite or approved equal conforming to ASTM F 1861, Group 1, Type TV, and as follows:

1. Height: 4 in. typical.
2. Thickness: 1/8 in. gage.
3. Style: Top-set cove at resilient flooring Style B (Cove), straight at carpet Style A (Straight). Provide formed corners.
4. Finish: Matte.
5. Roll Lengths: 100 ft. rolls, continuous runs with no pieces less than 10 ft. in any run over 100 ft.
6. Adhesive: Parabond adhesive and cement.
7. Colors: As selected by Architect.

2.05 ADHESIVES, MASTIC UNDERLAYMENTS, CRACK FILLERS, AND PRIMERS

A. Adhesives shall be type and brand recommended by manufacturer for each of the various conditions and flooring materials. Where manufacturer lists more than one recommended adhesive, manufacturer's "preferred choice" shall be used.

B. Mastic underlayments for use at subflooring shall be as recommended by flooring manufacturer.

C. Crack filler and primers for use for all the various conditions and materials shall be as recommended by manufacturer of each specific material for each specific application.

2.06 CLEANER

A. VCT Cleaners and Polish: Floor cleaner for vinyl composition floor tile shall be a commercial floor cleaner, equal to Armstrong "C-410", Hillyard "Super Shine-All", or Huntington Laboratories "Contract Floor Polish", as approved by the Architect.

PART 3 EXECUTION

3.01 PREPARATION OF SURFACES

A. Initial Preparation Under Other Sections:

1. Surfaces to receive resilient materials shall be level, plumb, true and clean, free of projections, ridges, and waves, and free of loose dirt and dust, grease, oil, and other deleterious materials such as resin type curing compounds, paint, glue, and similar materials, ready to receive work of this Section. Filling of cracks with crack filler, as required, however, will be included as part of work of this Section.
2. Surfaces of concrete floor slabs to which resilient flooring is to be applied shall be finished to tolerance stated under Section 03300, CAST-IN-PLACE CONCRETE.
3. When variation in finished surface exceeds allowable amount specified therein, it shall be brought within the allowable tolerance with latex type underlayment applied in strict accordance with manufacturer's instructions.

B. Inspection of Surfaces and Final Preparation Under this Section:

1. Thoroughly examine all surfaces to receive work of this Section, and notify the Architect in writing of all conditions which would adversely affect this work. Do not commence work in any area where such notice of adverse conditions has been sent until corrective work has been completed or waived. Start of work in any area without issuances of such notice shall constitute acceptance of conditions in the area as suitable to properly receive the work of this Section.
2. Fill all cracks, control joints, etc., in sub-surfaces, using approved Crack Filler in accordance with manufacturer's published instructions. Do final cleaning of surfaces just prior to installation, removing all dust, dirt, and other loose particles which may have accumulated since initial cleaning.
3. Allow concrete slabs to dry adequately before commencing application of flooring materials, checking the moisture content, if necessary, by means of primer tests, relative humidity tests, or mat moisture and bonding tests, all such tests being at the option of the Contractor, although the Architect may require any such tests to be done by the Contractor at the Contractor's expense, if he wishes to verify or record the moisture conditions.

3.02 INSTALLATION, GENERAL

A. Do not begin installation until work of other sections including painting, is substantially complete. Use only experienced workmen. Strictly adhere to printed instructions of manufacturer's of various materials; if found to be in conflict refer to Architect for decision.

B. Maintain room temperatures in installation areas at not less than 65°F for a period of at least 48 hours prior to commencement of tile work, and to at least 48 hours after completion, and not less than 60°F from that time on.

C. Lay resilient materials in manner to insure good, uniform contact with subsurface materials, and to produce finished surfaces which are smooth, even, and in true planes, free of buckles, waves, and other imperfections. Store and use adhesive in accordance with manufacturer's published instructions.

D. Where different colors of resilient tile flooring occur in adjoining rooms or areas, and no threshold is called for, install feature strip under door or across center of doorless opening, of color selected by the Architect.

E. Fit flooring neatly into breaks and recesses, against bases and thresholds, and around pipes, columns, and other projections. Cut, fit, and scribe borders after application of field tile.

F. Install edge strips where resilient flooring materials terminate at points higher than contiguous finished flooring.

G. Clean off surplus adhesive from resilient materials and adjacent surfaces.

3.03 VINYL COMPOSITION TILE INSTALLATION

A. Lay tile square with room axis, with joints aligned in one direction, and staggered in the other, and with borders not less than 1/2 the width of the field tile, as directed or approved by the Architect. Direction of tile grain, when laid, shall lie in single direction. Use only full tile in the field.

B. Adjust tiles that have not been seated level with surrounding tiles in manner recommended by manufacturer.

C. Replace tile showing broken corners or fracture lines by warming tile, carefully removing, and replacing with new tile of same type, color, pattern, and thickness.

3.04 RUBBER FLOORING

A. Install materials in strict accordance with manufacturer's printed instructions, using recommended cement or other adhesive recommended by manufacturer.

B. Install floor tiles in ashlar pattern. Fit tile joints tightly and neatly. Adhere with factory approved adhesives. Do all necessary cutting, coping, and scribing, keeping all exposed cut lines neat, straight, and free of burrs.

3.05 RESILIENT BASE

A. Base: Adhere base to walls, columns, casework, and all other permanent surfaces and fixtures. Install base in rolls to minimize seams. Tightly bond base to walls without any gaps between wall and base and with 100% coverage of adhesive. Hand roll base to ensure full contact and adhesion. Field form sharp external corners and keep seams and joints as far from external corners as possible. Cut and cope base at internal corners; do not round internal corner with base.

1. Fill top edge of base with sealant where base runs along an irregular wall surface such as masonry. Sealant color shall closely match base color.

3.06 ADDITIONAL MATERIALS

A. Furnish additional, factory-sealed, standard cartons containing a total of at least 3% of the amount of each different material, type, and color of floor tile used on the Project.

B. Deliver the additional materials to site and place in storage area(s) within the building designated by the Architect.

3.07 CLEANING, POLISHING, AND PROTECTING OF VINYL COMPOSITION TILE

A. Allow flooring to set for at least five days without traffic.

B. At end of setting period, wash with diluted commercial floor cleaner, rinse thoroughly, and apply one coat of commercial buffing floor polish, all in strict accordance with manufacturer's printed instructions.

C. After application of floor polish, cover vinyl composition flooring with kraft paper or prohibit traffic completely.

D. Immediately prior to inspection for Substantial Completion, but not less than 48 hours after the first application of polish, dry or damp mop floors. Buff polished floors to high luster with mechanical buffer. In areas where the original coat of polish has become worn or damaged, thoroughly clean and, if necessary, strip original polish and apply new coat of same type and brand of polish. Buff new applications of polish as specified.

END OF SECTION

SECTION 09820

CEMENTITIOUS "STUCCO" COATING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide cementitious "Stucco" coating for parge coat on exposed, new and existing, exterior and interior concrete surfaces, where indicated on Drawings and as specified.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that relate directly to Work of this Section include, but are not limited to:

1. Section 03300, CAST-IN-PLACE CONCRETE.
2. Section 04200, UNIT MASONRY.

1.04 SUBMITTALS

A. Submit product describing the products, chemical composition, characteristics, and application instructions.

B. Submit product certificates signed by manufacturers of specified products certifying that their products comply with specified requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the cementitious coating manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

B. Field-Constructed Mockup: Prior to installing cementitious coating, erect mockups for approval by the Architect. Mockup shall demonstrate color, texture, finish, and other material qualities and application thicknesses of coating system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cementitious coating products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for materials.

B. Store and handle cementitious coating materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.07 PROJECT CONDITIONS

A. Do not install cementitious coating when ambient or substrate temperatures are outside limits permitted by cementitious coating manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS / MANUFACTURERS

A. Cementitious "Stucco" Coating System: Cementitious "Stucco" coating shall be a specially formulated stucco coating suitable for trowel-applied parge coat on exterior concrete equal to one of the following products:

Product	Manufacturer
Silpro "Concrete Finish" with acrylic latex admix	Silpro Corporation Stony Brook Park 2 New England Way Ayer, MA 01432-1514 Telephone 1-800-343-1501.
"Conpro-Stucco" with acrylic latex admix	Conproco Coatings P. O. Box 16477 Hookset, NH 03106-6477 Telephone 1-800-258-3500.
"Thoro Stucco" with acrylic latex admix	Harris Specialty Chemicals, Inc. 10245 Centurion Parkway, North Jacksonville, FL 32256-0565 Telephone 1-800-322-7825.

B. Cementitious "Stucco" coating shall conform to the following:

1. Set Time, ASTM C 191: 240 minutes.
2. Air Content, ASTM C 173: 6%.
3. Compressive Strength, ASTM C 109: 7 day - minimum 2500 psi; 28 day - minimum 3000 psi.
4. Tensile Strength, ASTM C 190: 7 day - minimum 300 psi; 28 day - minimum 450 psi.

C. Color: Color will be selected by the Architect from manufacturer's full line of available colors.

2.02 MISCELLANEOUS MATERIALS

A. Patching Materials: Silpro Easy Patch, Thoro "Thoropatch", or Conproco "Conpro-Set".

B. Acrylic Latex Admix: Silpro C-21 Acrylic Latex Admix, Thoro Acryl 60, or Conproco K 88 Admix.

C. Mixing: Per coating manufacturer's printed instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for substrate, and other conditions affecting performance of cementious coating.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 SUBSTRATE PREPARATION

A. Concrete surfaces must be clean and dry and fully cured in accordance with coating manufacturer's recommendations.

B. Repair any spalled areas or cracks and fill form tie wire holes and other holes using specified patching material.

3.03 MIXING AND APPLICATION OF CEMENTITIOUS COATING

A. Mix coating in accordance with manufacturer's recommendations with a minimum of one quart of acrylic latex admix as a substitute for mixing water for each 50 lb. of cementitious coating.

B. Dampen substrate with water immediately prior to application of coating system.

C. Apply coating in accordance with manufacturer's recommendations.

1. Apply one key coat of acrylic latex modified cementitious "Stucco" coating in accordance with manufacturer's printed instructions.
2. After key coat has set, trowel apply latex-modified finish stucco coat to a minimum thickness of 1/8 in.
3. Texture and finish shall match approved mockup.

3.04 PROTECTION AND CLEAN-UP

A. Provide positive protection of all surfaces not to be coated, using masking materials, tarpaulins, drop-cloths, tape, and any shielding necessary.

B. After completion, remove all equipment, restore the area to its original condition, and remove any sealer which has spilled or splashed on surfaces not to be treated.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Provide painting and finishing work throughout exterior and interior of Project as indicated on the Drawings and as specified.

B. Examine Contract Documents to determine full extent of painting and finishing work required. Materials provided under other Sections that need painting or finishing and are left unfinished under requirements of other Specification Sections, shall be painted and finished to completion under work of this Section, unless specifically scheduled herein to be left unfinished.

C. Preparatory work of materials and surfaces to receive paint beyond that specified to be done as work of other Sections, shall be included as work of this Section.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:

1. Section 04200, UNIT MASONRY.
2. Section 05030, GALVANIZING AND METAL COATINGS; galvanizing, color galvanizing, and high performance polyester coatings.
3. Section 05310, STEEL DECK.
4. Section 05500, METAL FABRICATIONS; Prime coat on miscellaneous metal .
5. Section 06100, ROUGH CARPENTRY; Wood preservative treatments.
6. Section 08110, STEEL DOORS AND FRAMES; Prime coat on steel doors and frames.
7. Section 09250, GYPSUM DRYWALL.
8. Section 09820, CEMENTITIOUS STUCCO COATING.
9. Division 15 - MECHANICAL and Division 16 - ELECTRICAL; Factory finish and prime coats on mechanical and electrical fixtures and equipment.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Initial Color Selection Samples: Submit manufacturer's standard color charts or chips showing complete range of colors, textures, and finishes available for each paint system used.

C. Verification Samples: After initial selection of colors, submit representative samples of each paint system color that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide texture to simulate actual conditions. Define each separate coat, including block fillers and primers. Resubmit samples until required sheen, color, and texture have been approved. Provide samples as follows:

1. Paint Samples for Smooth Surfaces: Provide samples of painted finishes on gypsum drywall, Masonite board, and CMU surfaces to be painted, having minimum size of 144 sq. in.

1.05 QUALITY ASSURANCE

A. Source: Provide primers and undercoat paint produced by same manufacturer of finish coats for each substrate.

B. Coordination: Review other Specification Sections where primers are provided to ensure compatibility with finish coatings provided under this Section.

C. Mock-Ups: Prior to commencing work of this Section, provide 50 sq. ft. mock-ups of each color, paint system, and substrate at locations acceptable to the Architect. Obtain Architect's acceptance of visual qualities. Refinish mock-ups until Architect's acceptance is obtained. Maintain acceptable mock-ups throughout the remainder of the work to serve as criteria for acceptance of the work. Acceptable mock-ups may be incorporated into the finish work.

1.06 TESTS

A. The Owner may employ an independent testing agency to perform tests, evaluations, and certifications of products used. Cooperate and permit samples of materials to be taken as they are used.

1.07 PROJECT CONDITIONS

A. Weather, Temperature, and Humidity: Perform work only when existing and forecasted weather conditions fall within limits established by manufacturers of materials used.

1. Indoor Temperature: Maintain indoor temperature at 65°F. during application and drying of paints.
2. Outdoor Temperature and Conditions: Air and surface temperature shall be between 50°F and 90°F. Surfaces shall be dry within limits of finish system manufacturer.
3. Do not paint or stain exterior surfaces while surfaces are exposed to the hot sun.

B. Substrates: Proceed with work only when substrate construction and penetration work is complete.

C. Lighting: Since lighting conditions can alter appearances of finish painting work, perform work of this Section under lighting conditions simulating permanent lighting system to the greatest extent possible.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in unopened original containers bearing manufacturer's labels.

B. Store materials in fully sealed containers, outside the building, preferably in exterior storage shed, well ventilated, and with a minimum ambient temperature of 45°F. Oily rags and waste must be removed from the building every night, and under no circumstances will be allowed to accumulate. Each space containing stored paint materials shall be provided with UL labeled fire extinguisher of suitable type, class, and capacity.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Latex and Alkyd Based Paints: Provide products of one of the following manufacturers that meet or exceed specified requirements:

1. Benjamin Moore and Co. (Moore).
2. Pratt and Lambert (P & L).
3. The Sherwin Williams Company (S-W).

B. High Performance Paint Coatings: Provide products of one of the following manufacturers that meet or exceed specified requirements:

1. Tnemec Company, Inc. (Tnemec).
2. DuPont.
3. Hempel.

C. Materials used shall be best grade products of their respective kinds. The Painting Schedule is based on products the above named manufacturers. These are specified to establish a standard of quality and kind of material desired. Provide these products, or equals as approved by Architect.

D. Note: If substitutes are proposed, submit complete schedule showing materials specified and equivalent materials proposed as substitutes. Provide complete manufacturer's product data on proposed materials. Substitutes must be approved by Architect before commitment for materials is made.

E. Assume full responsibility for proper performance of materials, for method of application, and for compatibility of materials applied over shop coats or other coats previously applied, including but limited to primers, sealers, preservative treatments, etc. Notwithstanding specific schedules in this Section, select primers which have been verified to be appropriate for each of the substrates and finishes encountered.

F. Provide miscellaneous painting materials such as linseed oil, shellac, turpentine, and thinner of the highest quality.

2.02 COLORS

A. Provide colors in accordance with schedule provided by Architect. Tint and match colors to the satisfaction of Architect. Provide facilities for comparison and adjustment of colors. No limit is placed on number of colors that may be required; however the following maximum number of colors may be used in any one room, area, or surface:

1. Three colors.

2.03 FILLERS, SOLVENTS, AND MISCELLANEOUS MATERIALS

A. Turpentine: Pure gum spirits of turpentine conforming to Fed Spec. TT-T-801.

B. Drier: Conform to Fed. Spec. TT-D-65.

C. Tinting Materials: Best quality, ground in pure boiled linseed oil, limeproof, and non-fading.

PART 3 EXECUTION

3.01 INSPECTION AND GENERAL PREPARATION

A. Inspect surfaces to receive finishes to ensure they are in proper condition to receive work under this Section.

B. If surfaces are not thoroughly dry, or if surfaces cannot be put in proper condition to receive paint or other finish by customary cleaning methods, sanding, or spackling, notify Architect in writing.

C. Commencing work on any surface will be construed as acceptance of the surface as being satisfactory to properly receive the work of this Section.

D. Furnish and lay drop cloths in all rooms and areas where painting and finishing is being done, to adequately protect flooring and other work from all damage during the painting work.

E. Remove hardware, accessories, device plates, lighting fixtures, factory finished work, and similar items; or provide ample in-place protection. Use skilled mechanics for removal, resetting, and protection.

F. Cleaning: Do not paint over dirt, dust, rust, grease, moisture, or other contaminants detrimental to the formation of a durable paint finish. Clean surfaces thoroughly prior to painting in any given area.

G. Touch up bare or abraded spots on surfaces with shop or existing finishes scheduled to be painted under this Section. Use same material used for shop coat. Substrate shall be smooth, free from raised grain; putty sags, cracks, rust, grease, dirt, or other foreign matter or defect.

H. Incompatible Shop Primers: Remove incompatible shop primers and reprime surfaces, or provide barrier coats in compliance with finish paint manufacturer's instructions.

3.02 SURFACE PREPARATION

A. Prepare surfaces to receive work of this Section in strict accordance with manufacturer's instructions applicable to each material, condition, and finish.

B. Gypsum Wallboard: Fill holes, dents, and similar flaws in gypsum wallboard with plaster of Paris or spackling compound. Cut out and fill cracks. Sand surface of patch smooth and flush

with adjacent surfaces. Do not abrade adjacent surfaces. Patched areas shall not be detectable in finished work.

C. Concrete and Masonry: Prepare concrete and masonry surfaces prior to painting. Allow a minimum of 60 to 90 days curing time prior to painting poured or precast concrete. Allow a minimum of 30 to 60 days curing time prior to painting concrete masonry. Determine substrate alkalinity and moisture content and take appropriate remedial actions as recommended by paint material manufacturer. Do not paint surfaces which are sufficiently alkaline to cause blistering or peeling until remedial action is taken. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed instructions.

1. Thoroughly clean of dirt, grit, loose materials, mortar drippings, and other deleterious substances.
2. The first coat for masonry is a fill coat. Thoroughly brush fill coat into the surface in accordance with manufacturer's directions. Preliminary coats on masonry are to be absorbed into the surface. Provide additional undercoats as necessary to achieve perfect uniformity of finish coats.

D. Ferrous Metal: After installation, field-welding, and grinding, and immediately before painting, remove rust, loose mill scale, dirt, weld flux, weld spatter, weld smoke stains, burnt primer, and other foreign material with wire brushes and/or steel scrapers. Power tool clean in accordance with SSPC SP 3. Remove grease and oil by use of solvent recommended by paint manufacturer. Sand exposed surfaces, and between coats, as required to produce smooth, even finishes.

1. Sand smooth and spot prime welded areas, and areas where prime coat has been damaged or abraded, using rust inhibitive primer scheduled in this Section.
2. Spot prime all areas where shop coat has been damaged or abraded, using same type paint as used for shop coat.

E. Other Non-Ferrous Metal: Prepare shop primed non-ferrous metals similarly to ferrous metals, specified above.

1. Prepare unprimed non-ferrous metals by thoroughly cleaning of oil, grease, and temporary protective coatings using solvent recommended by primer manufacturer. Provide additional pretreatment recommended by primer manufacturer to assure permanent adhesion of paint coats.

F. Other Materials: Prepare other materials in strict accordance with recommendations of manufacturers of materials to be finished, and primers and finishes to be applied.

G. Materials Preparation: Mix and prepare paint materials in accordance with manufacturer's printed instructions. Use only thinners approved by paint manufacturer, and only within recommended limits.

3.03 APPLICATION

A. Painting Schedule in this Section lists minimum number of coats required. If specified minimum number of coats does not completely cover or hide base materials, provide additional coats required for coverage and uniform finish appearance, without additional cost to Owner.

B. Apply paint in strict accordance with manufacturer's instructions. Use applicators and techniques best suited for substrates and types of materials being applied. No material shall be thinned in any way except as directed by manufacturer.

C. Apply paints, stains, and coatings at coverage rates and dry film thicknesses scheduled at the end of this Section. Each coat applied must be inspected and approved by Architect prior to application of succeeding coat, otherwise no credit for the coat applied will be given and work in question shall be recoated without additional expense to the Owner. Notify Architect when each coat is ready for inspection.

D. Additional Coats: Provide additional coats necessary to eliminate show through and bleed through conditions.

E. Drying Time: Allow manufacturer's recommended drying time between successive coats. However, allow each coat to thoroughly dry prior to application of subsequent coat.

F. Sanding: Lightly sand finishes between coats using #00 sandpaper.

G. Tinting: Tint prime coat on gypsum wallboard and plaster to approximate color of final shade.

H. Closets: Finish closets inside the same as adjoining rooms, unless otherwise specified or scheduled.

I. Doors and Panels: Paint all doors, panels, access panels, etc., in the "open" position. Paint all edges, tops, bottoms, and both faces. Paint back face of access panels and removable or hinged covers to match adjacent exposed surfaces.

J. Movable Equipment and Furnishings: Paint surfaces behind movable equipment and furnishings same as adjacent exposed surfaces.

K. Permanently Fixed Equipment: Paint surfaces behind permanently fixed equipment with prime coat only.

L. Duct Interiors: Paint interior surfaces of ducts where visible through registers, grilles, or louvers with flat black, non-specular paint.

M. Finished work shall be free from runs, sags, hairs, defective brushing, and clogging of lines and angles. Flaws visible in the completed work shall be removed and the area satisfactorily repaired.

N. Mechanical and Electrical Work: Painting of mechanical and electrical items is limited to to items exposed to view in the mechanical rooms and in occupied areas.

1. Mechanical items to be painted include, but are not limited to:

   Ductwork.
   Heat exchangers.
   Insulation
   Motors and mechanical equipment.
   Piping, hangers, and supports.
   Tanks and equipment.

2. Electrical items to be painted include but are not limited to:

   Conduit and fittings.
   Switchgear.

O. Completed Work: Provide finishes that match approved samples and mock-ups for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.04 COMPLETION

A. Cleaning: At completion of work of this Section, remove paint and varnish spots, and oil, grease, and other stains caused by this work from exposed surfaces. Leave finishes in a satisfactory condition.

B. At completion of work of this Section, remove masking materials and other debris. Reinstall or replace fixtures, plates, etc., removed to facilitate application of paint.

C. Retouching: Touch-up and repair applied finishes which, for any reason have been damaged during construction work. All finished work applied under this Section shall have finished surfaces as approved by finish material manufacturer.

D. Final Inspection: Protect painted surfaces against damage until date of Substantial Completion. Architect will conduct final inspection of painting work. Areas that do not comply with requirements of these Specifications shall be repainted or retouched to satisfaction of Architect at no additional cost to the Owner.

3.05 SURFACES NOT TO BE FINISHED

A. Finishes for the following items are either included under other appropriate Sections or require no painting, except as otherwise specifically scheduled with subsequent Exterior and Interior Schedules.

1. Chrome or nickel plating, stainless steel, bronze, brass, and aluminum other than mill finished, unless otherwise specified.
2. Factory finished mechanical and electrical equipment, pumps, and machinery, which occur in mechanical or equipment rooms or areas.
3. Galvanized ducts, pipes, conduits, etc., occurring within mechanical areas or spaces. Also all such items fully concealed from view in the finished work.
4. Factory finished materials, specialties, and accessories unless otherwise specified.
5. Ceramic and clay products, glass, plastic, and other surfaces with "integral" finishes, except as otherwise scheduled hereinbelow.
6. Exterior concrete.

3.06 PAINT SCHEDULE

A. Number of coats scheduled is minimum. Refer to Paragraph 3.03A., hereinbefore.

B. Painting of Interior Surfaces: Important Note: Notwithstanding anything in the following schedule to the contrary, interior painting and finishing shall conform to the applicable laws and building code regarding fire hazard classifications of finish materials.

1. Interior Gypsum Wallboard for Alkyd Flat Finish:

One Coat	1.	Moore Latex Quick Dry Prime Seal (201)
	2.	Devoe 1102 Wonder-Tones Latex Primer
	3.	Duron 56-900 Pro Kote Vinyl Primer Sealer
	4.	Con-Lux "Grip-Plex 490"
	5.	S-W ProMar 200 Latex Wall Primer
Two Coats	1.	Moore Alkyd Sani-Flat (204)
	2.	Devoe 21XX Velour Flat
	3.	Duron 42-003 Wall Kote Alkyd Flat
	4.	Con-Lux "Flat-Lite 600 Series"
	5.	S-W ProMar 200 Alkyd Flat Wall Paint

2. Interior Gypsum Wallboard for Alkyd Eggshell Finish:

One Coat	1.	Moore Latex Quick Dry Prime Seal (201)
	2.	Devoe 1102 Wonder-Tones Latex Primer
	3.	Duron 56-900 Pro Kote Vinyl Primer Sealer
	4.	Con-Lux "Grip-Plex 490"
	5.	S-W ProMar 200 Latex Wall Primer
Two Coats	1.	Moore Satin Impervo (235)
	2.	Devoe 23XX Velour Eggshell
	3.	Duron 45 Wall Kote Alkyd Eggshell Enamel
	4.	Con-Lux "Luster-Lite 2900 Series"
	5.	S-W ProMar 200 Alkyd Eg-Shel Enamel

3. Interior Gypsum Wallboard for Alkyd Semi-Gloss Finish:

One Coat	1.	Moore Moorcraft Vinyl Latex Primer (273)
	2.	Devoe 1102 Wonder-Tones Latex Primer
	3.	Duron 56-900 Pro Kote Vinyl Primer Sealer
	4.	Con-Lux "Grip-Plex 490"
	5.	S-W ProMar 200 Latex Wall Primer
Two Coats	1.	Moore Moorcraft Alkyd Semi-Gloss (271)
	2.	Devoe 26XX Velour Semi-Gloss
	3.	Duron 55 Pro Kote Alkyd Semi Gloss Enamel
	4.	Con-Lux "Satin-Lite 900 Series"
	5.	S-W ProMar Salon Alkyd Semi-Gloss Enamel

4. CMU Walls in Dry Areas:

Primer (100 sq. ft. per gallon)	Tnemec Series 130 Envirofill Acrylic Block Filler Spray-Applied and Rolled Out

Two Coats (dry-film at 4.0 mils, per coat)	Tnemec 161 Fascure Epoxy

5. CMU Walls at Wet Areas:

Primer (100 sq. ft. per gallon)	Tnemec Series 130 Envirofill Acrylic Block Filler, Spray-Applied and Rolled Out.
Two Coats (dry-film 5.0 to 7.0 mils per coat)	Tnemec Series 83 Ceramlon II or 161 Fascure Epoxy

6. Exposed Steel Deck:

Shop Primer	Tnemec Series 161 Tneme-Fascure Shop-applied primer as specified in the applicable steel section. Refer to Section 05310, STEEL DECK.
Intermediate Coat	Tnemec Series 161 Tneme-Fascure
Finish Coat	Tnemec Series 73 Endura-Shield

7. Interior Ferrous Metal and Non-Ferrous Metal:

Surface Preparation:	SSPC SP1 Solvent Wipe and SSPC SP3 Power Tool
One Coat	Epoxy Primer in shop, under other Section.

After Installation:

Touch-Up Coat (dry film 3.0 mils)	Tnemec "No. 66 Hi-Build Epoxoline" Epoxy
One Coat (dry film 3.0 mils)	Tnemec "No. 73 Endura-Shield III" Acrylic Polyurethane

8. Interior Metals not Specified to Receive other Coating Systems:

One Coat (where specified)	Approved primer, in shop under other Sections
One Coat	Field Primer (only where shop primer is not specified): 1. Moore Ironclad Retardo Primer 2. Devoe 13101 Rust Penetrating Primer 3. S-W Kem Kromik Metal Primer

OR, at non-ferrous metals only,

1. Moore Ironclad Zinc Chromate Primer
2. Devoe Zinc Chromate Primer
3. Glidden Zinc Chromate Primer

Note: One prime coat only is required at interior metal work, except touch-up of areas which have become rusted or damaged prior to finish painting.

Two Coats

1. Moore Satin Impervo Enamel
2. Devoe Velour Semi-Gloss Enamel
3. Glidden Spred-Lustre Semi-Gloss Enamel
4. S-W ProMar Salon Alkyd Semi Gloss Enamel

9. Structural steel exposed to view (Base Bid):

Shop applied: See SECTION 05030, GALVANIZING AND METAL COATINGS.

Field application: Surface Prep: pressure wash at 2500 psi and touch up.
One Coat: TNEMEC 1075U Endurashield UV at 2.5 to 3.0 mils.

10. Structural steel exposed to view (Alternate #1):

Shop applied: Surface prep: SSPC-SP6 Commercial blast clean.
One Coat: TNEMEC 90-97 zinc rich primer at 3.0 to 3.5 mils. DFT.
One Coat: TNEMEC 1075U Endurashield at 4.5 to 6.0 mils. DFT.

Field Applied: Surface Prep: Touch up.
One Coat: TNEMEC 1075U at 3.0 mils. DFT.

11. Structural steel exposed to view (ALTERNATE #2):

Shop applied: Surface Prep: SSPC-SP6 Commercial blast clean.
One Coat: TNEMEC 90-97 zinc rich primer at 3.0 to 3.5 mils. DFT.

Field applied: Surface prep: Touch up.
One Coat: TNEMEC 1075U Endurashield at 2.5 to 3.0 mils DFT.
One Coat: TNEMEC 1071 Floronar poly floropolymer at 2.0 to 3.0 mils. DFT.

12. Repair and repainting of existing steel (Phase 1 Parking Garage; perimeter columns, interior columns, and canopy support structure):

Exterior and Perimeter steel

Field applied: Surface Prep: water blast using 5000 psi, minimum, with "0" degree spinning tip.
One Coat: TNEMEC 135 Chembuild primer at 3.0 mils. DFT.
One Coat: TNEMEC 1075U Endurashield at 3.0 mils DFT.

One Coat: TNEMEC 1071 Floronar poly floropolymer at 2.0 to 2.5 mils DFT.

Canopy support steel

Field applied: Surface Prep: water blast using 5000 psi, minimum, with "0" degree spinning tip.
One Coat: TNEMEC 135 Chembuild primer at 3.0 mils. DFT.
One Coat: TNEMEC 1075U Endurashield at 3.0 mils DFT.
One Coat: TNEMEC 1071 Floronar poly floropolymer at 2.0 to 2.5 mils DFT.

Interior columns and steel

Field applied: Surface Prep: water blast 500 psi, minimum, with with "0" degree spinning tip.
One Coat: RD coating Elastometal at 4.0 to 5.0 DFT.
One Coat: RD coating Elastometal at 7.0 to 9.0 mils DFT.
One Coat: TNEMEC 1028 acrylic at 2.5 to 3.0 mils DFT.

13. Mechanical and Electrical Work (Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or areas, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork visible through grilles and registers):

    Same as specified for other interior metals, hereinabove.

END OF SECTION

SECTION 10210

METAL WALL LOUVERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Furnish and install metal wall louvers, as indicated on Drawings and as specified herein.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 05120, STRUCTURAL STEEL; Structural metal framing.
2. Section 05500, METAL FABRICATIONS; Miscellaneous metal framing.
3. Section 06100, ROUGH CARPENTRY; Wood blocking and nailers.
4. Section 07410, METAL PANEL SYSTEM.
5. Section 07900, JOINT SEALERS; Perimeter sealing of louver frames.

1.04 SUBMITTALS

A. Submit shop drawings and samples in accordance with the following:

1. Shop drawings shall include details of fabrication and erection, anchorage, blank-off panels (where required), accessories and finishes.
2. Samples shall include sample louver section which indicates frame corner construction, blade construction, typical welds, and specified finish.

B. Manufacturer's Product Data: Submit descriptive data of louvers including standard drawings, louver free area, blank-off panels (where required), and installation instructions.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver louvers to project site, fully identified, and protected by padded blankets, scheduled to arrive at time of erection sequence requirements.

B. Store louvers off ground, under cover, protected from weather and construction operations.

C. Handle louvers during transportation and installation in a manner that prevents racking or damage to finish or adjacent construction.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Metal wall louvers shall be the products of one of the following manufacturers, or approved equal:

1. Airolite Company, Marietta, OH 45750.
2. Construction Specialties Inc., Cranford, NJ 07016.
3. Industrial Louvers, Inc., Delano, MN 55328.
4. Greenheck, Schofield, WI. 54476.

a. Basis-of-Design: Geenheck EDJ-430.

2.02 MATERIALS

A. Aluminum Extrusions:

1. ASTM B 221, alloy 6063-T52.
2. Minimum thickness: 0.081 in.

B. Attachment Hardware: Aluminum or stainless steel.

2.03 FABRICATION

A. Exterior stormproof louvers shall be 4 in. deep, continuous blade, with 50% minimum free air area and channel frame as indicated.

1. Where louver width necessitates intermediate mullion, provide Airolite K638.
2. Where mullion is not required, provide Airolite CB638.

B. Construction:

1. Assemble louvers by heli-arc welding.
2. Arrange louvers in full height and width panels without exposed vertical mullions.
3. Heads, sills, and jambs shall be one piece structural members.
4. Manufacturer shall provide all necessary structural supports and bracing to carry wind load of not less than 20 psf.

C. Screens: Provide louvers with 1/2 in. mesh, 0.063 in. diameter aluminum wire intercrimp bird screens secured in removable extruded aluminum frames.

2.04 FINISH

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. High-Performance Organic Coating: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

1. Fluorocarbon 4-Coat Coating System: Manufacturer's standard 4-coat thermo-cured system, complying with AAMA 605.2, composed of specially formulated inhibitive primer and fluorocarbon color and topcoat containing not less than 70 percent polyvinyldene fluoride resin by weight. Provide coating equal to PPG Duranar XL.

D. Colors: Provide colors to match adjacent metal panels, as approved by the Architect.

2.05 BLANK-OFF PANELS

A. General: Fabricate blank-off panels from materials and to sizes indicated and to comply with the following requirements:

1. Finish: Match finish applied to louver with respect to coating type, except for color, which shall be as follows:

a. Color: Black.

2. Attach blank-off panels to back of louver frames with clips.

B. Uninsulated, Blank-Off Panels: Aluminum sheet complying with the following requirements:

1. Thickness: 0.050 in., unless otherwise indicated.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine openings to receive louvers to assure dimensions conform to shop drawings and that openings are free of irregularities which would interfere with installation. Report unsatisfactory conditions to Architect in writing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install louvers in accordance with shop drawings and manufacturer's recommended installation instructions.

3.03 ADJUST AND CLEAN

A. After installation, ensure that units are level and securely anchored.

B. Verify that screens are installed and blank-off panels (where required).

C. Repair damage to louver finish to match original or replace.

D. Provide final cleaning of louvers with cleaning materials recommended by louver manufacturer.

END OF SECTION

SECTION 10220

METAL GRILL PANELS AND PRIVACY SCREENS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. The work of this section includes, but is not limited to, the following:

1. Metal exterior operable privacy screens.
2. Metal Grill Panels at Garage.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:

1. Section 07600, Flashing and Sheet Metal.
2. Section 07900, Joint Sealers
3. Section 10210, Louvers.
4. Division 15 – HVAC; blank-off plates, dampers.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, certified performance data and finish specifications. Provide certifications stating that materials comply with requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide elevations and details of anchorages, connections and accessory items. Indicate joinery, fasteners and all other relevant information.

C. Samples: Submit one full size sample, 24 in. wide by full length of entire privacy screen unit showing each material to be utilized with finish.

D. Field Measurements: Take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress.

E. Verification Samples: Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected. Provide samples 24 in. wide by full length of privacy screen unit.

F. Test Reports: Submit certified reports for performance.

G. Warranty: Provide complete manufacturer's finish and workmanship warranty.

1.05 QUALITY ASSURANCE

A. Source: Provide grills and privacy screens which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturer.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage. Sequence deliveries to avoid delays, but minimize on-site storage.

1.06 WARRANTY

A. Materials and workmanship. Manufacturer to warrant the original purchaser of fencing/infill/gate systems to be free from defects in material and workmanship and all fabrications to be in accordance with NAAMM steel fabrication industry tolerances and standards. Manufacturer to supply written warranty information in accordance with specification requirements.

B. 20-Year Finish Warranty. Supply "BB-20", 20-year warranty TGIC polyester powder coat finish system (not applied over hot-dip galvanizing), guarantee supplied components will not rust, peel or blister for a period of Twenty (20) years from the date of purchase. Manufacturer to supply written warranty information in accordance with submittal requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Metal Grill Panels at Garage Façade Perimeter: Provide louvered panels as shown on Drawings, 80% openness, as manufactured by Ametco/Orsogril, or approved equal.

1. Panels shall be a prefabricated electro-forge welded steel.
2. Panels shall be factory-coated with shop applied polyester powder coating, Thermoset by Duncan Galvanizing. Color will be selected by the Architect.
3. Panel Heights and Widths: As indicated.

B. Operable Privacy Screens: Provide operable fabricated screens by Orsogril.

2.02 MATERIALS AND PRODUCTS

A. Steel:

1. Steel Bar Stock ASTM A36
2. Steel Tubing ASTM A500, Grade B

B. Orsogril® Patterns Steel fence panels, visual screening panels, area infill panels, handrail infill panels and infill for gates (as required) will utilize one (or more) of the following available BarnettBates Orsogril® patterns.

1. BarnettBates Orsogril® Talia-80 80% view-blocking louver. 1/16" (2mm) thickness formed sheet metal louvers (may be positioned horizontally, vertically or inverted in

horizontal position to effectively block sight lines from below). Louvers positioned and held in place by 5/32" round crossbars at 5 7/32" centers. Custom engineered panel system banding/framing/mounting clips per fabrication detail.

C. Fastenings: Provide stainless steel fasteners, anchors and inserts. Conceal from view to greatest extent possible. Finish exposed items to match.

D. Anchors and Inserts: Provide stainless steel anchors and inserts, as recommended by the manufacturer.

E. Components:

1. Wall brackets shall be designed to receive and anchor the outrigger to the substructure. Provide mounting hardware, as required.

2.03 FABRICATION

A. Shop fabricate work to the greatest extent possible. Fabricate work to be truly straight, plumb, level and square. Maintain equal blade spacing from blade to blade and from blade to frame. Use welded connections wherever possible.

1. Electro-forge welding Fence panel and infill panels electro-forge welded for complete weld penetration of crossbar.

B. Provide work to sizes, shapes, and profiles indicated on approved shop drawings. Provide all supports, anchors, fasteners and accessories necessary for a complete installation. Provide metal sill pans to prevent water penetration at sill.

C. Fabricate work with uniform, tight joints.

D. NAAMM: Prior to shipment, all fabricated components will be analyzed and meet standard NAAMM steel fabrication requirements and tolerances.

E. OSHA/BOCA: Fabricated components, when installed properly will meet applicable OSHA, and/or BOCA loading requirements.

2.04 FINISHES

A. BarnettBates Orsogril® 20-year Warranty Finish System: All supplied components will be finished with this system.

1. All fabricated product to be 100% sandblasted to white metal for removal of scale, oil and debris to create a minimum 2mil etching for proper adhesion.
2. Electrostatic application of DuPont Gray Morning epoxy powder primer with 375f. minimum 15 minute duration heat cure for maximum corrosion protection.
3. Immediate electrostatic application of DuPont TGIC polyester powder color coat while metal temperature is minimum of 300f. and heat cure for minimum 10 minutes at 400f.
4. Provide an average of 8-10 mils total coating thickness.

PART 3 - EXECUTION

3.01 INSTALLATION/ERECTION

A. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section. Beginning work means Installer accepts substrates and conditions.

B. Install truly plumb, level, square and in alignment with adjacent work, unless indicated otherwise. Conceal fasteners and connections to the greatest extent possible.

C. Make all connections and joints watertight. Leave spaces for joint sealers at entire perimeter and other locations as indicated or required.

D. Protect metal from contact with masonry, concrete and dissimilar metals by coating with bituminous paint or providing another isolation material approved by Architect.

E. Coordinate installation with flashing work and joint sealing work specified in other specification sections.

F. Number panels and major components per shop drawings. Review numbering system and then properly distribute and stack components (with protective padding between panels) on site for prior to beginning installation/erection.

1. Typical Fabricated Panel. Loose-assemble clip-angle attachment hardware to corner mounting tabs on fabricated panel. Place panel in position at lower-left corner of first installation area. Align and tighten clip-angles to support bottom of panel, positioned level and plumb. Work around panel sides to affix clip angles and gradually tighten bolts to complete first panel installation. Mark and remove clip angles in order to install concrete anchors as necessary prior to reassembly for final panel attachment. Adjust for final positioning by moving bolts within slotted holes. Move to adjoining panel areas and install remaining panels. Re-tighten bolts with panels in final position.

3.02 TOLERANCES

A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Documents and shall not be added to allowable tolerances indicated for other work.

1. Allowable Variation from True Plumb, Level and Line: ± 1/8" in 20'-0"
2. Allowable Variation from True Plane of Adjacent Surfaces: ± 1/16"

3.03 CLEANING, TOUCH-UP AND PROTECTION

A. Touch-up damaged coatings and finishes to eliminate evidence of repair.

B. Repair minor damage to eliminate all evidence of repair. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned or repaired.

C. Provide temporary protection to ensure work being without damage or deterioration at time of

final acceptance. Remove protections and reclean as necessary immediately before final acceptance.

END OF SECTION

SECTION 10400

SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. The work as herein identified, requires the manufacture and/or purchase of; and delivery, installation and/or application of: Signage and Environmental Graphics as part of the Portland International Jetport Phase II Expansion to the Parking Garage.

1.2 SUBMITTALS

A. SHOP DRAWINGS / MATERIAL/FINISH SAMPLES

1. Prior to the commencement of fabrication work, or delivery to the site of any manufactured elements, the Contractor shall furnish to the Designer for approval, three (3) copies of Shop Drawings on the contractor's title block, indicating at a minimum, the following:

a. Methods and materials of fabrication;

b. All connection details, including adhesives and mechanical fasteners;

c. Inserts, waterproofing and anchorages;

d. Illumination and electrical, including location and clearance of "luminous" tubing (or other illumination source) and location of transformers;

e. Insulation of dissimilar metals;

f. Methods and materials relating to finishes;

g. One-quarter full-size butcher paper "pen plot" patterns for each sign face, indicating graphic layouts, typography and/or graphic devices (from same output/computer program/device that will direct final graphic plotting/routing/cutting). Retain all original annotated patterns reviewed during pattern submittal process. Retain final approved/stamped patterns for use and review at installation;

h. Message listing with all forms, symbols and text to be used. Message listing to correspond to numbering system shown on Sign Location Plans, Sign Design Drawings and the Sign Message Schedule provided by the Designer.

i. Submit samples as follows for review and approval. Identify each sample with the sign type number to which the sample applies, as follows:

1.) Three (3) paint samples, 6" x 6", on specified materials to match color, texture and finish.

2.) Three (3) each type of exposed metal used for major elements of work with respective finish.

3.) Three (3) each type plastic (acrylic, polycarbonate, PVC) used for major elements of work with respective finish..

4.) Three (3) each type fabric used for major elements of work.

5.) Three (3) each type adhesive plastic film, 6" x 6", including die-cut designs.

6.) Three (3) decorative hardware, including bolt-heads, nail-heads, screw-heads, rivets and similar exposed items.

7.) Three (3) of all other items as may be required by Owner or as indicated on Design Drawings.

2. Shop Drawings in the form of manufacturer's descriptive literature, catalog cuts and brochures which are approved with no corrections will be stamped "Approved"; and those requiring only minor corrections will be stamped "Approved with Corrections Noted". Please Note: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the product, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 QUALITY ASSURANCE

A. Reference is made to all individual tests and performance specifications indicated herein, as well as the highest standards of the Architectural Contract Signage industry.

B. The work shall comply with all laws, ordinances, rules, regulations and otders of any public authority having jurisdiction over the work.

C. It is the intent of these specifications to establish quality and performance standards of materials and equipment installed, hence, specific items are identified by manufacturer, trade name and catalog designation where possible. Should the Contractor propose to furnish materials and equipment other than those specified as permitted by the "or approved equal" clauses, he shall submit this request in writing to the Designer prior to the supplying of said item.

D. The electrical installation shall be in compliance with the requirements of the latest edition of the National Electrical Code, O.S.H.A., and the rules and regulations of the power company supplying power to the building.

E. All electrical equipment shall be equal to or exceed the minimum requirements of N.E.M.A., I.E.E.E., and Underwriters' Laboratories.

1.4 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be entirely responsible for receiving, handling, storage, delivery and placement of signage or other materials, including warehousing as may be necessary until the start of the installation, and shall make his own arrangements with all parties concerned in this regard.

B. The Contractor shall:

1. Protects signs after installation from damage due to subsequent construction activities until acceptance by the Owner including, but not limited to the following:

a. Plaster of painting overspray or droppings on both shop-finished or field finished signs and graphics.

b. Physical impact damage from construction activities, including workmen and equipment.

2. Warning signs and other methods of protection must be sufficiently substantial to withstand normal, anticipated construction activities and are subject to Owner's approval.

1.5 MAINTENANCE

A. The Contractor shall supply the Owner with three (3) copies of instructions on the proper maintenance of all items covered in this Contract.

1.6 DESIGNER'S REVIEW OF IN-SHOP WORK-IN-PROGRESS

A. In addition to the Base Bid amount for the fabrication and installation of all work as identified herein, the bidder shall include costs associated with a maximum of two (2) in-shop reviews of work-in-progress by the designer and the Owner's representative. These costs, to be directly reimbursed to the designer, shall include travel between Knoxville, Tennessee, and the location of the fabrication plant (air transportation - coach), ground transportation while in the city of the fabrication plant (car rental - economy class, and gasoline) or $.39 per-mile for surface transportation, lodging (one night), and meals (per-diem of $25). These dollars are to be exclusive of fee; part of the existing services provided to and paid for by the Owner.

B. In the event the in-shop work-in-progress review is not taken by the Designer or Owner's representative, the amount carried for these expenses shall be taken as a credit to the Contract Base Bid.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements herein, manufacturers offering Architectural Contract Signage systems and/or product/material/finishes that may be incorporated in the Work include, but are not limited to the following:

Typography (electronic) FontHaus, Incorporated
1375 Kings Highway East
Fairfield, Connecticut 06430
203.367.1993

Typography (electronic) Adobe Systems, Incorporated
345 Park Avenue
San Jose, California 95110-2704
800.445.8787

Laser-cut Foam/Acrylic Letterforms: Precision Letter Corporation
649 East Industrial Park Drive
Manchester, New Hampshire 03109

603.625.9625

Vinyl Die-cut Letterforms:	Graphitek of Vermont Route 7A, P.O. Box 69 Bennington, Vermont 05201 802.442.3183
Vinyl Die-cut Letterforms:	Simple Space-Rite P.O. Box 11978, 3315 West Vernon Phoenix, Arizona 85061 800.528.8429
Fabricated Metal Letterforms:	Steel Art 75 Brainerd Road Boston, Massachusetts 02134-9108 617.566.4079
Fabricated Metal Letterforms:	US Sign One Trefoil Drive Wilton, Connecticut 06611 203.601.1000
Applied Paint Finishes:	Matthews Paint Company 8201 100th Street Kenosha, Wisconsin 53142-7739 414.947.0700
Applied Paint Finishes:	Wyandotte Sign Finishes (AKZO Nobel) 6369 Old Peachtree Road Norcross, Georgia 30071 800.233.3301
Metal Sign Extrusions:	Sign Comp 5009 West River Drive Comstock Park, Michigan 49321 616.784.0405
Metal Sign Extrusions:	Excellart Sign Products, L.L.C. 1654 South Lone Elm Road Olathe, Kansas 66061 913.764.2364
Laser-cut/Water-jet Cutting:	Millennium Sign & Display Group, Inc.

90 West Graham Avenue
Hempstead, New York 11550
516.292.8000

2.2 MATERIALS

A. METALS

1. Aluminum used for exposed structural elements shall be T-5 mill aluminum, thickness as shown on the Construction Drawings.

2. Aluminum used for concealed framing of signage shall be 6063 T-5 Alloy with mill finish.

   a. Sheet aluminum: ASTM B209. Provide alloy and temper consistent with specific fabrication and finishing processes.

   b. Extruded aluminum: Provide allow and temper consistent with specific fabrication and finishing processes.

      1.) Bars, rod, wire and shapes: ASTM B221

      2.) Pipe and tubing: Seamless, minimum Schedule 40 or equivalent wall thickness.

         a.) Structural: ASTM B429

         b.) Non-structural: ASTM B210 and ASTM B241.

B. PLASTICS

1. All plastics necessary for particular applications noted in specifications or shown on Construction Drawings shall be of new stock, free from defects and of the best quality available.

2. Acrylic Plastic: Provide acrylic plastics equivalent to "Plexiglas" manufactured by Rohm and Haas Company, in sizes, thickness, clarity, opacity, texture and color as shown.

   a. Provide colors as shown, or as selected by D:C.

   b. Provide ultra-violet resistant type, where exposed to sunlight.

C. NEOPRENE AND TAPE GASKETS

1. Neoprene gaskets, where shown or required, shall be of hardness shore durometer 80 with a minimum tensile strength of 2000 psi and 175% elongation. After heating the neoprene compounds in air for 22 hours at 158 degrees F., the compression set shall not exceed 35%. All rubber compound shall withstand bending 180 degrees flat without showing visual surface cracks, checks or breaks. All neoprene shall be reasonable smooth and free from talc and wax. The color of the materials shall be black.

2. Tape gaskets, where required, shall be polyurethane foam tape with adhesive on one side, as manufactured by Minnesota Mining and Manufacturing Company or approved equal.

D. ADHESIVES

1. All adhesives required for metals and plastics - for assembly of elements, or attaching those elements to the work - shall be of a type recommended for the particular usage by the manufacturer and guaranteed to meet the general and structural support criteria shown on the drawings. Exact identification of all adhesives shall be noted on the shop drawings, together with data describing the method of application.

E. MISCELLANEOUS MATERIALS

1. Silicone: sign-component silicone rubber, General Electric or Dow Corning as approved by the Owner.
2. Epoxy: Two-part, catalyzed; provide fast-setting, high-strength, flexible, high-viscosity or other specific types as necessary and approved by the Owner
3. Tape: Double-coated, high strength acrylic adhesive foam tape, 3M VHB+ tape.
4. Thread-locking: Anaeobic, single-component adhesive, as manufactured by Hernon, Loctite, Permabond or equivalent.
5. Solder metal: ASTM B32, lead-free (less than 0.2% lead content), silver, tin, antimony or alloys thereof best suited for conditions.
6. Locks: Tubular key or Allen wrench activated cam lock, brass and/or stainless steel construction.
7. Magnets: Commercial quality. Type and size required for the work.
8. Hook and loop tape (Velcro): High shear strength, dual-grip hook and loop with pressure-sensitive adhesive backing.
9. Misc. hardware: Provide continuous (piano) hinges, hooks and hook-eyes, hinges and bolts with acorn nuts, chain, invisible (Soss) hinges, and other non-corrosive, commercial type hardware items including fasteners as necessary, where not specifically indicated on the Design Drawings. Ferrous metal hardware is not acceptable.

2.3 MANUFACTURED UNITS - SIGNS

A. Signs are fully detailed as to size, location, color, copy graphic content and layout, and fabrication or connection details on the construction drawings.

2.4 FABRICATION

A. METAL

1. Shop fabrication and tolerances shall conform to the standards of the industry.
2. Field dimension shall be verified by the Contractor before releasing work for fabrication.
3. All welding procedures shall conform to applicable AWS specifications. All welds shall develop capacity of members being joined unless specific length or extent is noted on the Construction Drawings.
4. All exposed screw fastening shall be kept to a minimum and shall be made with counter-sunk TORX flat-head self-tapping machine screws of the same material as the parts that are joined, except as noted on the Construction Drawings, so far as possible.

5. All supplemental parts necessary to complete each item shall be furnished by the Contractor, even though such parts are not definitely shown on the Construction Drawings or specified herein. All anchors and other fasteners for securing work to the construction shall be included.
6. Design components to allow for expansion and contraction for a minimum material temperature range of 100 degrees F., without causing buckling, excessive opening of joints or over-stressing of welds and fasteners.
7. Form work to the required shapes and sizes, with true curves, lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.
8. Items shall be shop fabricated so far as practical. Joints shall be fastened flush to conceal reinforcement, or welded where thickness of section permits.
9. Contact surfaces of connected members shall be ground true. Parts shall be so assembled that joints will be tight and practically unnoticeable, without use of filling compound.
10. Holes for bolts and screws shall be drilled. Fastenings shall be concealed where possible. Exposed ends and edges shall be milled smooth, with corners slightly rounded. Joints exposed to weather shall be formed to exclude water.

B. PLASTICS

1. Panel and/or plaque edges are to be straight and true, and contain no chatter marks, scratches, scars or ripples. Following assembly, and prior to any surface applied final color coat, all exposed panel/plaque edges shall be "buff" polished to a satin finish.
2. Holes drilled per Construction Drawings, shall be normal to the panel/plaque plane, unless noted otherwise, and be clean and free of gouges, scratches, scars or drilling debris.
3. No visible adhesive "ooze", sags, sheeting edges or tape will be accepted.

2.5 GRAPHICS/IMAGERY

A. Letterforms and Lettersize

1. Letterforms shall be as shown or indicated on the Construction Drawing(s), and shall be the only typography used.
2. Lettersize for their appropriate sign types shall be as shown on the Construction Drawing(s), graphic layouts. Case shall be as indicated.
3. Alternate letterforms and lettersize will not be accepted.

B. Letterspacing and Word Spacing

1. Letterspacing shall be standard optical spacing. Spacing between words shall be equal to the horizontal dimension of a lower-case "r" for the size of the copy and typestyle being used. The Contractor shall furnish to D:C for approval, full-size spacing patterns for each message and legend specified.
2. No work shall be executed from spacing patterns not approved by D:C.

C. Directional Arrowforms

1. The directional arrowforms, sizes and locations as shown on the Construction Drawing(s), shall be used in the orientations indicated on the graphic layouts and Sign Message Schedule, hereinafter.

2. Alternate arrowforms and/or usage will not be accepted.

D. Pictograms

1. Pictograms, sizes and locations as shown on the Construction Drawing(s) shall be the ONLY pictograms used.

2. Alternate pictograms will not be accepted.

2.6 FINISHES

A. PAINTED/IMPRINTED SURFACES

1. Before painting, all loose mill scale, dirt, weld flux, weld spatter and other foreign material shall be removed. All grease and oil shall be removed by solvent. Surfaces shall be dry when paint is applied.

2. All exposed surfaces shall receive one (1) thorough prime coat of a suitable primer before leaving the shop. Thickness of this coat shall be 1.0 to 1.5 mil. In addition to the prime coat, all exposed metal shall receive two (2) color coats totaling 1.5 to 2.0 mils in thickness. Final colors shall match those colors identified on the Color Schedule, hereinafter. Color samples shall be submitted to and approved by D:C.

3. Paint shall be thoroughly and evenly applied and shall be well worked into corners and joints and shall have no edge or joint build-up.

4. Though not a specific requirement, a Down-Draft spray booth is preferred for all shop finished work. This preference is based on a general reduction of over-spray, compared to a cross-flow spray booth.

5. Contractor shall insure that all spray booth filters are clean, and fans and/or air circulation devices (fresh air source outside the host building) are operating properly. All doors to the booth shall remain closed during the application of paint finish; the booth at "positive pressure" prior to the application of paint.

6. All inks, paints and lacquers required for silk-screened or imprinted surfaces or other specified surfaces shall be a type made for the surface material on which it is to be applied and recommended by the manufacturer of the ink or paint. Exact identification of all ink and paint shall be noted on the shop drawings, together with data describing the method of application and, if other than "air" dried, drying.

7. All silk-screen inks shall be made by a manufacturer with experience in production and consistency of such inks for the purposes and surfaces involved.

8. No paint, ink or lacquer that will fade, discolor or de-laminate as a result of proximity to UV light source or heat therefrom shall be used.

9. All inks, paints and lacquers shall be evenly applied and without pinholes, scratches, orange peeling, application marks, etc. Rear-illuminated panels containing the above or other defects that cause light leaks in surface areas specified to be covered will not be accepted. Workmanship in connection with finishes and formations of letters and/or graphics shall conform to the standards of the trade and shall be acceptable to D:C.

10. Prime coats or other surface pre-treatments, where recommended by the manufacturer for inks, paints or lacquers, shall be included in the work (and noted on the shop drawings) as part of the finished surface work at no extra cost to the Owner.

11. Contractor shall provide to the Owner, the contact name, address and telephone for a local (immediate project area) source of supply for each component of finish medium used throughout this work.

B. REPRODUCTION PROCESSES

1. Vinyl Die-cut Letterforms and Graphics

   a. Film for die-cut letterforms and/or graphics shall be "Scotch-Cal" ("Scotch-Lite") brand film, engineer grade, with pressure sensitive adhesive, as manufactured by Minnesota Mining and Manufacturing Company, or approved equal; colors as indicated on the Color Schedule, hereinafter. Installation shall be as recommended by the manufacturer.

   b. All letters and/or graphics shall be permanently affixed to surfaces in such a manner that all letter surface and edge areas are tightly and evenly adhered to the subject surface. Letters with creases or air pockets, or with folded, curled or loose edges or corners will not be accepted.

   c. Excess adhesive, if any, shall be removed from applied and letter surfaces in such a manner and with such a solvent that neither the applied nor vinyl surfaces are scratched, dis-colored, glossed or de-glossed.

   d. Typography and/or graphics shall be pre-spaced on carrier tapes prior to application. Composition of copy at site is not acceptable.

   e. Vinyl die-cut legends and/or graphics scheduled to be placed upon painted surfaces, as shown on the construction drawings or graphic layouts, shall not be installed earlier than twenty-four (24) hours following the application of the final color coat. Surface bubbles as a result of paint curing ("off-gassing") beneath vinyl legends and/or graphics shall be cause for rejection of the work; requiring removal and reinstallation of the affected legends and/or graphics.

2. Masked and/or Frisket Letterforms and Graphics

   a. Masks and/or frisket for letterforms and/or graphics to appear on new construction sign faces (or rehabilitated sign faces) shall be formed from "low tack" vinyl (Control-tac AGB-224-D, Matte White, manufactured by Minnesota Mining and Manufacturing) die-cut letterforms and/or graphics.

   b. After positioning the letterforms and/or graphics on the sign face (acrylic-plastic, painted metal, etc.) specified hereinafter, two (2) coats of an opaque primer (black) shall be

evenly sprayed over the entire sign face. When these primer coats are hard and dry, two (2) additional coats of primer (bright "cold" white) shall be evenly sprayed over the entire sign face.

c. When all primer is hard and dry, the finish color coats, specified hereinafter, shall be evenly sprayed over the entire sign face. Lightly applied, the final color shall receive sufficient coats until the color specified is achieved over the entire sign face.

d. The vinyl mask shall be removed with sufficient care to insure that no knife marks or other surface damage is visible, and that sharp and true edges of the letterform and/or graphic result.

e. Sign faces made up of multiple panels shall be sprayed simultaneously so that color and finish is consistent.

3. Routed/Laser-cut Letterforms and Graphics

a. All "Routed" letters, logotypes and/or graphic devices specified as part of this work shall be executed from either photo-mechanical artwork or approved computer generated images of the copy specified. Contractor shall submit full size showings of foundry, mechanicals or butcher-paper "pen-plots" to be used to D:C for approval. All above work is to be included in this Contract.

b. Actual "routing" of material shall consist of one of the following:

1) Metal pattern/pantograph routing,

2) Light laser cutting, or

3) High pressure "water-jet" cutting.

c. No freehand-cut routing will be accepted.

d. All "routing" shall be executed in such a manner that edges and corners of finished letterforms and graphic devices are normal to the surface and are true and clean. Letterforms and/or graphic devices with minute rounded corners inherent in the routing process, will be accepted.

e. Cut edges shall be finished so that all burrs, chatter and/or burn marks, etc., are removed without visually degrading the specified letterforms and/or graphic devices.

f. Letterform and/or graphic device "voids" (the hole in an "o" or "d", etc...) shall be reinstalled upon the surface of the back-up plexiglas sheet using mechanical means (studs, washers and nuts..). Adhesives and/or tapes alone will NOT be accepted for this application.

4. Photo Polymer Sign Faces - Tactile Letterforms, Graphics and Braille

a. Panel material shall consist of solid Photo Polymer material with a .125 inch nominal thickness, prior to bonding to any base material and/or plate, as shown or indicated on Construction Drawings.

b. Etched graphics, including letterforms, pictograms, arrows and Braille, shall be tactile via photomechanical resist and chemical etching. Etched images shall be at least 1/32 inch

deep and shall not exceed 3/64 inch depth in order to keep tactile and Braille lettering legible. Letterforms, Braille and any other graphic devices shall be photographically reproduced from approved type-styles and "cuts", and shall follow dimensions, kerning, spacing and leading qualities shown on Construction Drawings.

c. Panel background finish shall consist of primer and finish color coat per polymer and paint manufacturer's specifications utilizing Matthew's Acrylic Polyurethane VOC or approved equal; the final color as indicated in the Color Schedule, herein. All final color finishes shall be "eggshell", with a measurable 20% gloss.

d. Braille text shall consist of photo-chemically reproduced Grade 2 Braille letters as a result of etching background to a depth of 1/32 inch minimum and no deeper than 3/64 inch overall. Braille images shall be smooth and rounded upon the face of the dots and shall be acceptable for tactile reading. Sharp edged dots are specifically not acceptable.

e. Photopolymer sign faces shall be installed upon the front surface of the indicated base plate/material with sheets of 3M VHB (Very High Bond) Tape equal to the overall dimension of the pieces being bonded.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractors, subcontractors, and materials suppliers shall inform themselves as to all conditions, existing and proposed relative to this work. Neglect of this requirement will not be accepted as cause for additional compensation.

3.2 PROTECTION OF PRESENT BUILDING AND PROPERTY

A. Damage due to negligence of the Contractor to surfaces or building to remain, shall be repaired and restored to its original condition by this Contractor at no extra cost to the Owner nor tenant of the Owner.

B. Contractor shall notify the Designer of conflicting conditions before the start of work. Failure to do so constitutes acceptance of these conditions and places responsibility of corrective measures with the Contractor.

3.3 INSTALLATION

A. METAL

1. All surfaces shall be covered with protective cover non-deleterious to finish for protection until final installation or erection.

2. Complete all connections in proper alignment and tighten bolts securely. Leveling is to be done only by instruments: Measuring equal distances from existing building surfaces will not be acceptable as a basis of level and/or plumb.

B. ELECTRICAL SIGNS

1. DESCRIPTION

a. The work covered by this section shall include all labor, equipment, supplies and materials necessary for the installation of the complete electrical system as shown or indicated on the accompanying plans and specified herein.

b. It is the intent of these documents that the entire electrical installation shall be complete in every respect and any minor items omitted but obviously necessary to accomplish this intent shall be furnished and installed.

c. All local fees and permits and services of inspection authorities shall be obtained and paid for by the Contractor. The Contractor shall cooperate fully with the local utility company with respect to their services.

d. It shall be understood during the bidding process that the power source for all electrified signs shall be 277 volts, and that this power shall be "stepped down" to 110 volts for the illumination source within each electrified sign cabinet.

2. CODES, REGULATIONS AND STANDARDS

a. The electrical installation and the Contractor shall comply fully with all city, county, and state laws, ordinances and regulations applicable to electrical installations as identified by this Contract.

3. INSPECTIONS, TESTS AND GUARANTEES

a. The work shall be subject to inspection by the Owner and D:C or their representatives at all times and in the event of questionable work, their decision will be final.

b. After the electrical installation is completed and at such times as the Owner or D:C may direct, the Contractor shall conduct an operating test for approval. The installation shall be demonstrated to be in accordance with the requirements of this specification. Any defects revealed shall be corrected promptly and the test re-conducted, at no additional cost to the Owner.

4. PROGRESS OF WORK

a. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the condition of the building will permit. Any cost resulting from the defective or delay of work performed under this section shall be borne by the Contractor.

5. CUTTING, PATCHING, ETC.

a. The work shall be carefully laid out in advance. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support, or anchorage of raceway, outlets or other electrical equipment required by this work, it shall be carefully done. Any damage to the building, piping, equipment or any defaced finish plaster, metal or metalwork shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner.

b. The Contractor shall do no cutting, channeling, chasing or drilling of unfinished concrete, masonry, tile, etc., unless he first obtains permission from D:C. If permission is granted, the Contractor shall perform this work in a manner approved by D:C.

6. IDENTIFICATION OF EQUIPMENT

   a. Legible and complete wiring and circuitry diagrams, lamp sizes and wattage and any special operating or replacement instructions are to be provided on waterproof paper labels and firmly affixed to the interior of signage access panels.

   b. Identify all applicable circuits in branch circuit panel-boards with a type-written directory mounted behind clear plastic and fastened to inside of panel door.

7. LIGHTING

   a. Furnish and install all lighting equipment described in these specifications and shown on the Construction Drawings. Lighting equipment shall be installed complete, including suspensions of proper lengths, sockets, holders, reflectors, ballasts, lamps, etc., all wired, assembled and ready for operation.

   b. All lighting fixtures shall bear the U.L. label for its application, be free of light leaks, warps and dents. When utilizing ballasts, they shall be designed and constructed so that the ballast case temperature will not exceed the U.L. 90 degree Centigrade limit in a 25 degree Centigrade ambient.

   c. Install all fixtures straight and true with reference to sign cabinet and supporting structural members. Before final acceptance, adjust and direct all fixtures as directed by D:C.

8. GROUNDING

   a. All electrical neutral conductors, raceways and non-current carrying parts of electrical equipment and associated enclosures shall be grounded in accordance with the National Electrical Code (N.E.C.). This shall include neutral conductors, conduits, supports, cabinets, boxes, ground buses, etc. The neutral conductor shall be grounded at one (1) point only; its transformer ground source.

9. RACEWAYS AND WIRING

   a. All wiring located outside the electrified sign cabinets that are supplied and installed as required by this work, shall be installed in conduit. Use corrosion resistant rigid steel with PVC coating or heavy wall PVC. Provide rigid steel ells coated with PVC where PVC raceways are used.

   b. In locations where mechanical damage may be incurred, corrosion resistant rigid steel or intermediate metal conduit shall be used except heavy wall aluminum may be used in dry locations where exposed. Electric metallic tubing or intermediate metal conduit may be used in all other applications.

   c. Use approved type couplings and connectors in all conduit runs, and make all joints tight. Provide insulated bushings for all terminations. Set-screw type couplings will be permitted for exposed EMT conduits only. Provide expansion fittings and bonding conductors for all runs that cross building expansion joints. Fittings shall be as manufactured by O.Z., Tomic, Raco, Appleton, Steel City or I and B.

d. Exposed conduit shall not be installed in finished areas. Exposed conduit may be installed at surface mounted equipment and at other locations approved by the Designer. All exposed conduit shall be run parallel to or at right angles to building lines.

e. Conduit shall be of the size required by, and installed according to the N.E.C. Bends shall be made with approved hickey or conduit bending machine. Provide supports in accordance with N.E.C. requirements

f. No wire shall be installed until work that might cause damage to the conductors has been completed. Prior to pulling of the conductors, conduits shall be swabbed clean of all foreign matter, or replaced where such accumulation cannot be removed by approved methods.

3.4 SCHEDULES

A. SIGN COLOR SCHEDULE

1. All finish color for signage elements shall be as hereinafter indicated. Color specification as shown on the color schedule, refers to the Pantone Matching system (P.M.S. number), Acrylic Plastic (plexiglas) material as manufactured by the Rohm & Haas Company (R.H. number), Paint as manufactured by the Matthews Paint Company (MAP number), Pressure sensitive vinyl as manufactured by the Minnesota Mining and Manufacturing Company (3-M number), or metallic finish as identified. The intent with respect to applied finish or referenced manufactured product, is to provide a MATCH to those colors noted, using the finish appropriate to the surface.

2. Alternate colors or hues of these colors will not be accepted.

3. When the colors of factory-finished equipment are specified to be selected by D:C, the colors selected may or may not be the manufacturer's standard colors. Should special colors be specified, samples shall be provided as required.

3. Finish color shall be as follows:

.....

Sign Type A

Panel background – MAP 70A-1A Mosaic Blue (satin)
Angles/connector piece – MAP 18A-1A Really Orange (gloss)
Legends/arrowforms – 3M 280-10 White (reflective)
Panel background (A.4) – MAP 5A-1A Spectrum Red (satin)
Legend (A.4) – 3M 280-10 White (reflective)
Pictogram (A.4) – 3M 280-10 White (reflect.)/280-72 Red (reflect.)

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Sign Type B

Legend panel face/edges – MAP 70A-1A Mosaic Blue (satin)
"Level" & numeral – 3M 220-11 Pearl Grey (non-reflective)
"Row" & alpha – 3M 220-11 Pearl Grey (non-reflective)
Graphic rule – 3M 220-77 Peacock Blue (non-reflective)
"Make note...keys!" – 3M 220-11 Pearl Grey (non reflective)

"Elevators...building" – 3M 220-11 Pearl Grey (non-reflective)
"Pay on..." "Airport Parking" – MAP 70A-1A Mosaic Blue (match)
"P" – MAP 69A-3P Forget-me-not (match)
"Pay on Foot" – 28A-1A Cadmium Yellow (match)
A.4 panel face/edges – MAP 39A-2P Winter Sky (gloss)
Arrowform – 3M 220-10 White (non-reflective)
Cabinet, level 1 – MAP 64B-1P Blue Goddess (satin)
Cabinet, level 2 – MAP 71B-1P Thistle (satin)
Cabinet, level 3 – MAP 14C-1P Salmon Mousse (satin)
Cabinet, level 4 – MAP 19B2T Orange Gem (satin)
Cabinet, level 5 – MAP 27A-2P Banana Split (satin)

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Sign Type C
Cabinet face/edges/rear – MAP 70A-1A Mosaic Blue (satin)
Routed faces – RH 2146 Ivory
Connection to ceiling – MAP 70A-1A Mosaic Blue (satin)

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Sign Type D
Level 1
Dimensional letterforms – MAP 64B-1P Blue Goddess (satin)
PSV legends – 3M 220-77 Peacock Blue / 3M 220-347 Powder Blue
Level 2
Dimensional letterforms – MAP 71B-1P Thistle (satin)
PSV legends – 3M 220-88 Violet / EM 220-138 Pale Lavender
Level 3
Dimensional letterforms – MAP 14C-1P Salmon Mousse (satin)
PSV legends – 3M 220-94 Coral / 3M 220-104 Dark Coral
Level 4
Dimensional letterforms – MAP 19B-2T Orange Gem (satin)
PSV legends – 3M 220-64 Apricot / 3M 220-54 Orange
Level 5
Dimensional letterforms – MAP 27A-2P Banana Split (satin)
PSV legends – 3M 220-25 Sunflower / 3M 220-85 Vista Yellow

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Sign Type E
Disk face/edges/wall connection – MAP 67A-1A Continental Blue (satin)
"I" image/edges – MAP 39A-2P Winter Sky (satin)
Structure/connectors/connection/map frame – MAP 39A-2P Winter Sky (satin)
Chrome "raceway" tubing – No. 8 mirror polish
"TERM...ION", face/edge/rear – MAP 56A-1A Jamaican Holiday (satin)
"PWM", face/edge/rear – MAP 67A-1A Continental Blue (satin)
"Portland...Jetport", face/edge/rear – MAP 39A-2P Winter Sky (satin)

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Sign Type F.1

Plaque background – MAP 39A-2P Winter Sky (satin)
Upper graphic background – MAP 56A-1A Jamaican Holiday (satin)
Upper legend – 3M 220-10 White (non-reflective)
Lower legends – 3M 220-151 Traffic Grey (non-reflective)

Sign Type F.2

Plaque background – MAP 39A-2P Winter Sky (satin)
Graphic border – 3M 220-151 Traffic Grey (non-reflective)
Flame – 220-253 Warm Red (non reflective)
Figure/stairs/arrow – 220-12 Black (non-reflective)
Legends – 3M 220-151 Traffic Grey (non-reflective)

Sign Type F.3

Base-plate face/edges – MAP 39A-2P Winter Sky (satin)
Graphic plate face/edges – MAP 70A-1A Mosaic Blue (satin)
Pictogram – 3M 220-11 Pearl Grey (non-reflective)
Tactile face/edges – MAP 70A-1A Mosaic Blue (satin)
Tactile legend – MPA 39A-2P Winter Sky (satin)

Sign Type F.4

Plaque background – MAP 39A-2P Winter Sky (satin)
Headline – 3M 220-151 Traffic Grey (non-reflective)
"Level…level" – 3M 220-12 Black (non-reflective)

Level colors in corresponding boxes…

level 1 – MAP 64B-1P Blue goddess (satin)
level 2 – MAP 71B-1P Thistle (satin)
level 3 – MAP 14C-1P Salmon Mousse (satin)
level 4 – MAP 19B2T Orange Gem (satin)
level 5 – MAP 27A-2P Banana Split (satin)

……

Sign Type G

"Airport Parking" – MAP 70A-1A Mosaic Blue (gloss)
"P" – MAP 39A-2P Winter Sky (gloss)
"Pay on Foot" – 28A-1A Cadmium Yellow (gloss)
"Portland … moving" - MAP 70A-1A Mosaic Blue (gloss)

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Sign Type H

Vertical post – SW4079 Laser Blue (gloss) (match)
Capital/connection pieces – MAP 56A-1A Jamaican Holiday (gloss)
Flag panels/edges – MAP 39A-2P Winter Sky (satin)
Graphic panels/edges – MAP 70A-1A Mosaic Blue (satin)
Legends – 3M 220-10 White (non-reflective)
Picto panels – 3M 220-10 White (non-reflective)
Picto images – 3M 220-12 Black (non-reflective)
Vertical connection/cross bar – MAP 18A-1A Really Orange (gloss)

Dist face (both) MAP 67A-1A Continental Blue (satin)
"I" images/edges – MAP 39A-2P Winter Sky (satin)

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Sign Type J

Vertical post – MAP 56A-1A Jamaican Holiday (satin)
Panel face – Map 67A-1A Continental Blue (satin)
Pictogram / legend – 3M 280-10 White (reflective)
Panel rear – MAP 56A-1A Jamaican Holiday (satin)

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Sign Type K

Cabinet face/edges/rear – MAP 39A-2A Winter Sky (satin)
Legend RH 2051 Blue
Stripe – 3M 220-25 Sunflower (non-reflective)
Connection tubing – MAP 39A-2P Winter Sky (satin)

B. SIGN MESSAGE SCHEDULE

1. Capitalization (case) shall be as indicated on the Sign Message Schedule, which follows this Section.
2. Alternate sign messages will not be accepted.
4. Sign messages/legends shall be as follows:

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A-101

Face a	(u) Parking	graphic layout A.3
Face b	(l) Parking / Parking (r)	graphic layout A.3

……

A-102

Face a	(u) Parking	graphic layout A.3
Face b	(u) Parking	graphic layout A.3

……

A-103

Face a	(u) Parking	graphic layout A.3
Face b	(l) Parking / Parking (r)	graphic layout A.3

……

A-104

Face a	(l) Parking	graphic layout A.1
Face b	Parking (r)	graphic layout A.2

……

A-105

Face a	(l) Parking / Parking (u)	graphic layout A.3
Face b	Wrong Way	graphic layout A.4

……

A-106

Face a (l) Parking / Parking (r) graphic layout A.3
Face b (u) Parking graphic layout A.3

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A-107

Face a (l) Parking / Parking (u) graphic layout A.3
Face b (u) Parking / Parking (r) graphic layout A.3

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A-108

Face a (l) Parking / Parking (r) graphic layout A.3
Face b (u) Parking graphic layout A.3

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A-109

Face a (l) Parking / Parking (u) graphic layout A.3
Face b Parking (r) graphic layout A.2

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A-110

Face a (l) Parking graphic layout A.3
Face b (u) Parking graphic layout A.3

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A-201

Face a (u)Parking / Parking (r) graphic layout A.3
Face b (l) Parking / Parking (u) graphic layout A.3

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A-202

Face a (u) Parking graphic layout A.3
Face b (l) Parking / Parking (r) graphic layout A.3

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A-203

Face a (u) Parking graphic layout A.3
Face b (.) Parking / Parking (r) graphic layout A.3

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A-204

Face a (u) Parking / Parking (r) graphic layout A.3
Face b (l) Parking graphic layout A.1

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A-205

Face a (u) Parking graphic layout A.3
Face b Parking (r) graphic layout A.2

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A-206

Face a (u) Parking graphic layout A.3
Face b (u) Parking / Parking (r) graphic layout A.3

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A-207

Face a (l) Parking / Parking (r)	graphic layout A.3
Face b (u) Parking	graphic layout A.3

.....

A-208

Face a (l) Parking / Parking (r)	graphic layout A.3
Face b (u) Parking	graphic layout A.3

.....

A-209

Face a (l) Parking / Parking (u)	graphic layout A.3
Face b Parking (r)	graphic layout A.2

.....

A-210

Face a (l) Parking	graphic layout A.1
Face b (l) Parking	graphic layout A.3

.....

A-301

Face a (u)Parking / Parking (r)	graphic layout A.3
Face b (l) Parking / Parking (u)	graphic layout A.3

.....

A-302

Face a (u) Parking	graphic layout A.3
Face b (l) Parking / Parking (r)	graphic layout A.3

.....

A-303

Face a (u) Parking	graphic layout A.3
Face b (.) Parking / Parking (r)	graphic layout A.3

.....

A-304

Face a (u) Parking / Parking (r)	graphic layout A.3
Face b (l) Parking	graphic layout A.1

.....

A-305

Face a (u) Parking	graphic layout A.3
Face b Parking (r)	graphic layout A.2

.....

A-306

Face a (u) Parking	graphic layout A.3
Face b (u) Parking / Parking (r)	graphic layout A.3

.....

A-307

Face a (l) Parking / Parking (r)	graphic layout A.3
Face b (u) Parking	graphic layout A.3

.....

A-308

Face a (l) Parking / Parking (r) graphic layout A.3
Face b (u) Parking graphic layout A.3

.....

A-309

Face a (l) Parking / Parking (u) graphic layout A.3
Face b Parking (r) graphic layout A.2

.....

A-310

Face a (l) Parking graphic layout A.1
Face b (l) Parking graphic layout A.3

.....

A-401

Face a (u)Parking / Parking (r) graphic layout A.3
Face b (l) Parking / Parking (u) graphic layout A.3

.....

A-402

Face a (u) Parking graphic layout A.3
Face b (l) Parking / Parking (r) graphic layout A.3

.....

A-403

Face a (u) Parking graphic layout A.3
Face b (.) Parking / Parking (r) graphic layout A.3

.....

A-404

Face a (u) Parking / Parking (r) graphic layout A.3
Face b (l) Parking graphic layout A.1

.....

A-405

Face a (u) Parking graphic layout A.3
Face b Parking (r) graphic layout A.2

.....

A-406

Face a (u) Parking graphic layout A.3
Face b (u) Parking / Parking (r) graphic layout A.3

.....

A-407

Face a (l) Parking / Parking (r) graphic layout A.3
Face b (u) Parking graphic layout A.3

.....

A-408

Face a (l) Parking / Parking (r) graphic layout A.3

Face b (u) Parking graphic layout A.3

……

A-409

Face a (l) Parking / Parking (u) graphic layout A.3

Face b Parking (r) graphic layout A.2

……

A-410

Face a (l) Parking graphic layout A.1

Face b (l) Parking graphic layout A.3

……

B-101

North face (blank)

South face 1D

East face graphic layout/ legend B2

West face graphic layout/ legend B3

……

B-102 two adjacent columns, total of six faces (inside face blank)

North face 1C

South face 1C

East face, left graphic layout/ legend B4

East face right graphic layout/ legend B3

West face, left graphic layout/ legend B4

West face, right graphic layout/ legend B3

……

B-103 two adjacent columns, total of six faces (inside face blank)

North face 1C

South face 1C

East face, left graphic layout/ legend B3

East face right graphic layout/ legend B2

West face, left graphic layout/ legend B2

West face, right graphic layout/ legend B3 w/ "up" arrow

……

B-104

North face (blank)

South face 1D

East face graphic layout/ legend B4

West face graphic layout/ legend B2 w / "up" arrow

……

B-105

North face 1A

South face (blank)

East face graphic layout/ legend B3 w/ "up" arrow

West face graphic layout/ legend B2

.....

B-106 two adjacent columns, total of six faces (inside face blank)

North face 1B
South face 1B
East face, left graphic layout/ legend B2
East face right graphic layout/ legend B4
West face, left graphic layout/ legend B3
West face, right graphic layout/ legend B4

.....

B-107

North face 1A
South face (blank)
East face graphic layout/ legend B3 w/ "up" arrow
West face graphic layout/ legend B2

.....

B-108 two adjacent columns, total of six faces (inside face blank)

North face 1B
South face 1B
East face, left graphic layout/ legend B3 w/ "up" arrow
East face right graphic layout/ legend B2
West face, left graphic layout/ legend B4
West face, right graphic layout/ legend B2

.....

B-201

North face (blank)
South face 2D
East face graphic layout/ legend B2
West face graphic layout/ legend B3

.....

B-202 two adjacent columns, total of six faces (inside face blank)

North face 2C
South face 2C
East face, left graphic layout/ legend B4
East face right graphic layout/ legend B3
West face, left graphic layout/ legend B4
West face, right graphic layout/ legend B3

.....

B-203 two adjacent columns, total of six faces (inside face blank)

North face 2C
South face 2C
East face, left graphic layout/ legend B3
East face right graphic layout/ legend B2
West face, left graphic layout/ legend B2

West face, right graphic layout/ legend B3 w/ "up" arrow

.....

B-204

North face (blank)
South face 2D
East face graphic layout/ legend B4
West face graphic layout/ legend B2 w / "up" arrow

.....

B-205

North face 2A
South face (blank)
East face graphic layout/ legend B3 w/ "up" arrow
West face graphic layout/ legend B2

.....

B-206 two adjacent columns, total of six faces (inside face blank)

North face 2B
South face 2B
East face, left graphic layout/ legend B2
East face right graphic layout/ legend B4
West face, left graphic layout/ legend B3
West face, right graphic layout/ legend B4

.....

B-207

North face 2A
South face (blank)
East face graphic layout/ legend B3 w/ "up" arrow
West face graphic layout/ legend B2

.....

B-208 two adjacent columns, total of six faces (inside face blank)

North face 2B
South face 2B
East face, left graphic layout/ legend B3 w/ "up" arrow
East face right graphic layout/ legend B2
West face, left graphic layout/ legend B4
West face, right graphic layout/ legend B2

.....

B-301

North face (blank)
South face 3D
East face graphic layout/ legend B2
West face graphic layout/ legend B3

.....

B-302 two adjacent columns, total of six faces (inside face blank)

North face 3C
South face 3C
East face, left graphic layout/ legend B4
East face right graphic layout/ legend B3
West face, left graphic layout/ legend B4
West face, right graphic layout/ legend B3

……

B-303 two adjacent columns, total of six faces (inside face blank)
North face 3C
South face 3C
East face, left graphic layout/ legend B3
East face right graphic layout/ legend B2
West face, left graphic layout/ legend B2
West face, right graphic layout/ legend B3 w/ "up" arrow

……

B-304
North face (blank)
South face 3D
East face graphic layout/ legend B4
West face graphic layout/ legend B2 w / "up" arrow

……

B-305
North face 3A
South face (blank)
East face graphic layout/ legend B3 w/ "up" arrow
West face graphic layout/ legend B2

……

B-306 two adjacent columns, total of six faces (inside face blank)
North face 3B
South face 3B
East face, left graphic layout/ legend B2
East face right graphic layout/ legend B4
West face, left graphic layout/ legend B3
West face, right graphic layout/ legend B4

……

B-307
North face 3A
South face (blank)
East face graphic layout/ legend B3 w/ "up" arrow
West face graphic layout/ legend B2

……

B-308 two adjacent columns, total of six faces (inside face blank)
North face 3B

South face 3B
East face, left graphic layout/ legend B3 w/ "up" arrow
East face right graphic layout/ legend B2
West face, left graphic layout/ legend B4
West face, right graphic layout/ legend B2

.....

B-401
North face (blank)
South face 4D
East face graphic layout/ legend B2
West face graphic layout/ legend B3

.....

B-402 two adjacent columns, total of six faces (inside face blank)
North face 4C
South face 4C
East face, left graphic layout/ legend B4
East face right graphic layout/ legend B3
West face, left graphic layout/ legend B4
West face, right graphic layout/ legend B3

.....

B-403 two adjacent columns, total of six faces (inside face blank)
North face 4C
South face 4C
East face, left graphic layout/ legend B3
East face right graphic layout/ legend B2
West face, left graphic layout/ legend B2
West face, right graphic layout/ legend B3 w/ "up" arrow

.....

B-404
North face (blank)
South face 4D
East face graphic layout/ legend B4
West face graphic layout/ legend B2 w / "up" arrow

.....

B-405
North face 4A
South face (blank)
East face graphic layout/ legend B3 w/ "up" arrow
West face graphic layout/ legend B2

.....

B-406 two adjacent columns, total of six faces (inside face blank)
North face 4B
South face 4B

East face, left graphic layout/ legend B2
East face right graphic layout/ legend B4
West face, left graphic layout/ legend B3
West face, right graphic layout/ legend B4

……

B-407
North face 4A
South face (blank)
East face graphic layout/ legend B3 w/ "up" arrow
West face graphic layout/ legend B2

……

B-408 two adjacent columns, total of six faces (inside face blank)
North face 4B
South face 4B
East face, left graphic layout/ legend B3 w/ "up" arrow
East face right graphic layout/ legend B2
West face, left graphic layout/ legend B4
West face, right graphic layout/ legend B2

……

C-101 Face out – Stairs & Elevators & Stairs…
Face in – Level 1 Level 1 Level…

……

C-102 Face out – Stairs & Elevators & Stairs…
Face in – Level 2 Level 2 Level…

……

C-103 Face out – Stairs & Elevators & Stairs…
Face in – Level 3 Level 3 Level…

……

C-104 Face out – Stairs & Elevators & Stairs…
Face in – Level 4 Level 4 Level…

……

C-105 Face out – Stairs & Elevators & Stairs…
Face in – Level 5 Level 5 Level…

……

D-101 Level 1

……

D-102 Level 2

……

D-103 Level 3

……

D-104 Level 4

……

D-105 Level 5

.....

E-101 See elevation drawing for this sign type

.....

F.1-101 Southwest Stairwell

Access from Level 5 to Level 1

Level 1

Exit this Level

.....

F.1-102 Southwest Stairwell

Access from Level 5 to Level 1

Level 2

Down the stairs to Level 1 for Exit

.....

F.1-103 Southwest Stairwell

Access from Level 5 to Level 1

Level 3

Down the stairs to Level 1 for Exit

.....

F.1-104 Southwest Stairwell

Access from Level 5 to Level 1

Level 4

Down the stairs to Level 1 for Exit

.....

F.1-105 Southwest Stairwell

Access from Level 5 to Level 1

Level 5

Down the stairs to Level 1 for Exit

.....

F.2 See elevation for this sign type

.....

F.3 See elevation for this sign type

.....

F.4 See elevation for this sign type

.....

G See elevation for this sign type

.....

H-101

Panel N/left: (blank)

Panel N/right: (u) Terminal & Baggage Claim – w/pictos

Panel S/left:(blank)

Panel S/right: (u) Airport Parking

Panel E/left:(l) Terminal & Baggage Claim – w/pictos

Panel E/right: (r) Airport Parking – w/picto

Panel W/left: (l) Airport Parking – w/picto
Panel W/right: (r) Terminal & Baggage Claim – w/pictos

.....

H-102

Panel N/left: (l) Baggage Claim – w/picto
Panel N/right: (u) Terminal & Ticketing – w/picto
Panel S/left:(blank)
Panel S/right: (u) Airport Parking – w/picto
Panel E/left:(l) Terminal & Ticketing – w/pictos
Panel E/right: (r) Airport Parking – w/picto
Panel W/left: (l) Airport Parking – w/picto
Panel W/right: (u) Baggage Claim – w/picto

.....

J.1 See elevation for this sign type

.....

J.2 See elevation for this sign type

End of Section

SECTION 10520

FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Work Included: Provide all labor, materials, and equipment necessary to complete the work of this Section. The work of this Section includes, but is not limited to the following:

1. Wheeled fire extinguishers.
2. Fire extinguishers.
3. Mounting brackets.
4. Wall recessed extinguisher cabinets.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 15300, FIRE PROTECTION; Fire hose cabinets and valve cabinets.
2. Section 15300, FIRE PROTECTION; Fixed fire protection systems.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect is required include color charts showing full range of manufacturer's standard colors and designs available.

B. Samples: Submit samples, 6 in. square, of each required finish. Prepare samples on metal of same gage as metal to be used in the work. Where normal color variations are to be expected, include two or more units in each sample showing the limits of such variations.

1.05 QUALITY ASSURANCE

A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer, unless otherwise acceptable to Architect.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

C. FM Listed Products: Provide new portable fire extinguishers which are approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher indicated and carry appropriate FM marking.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Ansul, Inc.
2. Walter Kidde, The Fire Extinguisher Co.
3. General Fire Extinguisher Corporation.

2.02 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers at office area and other areas as indicated.

B. Abbreviations indicated below to identify extinguisher types related to UL classification and rating system and not, necessarily, to type and amount of extinguishing material contained in extinguisher.

C. Multi-Purpose Dry Chemical: UL-rated 3-A:40:B:C, 5 lb. nominal capacity, in enameled steel container, for Class A, Class B, and Class C fires.

2.03 MOUNTING BRACKETS

A. Provide manufacturer's standard bracket designed to prevent accidental dislodgement of extinguisher, of proper size for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

2.04 WHEELED FIRE EXTINGUISHER

A. General: Provide wheeled fire extinguishers of type, size, and capacity for locations indicated.

B. Carriage: Fabricate from enameled-steel pipe, complete with hanger assembly, long-range nozzle, semipneumatic solid-rubber tires, and the following:

1. Hose: 100 feet.

C. Multipurpose Dry-Chemical Type: UL-rated 30-A:160-B:C, 50-lb nominal capacity, in enameled-steel container.

2.05 CABINET

A. Cabinets: Provide recessed units of proper size to accommodate extinguisher. Provide baked enameled steel door with vertical plate glass strip (vertical duo-panel) and include

manufacturer's standard piano hinge, door pull and friction catches or latches. Provide units by manufacturer of extinguisher or approved equal by Larsen or Muckel.

PART 3 EXECUTION

3.01 INSTALLATION

A. The Installer shall examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.

B. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer's instructions.
2. Where exact location of bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

3.02 IDENTIFICATION

A. Identify extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location as selected by Architect.

3.03 ADJUSTING, CLEANING, PROTECTION

A. Adjust operating parts to work easily, smoothly, and correctly.

B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

C. Clean exposed surfaces using materials and methods recommended by manufacturer of product being cleaned. Remove and replace work that cannot be successfully cleaned.

D. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.

END OF SECTION

SECTION 12690

ENTRANCE MATS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. The work of this section includes, but is not limited to, the following:

1. Entrance mats.
2. Recessed metal frames.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 03300 - CAST-IN-PLACE CONCRETE

1.04 QUALITY ASSURANCE

A. Source: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, and maintenance recommendations for each material used. Provide certifications stating that materials comply with requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication and installation of all parts of the work. Provide large scale plans and details of anchorages, connections and accessory items. Provide installation templates for frames installed in coordination with concrete work.

C. Field Measurements: Where possible, take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress; allow for field cutting and fitting where taking field measurements before fabrication is not possible.

D. Verification Samples: Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected. Provide samples having minimum area of 144 square inches.

SECTION 13060

SNOW MELTING EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. Work of this Section includes, but is not limited to:

1. Stationary gas-fired snow melters and related items as specified.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Division 15, MECHANICAL and Division 16, ELECTRICAL; hangers, brackets, troughs, guards, and other steel items for support or protection of Mechanical and Electrical work.

1.04 SUBMITTALS

A. Product data for each type of snow melter specified, including installation instructions for each principal component. Provide shipping, installed, and operating weights.

B. Shop drawings from the manufacturer detailing snow melter fabrication and installation. Include plans, elevations, and large-scale details showing the layout and types of each item of equipment required, including components, and accessories.

1. Show rough-in dimensions, service connection details, and the location of field connections.
2. Show required clearances for equipment service and operation.
3. Include setting drawings, templates, and directions for installing anchor bolts and other anchorages to be installed as a unit of Work under other Sections.

C. Wiring diagrams detailing wiring for power and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring.

D. Maintenance data for each snow melter to include in the "Operating and Maintenance Manual" specified in Division 1. Include operating and maintenance instructions, parts list, parts inventory list, purchase source for operational and maintenance materials, emergency instructions and similar information. Include name, address, and telephone number of the manufacturer's nearest service representative.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is an authorized representative of the snow melter manufacturer for both the installation and maintenance of the type of equipment required for this Project.

1. Maintenance Proximity: Not more than 2 hours normal travel time from the Installer's place of business to the Project site.

B. Electrical Component Standard: Provide components that comply with NFPA 70 "National Electrical Code" and are listed and labeled by UL.

C. EPA Standards: Provide equipment complying with EPA regulations for control of hazardous wastes, as set forth in Code of Federal Regulations.

D. Design Concept: The Drawings indicate the size, profiles and dimensional requirements of each snow melter component and are based on the specific type and models indicated.

1.06 MAINTENANCE SERVICE

A. Maintenance: Starting at date of Substantial Completion, provide full maintenance of snow melters for 2 years on an on-call basis. Correct operational imperfections and restore or replace defective or deteriorated components and finishes. Use only genuine parts, components, and supplies as used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Provide one Model No. 40-SG snowmelter as manufactured by MBB-Trecan and complying with the following. No substitution of other manufacturer is acceptable.

1. Specifications:
   Rating: 40 tons/hr
   Equivalents: 100-200 cu.yds./hr based on snow with average density of 15-30 lbs/cu.ft.
   Water Outflow: 160 USGPM@38°F
   Fuel: Natural Gas5 psig (min.)
   Fuel Flow: 9,000 SCFHBurner: 2,200 SCFH @ 2.35 psig
   Weights: Equipment Package: 2,750 fibs
   Burner Package: 1,850 lbs
   Power Consumption: 39 KVA
   Power Supply: 575/3/60
   Blower Rating: 1,340 CFM@2.35 psig
2. General: The 40-SG Snow Melter shall have a guaranteed capacity of 40 tons of snow per hour. The melter shall be built as two general assemblies, the equipment package and burner/downcomer assembly. The melter shall be complete with all required control and auxiliary equipment.

B. Provide one Model 60-SG by MBB-Trecan with a guaranteed capacity of 60 tons of snow per hour.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to beginning installation, examine areas to receive snow melting equipment. Verify that critical dimensions are correct and that conditions are acceptable.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install snow melters according to manufacturer's instructions.

B. Set each snow melter securely and accurately in place; plumb, level and properly aligned. Anchor as required for secure operation.

C. Complete field assembly with joints as recommended by manufacturer. Grind welds smooth and restore finish. Comply with NECA Standards for electrical work.

3.03 DEMONSTRATION

A. Startup Services: Provide the services of a factory-authorized service representative to provide startup service and to demonstrate and train the Authority's personnel as specified below.

1. Test and adjust snow melter controls and safety features. Replace damaged or malfunctioning controls and equipment. Make necessary adjustments for safe and proper operation of equipment.
2. Instruct the Authority's operational personnel in proper use and maintenance of snow melters. Demonstrate capacity ratings, safety features, cleaning procedures, and proper methods for operation and maintenance of the units.
3. Provide 6 bound copies of operating and maintenance manuals for all items.
4. Schedule training with the Authority through the Construction Manager, with at least 7 days' advance notice

END OF SECTION

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturers' instructions and recommendations. Protect from damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.07 SEQUENCING AND SCHEDULING

A. Conference: Convene a pre-installation conference to establish procedures to coordinate this work with related and adjacent work.

B. Provide oversized recess in concrete subfloors and delay actual installation of recessed mat frame until near time of substantial completion of project. Do not install mats until immediately before Owner's final acceptance of the project.

PART 2 - PRODUCTS

2.01 ACCEPTABLE PRODUCTS/MANUFACTURERS

A. Recessed Cocoa Mats: Provide mats by Pawling Corp., or approved equal by one of the following manufacturers that meet or exceed specified requirements:

1. American Floor Products Company, Inc.
2. Mats, Inc.
3. R.C. Musson Rubber Company.
4. U.S. Mat and Rubber Company, Inc.

2.02 MATERIALS

A. Cocoa Mats: Constructed from cocoa fiber yarn permanently bonded to polyvinyl chloride (PVC) backing for dimensional stability and resistance to shedding.

1. Thickness: 5/8 inch to 3/4 inch overall; 1.5 lb per sq. ft.
2. Mat Fabrication: Shop-fabricate units of floor mat work to greatest extent possible in sizes as indicated. Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints. Where possible, verify sizes by field measurement before shop fabrication.

B. Frame: Extruded 6063-T5 alloy aluminum in manufacturer's standard profile. Coat surface in contact with concrete with zinc chromate protective paint.

2.03 FABRICATION

A. Fabricate frame to be truly straight, level and square. Provide frame pieces in longest available lengths to minimize joints. Space unavoidable joints evenly about centerline of mat and spline butt-joints with connecting pins. Form corners with tightly mitered joints or use prefabricated jointless corners.

B. Provide frames and mats to sizes, shapes, and profiles indicated on approved shop drawings. Provide one-piece mats except where size exceeds manufacturer's recommended limit for easy removal and cleaning. Where more than one-piece mats are used, locate seams away from main traffic pattern.

C. Shop fabricate framework to the greatest extent possible.

2.04 FINISHES

A. Provide clear anodized aluminum frames.

B. Finish Insert Color: As selected by Architect from manufacturer's standard colors.

PART 3 EXECUTION

3.01 INSPECTION

A. The Installer shall examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.

3.02 INSTALLATION

A. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section.

B. Coordinate top of mat elevation with frame and floor elevations to provide proper foot cleaning and to avoid all possibility of tripping hazard. Coordinate installation with door bottom clearances of doors that swing across mats.

C. Install frame near time of Substantial Completion of Project. Shim and grout frame into oversize recess. Provide temporary filler of plywood or other suitable material to protect frame until installation of mat at time of final acceptance of Project.

3.03 CLEANING

A. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned.

END OF SECTION

SECTION 13340

PREFABRICATED BUILDING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. This Section includes metal building systems that consist of integrated sets of mutually dependent components including structural framing, roofing, exterior wall construction, interior wall construction, finishes, mechanical and electrical and accessories.

1.03 SYSTEM DESCRIPTION

A. General: Provide a complete, integrated set of prefabricated building system manufacturer's standard and custom mutually dependent components and assemblies that form a building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, metal roof panels, wall panels, and accessories complying with requirements indicated.

1. Provide building system of size and with spacings, slopes, and spans indicated.

B. Primary Frame Type: Aluminum.

C. Module Spacing: As determined by manufacturer.

D. Roof System: Aluminum.

E. Exterior Wall System: Manufacturer's factory-assembled wall panels.

1.04 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of the following metal building system components:

1. Structural-framing system.
2. Metal roof panels.
3. Metal wall panels
4. Doors.
5. Windows.
6. Lighting.
7. Accessories.

B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Anchor-Bolt Plans: Submit anchor-bolt plans before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.

4. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
   a. Show wall-mounted items including doors, windows, louvers, and lighting fixtures.
   b. Show translucent panels.

5. Accessory Drawings: Include details of the following items, at a scale of not less than [1-1/2 inches per 12 inches (1:8)] <Insert scale>:

   a. Flashing and trim.
   b. Louvers.

C. Product Certificates: For each type of building system, signed by product manufacturer.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

   a. Name and location of Project.
   b. Order number.
   c. Name of manufacturer.
   d. Name of Contractor.
   e. Building dimensions including width, length, height, and roof slope.
   f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
   g. Governing building code and year of edition.
   h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
   i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
   j. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Erector Certificate: Signed by manufacturer certifying that erector complies with requirements.

E. Manufacturer Certificate: Signed by manufacturer certifying that products comply with requirements.

F. Qualification Data: For Erector, manufacturer, and professional engineer.

G. Material Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural members including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

H. Source quality-control test reports.

I. Field quality-control test reports.

J. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for insulation and vapor retarders. Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

K. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.

L. Maintenance Data: For metal panel finishes[and door hardware] to include in maintenance manuals.

M. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

B. Manufacturer Qualifications: A qualified manufacturer
1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

C. Source Limitations: Obtain primary metal building system components, including structural framing and metal panel assemblies, through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal building system and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in General Requirements. Review methods and procedures related to metal building systems including, but not limited to, the following:

1. Inspect and discuss condition of foundations and other preparatory work performed by other trades.
2. Review structural load limitations.
3. Review and finalize construction schedule and verify availability of materials, Erector's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.
5. Review weather and forecasted weather conditions and procedures for unfavorable conditions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect modules in a manner to prevent bending, warping, twisting, and surface damage.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements:

1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fully enclosed, aluminum smoking shelters. Tinted glass. Including swinging door, benches, ash trays, vandal resistant lighting, exhaust ventilation and heating. Minimum size 12 foot by 12 foot and as indicated on the Drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Austin Mohawk Inc.

2. Shelters Direct.

3. Or equal.

2.02 FABRICATION, GENERAL

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with erection only after unsatisfactory conditions have been corrected.

3.02 CLEANING AND PROTECTION

A. Repair damaged coatings on items with repair paint according to manufacturer's written instructions.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.03 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable accessories.

END OF SECTION

SECTION 14210

TRACTION ELEVATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 WORK INCLUDED

A. The work of this section includes, but is not limited to, the following:

1. Provide electric traction passenger elevators, glass cab.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 04200, UNIT MASONRY.
2. Section 05500, METAL FABRICATIONS; pit ladder, sill angles.
3. Section 08800, GLASS AND GLAZING.
4. Division 16 - ELECTRICAL; power supply to machine room, telephone conduits.

B. Providing a legal hoistway is not the work of this Section and is specified in various other sections.

1.03 DEFINITIONS

A. Electric Traction Elevators: Elevators in which cars are hoisted by wire ropes using electrically driven traction sheaves and are defined to include driving machines; cars; hoistway doors; guide rails; guide-rail brackets; roping; buffers; counterweights; signals; control systems; electrical wiring within elevator system; and devices for operations, safety, security, required performance at rated speed and capacity, and for complete elevator installation.

1. Counterweight displacement switches, seismic switch, and other elevator safety equipment required by the "Code" for seismic risk zone 2 or greater are included.

B. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each product and system used. Provide manufacturer's certifications stating that products and systems comply with requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation, and erection of all parts of the work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Provide information on pit beam, overhead beam, buffer and rail reactions.

C. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

D. Verification Samples: Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected. Provide samples having minimum area of 144 square inches.

E. Test Reports: Submit certified reports for tests required. Indicate test dates, test method, test results, interpretation of results and similar information. Submit additional copies directly to authorities having jurisdiction if required.

F. Maintenance Manuals: Provide complete, detailed, 3 ring bound loose-leaf manuals listing operating and maintenance instructions, emergency instructions, parts listings and sources, recommended parts inventory, and similar information.

G. Certificates and Permits: Provide copies of all inspection and acceptance certificates and permits required by authorities having jurisdiction to allow normal, unrestricted use of elevators.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage the elevator manufacturer or an experienced Installer approved by the elevator manufacturer who has completed elevator installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Regulatory Requirements: In addition to local governing regulations, comply with the applicable provisions of the following:

1. ASME A17.1, "Safety Code for Elevators and Escalators," referred to as the "Code."

a. Seismic Zone: Comply with code requirements for seismic risk zone 3 or greater.

1.06 TESTS

A. Perform operational and acceptance tests required by authorities having jurisdiction. Do not permit any use of elevator until permitted by authorities having jurisdiction.

B. Load elevator to its rated capacity and operate continuously over its entire travel distance, stopping at each level for a period of not less than 30 minutes. Record temperature rise of motors and pumps and report all failures in writing.

C. Notify Architect and authorities having jurisdiction at least 36 hours in advance of tests to be performed.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage and theft.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.08 SEQUENCING AND SCHEDULING

A. Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Electrical Work: Coordinate the location and requirements of power and telephone service to equipment rooms.

C. Hoistway Entrances: Coordinate installation of hoistway entrances to ensure accurate alignment with elevator rails.

D. Temporary Elevator Use: Do not permit temporary construction use of elevators, unless specifically permitted in writing by Architect.

1.09 WARRANTY

A. Provide written warranty signed by manufacturer, agreeing to repair or replace work which exhibits defects in materials or workmanship for a period of 12 months from date of Substantial Completion. "Defects" is defined to include, but is not limited to, operation and control system failures, performance below specified minimums, excessive wear, unusual noise or vibration, excessive maintenance need, and failure to perform as required.

1.10 MAINTENANCE CONTRACT

A. Provide complete maintenance and service contract for period of 12 months from date of Substantial Completion. Contract shall cover everything except vandalism and abuse.

B. Include in contract all consumable materials and supplies not covered by warranty.

C. Include provision for 24 hour a day, seven day a week service with service response within two hours after first notification of need for service.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide products of one of the following manufacturers or architect approved equal or better that meets or exceed the requirements of these specifications:

1. Thyssen/Dover Elevator Co.
2. Otis Elevator

3. Schindler Elevator

2.02 ELEVATOR SCHEDULE

A. Provide pre-engineered, packaged elevator units which fulfill the specification requirements and have specified features and characteristics as indicated on the Drawings and specified herein.

1. Passenger Elevators:

a. Capacity: 3000 pound
b. Speed: 250 fpm
c. Car Size: As indicated
d. Landings Served: 5.
e. Travel Distance: Refer to Drawings.
f. Entrance Size: 3' -6" by 7'-0".
g. Entrance Door Operation: Side opening.
h. Power Supply: 480 volt, 3 phase, 60 Hz.

B. Provide car enclosures which fulfill the specification requirements and have specified features and characteristics:

1.	Walls:	Glass.
2.	Floors:	Raised rubber.
3.	Front and Transom:	Full width wrap around, brushed stainless steel.
4.	Doors:	ANSI No. 6 stainless steel.
5.	Ceiling:	ANSI No. 6 stainless steel with downlight halogen lighting.
6.	Sill:	Extruded aluminum.
7.	Handrails:	Cylindrical, ANSI No. 6 stainless steel.
8.	Accessories:	Two speed fan, cab pads and hooks, telephone cabinet and hands-free phone.
9.	Finishes:	Signal and control equipment equal to Dover "Traditional Style".

2.03 CONTROLS AND FEATURES

A. Controls in Elevator Cabs: Provide the following:

1. Flush mounted metal panels containing illuminated plastic call buttons for each landing served.
2. Key controlled car light switch.
3. Key controlled car fan switch.
4. Alarm/emergency stop button.
5. Car position and direction indicators above door transom.
6. Audible floor and direction signals to comply with handicapped accessibility requirements.
7. All other switches and indicators required by authorities having jurisdiction.

B. Controls at Landings: Provide the following:

1. Recessed flush illuminated plastic call buttons with metal coverplate for travel directions possible.
2. Illuminated hall lanterns to signal direction of next car travel; these may travel with car.

3. Elevator position indicators to show location of each elevator; provide at main lobby only.

C. Miscellaneous Features: Provide the following:

1. Top of car inspection operation with light, power outlet and constant pressure controls.
2. Automatic leveling to within 3/8" under any load, at any speed, in either direction.
3. Fireman's emergency service switches acceptable to authorities having jurisdiction.
4. Hoistway access switches.
5. Key switches to lockout every floor individually.
6. Key switch to lockout all hall buttons.
7. Key switch operation from first floor for off hours.
8. Key controlled access at elevators with multiple side opening doors.
9. Door nudging feature to discourage holding elevator open.
10. Dual photo-eye door protection devices to stop and open doors when beam broken.
11. Minimum 30" x 30" ceiling hatch to permit carrying large construction materials such as carpet rolls.
12. Controls and annunciators acceptable to authorities having jurisdiction and as required by 780 CMR Section 403.0, High Rise Buildings, including but not limited to the following:
    a) Voice and alarm system devices and connections to the fire department communication system.
    b) Visual annunciator located in the fire command center indicating the elevator cab location and activity.
    c) Elevator service controls at each floor for fire department emergency access.

D. Graphics: Provide visual and tactile graphics in strict compliance with requirements of authorities having jurisdiction. Obtain Architect's approval of size, style, font, location and color; decals and applied labels are not permitted. Provide glazed cut-outs for flush, recessed installation of certificates and permits required by authorities having jurisdiction.

E. Operation and Control: Provide selective collective operation for all cars in a group. System shall collect all car and hall calls and selectively answer calls in the optimum sequence. Provide solid state modular microprocessor to control car movements with automatic response of system to changes in demand for traffic conditions including heavy up traffic, heavy down traffic and heavy two-way traffic.

F. Hoistway Entrances: Provide automatic, adjustable speed, flush metal panel doors. Provide minimum 16 gage doors and 14 gage frames. Sound deaden all work. Provide fully welded and mitered frames with welds ground flush and smooth so they are not visible after priming for painted work and uniformly finished to match adjacent metal on ornamental metal work.

1. At all floors, provide ANSI No. 6 finish, stainless steel doors and frames.

G. Cab Entrances: Provide finished metal car entrances which match hoistway entrances in size, style, opening and other features. Open car doors and hoistway doors automatically and simultaneously.

H. Cab Platform: Provide fully welded units with special sound deadening undercoating and sound isolated platen plate.

I. Inserts: Provide inserts, brackets and anchors which are needed for installation of elevator components and accessories. Furnish inserts to other trades with detailed location templates, when installation of inserts is work of another section.

2.03 MACHINES AND EQUIPMENT

A. Electric Traction Elevators: Except as otherwise indicated or required, provide manufacturer's standard variable voltage, geared, traction-type hoisting machines. Provide manufacturer's standard solid state power converters suitable for use with motors used. Provide machines and equipment which provide the performance level specified without overloading, overheating or other problems.

B. Control System: Provide solid state modular microprocessor to control car movements with automatic response of system to changes in demand for traffic conditions including heavy up traffic, heavy down traffic and heavy two-way traffic.

2.04 FABRICATION

A. Fabricate work to be truly straight, plumb, level and square with uniformly finished surfaces. Provide work to sizes, shapes, and profiles indicated on approved shop drawings. Make work with uniform, tight joints.

B. Do not display manufacturer's/fabricator's name on any visible location.

PART 3 - EXECUTION

3.01 INSPECTION

A. The Elevator Subcontractor shall examine substrates, supports, hoistways, hoistway openings, supporting structure, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates, supports and other conditions.

3.02 INSTALLATION/ERECTION

A. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section.

B. Install work plumb and accurately located in hoistway; anchor securely. Make welded connections wherever possible for connections which do not need future adjustment, replacement or routine maintenance.

C. Coordinate with other work to avoid project delays and to ensure dimensional coordination of the work.

D. Mount all equipment with sound and vibration isolating mounts to prevent transmission of noise to structure and cab.

E. Accurately align hoistway entrances with elevator guide rails. Reduce clearances to minimum, safe, workable dimensions.

F. Grout sills with non-staining, non-shrink grout. Set sills accurately aligned and slightly above finished floors.

3.03 ADJUSTING, CLEANING, PROTECTION

A. Adjust operating parts to work easily, smoothly, and correctly.

B. Touch-up damaged coatings and finishes to eliminate evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

C. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned.

D. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.

3.04 DEMONSTRATION

A. Provide and review maintenance manual, demonstrate equipment, and instruct Owner's personnel in routine maintenance and proper operation procedures. Instruct Owner's personnel in procedures to follow to check for sources of malfunctions and operational failures. Review procedures and responsibilities of continuing maintenance program.

END OF SECTION

SECTION 14700

MONORAIL AND HOIST

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. The work of this Section includes, but is not limited to:

1. Electric cable hoist system, including track, supports, hoist and trolley, and controls.

B. Sustainable Design Intent: Comply with project requirements intended to achieve a Silver Rating, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council.

1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 05500, Metal Fabrications; Miscellaneous metal items, except as specified herein.
2. Division 16 - Electrical; Electrical power supply to hoist.

1.04 SUBMITTALS

A. Manufacturer's Product Data: Submit manufacturer's product data for the following:

1. Hoist and trolley.
2. Controls.
3. Clamps and supports.
4. Push button station.
5. Electrification.
6. Motors.
7. Brakes.

B. Shop Drawings: Submit shop drawings for the following:

1. Show the general arrangement of all components, clearances and principal dimensions, assemblies of hoist and electrical schematic drawings.
2. Include weights of components and maximum loads and spacings.

C. Design Data: Submit design data for the following:

1. Load and sizing calculations.

D. Load and Sizing Calculations:

1. Submit calculations including seismic analysis verifying the sizing of the rail.

E. Statements:

1. Overload Test Certificate: Submit a statement that the hoist can be periodically load tested to 125 percent (plus 5 minus 0) of rated load.

F. Factory Test Reports: Submit factory test reports for hoist.

G. Field Test Reports: Submit field test reports for the following:

1. Post-erection inspection.
2. Operational tests.
3. No-load test.
4. Load tests.

H. Operation and Maintenance Manuals: Submit operation and maintenance data in accordance with the Conditions of the Contract.

I. LEED Certification Documentation: Submit documentation from the manufacturer highlighting LEED requirements for materials and products of this Section. Comply with requirements of Section 01315, LEED SUBMITTALS.

1.04 REGULATORY REQUIREMENTS

A. Strictly comply with applicable codes, regulations, and requirements of authorities having jurisdiction.

B. Comply with the requirements of BOCA Code regarding loading and all other pertinent criteria.

C. Welding shall conform to AWS D1.1.

D. Electrical work shall conform to NFPA 70, and requirements of local authorities having jurisdiction.

1.05 VERIFICATION OF DIMENSIONS

A. The Contractor is responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall verify all dimensions of the building that relate to fabrication of the rail and crane and shall notify the Engineer of any discrepancy before the order for the crane and rail is finalized.

PART 2 - PRODUCTS

2.01 MONORAIL SYSTEM

A. All materials shall be new. All rail, supports (other than structural) and rolling equipment shall be the product of one monorail manufacturer regularly engaged in the production of such

equipment. Acceptable manufacturer's are Cleveland Tram Rail (Super Tarca Track) by TC American Monorail, Inc. U.S. Monorail Corp., Ingersoll-Rand or acceptable equivalent.

B. Track and Fittings

1. Size of the track shall be computed based on the load positioned on the track system to produce the most severe conditions of stress and deflection. The overall track depth shall be limited to a maximum of 15 inches.
2. The total track deflection shall not exceed 1/450 of the span, or 1-1/4 inch, whichever is less.
3. Track end stops shall be of the bolted type and shall be capable of withstanding the impact of a fully loaded crane or carrier traveling at 50% of the rated full load speed.
4. Track sections shall be installed with bolted type splice plates to provide flush and level connections at the operating tread of the track. The maximum gap between the adjacent ends at load carrying flange shall not exceed 1/16 inch.

C. Track Suspensions

1. All necessary clamps, hanger rods, bolts and other fittings from which the track system is suspended, shall be provided as part of the overhead track system. Track hanger supports shall be spaced as shown on the Shop Drawings and attached as specified. When track runs parallel to the structural beams above, diagonal bracing shall extend to the top flanges of the beams.
2. All suspension fittings shall be furnished with S.A.E. Grade 5 or ASTM A-325 mounting bolts.

2.02 ELECTRICALLY-OPERATED HOISTS

A. Design Stresses

1. The hoist and appurtenances shall be designed to withstand all stresses imposed under severe operating conditions while carrying and handling loads within the rated load. Load bearing parts shall be designed so that the static stress, calculated for the rated load, shall not exceed 20% of the average ultimate material strength. Elements specifically provided to give a visible warning of severe overload shall be designed so that the static stress calculated for the rated load shall not exceed 35% of the ultimate strength. Hoist shall be capable of operation in severe conditions in a temperature differential not less than 150 degrees F.

B. Load Blocks

1. Load blocks shall be of the enclosed type and shall guard against chain jamming during the recommended usage.

C. Hooks

1. Hooks shall have sufficient ductility to open noticeably before hook failure as a result of abuse or overload.
2. Load Hooks shall be free to rotate through 360 degrees when supporting the rated load.
3. Hooks shall be retained in the housing by positively secured lock nuts, collars or other suitable devices which will prevent hooks from working loose.
4. Latch type hooks shall be used unless the latch would cause a hazard under certain

operations.

D. Hoisting Chain

1. The hoisting chain shall be of a recommended construction for hoist service. The diameter of the chain and number of strands of chain shall be as required for the specified capacity.
2. The chain ends shall be attached to the hist in a manner preventing disengagement throughout rated hood travel.
3. Socketing shall be done in the manner specified by the hoist manufacturer.
4. Rope clips attached with "U" bolts shall have the "U" bolts on the dead end or short end of the rope. Spacing and number of all types of clips shall be in accordance with the clip or rope manufacturer's recommendations.
5. If load on one load block is supported by more than one part of rope, tension in the parts shall be equalized.
6. Hoisting chain shall be electric with single lifting speed of 15 feet per minute maximum, chain container and two brakes capable of holding a suspended load. The Hoist Trolley shall be motorized with single travel speed of 35 feet per minute maximum and solid state reduced torque starting. Provide an 8 button pendant control attached to the hoist.

E. Gearing

1. The type of gearing shall be spur.
2. All gears and pinions shall be constructed of steel or other material of adequate strength and durability to meet the requirements for the rated class of service.
3. Means shall be provided to insure adequate and proper lubrication of all gearing.

F. Trolley Wheels:

1. When a trolley is specified, wheels shall be in accordance with the following:
    a. Wheels shall be designed to carry a maximum applied load under normal conditions.
    b. Wheels on a given trolley shall have a uniform surface hardness. The recommended wheel load is that load produced with the trolley handling the rated load in the position to exert the maximum load and may be used as a guide for wheel sizes. Impact is not considered in these figures. Wheel shall be designed to run on specified beam.

G. Trolley Stops: Trolley stops shall be located at the limit of trolley travel. Stops should engage the trolley frame rather than the wheel treads.

H. Rope Sheaves and Rope Drums: As recommended by manufacturer for seervice required.

I. Cantilevered Monorail: Cantilevered monorail shall be motorized with solid state reduced torque starting at the single speed of 35 feet per minute maximum. Electrification to be by power bar.

2.03 SHOP PAINTING

A. All materials shall be cleaned of loose rust, mill scale and foreign matter.

B. Monorail, hoist, and suspension fittings shall be painted one prime coat and one finish coat. Color to be selected by Architect from manufacturer's standard. All paint coats shall be smooth and even, free of runs, sags, orange peel, or other defects.

C. Bolts and hanger rods shall not be painted, but must be adequately protected against damage and rust in shipment.

PART 3 EXECUTION

3.01 ERECTION AND INSTALLATION

A. Erect and install the rail and crane system, complete in accordance with the Drawings, approved shop drawings, and in condition to perform the operational and acceptance tests.

3.02 ERECTION SERVICES

A. The rail and crane manufacturer shall provide supervisory erection services.

3.03 FIELD QUALITY CONTROL

A. Post-Erection Inspection: After erection, the Contractor and the Engineer shall jointly inspect the crane bridge and hoist systems and components to determine compliance with specifications and approved submittals. The Contractor shall notify the Engineer five days before the inspection. Provide a report of the inspection indicating the crane is considered ready for operational tests.

B. Operational Tests: After erection and inspection, test the hoist and trolley as specified herein. Perform the 125 percent rated load test with the bridge and trolley located to obtain maximum loads on the bridge and track girders. Test the systems in service to determine that each component of the system operates as specified, is properly installed and adjusted, and is free from defects in material, manufacture, installation, and workmanship. Rectify all deficiencies disclosed by testing and retest the system or component to prove the crane is operational.

C. Test Data: Record test data on appropriate test record forms suitable for retention for the life of the crane. Record operating and startup current measurements for electrical equipment (motors and coils) using appropriate instrumentation (i.e., clamp-on ammeters).Compare recorded values with design specifications or manufacturer's recommended values; abnormal differences (i.e., greater than 10 percent from manufacturer's or design values) shall be justified or appropriate adjustments performed. In addition, high temperatures or abnormal operation of any equipment or machinery shall be noted, investigated, and corrected. Record hoist and trolley speeds during each test cycle.

D. No-Load Test: Raise and lower the hook through the full range of normal travel at rated speed for three complete cycles. Raise and lower the hook, testing other speeds of the crane. Verify proper operation of hoist limit switches. Operate the trolley in each direction the full distance between end stops. Operate through the entire speed range and verify proper brake operation.

E. Load Tests: Hoist: Perform the following tests, as specified, with test loads of 50, 100, and 125 percent (plus 5 minus 0) of rated load. If the hoist is equipped with an overload limit device, disconnect it to allow the hoist to lift the test load. Proof test the overload limit device after it is reconnected.

1. Static Load Test (125 percent only): Check entire structure, holding brake and hoisting components as follows: Raise the test load approximately one foot. Hold the load for 10 minutes. Rotate the load and hook to check bearing operation. Observe lowering that may occur which indicates a weakness in the structure or malfunction of hoisting components or brakes.
2. Raise and lower and test load through the full lift range. Lower the load to the floor, wait 5 minutes, then raise and lower the load through two more cycles. As a minimum, operate in each speed for each test load. In addition, the dynamic test of test load sequence number 2 (100 percent of rated load) shall be repeated for 10 cycles at rated speed, in order to demonstrate proper operation and repeatability of all functions without component overheating or malfunction. Completely stop the machinery at least once in each direction during each cycle to ensure proper brake operation. The hoist shall not be stopped for more than 15 seconds prior to commencing the next cycle.
3. Hoist Load Brake (125 percent only): Raise test load approximately 5 feet. With the hoist controller in the neutral position, release (by hand) the holding brake. The load brake should hold the test load. Again with the holding brake in the released position start the test load down (first point) and return the controller to the "off" position as the test load lowers. The load brake should prevent the test load from accelerating.
4. Hoist Loss of Power Test (125 percent only): Raise the test load to approximately 8 feet. While slowly lowering the test load (first point), disconnect the crane's power source. Verify that the test load does not lower and that the brake is set.
5. Trolley: Operate the trolley the full distance of the bridge rails in each direction with a test load of 125 percent of rated load on the hook (one cycle). Check proper functioning of all drive speed control points. Verify proper brake action.
6. Rated Travel Tests: Repeat travel tests for trolley with a test load of 100 percent of rated load. Repeat the test for 5 cycles at rated speed to demonstrate proper operation and repeatability of all functions without the overheating or malfunction of any components. Completely stop the machinery at least once in each direction during each cycle to ensure proper brake action. The machinery shall not be stopped for more than 15 seconds prior to commencing the next cycle.
7. Trolley Loss of Power Test: With a test load of 100 percent of rated load, raise the test load approximately midway between the trolley and any permanent obstruction on the operating floor. Starting at a safe distance from walls or other obstructions, attain a slow speed (first point) of trolley travel. While maintaining a safe distance from obstructions, disconnect the main power source at the wall mounted safety switch (disconnect) to simulate a power failure. Verify that the trolley stops and that the brake sets properly. Measure the distance required for the trolley to stop.

END OF SECTION

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DIVISION 15 - MECHANICAL

Section	Title
15010	Mechanical General Provisions
15050	Basic Material and Methods
15180	Insulation
15300	Fire Protection
15430	Plumbing - Domestic Water
15440	Plumbing - Drainage
15460	Plumbing - Gas
15800	Air Handling Equipment and Air Distribution
15850	Electric Heating Cables

SECTION 15010

MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work specified under this Division includes the furnishing of all labor, materials, services, supplies, tools, equipment, transportation and facilities necessary to furnish and install complete and operable mechanical and plumbing systems shown on the Contract Drawings and specified herein.

1.02 CODES AND STANDARDS

A. The edition in force by the State of Maine of the following codes and standards apply.

1. International Building Code (2003).
2. Maine State Plumbing Code (Code of Maine Rule 10, Chapter 238).
3. International Mechanical Code.
4. National Fire Codes: NFPA.
5. National Electrical Code: NEC.
6. State of Maine Energy Code.

B. The codes in force represent the minimum acceptable standards for materials and construction. Where this specification requires better quality of materials which differ from the codes, this requirement is binding upon the CONTRACTOR regardless of code standards.

C. The CONTRACTOR shall furnish and install all equipment required by the codes or required by the Code Officials having jurisdiction for the proper and safe operation of all mechanical and plumbing systems shown on the Contract Drawings and specified herein.

1.03 REFERENCE STANDARDS

A. The following reference publications are used in this Division and are defined as follows:

1. ASTM - American Society For Testing and Materials.
2. ANSI - American National Standards Institute.
3. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.
4. ASA - American Standards Association.
5. AMCA - Air Moving and Conditioning Association.
6. ASME - American Society of Mechanical Engineers.
7. SMACNA - Sheet Metal and Air Conditioning Contractors National Association.
8. NEMA - National Electrical Manufacturer's Association.
9. FM - Factory Mutual Engineering Division.
10. UL - Underwriter's Laboratories, Inc.

1.04 SUBMITTALS

A. Material list:

1. Within ten (10) days after award of CONTRACT, submit a list of manufacturers and materials proposed for use in items required in shop drawing submittals. This preliminary list is not to be considered a substitute for submittal data required.
2. Nonconformance with this requirement signifies that specified manufacturers are to be used.

B. Submittals:

1. Within fifteen (15) days after award of CONTRACT, and before any mechanical materials are delivered to the job site, the CONTRACTOR shall submit detailed equipment performance and dimension sheets, for the approval of the ENGINEER. **These sheets shall be red lined in complete detail and edited to show clearly the items to be furnished**, their characteristics, model numbers, dimensions, performance ratings, and specific application relating to the Specifications or Drawings.

C. **Submittals shall be manufacturer's** product specification sheets, showing full details of the equipment as is normally contained in engineering catalogs; the submittal must be complete date, dimensions and functional detail sheets of the manufacturer, illustrating also the appearance of the equipment in pictorial view.

D. Approvals must be obtained on all items and categories of equipment and materials, both specified and substitute items, unless otherwise noted.

E. Approval of a substitute item by the ENGINEER is an indication only that the substitute item is comparable with the specified item as a claim of the manufacturer. It shall remain the responsibility of the CONTRACTOR to insure dimensional property and performance and quality of the substitute item, regardless of approvals.

F. Furnishing of the specified item shall in no way relieve the CONTRACTOR of full responsibility to produce the results, performance, dependability, and quality reasonably to be expected within the spirit of the specification and drawings, and the standards of good mechanical performance normal to the trade. Repeated malfunctioning and/or failure in service of any item or work of the system shall be deemed sufficient cause for the ENGINEER to order the removal of the item, and its replacement with a new item all at the expense of the CONTRACTOR; in this respect the decision of the ENGINEER shall be final.

G. Confirm all dimensions at job site to insure that items to be furnished fit the space available. Order equipment so that final installation suits the true intent of the CONTRACT.

H. When equipment requiring different arrangement of connections from those shown is approved, furnish revised layouts, install equipment to operate properly with contract intent and make all changes in work required by new arrangement of connections. Coordinate control and power wiring with other trades and pay for any charges so imposed.

I. Remove all equipment and materials installed without approval of the ENGINEER and replace with materials approved by the ENGINEER at CONTRACTOR'S expense.

1.05 PRODUCT RECORD DOCUMENTS

A. Maintain two complete sets of mechanical Contract Drawings, bound together, at the job site at all times. Record all changes made to the mechanical system.

1.06 DEFINITIONS

A. The following terms are used in this Division and are defined as follows:

1. "Provide" means "to furnish, install and connect completely in the specified or an approved manner the item or material described."

2. "Shall" and "will" indicate mandatory requirements of this specification.

3. "May" and "should" are advisory and indicate preferences.

4. "Concealed" means not visible to occupants when the building is completed.

1.07 PERMITS AND FEES

A. Secure and pay costs of all permits, certificates, licenses, inspections and approvals as required by law.

1.08 APPROVALS

A. Obtain Certificates of Approval from building officials.

1.09 INTENT OF DRAWINGS

A. The drawings accompanying this specification, and a part thereof, are working drawings showing the location and arrangement of the increments of the systems of this section of the work. Any material deviation from this arrangement, process or means of application, shall bear the ENGINEER'S approval in writing before the change is made on the job or materials are ordered. Changes made without such approval shall be properly ordered removed and reinstalled as specified and/or shown on the drawings, all at the expense of the CONTRACTOR.

B. Drawings are diagrammatic and indicate general arrangement of work. Basic design concepts indicated are minimal and must be followed or bettered. Do not scale drawings. Consult architectural and structural drawings for space conditions.

C. The drawings are not intended to show in minute detail all minor items of installation materials such as specified fittings. All materials necessary and incidental to the installation of a complete functional system are properly the province of the CONTRACTOR to furnish and install as a part of this section of the work.

D. Large scale drawings take precedence over small scale drawings.

1.10 SITE VISITATION

A. Contractors are to visit site, review Plans and Specifications against existing conditions and base bid accordingly. No extras will be allowed for conditions which could have been viewed at the site.

1.11 MANUFACTURERS SPECIFIED

A. Manufacturers named establish a standard of quality only and shall not be construed to exclude an item equal to that named or described or as limiting competition.

B. Assume the cost of and responsibility for the use of material other than specified. Satisfactorily accomplish all changes (including engineering costs of redesign by the ENGINEER) required by the substitution of material

C. If no manufacturer is named, submit the product intended for use for approval of the ENGINEER.

D. In all design and purchasing, interchangeability of items of equipment, subassemblies, parts, motors, starters, relays and other items is essential. All similar items shall be of the same manufacturer, type, model and dimensions.

E. Comply with manufacturer's directions, recommendations and specifications for installation, handling, storing, adjustment and operation of their equipment. Responsibility for proper performance rests with the CONTRACTOR.

1.12 ELECTRIC CONTROLS AND WIRING

A. General:

1. Except where otherwise indicated, the requirements of Division 16 apply.

2. Mechanical contractor to furnish properly sized magnetic starters, motors and manual motor starters to the electrical contractor for all electric motor driven equipment specified in Division 15.

3. Mechanical contractor to furnish and install all 120 and 24 volt control wiring, conduit, devices and related appurtenances for the control and electric interlock of all equipment specified in Division 15.

4. Electrical contractor to install all magnetic and manual motor starters for motor operation furnished by Division 15, when not furnished as an integral part of mechanical equipment.

5. Electrical contractor to furnish and install all power wiring.

B. Magnetic starters:

1. Maintained type magnetic starter in NEMA type general purpose enclosure, equipped with the following features:

a. Overload protection in each phase leg.
b. Low voltage protection.
c. 2-1/2 x 3/4-inch aluminum engraved nameplate identifying service of each starter, bolted on outside of enclosure.
d. Reset button on cover.
e. Phase loss monitor on 3-phase starters.

2. Additional features required in accordance with the following:

a. Control circuit of 120 volts and self-contained control transformer where required.
b. With two N.O. auxiliary contacts each holding coil.
c. With red operating pilot light.

C. Disconnect switch:

1. Division 15 to provide disconnect switches which are an integral part of equipment.

2. Division 15 is to provide under requirements of Division 16 disconnect switches which are not an integral part of electric motor drive equipment operated by a magnetic starter. Disconnect switches are to be installed by Division 16.

D. Manual motor starters:

1. Division 15 to operate or otherwise protect by a manual starter with properly sized overload protection all fractional horsepower motors not scheduled to be operated by a magnetic starter.

2. Mechanical contractor to furnish a disconnect switch sized for motor nameplate rating for motors having built-in (integral) overload protection.

3. All motors less than 1/8 HP to have built-in (integral) overload protection.

1.13 WORKMANSHIP

A. Replace work not approved by the OWNER without additional charge.

B. Coordinate with other trades to prevent interferences.

1.14 ACCESSIBILITY

A. Place valves, unions, cleanouts, items requiring maintenance adjustment, repair in accessible locations.

B. Access door minimum sizes:

1. 12 by 12 inches at easily accessible items.

2. 16 by 16 inches where partial body access is required.

3. 24 by 24 inches where entire body access is required.

4. Provide appropriately sized access doors for equipment that requires access larger than 24 by 24 inches.

C. Conform to masonry unit dimensions and coursing when establishing access door sizes in masonry surfaces.

D. Access doors located in fire rated walls, ceilings and floors to have UL label for required rating.

E. Coordinate with ENGINEER for exact location of access doors, if location is not shown on Drawings.

1.15 INSTALLATION OF EQUIPMENT

A. Take special care to insure proper alignment of all equipment with particular reference to the pumps, drives and bearings. Carefully align units on their foundations by qualified millwrights after sole plates have been shimmed to true alignment at the anchor bolts. Assume responsibility for exact alignment of equipment with associated piping. Under no circumstances will "pipe springing" be allowed.

B. Furnish all wedges, shims, filling pieces, keys, packing, red or white lead grout, or other materials necessary to properly align, level and secure apparatus in place. All parts intended

to be plumb or level must be proved to be exactly so. Provide necessary grinding or bring parts to proper bearing after erection.

1.16 IDENTIFICATION NAMEPLATES

A. All mechanical equipment such as pumps and air handling units shall be identified by approved nameplates to be provided by the CONTRACTOR furnishing the equipment. Nameplates shall be securely affixed to each individual piece of equipment and also to include, but not be limited to, each starter, switch, relay, and transformer which controls this equipment. Nameplates shall bear notations corresponding to the same notations on the framed wiring diagram and/or operating instructions.

Nameplates to be aluminum 2-1/2" x 3/4", with a black enamel background with etched or engraved natural aluminum lettering.

B. Furnish on all equipment, controls, switches, starters, relays, and transformers approved nameplates describing the function and use of the equipment in nontechnical language. Nameplates to be aluminum 2-1/2" x 3/4" with a black enamel background, with etched or engraved natural aluminum lettering as furnished by Seton Name Plate Corp., New Haven, Connecticut 06505 (or approved equal).

C. This CONTRACTOR shall identify all electrical switches, pilot devices, pushbuttons, selector switches associated with the mechanical equipment, with approved nameplates describing their function and use in nontechnical language. Nameplates to be aluminum, 2-1/2" x 3/4", with a black enamel background with etched or engraved natural aluminum lettering.

D. This CONTRACTOR shall identify all pushbuttons, pilots and controls on the control board(s) with an approved nameplate describing their function and use in nontechnical language. Nameplates to be aluminum, 2-1/2" x 3/4", with a black enamel background with etched or engraved natural aluminum lettering.

1.17 IDENTIFICATION OF VALVES (Brass or Plastic Valve Tags)

A. All valves shall be designated by distinguishing numbers and/or letters on required chart(s) and/or diagrams. The CONTRACTOR shall install approved brass or plastic tags for all designated items, with numbers and/or letters on the tags corresponding to those on the chart(s) and/or diagram(s).

B. Each valve identification tag to be minimum 19-gauge polished brass or plastic, 1-1/2" diameter. Each tag to designate appropriate service (1/4" stamped black-filled letters) and appropriate valve number (1/2" stamped black-filled number).

C. Tags shall be securely fastened to valves with approved meter seal with 4-ply, .018 copper smooth wire, or approved brass "S" hooks, or brass jack chain, in a manner to permit easy reading.

D. Each valve shall have an identifying letter designating the system, and an identifying number designating the unit. Identifying letters for various systems shall be, for example, HTG, PLBG. Abbreviations shall be approved by the ENGINEER.

E. A chart of all valves shall be furnished by the CONTRACTOR; said chart to include the following items:

1. Valve identification number.
2. Location.

3. Purpose.

F. Chart to be mounted in a frame (aluminum with plexiglass) and secured on a wall in the mechanical room or in a location as otherwise directed by the ENGINEER.

G. Each control valve for the hot water heating system shall be tagged to indicate the rooms served.

1.18 IDENTIFICATION OF PIPING

A. All service piping which is accessible for maintenance operations (except piping in finished spaces) will be identified with semi-rigid plastic (not pressure-sensitive), snap around, 360-degree visibility identification markers.

B. Direction of flow arrows is to be included on each marker.

C. In conformance with "Scheme for the Identification of Piping Systems" (ANSI A13.1-1981), each marker must show (1) approved color-coded background, (2) proper color of legend in relation to background color, (3) approved legend letter size, and (4) approved marker length.

D. For pipes under 3/4" O.D. (too small for color bands and legends), brass or plastic identification tags 1-1/2" in diameter with depressed 1/4" high black-filled letters above 1/2" black-filled numbers will be fastened securely at specified locations.

E. Locations for pipe and valve markers to be as follows:

1. Adjacent to each valve and fitting (except on plumbing fixtures and equipment).

2. At each branch and rise take-off.

3. At each pipe passage through wall, floor, and ceiling construction.

4. At each pipe passage to underground.

5. On all horizontal pipe runs - marked every 20 feet.

F. Markers shall be located for maximum visibility, close to valves, and at intervals of approximately 20 feet, at each change of direction, and at each side of wall penetrations. Height of lettering shall be 33/4" for pipe or insulation 2" O.D. and under, 1-1/2" for larger O.D. The arrows shall be not less than 8 inches in length. Letter color shall be black or white to suit conditions.

G. Coding shall conform to the following:

C W - Domestic Cold Water
NG - Natural Gas

1.19 TAGS AND CHARTS

A. Furnish four (4) schedules of valves so tagged, mounted in bound booklets.

B. Furnish four copies of diagrammatic charts showing schematically the essential features of all systems of piping, pumps, equipment control valves and numbers thereof. Mount schematic diagram in mechanical room.

1.20 HANDLING AND STORAGE OF MATERIALS

A. Handle and store all material to be incorporated in the work in a manner satisfactory to the ENGINEER.

B. Protect material before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting and any injury, theft or damage of any kind.

C. Store all mechanical equipment subject to corrosive damage by the atmosphere in a building to prevent injury. The building may be a temporary structure or elsewhere, but it must be acceptable to the ENGINEER.

D. Remove any materials which, in the opinion of the ENGINEER, have become damaged so as to be unfit for the use intended or specified. Removal and replacement of damaged material is at the CONTRACTOR'S expense.

E. Unload all pipe and material delivered to the job site and place in a manner which will not hamper the normal operation or interfere with the flow of traffic.

1.21 PROTECTION OF PIPING, DUCTWORK AND APPURTENANCES

A. Protect all ductwork, piping, appurtenances and openings from dirt, foreign objects and damage during the construction period. Replace damaged piping, ductwork or other appurtenances without additional cost to the OWNER, should the damage occur prior to final acceptance of the work by the OWNER.

B. Take suitable precautions against freezing during cold weather.

C. Prevent obstruction and damage to open ends of piping with a suitable cap or plug fitting.

D. Restore to existing condition work of other trades that may be disturbed or damaged in the course of this work.

1.22 PROTECTION OF EQUIPMENT

A. General: Particular care shall be exercised by the CONTRACTOR during construction and start-up to prevent loose weld material, welding rods, small tools, and miscellaneous scrap getting into the piping systems and lodging in valves, fittings or other equipment. The CONTRACTOR shall, if required by the ENGINEER, temporarily block off equipment openings with solid diaphragms until after the piping systems have been cleaned and inspected.

B. Cleaning: The interior of all equipment shall be inspected to establish that it is free from dirt or other foreign matter prior to its connection with the piping system. The CONTRACTOR shall be responsible for the repair of equipment damaged by passage of such dirt of foreign matter.

C. Permanent strainers: During the initial period of operation, the CONTRACTOR shall remove, clean, and replace the baskets of all permanently installed strainers as directed, until the ENGINEER is satisfied that a clean system exists.

D. Scavenging: Upon completion, all pipe lines shall be thoroughly cleaned and flushed or blown out by the CONTRACTOR. The CONTRACTOR shall furnish and install temporarily connected blow-out lines, through which water may be discharged. Temporary lines shall be properly supported and adequate precautions shall be taken to prevent impingement of the discharge on structures or to areas where personnel might be injured. When the ENGINEER is satisfied that the line is clean, the CONTRACTOR shall remove the temporary line and seal the opening

in the scavenged system as directed by the ENGINEER. Water for blowing out and washing out pipe lines will be provided by the CONTRACTOR.

1.23 EQUIPMENT CLEANING

A. Remove from premises all debris and unused material and leave premises in a clean and neat condition.

B. Thoroughly clean and ready for finish painting all equipment, piping, ductwork, insulation and other work scheduled for painting by General Contractor.

C. Inspect all items of equipment for dents, scratches, etc. Replace or repair and paint damaged equipment to match original finish.

D. ENGINEER to inspect and approve all items repaired and refinished.

1.24 SYSTEM CLEANING

A. Blow through, wash out and/or flush after completion to remove grit, dirt, sand, etc., from coils and piping and to thoroughly clean the apparatus. Clean or blow out prior to the end of the guarantee period all strainers, traps and dirt legs.

B. Remove or otherwise protect all elements within the system that may be damaged by the cleaning operation.

C. Repair or replace any control valves or other system components which do not function properly due to damage during the cleaning operation or because of imperfect cleaning of any piping system.

D. Inspect and clean as often as required all strainers and leave in a clean condition.

E. Inspect and remove all debris from ductwork, plenums and air handling units for each ventilating system.

F. Vacuum all construction dust from all coils, plenums and air handling units with industrial type vacuum cleaner.

G. Replace all air filters after completion of all tests and before final acceptance.

1.25 PRESSURE TESTS - GENERAL

A. Pressure test all piping before covering or concealment.

B. Make all tests in the presence of, and to the satisfaction of the ENGINEER or ENGINEER'S representative and any local or state inspector having jurisdiction.

C. Provide not less than three days notice to the ENGINEER and the authority having jurisdiction when it is proposed to make the tests.

D. Retest unprotected piping subject to mechanical or other injury when directed by the ENGINEER or his representative.

E. The piping systems may be tested in sections as the work progresses, but no joint or portion of the system shall be left untested.

F. Furnish all necessary grease, oil, fuel, electric power and other items required during all tests made on equipment. Furnish the OWNER with one year's supply of required lubricants, including grease and oil of the type recommended by the manufacturers of all equipment supplied under Division 15.

G. Remove or otherwise protect all elements within the system that may be damaged by the testing operation.

H. Correct and make tight in an approved manner all defects and leaks observed during the tests. Repeat tests until the system is proven tight.

I. Repair all damage done to existing or adjacent work or materials due to or on account of the tests.

J. Provide test pumps, calibrated gauges and other instruments and equipment required for the performance of all tests.

K. Test all welded joints with hammer tests while under pressure.

L. Maintain tests for as long a time as required to detect all defects and leaks, but not less than four consecutive hours during which time the pressure shall remain constant.

1.26 PIPING SYSTEM TESTS

A. General: Perform tests prior to connection of fixtures, appliances, equipment and piping specialties under conditions of no measurable pressure reduction or leakage.

B. Flush piping, prior to testing, to remove foreign materials which may have entered during the course of installation. Clean filters and strainers after flushing.

C. After fixtures, appliances, equipment and piping specialties have been connected, test entire system for tightness.

D. Test sanitary drainage, storm drainage and venting systems at least as follows:

1. Water test: When roughing-in work is complete, close all openings except uppermost and fill system with water to point of overflow. Maintain this condition for at least four hours.

E. Test domestic water piping under hydrostatic pressure of 100 psi for at least four hours.

F. Test hot water heating piping and oil piping to pressures indicated on the drawings for at least four hours.

G. Test gas piping at 3 psi minimum in accordance with NFPA 54.

1.27 TESTING AND BALANCING

A. General requirements:

1. Procure the services of approved, independent, specialist contractors to supervise the balancing, adjusting and testing of air and water systems and to conduct sound tests.

2. The air balance contractor shall be a certified member of the Associated Air Balance Council, or shall be approved by the ENGINEER or OWNER'S evaluation of the submitted agency's qualifications, specializing in the balancing and testing of heating, ventilating and air conditioning systems. He shall be engaged full time in testing and balancing and no other substantial work.

3. Submit for advance approval the name, references and qualifications of the air balance contractor. Include his proposal, together with his proposed procedure, list of test equipment to be used, etc.

4. Tabulate the results of testing on approved forms and submit three copies for approval and record.

5. Perform this work in accordance with the procedures and standards of the Associated Air Balance Council.

B. Submit the following test data. Arrange test data by system:

1. Fan data or apparatus data:

   a. Manufacturer and model number.
   b. CFM, design.
   c. CFM, actual.
   d. RPM, design and actual.
   e. Inlet static pressure.
   f. Discharge static pressure.
   g. Fan curves showing variations of CFM with static pressure at operating RPM and motor loading.
   h. Pressure drops across coils and filters.

2. Motor data:

   a. Manufacturer and model number.
   b. Horsepower.
   c. Phase.
   d. NEMA code letter.
   e. Rated volts.
   f. Actual volts.
   g. Rated amperes.
   h. Actual amperes.
   i. Raw traverse measurements and calculations.
   j. System diagram showing every outlet.
   k. Size.
   l. Outlet factor.
   m. Design velocity.
   n. Design CFM.
   o. Actual adjusted CFM.

3. Upon completion of the above tests, compile the information and results attained and submit them in a written report to the ENGINEER.

4. In cooperation with the automatic control manufacturer, adjust the regulators and all other system controls entailing control response to pressure or volume measurement, including outside air controls, relief dampers and return air damper controls.

5. Perform leakage tests on all dampers in the closed position. Include data on these tests in the testing and balancing report. Show raw data and method of measurement and calculation.

6. Notify the mechanical contractor and ENGINEER immediately if dampers exceed the maximum leakage specified. Retest replaced or adjusted dampers until tests show that leakage is within specified limits.

7. The ENGINEER may request a recheck or resetting of any outlet, fan, pump or equipment for a period of one year after completion of project and/or plant start-up.

8. Calibrate instruments required for air balance within a period of six months prior to balancing on this project. List types, serial numbers and dates of calibration of all instruments used. Provide instrument holes in ducts for Pitot tube insertion where required by the balancing agency.

9. It is the responsibility of the mechanical contractor in coordination with the air balance contractor to change motors, sheaves, drives and belts as required to obtain air quantities.

C. Balancing procedure - air systems:

1. Prepare a schematic diagram showing all dampers, outlets, duct sizes, CFM's. All outlets numbered for identification.

2. Ascertain that all equipment is in good operating condition, bearings lubricated, clean filters in place, dampers properly set, ducts clean, controls adjusted.

3. Make complete tests of supply and return fans with Pitot tube and draft gauge traverses. Read motor amps, RPM's. Adjust fan to near specified CFM with vanes open.

4. Before adjusting any dampers, make a series of spot readings at selected inlets and outlets around the system.

5. Start adjustment with zone dampers, rather than outlet dampers. After spot readings have been rechecked and show air in all major sections to be evenly distributed, begin balancing branch duct dampers. Then finally, start adjusting the outlets.

6. Begin at farthest outlet on the farthest branch, working inward. Since adjusting one outlet affects another, repeat the procedure, making finer adjustments until all outlets are within 5% of design quantities.

7. Recheck the fan capacity regularly during balancing procedures adjusting the speed each time to bring the CFM within tolerances.

8. Record all readings in a systematic form that ties into the schematic which identifies the locations of all readings.

9. Outlet test report shall show, for each outlet, the following: type, model, size, "K" factor, design CFM, design velocity or static pressure velocity readings on successive tests during balancing, final velocity and actual final CFM.

10. In fan test report show both design value and actual values of the following: manufacturer and model number, CFM, SP on suction and discharge, total SP, vortex

damper position, sheave size and bore, keyway, number of belts, make and size, centers between pulleys, motor manufacturer, frame size, horsepower, voltage, full load amps, RPM, sheave size and bore and keyway size.

11. Adjust fan drive so that maximum motor speed and maximum desired capacity coincide.

12. Upon completion, system operation to be efficient, without noise or excessive back pressure on pumps.

13. Noise levels shall be in full compliance with OSHA CFR 1910.95.

1.28 PAINTING

A. Finish painting to be provided by the General Contractor except as specified herein.

B. Factory coat with one coat of primer and one coat of machinery paint on all pumps, motors, tanks, heat exchangers and all other factory manufactured and assembled apparatus except where special finishes are specified herein.

C. Clean and paint to match original finish all items scratched or otherwise damaged.

D. Paint all vibration isolation rails, structural steel supports, etc., that will not be accessible when the installation is completed with zinc chromate primer before installation.

E. Paint ferrous metal hanger and support surfaces with zinc chromate primer unless factory coated.

1.29 MISCELLANEOUS STEEL ITEMS

A. See Drawings and schedules or articles located herein for items to be fastened to and/or supported by the structure. Furnish and install all necessary anchor bolts, concrete inserts, steel beams, bars, bearing and leveling plates and incidental items as may be needed to install the work. Items to be built into masonry and concrete must be furnished to the respective trade at the proper time to be built in and include instructions and templates for their installation unless it is explicitly shown or specified otherwise.

1.30 OPERATING AND MAINTENANCE MANUALS

A. Before final acceptance of the project, prepare and submit to the OWNER for approval and transmittal to the OWNER, four (4) copies in bound form, all operating instructions and service manuals, each consisting of no less than the following where applicable:

1. Identification on, or readable through, the front cover stating general nature of the manual.

2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all data.

3. Complete instructions regarding operation and maintenance of all equipment involved.

4. Complete nomenclature of all replaceable parts, their part numbers, current cost and name and address of nearest vendor of parts.

5. Copy of all guarantees and warranties issued.

6. Complete set of approved shop drawings of <u>all</u> equipment installed.

7. Approved testing and balancing report.

8. All pump service manuals.

9. Fan service manuals.

10. Complete automatic temperature control sequence and wiring diagrams.

11. Copy of diagrammatic charts showing schematically the essential features of the several systems of piping, pumps, equipment control valves and numbers thereof.

B. Where contents of manuals include manufacturer's catalog pages, clearly indicate the precise items included in this installation and delete or otherwise clearly indicate all manufacturer's data with which this installation is not concerned.

C. Before final acceptance of the project, provide a reasonable amount of oral instruction to the OWNER, or his representative, by a competent technician in the care and maintenance of the system.

D. Post in boiler room a list of phone numbers to call for service during the guarantee period.

1.31 WARRANTY

A. Guarantee all work performed and materials and equipment installed to the full extent required by the Drawings and Specifications to be free from inherent defects of material and workmanship for a period of one (1) year from the date of final acceptance.

B. Replace any material and equipment prior to the final acceptance which is corroded or otherwise damaged through the mechanical contractor's failure to properly operate and maintain the installation during construction or retesting.

C. Keep the work in repair and replace any defective materials, equipment or workmanship upon notice from the ENGINEER or OWNER'S representative for a period of one year from date of acceptance.

D. Consider defective all material or equipment requiring excessive service during the first year of operation.

E. The date of acceptance of the project appears on the ENGINEER'S certificate of substantial completion.

1.32 INSURANCE

A. The CONTRACTOR shall, during the life of the Contract, maintain in force such insurance as is required of the General Contractor in the General Conditions of the Contract; and shall furnish the General Contractor and the OWNER with certification of such insurance before beginning work on this section of the Contract.

1.33 COOPERATION BETWEEN TRADES

A. The CONTRACTOR shall provide full information sufficiently in advance of this work, so that all necessary work by other trades may be planned and installed without any delays or conflicts. The CONTRACTOR shall furnish and locate all sleeves, supports, and anchors. Failure of the CONTRACTOR to give timely notice of and to locate openings and furnish sleeves for his work

shall cause him the extra expense of cutting these openings, all at no additional expense to the OWNER. The CONTRACTOR shall locate all necessary access panels, wall and floor sleeves, and vent stacks through roof to complete work in advance without delay to the other trades.

B. It is not the intention of the drawings to show every item, piece of equipment, and detail. Provide complete operating systems.

C. Install work as closely as possible to layouts shown on drawings. Modify work as necessary to meet job conditions and to clear other equipment. Consult ENGINEER before making changes which affect the function of systems or appearance.

D. Dimensions, elevations, and locations are shown approximately. Verify all measurements in the field prior to installation.

E. ENGINEER reserves the right to order changes in layout of such items as piping, ducts and equipment, if such changes do not substantially affect costs and if affected items have not been fabricated or installed.

F. In some cases, drawings are based on products of one manufacturer, as listed in specifications. Be responsible for modifications made necessary by substitution of products of other manufacturers.

G. Do not install part of a system until all critical components of the system and related systems have been approved. Coordinate parts of systems.

H. Coordinate work with work specified in other Sections. Relocate work if required for proper installation and functioning of other systems.

1.34 WORKMANSHIP

A. The Drawings are schematic in nature, and it is not intended that the Drawings shall show in great detail every pipe, fitting, and accessory device; therefore the Mechanical Contractor shall furnish and install all such parts as may be necessary to complete the system in accordance with the best trade practice, code requirements and to the satisfaction of the ENGINEER.

B. Provide the General Contractor information as to the shape, size, and position of all required openings in sufficient time so all such openings may be provided. Furnish anchor bolts to be encased in concrete to General Contractor who will locate them as directed by the respective subcontractor. If the subcontractor should fail to provide proper and timely information, he shall do his own cutting and patching, or have same done by the General Contractor, all without extra expense to the OWNER. Obtain information from the General Contractor and the other subcontractors which will facilitate work and the completion of the whole project.

C. Obtain and adhere to installation instructions furnished by the equipment manufacturers. Install equipment in accordance with contract documents wherever these are more stringent than manufacturer's requirements.

D. All equipment and valves and accessory devices shall be installed in such a manner and in such a location, with sufficient clearance as to be accessible for service, maintenance and replacement. Furnish, for installation by appropriate trades, access panels for access to concealed valves, cleanouts, and the like.

E. All items requiring lubrication of any kind shall be left freshly and fully lubricated at the time the job is turned over to the OWNER. The Mechanical Contractor shall see that equipment is not turned on nor used for temporary service, nor run for testing purposes, without proper lubrication. One complete new set of any special lubrication devices such as grease guns,

fittings, adapters, etc., required to service the new equipment shall be delivered to the OWNER with an itemized list prior to the final acceptance of the Work.

F. All systems and equipment shall operate under conditions of load without objectionable noise or vibration. In the case of equipment such as compressors, pumps, etc., sound of vibration outside the room in which it is installed will be considered objectionable as will excessive sound levels in its own room. Sound and vibration considered objectionable by the ENGINEER shall be corrected in an approved manner by the Mechanical Contractor at his own expense.

PART 2 PRODUCTS

2.01 BASIC MATERIALS AND METHODS

A. Section 15050.

2.02 INSULATION

A. See Section 15180.

PART 3 EXECUTION

3.01 PERFORMANCE

A. All work shall be performed by licensed journeymen and apprentices of the particular trade involved, under direct supervision of a licensed master. The work shall meet all prevailing codes and standards in effect for the particular class of work. Where any portion of the work is not covered by an appropriate code or regulation in effect, the opinion of the ENGINEER as to compliance with the best accepted standards of trade practice shall be final and binding upon the CONTRACTOR.

B. Installation: The general piping and equipment arrangement shall be as shown on the drawings and specified herein. The CONTRACTOR shall note that the piping and equipment arrangement shown on the drawings is approximate and shall be confirmed in the field.

3.02 CLEAN-UP

A. On completion of the work all fixtures and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.

3.03 CUTTING AND PATCHING SLEEVES

A. All cutting and patching and setting of sleeves, frames and framing and/or lintels for wall openings shall be performed by the General Contractor.

END OF SECTION

SECTION 15050

BASIC MATERIAL AND METHODS

PART 1 GENERAL

1.01 INTENT

A. This Section summarizes the basic material and methods requirements for plumbing, heating, ventilating and air conditioning work generally. Only those items which specifically apply to this project are to be used.

1.02 GENERAL

A. All materials and equipment shall be in accordance with the drawings and technical provisions of these Specifications and shall be new.

1.03 STANDARDS

A. Flange dimensions, drilling and facing: ANSI B16.1.

B. Pipe threads: ANSI B2.1.

C. Identification of piping systems: ANSI A13.1

D. Pipe hangers and supports: MSS SP-58.

E. Nonmetallic pipe flange gaskets: ANSI B16.21.

10.4 SUBMITTALS

A. Refer to Section 15010.

B. Shop Drawings submitted shall include, but not be limited to, the following:

1. Piping specialties
2. Valves
3. Pipe hangers
4. Escutcheons
5. Vibration isolation
6. Meters and gauges
7. Anchors and guides
8. Dielectric fittings

1.05 PAINTING

A. Refer to Section 15010.

1.06 FASTENING DEVICES AND MOUNTING HARDWARE

A. Provide fastening devices and mounting hardware required for installation of work. Use proper devices and hardware compatible with material, finish, size and weight of items installed. Use noncorrosive materials in damp and wet areas.

B. Affix items, generally, with:

1. Wood screws or lag bolts to wood.
2. Self-tapping screws to metal.
3. Toggle bolts to hollow masonry.
4. Machine bolt expansion shields to concrete and brick.
5. Anchor bolts embedded in cast-in-place concrete.
6. "Hex bolts" to thin dual surfaced materials.

1.07 GENERAL INSTALLATION REQUIREMENTS

A. The drawings are schematic. Exact routing of piping shall be shown on the Contractor's shop drawings to meet field conditions and coordination between trades.

B. Erect piping in straight alignment, parallel to building lines or columns without springing, forcing or bending; with adequate provision for thermal expansion and contraction to prevent undue strains on piping or apparatus connected. Arrange branches to take up motion of main.

C. It is preferred to absorb expansion by means of pipe loops; however, where not possible, use expansion joints. Approved manufacturer: Barco.

D. Erect piping to clear obstructions, maintain access to openings and passageways, provide maximum headroom and ample space for operation, adjustment and maintenance of valves, unions and other appurtenances. Keep piping arrangements simple and neat with adequate clearance.

E. Where possible, conceal piping from view. Locate unconcealed piping close to walls and ceilings.

F. Make changes in size and direction with fittings. Use couplings only between full lengths of pipe or tubing. Do not use miter fittings, bushings, close nipples, or street elbows.

G. Do not place buried piping deeper than downward slope of 45E from footings and bearing walls parallel to piping.

H. Pitch water piping upward in direction of flow and arrange fittings to permit air to be vented automatically to system high points or to expansion tank, and to permit complete drainage to low points. Use eccentric fittings where necessary.

I. Provide flanges or unions and arrange piping to permit easy replacement of pumps, piping specialties, control valves and equipment. Provide piping including valves and strainers therein at line size. Make size reductions at points of final connection only. Screwed unions on piping 2 inches or less; flanges on 2-1/2 inches and up.

J. Exercise care in handling of pipe, tubing and fittings to prevent wrench and vise marks. Use tools designed to prevent damage to surface finish of piping.

K. Insides of piping must be smooth, clean and free from blisters, loose mill scale, oxides, sand, dirt, concrete and other foreign objects when erected. Keep openings closed during construction.

L. Make connection between dissimilar piping with adapter fittings or assembly of compatible materials having proper jointing configuration. Use dielectric unions at connections between ferrous and nonferrous materials. Caution: install dielectric unions with care; excess heat will cause deterioration of nonmetallic parts.

M. Only shoulder nipples shall be used. No close nipples permitted.

N. Screw threads shall be clean and true; screw joints made up tight without caulking. A nonhardening lubricant will be permitted. No bushings shall be used. Reductions to be made with eccentric reducers with the tops leveled on water piping and with the bottoms leveled on steam piping. Ream out pipe after cutting to remove all burrs.

O. Miscellaneous drains, vents, reliefs and overflows from tanks, equipment, piping, relief valves, pumps, etc., shall be run to the nearest open sight drain or roof drain. Provide drain valves whenever required for complete drainage of piping.

1.08 PIPE JOINTS

A. General: Cut pipe and tubing ends square; remove burrs and ream to original bore. Clean joint surfaces prior to assembly. Wipe off excess jointing compounds and flux residue.

B. Screwed: Use American Standard Taper Pipe Threads cut sharp and true and suitable for normal engagement. Screw threaded items up close to shoulders with not more than three threads exposed. Do not use lampwick, cord, wool or other "wicking" materials. Repair leaks with new materials; do not peen or caulk. "Teflon" pipe joint tape or joint compounds composed of red lead and graphite ground in linseed oil will be permitted applied to male threads only.

C. Flanged: Use flanges compatible with system materials. Mating flanges shall have similar facings. Assemble joints with gasket and American Standard carbon steel bolts and hex nuts made up with torque limiting wrench.

D. Welded: Use "Code for Pressure Piping" and American Welding Society Welding Procedures performed by qualified welders having test certificates issued within previous 12-month period. Grind out faulty welds and reweld.

E. Solder: Copper tubing - make up joints with 95-5 solder (95% tin, 5% antimony) melting range approximately 450EF. Core solder, 50-50 or other tin-lead solders will not be permitted.

F. Brazed: Make up joints with silver brazing alloy (15% silver, free flowing at 1280°F) and flux. If fittings with pre-inserted rings are used, follow manufacturer's methods.

G. Flared: Expand soft copper tubing ends with flaring tool. Use two wrenches to couple fittings.

H. Mechanical Coupling: Use manufacturer's materials and methods.

I. Solvent Weld: Use manufacturer's materials and methods.

J. No-hub Soil Pipe: Make up joints with cast-iron clamp, neoprene gasket, stainless steel bolted couplings. The use of stainless steel clamp and shield assembles is discouraged.

1.09 PIPING AND PIPING MATERIALS

A. The piping system shall consist mainly of the following:

1. Type CUL - copper, type L, hard temper: ASTM B88.
2. Type S1 - black: ASTM A120.
3. Type CINH - cast-iron soil, no-hub: CISPI 301, service weight.
4. Type CI - cast-iron soil, hub and spigot, push-on joint: ASTM A74, CISPI 301.

5. Type PEI – crosslinked polyethylene, SDR5: ASTM F876/F877 (Wirsbo hePEX plus or approved equal)
6. Type CUK - copper, type K, soft and hard temper, ASTM B88.
7. Type S2 – roll grooved-joint steel, schedule 40, galvanized: ASTM A53.

1.10 FITTINGS

A. Fittings shall comply with the following:

1. Type CUS - wrought copper, solder end: ANSI B16.22.
2. Type MI1 - malleable iron, threaded: ANSI B16.3, ASTM A197.
3. Type CINH - cast-iron soil, no hub fittings: CISPI 301.
4. Type CI - cast-iron soil, hub and spigot, push-on joint: ASTM C564.
5. Type QS20 – compression fitting for connecting in-slab radiant tubes to above slap copper piping, provided by radiant tubing manufacturer.
6. Type SW - steel, butt weld: ASTM A234, ANSI 816.9.
7. Type RG – roll grooved coupling and fittings, galvanized steel, bolted connection, gasket and housing: Install per manufacturer's directions.

1.11 PIPING SPECIALTIES

A. Unions: Ground joint, threaded end, compatible with system materials and of equal or superior pressure rating. Use flanged unions with piping larger than 2-1/2 inches.

B. Dielectric Union: Assembly of threaded end pipe connectors or flanges compatible with system materials, dielectric insulators and gaskets suitable for pressure of 175 psi and 600 volts.

C. Gaskets: 1/16-inch thick nonasbestos compound sheet.

D. Protective Coatings - Buried Piping: Field coat buried steel piping with single-wrap coal-tar coating, "Tapecoat 20" applied hot with torch and spiral wrapped with 1/2-inch overlap, or coat with at least two separate layers of minimum 12-mil thick plastic tape applied over prime coating of rubber base pressure sensitive adhesive containing fungicidal agents and spiral wrapped with at least 1/2-inch overlap.

E. Seals:

1. Seals for pipe penetrations through mechanical equipment room walls and floors, areaway walls and all walls below grade shall be Thunderline Corp. LINK-SEAL assemblies, Type C, Standard Service insulating type, Model LS-400 for 4-inch and larger pipes; Model LS-300 for 2-1/2-inch and 3-inch pipes; Model LS-200 for 2-inch and smaller pipe sizes. Wall and floor penetrations shall be either core drilled or accurately formed with removable plastic forms, or provided with steel or PVC wall sleeves with water stop and anchor flanges as manufactured by LINK-SEAL.

2. Interior wall and floor penetrations (except fire-rated assemblies) shall be sealed with Dow-Corning 3-6548 RTV silicone foam applied in accordance with manufacturer's instructions.

3. Fire-rated masonry assemblies shall be grouted-in with non-shrink, flame safe grout, with UL rating. Non-masonry assemblies shall be sealed with elastomeric type red sealant matching the fire rating of the assembly and shall be UL rated.

1.12 STRAINERS

A. Provide strainers in the hot water heating system ahead of each pressure regulating valve, pressure reducing valve and on suction side of all pumps. Strainers shall be Sarco, Elliott, Hoffman, or other approved equal as follows:

1. 2 inches and smaller - 250#, screwed, iron body, "Y" pattern, 1/2-inch plugged blow-off outlet, 20-mesh screen bronze basket.

2. 2 inches and larger - 125# ASA flanged iron body, "Y" pattern, 3/4-inch plugged blow-off outlet, 1/16-inch perforated bronze basket.

B. Each strainer with a blowout connection shall consist of a 6-inch nipple and gate valve, sized as follows:

Strainer Size	Blowdown Size
1/2", 3/4"	1/2"
1"	3/4"
1-1/4"	1"
1-1/2" through 4"	1-1/4"
6" and above	1-1/2"

1.13 VALVE INSTALLATION

A. Place valves in accessible locations with ample room for full opening, repacking, replacement of internal parts; with operating stem horizontal or vertically upward.

B. Threaded end valves equipped with tubing adapters are preferred over solder or brazed end valves to avoid excessive heating of valves.

C. Use globe valves where necessary to throttle water flow. Angle valves of equal quality may be used.

D. Handle valves with care to prevent wrench and vise marks.

1.14 VALVE MATERIALS

A. Valve materials shall be:

1. Bodies - bronze: ASTM B62.
2. Bodies - iron: ASTM A126 - Class B.
3. Stems - silicon brass: ASTM B198 - Grade 13B.
4. Discs: Manufacturer's standard for service involved.

1.15 VALVES

A. Gate - GVT: All bronze, solid wedge, rising stem, threaded end, 125 psi SWP; Jenkins 47.

B. Gate - GVF: Iron body, bronze mounted, solid wedge, OS&Y, renewable seats, flanged, 125 psi SWP; Jenkins 651A.

C. Globe - GLVT: All bronze, rising stem, renewable disc, threaded end, 150 psi SWP; Jenkins 106A.

D. Globe - GLVF: Iron body, bronze mounted, OS&Y, renewable composition disc, bronze seat ring, flanged, 125 psi SWP. Jenkins 613.

E. Check – CVT: All bronze, horizontal swing, screw-in cap, renewable disc, threaded end, 300 psi WWP; Jenkins 352.

F. Check - CVF: Iron body, bronze mounted, renewable seat and disc, bolted cap, flanged, 200 psi WWP; Jenkins 624.

G. Ball - BVT: Bronze body and ball, teflon seats and seals, lever handle, threaded end, 400 psi WOG; Jenkins 1050.

H. Plug - PVG: Bronze body and plug, square head, threaded end, 175 psi WOG; Lunkenheimer 454.

I. Relief valves for domestic hot water heaters to be furnished with heater.

J. Backflow preventers: Backflow preventers shall be provided as approved and required by the Plumbing Code and as shown on the Drawings.

1.16 PIPE HANGER AND SUPPORT INSTALLATION

A. Support, anchor and guide piping systems to withstand static and dynamic load conditions; to allow for expansion and contraction; to prevent vibration and swaying; to maintain alignment and minimize vertical deflection.

B. Except where otherwise shown, specified or required, hangers, supports, guides, anchors and concrete inserts shall be the standard types as manufactured by Grinnell Company or approved equal.

C. Support buried piping on undisturbed earth properly graded and shaped. In over-excavated areas and in rock, place piping on bed of well tamped sand or fine washed gravel. In backfilled and unstable soil areas, support piping with concrete or solid masonry piers bearing on solid base. When building is erected on piles, support piping from ground floor slab. Do not use wood block, stones, cobbles, shims as means of support.

D. Exercise care in placing supporting devices so that structure is not weakened or impaired. Do not support piping larger than 3/4-inch from bottom chord of open web steel joists. Piping may be
supported from top chord of joists, or from lower panel points, when 1-1/2-inch steel pipe is used to span lower panel points of adjacent joists. Secure pipe spans to joists.

E. Clamp and rod sizes indicated in this specification are minimum sizes. This trade shall be responsible for structural integrity of all supports. All hanging components shall have a safety factor of 5.

F. Anchor points shall be located and constructed to permit the piping system to take up its expansion and contraction freely in opposite directions away from the anchored points.

G. Guide points for expansion points shall be located and constructed wherever required or shown on drawings and at each side of an expansion joint or loop, to permit only free axial movement in piping systems.

H. Support multiple piping runs with metal framing and pipe clamps.

I. Do not support piping from other piping or duct work. Do not use wire, tape, metal bands, or other make-shift devices as means of support or attachment.

J. Secure hanger rods to attachments with double nuts or other suitable locking devices.

K. Secure attachments to structure with:

1. Wood screws or lag bolts to wood.
2. Toggle bolts to hollow masonry.
3. Machine bolt expansion shields to concrete and brick.
4. Inserts embedded in "cast-in-place" concrete.
5. Steel plates bearing on surface of permanent decking.
6. Beam clamps to structural steel, or by welding.
7. Explosive driven studs such as "Ramset" and the like are prohibited.

L. Secure concrete inserts to slab with steel rods slipped through insert openings and place across reinforcing steel.

M. Use steel washers for proper bearing surface of hanger rods slipped through oversized openings.

N. Provide insulated saddles at pipe attachments on insulated piping. In lieu of insulated saddles, provide protective shields and rigid insulation inserts to protect continuous insulation.

1.17 HANGER AND SUPPORT

A. Grinnell figure numbers are used to establish the desired style and quality. F&S, Carpenter and Patterson, Central Iron or other equal manufacturers, as approved by the ENGINEER, will be acceptable. All hangers and attachments for pipe sizes up to 6 inches shall be UL or FM approved for the application and use. All support components shall conform to MSS Specification SP-58, and as specified herein.

B. Pipe attachments shall be as follows:

1. All systems, 1-1/2-inch or smaller, noninsulated Grinnell Fig. 97 or CT-99, Fig. 269 or CT-269 adjustable pipe ring, or Fig. 65 or CT-65 clevis. Clevis type shall be used wherever insulation is required to pass uninterrupted through inside of hanger.

2. All systems, 2-inch to 6-inch pipe sizes, cast iron drain pipe 6-inch and larger - Grinnell Fig. 260 adjustable clevis type.

3. Pipe attachments in metal-to-metal contact with copper and brass pipe shall be copper-plated or PVC-coated.

4. On all insulated cold water and drain pipes, provide attachments sized for O.D. of insulation to permit insulation to pass through hanger. Provide pipe covering protection shields, equal to Grinnell Fig. 167 for piping 3 inches and smaller and all copper tube systems. Provide saddles equal to Grinnell Fig. 160, 161, or 162 for steel or C.I. pipe 4 inches and larger attached to pipe. High density rigid insulation sections or suitable factory-fabricated units may be used at pipe attachment location in lieu of pipe saddles.

C. Hanger rods shall be secured to building by one of the following approved structural attachments:

1. To structural steel beams for pipes 3 inches and smaller, malleable iron C-type beam clamps with retaining clip - Grinnell Fig. 85 or Fig. 87; for pipes 2 inches to 5 inches - by beam clamps, Grinnell Fig. 229, 225, or 227; for pipes 6 inches - bolted and welded beam attachments - Grinnell Fig. 66, or beam clamps, Grinnell Fig. 229 or 292. Channel clamps may be used in lieu of above types.

2. In completed concrete work or in other solid masonry, use self-drilling inserts equal to Phillips "Red Head" or expansion shields equal to Grinnell Fig. 117, cadmium plated.

D. Pipes run along walls or close to floor shall be supported as follows:

1. Piping along walls may have hanger rods supported from welded steel brackets, Grinnell Fig. 195, or Grinnell Fig. 199 heavy-duty. In lieu of hangers 4-inch and larger pipe may rest on adjustable roll stands supported by welded channel or I-beam wall brackets.

2. Wall brackets shall be secured to building concrete structure by Grinnell Fig. 281 galvanized steel inserts or after concrete work is completed by self-drilling inserts equal to Phillips "Red Head" or expansion shields equal to Grinnell Fig. 117, cadmium plated.

3. 2-inch and smaller - supported from floor on legs of angle iron, channels or pipe legs.

4. 2-1/2-inch to 4-inch - adjustable pipe saddles, Grinnell Fig. 264, supported from floor on pipe legs.

5. In lieu of roll-type supports, Grinnell Fig. 257 slide assemblies with adequate pipe attachments may be used.

6. Where longitudinal pipe movement must be restricted, use anchor chairs or approved pipe clamps.

E. Riser clamps for vertical piping shall be equal to Grinnell Fig. 261 (or Fig. 121C for copper pipe) where concealed.

F. Groups of horizontal pipes 3-inch and smaller, running at the same elevation, may be supported by means of vertical hangers and horizontal angles, channels or "Unistrut" on which pipes shall rest and be held in alignment with suitable pipe clamps. Building attachments and rods must be sized for total load of all pipes. Details of such hangers must first be approved by the ENGINEER. No contact between dissimilar metals is permitted.

G. Hangers and supports shall be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions. Where required, they shall be screw adjustable after installation. Supporting devices shall be designed in accordance with the best practice.

H. Where concentrations of valves, fittings and equipment occur, closer spacing of supports will be required. In no case shall any total hanger load (weight of piping, insulation and contents) exceed the following load carrying capacities for hot rolled steel rod as specified in ASTM A576.

Nominal Rod Diameter (Inches)	Maximum Safe Load (Pounds)
3/8	610
1/2	1,130
5/8	1,810
3/4	2,710
7/8	3,770

1	4,960
1-1/8	6,230
1-1/4	8,000
1-3/8	9,470
1-1/2	11,630

I. Anchors shall be furnished and installed where shown or required, for holding the pipelines and equipment in position or alignment. Anchors shall be designed for rigid fastening to the structures, either directly or through brackets. The design of all anchors shall be subject to approval by the ENGINEER.

J. Pipe anchors and alignment guides at expansion loops or joints shall be provided where required to control pipe movement. Anchors and guides shall be securely attached to the building construction. Anchors shall be welded or clamped to the pipes. Alignment guides shall be Flexonics Pipe Alignment Guides, or approved equal, or may be constructed of structural steel shapes. Insulation shall be protected by an 18-inch gauge, 12-inch long sheet metal sleeve. Guides shall be installed from the expansion joint as follows: First guide (4D) second guide (14D from first) and subsequent guides (21 feet from previous guide) where D equals pipe diameter.

K. Expansion joints, anchors and guides shall be in accordance with the Standards of the Expansion Joint Manufacturers' Association.

L. All piping on walls shall be properly supported by hangers securely anchored into the wall construction. Risers shall be supported with split ring clamps spaced not greater than 6 feet on centers.

M. Steel and cast-iron pipe inside the structure shall be supported at intervals as follows with clevis hangers, rod sizes as follows, double nuts on clevis hangers and on beam clips.

Hanger Pipe Size	Hanger Intervals Steel	Hanger Intervals Cast-Iron	Rod Sizes
2"	10'		3/8"
2-1/2"	11'		1/2"
3'	12'	11'	1/2"
4	14'	13'	5/8"
5"	16'	14'	5/8"
6"	17'	15'	3/4"
8" to 12"	19'	15'	7/8"

N. Cast-iron Soil Pipe: Intervals not exceeding 15 feet with minimum of one hanger per pipe section placed at hub end.

O. Copper tubing shall be supported at intervals as follows, with copper plated clevis hangers, rod sizes as follows, double nuts on clevis hangers and on beam clips.

Copper Tube Size	Hanger Intervals	Rod Sizes
1/2"	5'	3/8"
3/4"	5'	3/8"
1"	6'	3/8"
1-1/4"	7'	3/8"
1-1/2"	8'	3/8"
2"	8'	3/8"

2-1/2"	9'	1/2"
3"	10'	1/2"
4"	12'	5/8"

P. All pipe hangers shall be placed directly on O.D. of pipe unless otherwise required due to insulation.

Q. Vertical lines shall be supported at their bases with a hanger placed in the horizontal line near the riser, or with a base-type fitting set on a pedestal foundation or support. All concealed vertical lines extending through more than one floor level shall be supported at each floor with riser clamps.

R. Nonmetallic Piping: As recommended by manufacturer. Provide continuous support for piping subject to sagging.

S. Use roller type supports for pipes subject to axial movement. Brace them so that movement occurs in roller rather than support rods.

T. Provide all steel required for support of pipes, aside from the steel shown on structural drawings.

U. Structural engineer must approve method of hanging before work is started. This trade shall bear all responsibility for materials and workmanship as described in this section, and shall make sure that all hangers and supports are properly and permanently connected to building structure.

V. All hangers on piping including clevis hangers, rods, inserts, clamps, stanchions, brackets, shall be dipped in zinc chromate primer before installation.

1.18 LOAD-CARRYING CAPACITY - 1-1/2-INCH STEEL PIPE

Joist Spacing (Pipe Span)	Maximum Safe Load, Pounds		
	Schedule 40	Schedule 80	Schedule 160
up to 60 inches	480	600	850
up to 72 inches	400	500	700

1.19 PIPE HANGER COMPONENTS

A. Components: Designed with minimum safety factor of 5; of all metal construction; assembled with corrosion resistant square head machine bolts and square or hex head nuts, steel washers, and in such a manner as to prevent self-disengagement.

B. Pipe Attachment: Capable of vertical adjustment under load, shaped to OD of piping, sized to allow continuous insulation.

C. Surface Finish - Uninsulated Copper and Brass Piping: Copper plated or plastic coated.

D. Surface Finish - Chrome Plated Piping: Chrome plated.

1.20 METAL FRAMING

A. Material: Rust resistant continuous slot steel channel, or slotted steel angle, with matching fittings assembled with rust resistant hex head bolts and nuts.

B. Design loading: As recommended by manufacturer.

1.21 PROTECTIVE SHIELDS

A. Materials: Semicircular galvanized sheet metal of following length and gauge:

Pipe and Tube - Inches	Length - Inches	Minimum Gauge
1/2 to 3	12	18
4	12	16
4, 6	18	16
8 to 14	24	14

1.22 INSULATED SADDLES

A. Saddles: Semicircular galvanized sheet metal with molded rigid insulation insert and jacket compatible with abutting insulation materials. Fire hazard rating 25-25-25 or better.

1.23 PIPE SLEEVE INSTALLATION

A. Provide for piping passing through walls, partitions and slab sleeves sized at least 1 inch larger than OD of pipe for uninsulated lines and of pipe plus insulation for insulated lines.

B. Terminate sleeves through walls, partitions and ceilings flush with finished surfaces; through slabs 1/2-inch above floor finish and habitable spaces and 2 inches above rough finish in pipe spaces and other unfinished areas.

C. Set sleeves in place before placing concrete or securely fasten and grout in place with concrete. Exercise care in locating and setting of sleeves to assure accurate alignment. In absence of sleeves, use core drilled holes.

D. Provide casing seals around piping through walls in contact with earth.

E. Where insulated piping passes through barriers such as fire rated partitions, floors and walls, stop insulation at said barriers and grout sleeved hole fully to bare piping with nonshrink materials in masonry walls, floors or ceiling. Grout to be flame-safe and meet all UL ratings. None-masonry fire rated partitions, floors and walls to be provided with elastomeric type firestop appropriately rated for barrier.

F. Where piping passes through nonfire rated partitions, floors and walls, apply pipe insulation continuous through pipe sleeves.

1.24 PIPE SLEEVES

A. Interior Partitions: 22-gauge galvanized steel, lock seam joint.
B. Fire Rated Partitions: Schedule 40 galvanized steel pipe.

C. Interior Masonry Walls and Slabs: Schedule 40 galvanized steel pipe.

D. Exterior Walls and Foundations: Schedule 80 galvanized steel pipe or extra heavy cast-iron.

E. Casing Seal: Interlocking expandable synthetic rubber links, assembled with corrosion resistant bolts, nuts and pressure plates. Trade name: Link-Seal.

1.25 ESCUTCHEON INSTALLATION

A. Provide escutcheons on pipe protrusions at walls, partitions, ceilings and floors. Escutcheons shall fit snugly around bare and insulated piping and cover surface opening or fire stopping collars.

B. One piece escutcheons are preferred, but hinged escutcheons will be permitted on all but chrome plated piping. Equip escutcheons for bare piping with round head set screws and with spring clips for insulated piping.

1.26 ESCUTCHEONS

A. Painted Surfaces: Prime coated sheet steel, Beaton & Cadwell 13 or 40.

B. Acoustical Surfaces: Finish painted sheet steel, Beaton & Cadwell 13 or 40.

C. Glazed or Tiles: Chrome plated cast brass, Beaton & Cadwell 3A or 3S.

1.27 VIBRATION ISOLATION

A. All mechanical equipment shall be mounted on vibration isolators to prevent transmission of vibration and sound to the building structure.

B. All piping connected to machinery shall be suspended from vibration isolators for a minimum distance of 30 feet or 150 pipe diameters, whichever is greater. Hangers shall contain spring and neoprene in series. Minimum deflection: 1 inch.

C. Mechanical equipment above grade shall be on a concrete pad 8 inches thick and 12 inches longer and wider than the mechanical equipment mounted on it. Where inertia pads are used, a 4-inch thick housekeeping pad will suffice.

D. Minimum deflection of vibration isolators shall be minimum 1.5" deflection under full load.

E. All duct runs and breeching within mechanical equipment rooms and not less than 5 feet from connected equipment shall be isolated from the building structure by vibration hangers containing a steel spring and neoprene in series.

F. Schedule of isolator and base types:

	Isolator Type	Base Type
Fans and pumps on deck	1	A
Fans, suspended	3	------

G. Isolator types:

1. Type 1: Spring isolator, free standing, laterally stable, complete with 1/4-inch neoprene acoustical friction pads between the base plate and the support. Mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflections, compressed spring height and solid spring height.

2. Type 3: Vibration hangers for suspension shall contain a spring and double deflection neoprene element in series. Neoprene elements shall have a minimum deflection of 0.35-

inch. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

H. Base types:

1. Type A: Vibration isolator manufacturer shall furnish integral structural steel bases, rectangular in shape, for all equipment other than refrigeration machines and pump bases which may be Tee-shaped. Pump bases for split case pumps shall include supports for suction and discharge base ells. All perimeter members shall be WF beams with a minimum depth equal to 1/10 of the longest dimension of the base. Height saving brackets shall be employed in all mounting locations. Bases shall be WF bases as manufactured by Mason Industries, Inc.

I. Isolators for fans suspended from the roof structure above shall be provided with steel frame subbase for each fan, Mason type WF, modified for hanger rod suspension. Provide hanger rods and upper attachment hardware selected for a safety factor of 5. Provide additional steel required to connect hanger rods to overhead structure. Provide Type 3 suspension isolators selected for 2.5-inch static deflection. Provide thrust restraints and hardware to restrain movements in two horizontal directions. For the fans, provide vertical steel beams to connect the thrust restraints.

J. Secure the beams to floor and overhead structure. Provide a spring isolator in each thrust restraint, equal to Mason type WB.

K. Vibration isolation equipment submittal drawings shall include the following information:

1. Isolation mounting deflections.
2. Spring diameters, compressed spring heights at rated load.
3. Solid spring heights.
4. Equipment operating speed.

1.28 ACCESS DOORS

A. Access doors shall be flush type with anchors, 16-gauge steel frame and 14- gauge steel hinged panel, equal to Milcor Style DW for dry-wall, Style M for masonry or concrete, Style K for plastered walls and ceilings, and U.L. labeled fire rated (B) for use in fire walls.

B. Refer to Section 15010 for access door sizes.

C. Access doors or panels shall be provided at each cleanout, valve, water hammer arrester, etc., where necessary to service the piping, equipment or accessories. Where removable ceilings are provided no separate access door is required; however, suitable approved identifying marker shall be provided to indicate access locations.

1.29 APPROVED MANUFACTURERS:

A. Valves:

1. Milwaukee
2. Lunkenheimer Co.
3. Jenkins Bros.

B. Strainers:

1. Elliott
2. Sarco Co., Inc.
3. Hoffman

C. Escutcheons:

1. Beaton and Cadwell Mfg. Co.

D. Dielectric Unions:

1. Ecoff Products Co. (EPCO)

E. Pipe Hangers and Supports:

1. Grinnell Co.
2. Fee and Mason
3. American

F. Pipe Tape and Valve Tags:

1. Seton Name Plate Co.
2. Brady Co.
3. Thomas & Betts Co.

G. Casing Seals:

1. Thunderline Corp.

H. Vibration Isolators:

1. Mason Industries, Inc.
2. Vibration Eliminator Co.
3. Korfund Dynamics Co.

END OF SECTION

SECTION 15180

INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENT

A. The provisions of Section 15010 - General Provisions, apply to the work of this section.

1.02 WORK INCLUDED

A. Domestic cold, hot and hot water circulation piping within building.

B. Supply and return ductwork.

C. Waste vent piping through roof.

D. Horizontal roof drainage piping above grade.

E. Heat traced piping in parking garage.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Protective Shields - Section 15050.

1.04 FIRE HAZARD CLASSIFICATION

A. Composite installation of insulation material, jacket, facing, adhesive, surface coating, shall not exceed:

1. Flame spread: 25
2. Fuel contributed: 50
3. Smoke developed: 50

1.05 SUBMITTALS

A. Refer to Section 15010.

B. Submit shop drawings or catalog cuts showing insulation, jackets, facings, accessory materials.

1.06 ACCESSORY MATERIALS

A. Insulating and Finishing Cement: Calcium silicate, mineral fibers, binders.

B. Surface Coating: Foster 30-36.

C. Vapor Barrier Adhesive: Foster 82-07.

D. Fire Resistive Adhesive: Foster 85-20.

E. Wire: Minimum 16-gauge, copper clad soft annealed steel.

F. Vapor Barrier Tape: Flame resistant coated cloth, pressure sensitive adhesive backing.

1.07 INSTALLATION

A. Completely protect piping conveying water of temperature below 85EF against surface condensation with continuous completely sealed vapor barrier jacketed insulation.

B. Apply insulation to clean, dry, properly prepared surfaces of piping and equipment only after system has been tested satisfactorily.

C. Apply pipe insulation continuous through sleeves and hangers, and to piping in pipe spaces and concealed within building construction. Omit pipe insulation on chrome plated piping and piping in sleeves passing through fire rated barriers.

D. Use premolded insulation shapes dimensionally compatible with outer configuration of pipe, valves, fittings and strainers. Where standard shapes are unavailable, fabricate or build up shapes from insulation materials having identical insulating qualities. Cut, score or miter insulation to fit surface shape; finish with 1/4-inch smoothing coat of finishing cement.

E. Insulate valve bodies up to and including bonnets; strainer bodies up to but excluding blow-out connections. Bevel ends of insulation adjacent to flanges to permit bolt removal.

F. Make allowances for expansion and contraction to avoid separation of insulation and surface finish.

G. Fill surface imperfections with insulation materials secured in place and finished off smoothly. Point up joints and breaks of block insulation with cement.

H. Apply surface finishes to entire insulated surface to present tight, smooth finish. Finish raw edges and ends neatly. Position outdoor jacket laps to shed water.

I. Paste down jacket laps and butt strips with fire resistive adhesive.

J. Use wire to secure insulation shapes and segments and outdoor jackets. Remove bands on exposed piping only after jacket adhesives have set. Concealed piping shall be banded in place with three aluminum bands per section, one over each end of the joint sealing strip, and one in the middle of the section.

K. Use of staples is prohibited.

L. Remove damaged insulation and torn jackets, and replace with new. Seal minute jacket penetrations with surface coating.

1.08 INSULATION - H11

A. Pipe: Sectional premolded fibrous glass, factory applied fire retardant "all service" vapor barrier jacket, with self-sealing lap.

1. Minimum density: 3.5 lbs. PFC.
2. Maximum K-factor: 0.24 at 75° F, mean.

B. Valves and Fittings: Premolded, fibrous glass fitting covers, or fabricated mitered segments of pipe insulation, finished with 20-20 count glass cloth embedded in surface coating.

C. Surface Finish - concealed: None required.
exposed: PVC jacket.

1.09 INSULATION H31

A. Pipe: Sectional premolded fibrous glass, factory applied fire retardant all service jacket with vapor barrier & self sealing lap.

1. Minimum density: 3.5 lbs. per cubic foot.
2. Maximum K factor: 0.24 at 75° F mean temperature.

B. Valves and Fittings: Premolded, fiberglass fitting covers, or fabricated mitered segments of pipe insulation, finished with 20-20 count glass cloth embedded in surface cooling, suitable for covering electrically heat traced fittings.

C. Surface Finish: All heat traced piping in parking garage shall have an aluminum jacket. Provide butt joint overlaps for waterproofing. Provide aluminum bands at joint overlaps and spaced between butt joints for jacket securement. Provide end caps to seal insulation.

1.10 INSULATION H51

A. Duct: Light weight, fine fiberglass blanket with a factory applied vapor barrier on one side.

1. Minimum density: 0.75 lbs. PCF.
2. Maximum K-factor: 0.32 @ 75° F mean.

B. Application: Adhere insulation to duct with fire retardant adhesive in sufficient quantities to prevent sagging. Ducts with widths over 30 inches shall be further secured on underside with mechanical fasteners on maximum 18-inch spacings. All joints shall be over- lapped a minimum of 2 inches.

1.11 APPROVED MANUFACTURERS

A. Certain-Teed Saint Gobain Insulation Corp.

B. Johns-Manville Corp.

C. Owens-Corning Fiberglas Corp.

D. PPG Industries

E. Armstrong Cork Co.

F. Keene Building Products Corp.

G. The Celotex Corp.

H. Foster Division - Amchem Products, Inc.

END OF SECTION

SECTION 15300

FIRE PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of Section 15010, General Provisions, apply to this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Electric power and alarm wiring. Division 16.

1.03 SUBMITTALS

A. Refer to Section 15010.

B. Submit complete package including working drawings and hydraulic calculations to the Fire Prevention Office, Portland, Maine, for approval prior to installation of Work.

C. Submit shop drawings or catalog cuts showing sprinkler equipment, valves, hose equipment and all equipment required for a complete installation. Indicate type of piping and fittings to be provided.

1.04 WORK INCLUDED

A. Sprinkler contractor shall be responsible for obtaining water flow test results from Portland Water District. If a water flow test has not been conducted within the past year, sprinkler contractor shall perform a water flow test in accordance with NFPA. Provide Portland Water District with results.

B. Sprinkler contractor shall design, furnish, install and pressure test a dry standpipe system for the Phase 2 five level open parking including the following work:

1. Provide 2-1/2-inch standard fire hose valves (Class 1) with 1-1/2-inch iron pipe reducer and cap. Locate as indicated on Drawings.

2. Connect new dry standpipe system to existing sprinkler service entrance water supply.

3. Standpipe system shall be designed in accordance with NFPA 14. Design pressure calculations shall include operation of the city fire department pumper.

4. Provide properly sized air compressor based on system volume.

C. Work shall include flushing of piping, connection for domestic water service, pressure tests, and completion of Contractor Materials and Test Certificates. Provide properly sized air compressor based on system volume.

D. Provide a partial automatic sprinkler system for fire protection in the storage area of the APCOA Building as indicated on the Drawings. Sprinkler shall be supplied from the domestic water

system. Provide flow switch and shut-off valve. The complete installation shall be in accordance with NFPA 13.

1.05 STANDARDS

A. Sprinkler systems: NFPA 13 - edition adopted by State of Maine.

B. Life Safety Code: NFPA 101.

C. Standpipe systems: NFPA 14 - edition adopted by State of Maine.

D. Identification of piping: ANSI A13.1.

E. Parking structures: NFPA 88 A.

F. Factory Mutual standards.

G. Requirements of Portland Fire Protection Office.

1.06 SCHEDULE

A. The CONTRACTOR shall furnish drawings and equipment/material submittals as defined in section 1.03 of this specification within 30 days of receipt of order for OWNER'S review. All materials and equipment to be used must be submitted to the OWNER for their review. Any material purchased or installed by the CONTRACTOR without written review by the OWNER will be at the CONTRACTOR'S risk.

1.07 DESIGN CRITERIA

A. The dry sprinkler and dry standpipe systems shall be as follows:

1. Design the dry sprinkler system in accordance with NFPA 13 and NFPA 101.

2. Design the dry standpipe system in accordance with NFPA 14, 88A and 101. Provide pipe sizing to meet NFPA 14 requirement that water is delivered to the most remote hose connection in not more that three (3) minutes.

B. The designer shall be thoroughly experienced in sprinkler design.

C. Final, as-built drawings shall be given to the OWNER.

D. All drawings shall be stamped by a registered P.E. in the State of Maine.

E. The CONTRACTOR shall furnish the Contractor Materials and Test Certificates per NFPA 13.

F. Provide sprinkler head guards on sprinkler heads in mechanical spaces subject to injury or located less than 7 feet from finished floor. Sprinklers shall be listed for use with head guards.

1.08 CONSTRUCTION REQUIREMENTS

A. All work performed by the CONTRACTOR shall be neat, professional and meet industry standards as defined by NFPA 13. All work shall be performed by skilled and experienced personnel.

B. The CONTRACTOR shall be responsible for all core drilling and floor, ceiling and wall penetrations and installation of pipe sleeves. Steel plate, painted escutcheons shall be used where piping passes through walls and ceilings. Provide plastic escutcheons where escutcheons have to be cut due to conflicts with molding, etc.

C. The CONTRACTOR shall be responsible for all fire proofing caused by piping penetrations.

D. The CONTRACTOR shall design and provide all piping hangers and riser clamps.

E. The CONTRACTOR shall keep the sprinkler piping as high as allowed in all public areas.

F. The new sprinkler piping will be primed and painted by GC. All painting required at wall and floor penetrations will be done by GC.

G. No bending of steel pipe is permitted.

H. Threaded joints shall not be backed off to align the pipe.

I. The CONTRACTOR shall hydro test the piping to 200 psi for a minimum of two hours and be witnessed by the OWNER=S REPRESENTATIVE. All leaks shall be repaired and the system retested. Complete CONTRACTOR=S test certification. The sprinkler contractor shall conduct an air pressure test in accordance with NFPA 13.

1.09 PAINTING

A. Keep sprinkler heads free of paint. Protective covers shall in no way impede discharge from heads or cause premature operation of system. Replace heads showing evidence of having been painted. All protective coating shall be performed by the manufacturer.

1.10 MATERIALS

A. All risers and main headers may be schedule 10 steel pipe with rolled and grooved type fittings. All distribution piping shall be ASTM A53 Grade B schedule 40 steel with threaded cast iron fittings.

B. All hangers shall be made from ferrous materials.

C. All hanger rods shall be a minimum of 3/8 inch diameter.

D. No copper, CVPC or plastic piping shall be used.

E. All materials used shall be new and traceable to ANSI standards. USA made pipe and fittings only.

F. All required signage shall be provided and installed by the CONTRACTOR. Provide signs at fire department connection, water motor gong and standpipe hose valves. Install signs at location with appropriate visibility.

G. All materials shall be UL listed materials.

H. Air compressor: Properly sized for dry-pipe standpipe and sprinkler system.

1.11 PIPE JOINTS

A. General: Cut pipe ends square, remove burrs and ream to original bore. Clean joint surfaces prior to assembly. Wipe off excess jointing compounds. All joints shall meet the requirements of NFPA 13. Welded joints are not acceptable.

1.12 PIPE HANGER AND SUPPORT INSTALLATION

A. Support, anchor and guide piping systems to withstand static and dynamic load conditions, to allow for expansion and contraction, to prevent vibration and swaying, to maintain alignment and minimize vertical deflection.

B. Exercise care in locating and placing supporting devices so that strength of structure is not weakened or impaired. Do not support piping from other piping or ductwork. Do not use wire, tape, metal bands or other make-shift devices as means of support or fastening.

C. Refer to NFPA 13 and 14.

1.13 SPRINKLER EQUIPMENT

A. Sprinkler heads: Automatic type, pendent or sidewall, frangible element to meet conditions of proper temperature rating.

B. Head guards: Provide for sprinkler heads subject to abuse.

1.14 PIPING

A. Piping shall be pressure tested at 200 psi minimum in accordance with NFPA 13.

1.15 APPROVED MANUFACTURERS

A. Use Viking, Grinnell, Central, or approved equal.

END OF SECTION

SECTION 15430

PLUMBING - DOMESTIC WATER

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of Section 15010 - General Provisions, apply to this Section.

1.02 DEFINITION AND EXTENT OF WORK

A. Plumbing shall be the work having to do with the plumbing and drainage systems (in this contract) as defined by the Code.

B. Work included: The work covered by this section of the specifications includes the furnishing of all labor, material, equipment, transportation, permits, inspections, and incidentals, and the performing of all operations in connection with the plumbing work, as indicated on the drawings and/or herein specified. All work shall be the subject to the terms and conditions of the Contract.

1.03 SUBMITTALS

A. Refer to Section 15010.

B. Submit shop drawings or catalog cuts showing water piping specialties.

C. Submit certificate of compliance for water piping disinfection.

1.04 DISINFECTION OF POTABLE WATER PIPING

A. Complete and effective disinfection of potable water piping systems after testing and acceptance.

B. Water piping: Disinfect after flushing with clean water by filling entire system or any part thereof with water solution containing at least 50 parts per million of available chlorine. Allow solution to stand in system at least 24 hours before flushing out with clean potable water.

C. In lieu of above, swab water contacting surfaces with solution containing at least 200 parts per million of available chlorine. Allow solution to stand in system for at least three hours before flushing out with clean potable water.

1.05 PROTECTION OF POTABLE WATER SUPPLY

A. Protect potable water supplies against backflow, back siphonage, cross connection and other unsanitary conditions.

B. Do not directly connect potable water to, or run within, any piping or device containing or conveying sewage, wastes, or other materials hazardous to health and safety.

C. Equip plumbing fixture supplies, other than "over-rim" type, with approved vacuum breakers or air gap fittings. Supplies equipped for hose connection must have integral vacuum breakers.

1.06 DOMESTIC WATER PIPING SYSTEMS

A. System components making contact with potable water must be of copper, copper alloy or other approved noncorrosive materials.

B. Make final connections to equipment and piping specialties with threaded brass pipe and bronze fittings. Use chrome plated piping at visible connections in finished areas.

C. Provide means of venting piping systems at high points. Provide threaded drain connection at low points.

D. Run piping with adequate separation between hot and cold and other piping. Avoid air pockets. Avoid contact with electric cables, conduits and equipment. Do not run piping over electrical equipment.

E. Do not place piping in exterior walls and unheated areas unless freeze protection is provided.

F. Provide swing joints and expansion loops to allow for pipe movement.

G. Protect system against water hammer with mechanical pneumatic type shock absorbers placed on each individual supply branch to each quick-closing fixture.

H. Provide oversized copper drain piping from piping specialties such as air vents and relief valves that automatically discharge water when operating. Pipe discharge to spill into sink or floor drain, three inches above floor in safe location, or as indicated on the Drawings.

I. Provide valve required for proper control of system and:

1. On piping to toilet rooms and other groupings of fixtures.

2. On piping to each water supplied item other than fixtures.

3. On connections to fixtures not provided with supply stop.

1.07 WATER PIPING SPECIALTIES

A. Shock absorber: All stainless steel, mechanical-pneumatic type, hermetically sealed bellows, threaded inlet; 150 psi WWP. Size and placement determination: PDI-WH 201, or as indicated on drawings.

B. Vacuum breaker: Chrome plated bronze body, noncorrosive trim, threaded inlet and outlet, suitable for 125 psi, 210EF water; Watts 288 AC.

C. Vacuum breaker - water heater: Bronze body, silicone disc, threaded inlet and outlet, suitable for 200 psi; 250EF water; Watts 36A.

D. Other equipment as shown on the Drawings.

END OF SECTION

SECTION 15440

PLUMBING - DRAINAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of Section 15010, General Provisions, apply to this Section.

1.02 SUBMITTALS

A. Refer to Section 15010.

B. Catalog Data: Manufacturer's literature and illustrations.

C. Manufacturer's specifications and engineering data.

1.03 STANDARDS

A. Floor drains: ANSI A112.21.1.

1.04 DRAINAGE SYSTEMS

A. Extend cast-iron drainage piping at least five feet beyond building exterior.

B. Slope horizontal soil and waste drainage piping at uniform minimum grade of 1/4-inch per foot for piping three inches and smaller and 1/8-inch per foot for piping larger than three inches.

C. Slope horizontal roof drainage piping at uniform minimum grade of 1/8-inch per foot for piping above grade, and 1/8-inch per foot for piping in ground, unless otherwise noted.

D. Run piping straight with gradual bends and offsets of 45E or less. Make direction changes with long radius fittings. Do not use double branch fittings on horizontal runs of piping.

E. Do not trap vent piping. Slope to drain water by gravity.

F. Terminate vent piping at least 12 inches above high point of roof including parapet; at least two feet above any window, door or ventilation opening within 10 feet horizontally.

G. Provide roof coupling to serve as counter flashing where vent pipes terminate more than 12 inches above roof surface. Use of roof coupling as cap flashing is optional.

H. Install floor drains receiving equipment drainage accessible for clearing, but where above floor piping is not a hazard to foot traffic.

I. Provide accessible cleanouts to permit snaking of drainage system with 50- foot snake; at base of vertical stacks and leaders; at ends of horizontal runs; at each change of direction greater than 45E; on handholes of running traps.

J. Position cleanouts in line with direction of flow. Provide at least 18-inch clearance to permit access.

K. Extend cleanouts on concealed piping to finish flush with finished floor or wall unless other access is provided. Terminate floor and all cleanouts with cleanout plate. Refer to Drawings for specified manufacturer.

L. Equip cleanouts with lead sealed or taper threaded cast brass raised head plug of same nominal size as piping up to 4 inches and not less than 4 inches for larger piping.

M. Make up cleanout plugs and plate covers with graphite mixed in oil.

1.05 TRAPS

A. Provide each fixture and drain not so equipped with water sealed trap located close to fixture or drain outlet. Traps are not required on roof drains. Do not use swivel traps except in concealed limited space locations.

B. Equip traps except p-traps in ground with accessible threaded brass cleanout plug.

C. Trap seals: Minimum 3-inch for traps 3 inches and larger; at least 2-inch for smaller traps.

D. Sanitary traps 3 inches and larger and traps in ground: Cast-iron. Paint threaded traps in ground with coal tar enamel and wrap with 10-mil plastic tape.

E. Sanitary traps smaller than 3 inches: Cast brass. Galvanized cast-iron traps will be accepted for fixtures, drains and equipment requiring running traps.

END OF SECTION

SECTION 15460

PLUMBING - GAS

PART 1 GENERAL

1.01 STANDARDS

A. Gas piping system in accordance with NFPA 54.

1.02 SUBMITTALS

A. Refer to Division 1. Submit shop drawings of catalog cuts showing gas specialties.

B. Coordinate installation with local utility, Northern Utilities.

PART 2 PRODUCTS

2.01 MATERIALS

A. CONTRACTOR to furnish and install the following gas piping specialties: Flexible appliance connector - GAC: AGA certified, flexible corrugated seamless copper tubing, brass end fittings.

2.02 APPROVED MANUFACTURERS

A. Flexible appliance connectors: As listed by American Gas Assoc.

B. Regulators: Fisher.

C. Meter: Provided and installed by Northern Utilities.

2.03 GAS PIPING

A. Piping inside the parking garage (except piping to the snowmelt system) shall be threaded steel, black, ASTM A120. Fittings shall be malleable iron, threaded, 300 lb., ASTM A197, ANSI B16.3.

B. Piping to the snowmelt system shall be Schedule 40 steel, welded, ANSI/ASME B36.10.

C. Exterior exposed piping shall be galvanized steel in accordance with ASTM A120.

PART 3 INSTALLATION

3.01 GAS PIPING SYSTEM

A. Slope piping to low points without sags or traps. Provide drip pockets at low points.

B. Make branch connections to top or side of horizontal piping, not from bottom.

C. Locate gas piping with adequate separation between electric cables, conduit and other piping.

D. Provide valves required for proper control of system, and:

1. On gas service at point of entry into building.

2. At connection to gas supplied items not equipped with shutoff valve.

3. At branches to gas supplied equipment.

3.02 FUTURE SNOWMELTER EQUIPMENT

A. Gas piping serving future snowmelter equipment shall be pressure tested in accordance with NFP 54.

B. Gas piping serving future snowmelter equipment shall be left inactive at completion of project, purged of all gas or pressure test medium. Shut off valve at gas meter shall be locked closed.

END OF SECTION

SECTION 15800

AIR HANDLING EQUIPMENT AND AIR DISTRIBUTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Interior sheet metal ductwork.

B. Exterior and below grade ductwork.

C. Louvers.

E. Dampers.

F. Grilles, registers and diffusers.

G. Gas radiant heaters.

H. Rooftop HVAC Unit

I. Fans.

J. Roof curbs.

K. Ductwork construction drawings.

1.02 REFERENCE STANDARDS

A. "Duct Construction and Duct Liner Application" in this specification shall refer to the first edition of the "HVAC Duct Construction Standards" as published by the Sheet Metal and Air Conditioning Contractor's National Association, Inc. Associated text shall be part of the figures and tables referred to in the specification.

B. "ADC Standard 1062R4" in this specification shall mean the "Air Diffusing Equipment Test Code" as published by the Air Diffusion Council.

C. "AMCA Publication 99" in this specification shall mean the "Standards and Recommended Practices of Air Moving Devices" as published by the Air Moving and Conditioning Association.

D. "AMCA Standard 210" in this specification shall mean the "Test Code for Air Moving Devices" as published by the Air Moving and Conditioning Association.

E. "NFPA-90" in this specification shall mean Standard 90A Installation of Air Conditioning and Ventilating Systems and/or Standard 90B Installation of Air Heating and Air Conditioning Systems, as appropriate, and as published by the National Fire Protection Association.

F. AHVAC Air Duct Leakage Test Manual@ as published by the Sheet Metal and Air Conditioning Contractor=s National Association, Inc..

G. ANFPA-96" in this specification shall mean Standard 96 Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment as published by the National Fire Protection Association.

1.03 GENERAL REQUIREMENTS

A. General requirements shall be in accordance with Section 15010, Mechanical Work General Requirements.

B. Install in-line devices furnished under Section 15900, Controls and Instrumentation.

C. Sizes and capacities not specified herein are indicated on the Drawings.

1.04 QUALITY ASSURANCE

A. Noise levels in occupied spaces shall not exceed Noise Criteria 30.

1.05 SUBMITTALS

A. Shop drawings of ductwork and casings shall be submitted and shall be double line drawings at a minimum scale of 1/4 inches to 1 foot from measurements taken at the building. These drawings shall be reviewed and signed-off by all other trades to avoid conflicts in equipment and piping installation.

PART 2 PRODUCTS

2.01 DUCT SYSTEM CLASSIFICATIONS

A. Duct system classification shall be in accordance with the recommendations of the American Society of Heating, Refrigerating and Air Conditioning Engineers, and in accordance with Table 1-1 of the HVAC Duct Construction Standards.

1. 2500 Maximum Velocity Level: Static pressure in duct 2 inches of water or less. Unless otherwise indicated, all ductwork shall be constructed for 2 inches W.G.

B. 2500 FPM velocity level ductwork includes the following:

1. Exhaust air systems.

2. Ventilating systems.

2.02 SHEET METAL

A. Galvanized sheet metal shall be new copper bearing or prime grade galvanized steel sheets of lockforming quality and shall have a galvanized coating of 1-1/4 ounces total for both sides of one square foot of a sheet. Galvanized coating that will flake or peel under forming operations or laminated sheets will not be allowed.

2.03 2500 FPM MAXIMUM VELOCITY SYSTEMS

A. Ductwork:

Interior ductwork in the CRF office ceilings, HVAC trench and parking garage first floor shall be constructed of galvanized steel in accordance with Chapter 1, Basic Duct Construction, of the HVAC Duct Construction Standards.

1. Hangers and supporting systems shall be in accordance with Chapter 4 of the HVAC Duct Construction Standards.

2. Elbows, radius - shall be in accordance with Chapter 2 of the HVAC Duct Construction Standards.

3. Elbows, vaned - shall be of double vane construction in accordance with Figures 2-3 and 2-4 of the HVAC Duct Construction Standards. Ducts larger than 24 inches in width perpendicular to the vanes may use 4 inch nominal vanes. Otherwise, vanes shall be nominal 2 inch size.

4. Transitions and offsets shall be in accordance with Figure 2-7 of the HVAC Duct Construction Standards.

5. Obstructions shall be in accordance with Figure 2-8 of the HVAC Duct Construction Standards.

6. Supply, return and parallel flow branches shall be in accordance with Figures 2-5 and 2-6 of the HVAC Duct Construction Standards. Branch connection shall be as shown in Figure 2-8 (45E entry).

7. Installation of register, grille and ceiling diffuser shall be in accordance with Figures 2-14 and 2-15 of the HVAC Duct Construction Standards. Duct drops to diffusers shall have a minimum length of two times the duct diameter or square dimension in length.

8. Sealing requirements shall be in accordance with Table 1-2 and Commentary of the HVAC Duct Construction Standards. Seal Class C shall apply to all systems of 1/2-inch W.G. and greater pressure class.

9. Ductwork in the HVAC trench at the base of the return duct riser shall be covered with asphalt coating for waterproofing.

B. Underground Ductwork

1. All underground ductwork shall be UNI-COAT® duct and fittings as manufactured by United McGill Corporation. Construction shall be polyvinylchloride (PVC) coated G-60 galvanized steel spiral duct and factory-fabricated fittings.

2. All duct and fittings shall conform to the following schedules:

Underground, Uncoated Gauge		
Diameter (Inches)	0-10 Inches wg Positive Pressure	
	Duct (SPRUCD)	Fittings (SRU)
18 - 24	22	22
26 - 32	20	20
34 - 60	18	18

3. PVC coating shall be 4 mil (0.004-inch) on the exterior surface and 1 mil on the interior surface. All underground spiral duct shall have two corrugations, approximately 3/4-inch wide, located between lockseams on the finished duct.

4. All elbows shall be constructed as follows:

   a. Elbows 9 through 30 inches shall be standing-seam construction

b. Elbows 4 through 8 inches and 31 through 60 inches shall be standard-gore construction with joints riveted and bonded, button punched and bonded, or fastened with stainless steel sheet metal material and bonded.

5. All other fittings shall be constructed with joints that are riveted and bonded, button punched and bonded or fastened with stainless steel sheet metal screws and bonded. Duct openings to 10 inches by 48 inches duct taps to return grilles shall be made at the factory. Spiral wound lockseams shall be left intact at the duct taps for structural strength.

6. All couplings shall be of slip-joint construction with a minimum 2-inch insertion length. United McGill sealant products shall be used to seal all couplings. Sheet metal screws shall be installed to provide mechanical strength at all couplings. Maximum screw spacing shall be 6 inches with a minimum of three screws per joint. Duct sealant is to be applied to the ends of fitting-size connectors before insertion, and afterwards to cover the entire joint and sheet metal screws.

7. Any damage to the PVC coating shall be repaired with UNI-COAT® touch-up paint or similar product as soon as installation of the damaged piece is completed.

8. Manufacturer's recommendations shall be strictly adhered to regarding production application and installation.

9. All ductwork below floor slab including 10-inch by 48-inch branches shall be factory fabricated. Refer to detail on drawing M4-1.

10. All underground ductwork shall be installed in accordance with manufacturer's directions to avoid damaging the ductwork. Refer to United McGill Corp. Engineering Report No. 95 for underground duct installation.

11. It will be the responsibility of the sheet metal contractor and general contractor to ensure that underground ductwork is installed in accordance with manufacturer's directions.

2.04 AUTOMATIC DAMPERS

A. Automatic dampers shall be furnished with the specified equipment as indicated or provided by the control subcontractor.

2.05 DUCT SLEEVES

A. Ducts shall be sleeved through walls not rated as fire walls or fire partitions.

B. Duct sleeves shall be fabricated from 18 gauge galvanized sheet steel. Sleeves shall be 2 inch larger than duct (or duct insulation).

C. Space between sleeve and duct (or insulation) shall be filled with a sealant specifically formulated for use as part of a through penetration smoke and fire stop system with fire resistance rating per ASTM E 814 and listed by U.L. Fire rating of sealant shall be equal to or greater than fire rating of wall in which it is installed. System shall be fire stop sealant manufactured by Dow Corning, Pensile manufactured by GE, Fire Barrier Caulk manufactured by 3M or approved equal.

2.06 ACCESS DOORS

A. Access doors shall be provided at all temperature elements, volume control dampers, instrumentation, automatic control dampers and elsewhere as required for proper maintenance,

service, cleaning and adjustment as shown in Figures 2-12 and 2-13 of the HVAC Duct Construction Standards.

B. Provide access doors required in walls and ceilings to the general contractor for installation by other trades.

C. Minimum reach through access door size shall be 12 inches by 12 inches. Larger sizes up to 16 inches by 20 inches shall be provided where possible. Doors shall have hand locks.

D. Fabricate rigid and close fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum 1 inch thick insulation with sheet metal cover.

E. Provide hinges and sash locks in accordance with Figure 2-12 of the HVAC Duct Construction Standards.

2.07 FIRE DAMPERS

A. Fire dampers shall be constructed and installed in accordance with NFPA Standard 90A and local codes. Not all fire dampers are shown, but they shall be installed in each duct that pierces a structure separating fire areas and where otherwise required to meet Codes.

B. Dampers shall be constructed with the blade outside of the air stream and shall have sleeves for mounting directly in the wall or floor opening unless otherwise specified or approved by the ENGINEER.

C. Dampers shall bear the label of Underwriters Laboratories, Inc.

D. Fire dampers shall be manufactured by Ruskin, Greenheck, NCA or approved equal.

E. Fusible links: UL33, separate at 160EF. Supply five (5) spares to OWNER.

2.08 LOUVERS

A. Louvers shall be of extruded aluminum construction not less than 12 gauge properly stiffened and constructed in a substantial frame. All louvers shall be as shown on the Drawings or approved equal.

B. All louvers shall be furnished with 14 gauge aluminum 1/2 square inch mesh insect screens.

C. Louvers shall have Kynar fluoropolymer coating finish minimum 1.2 mils total dry thickness. Contractor to furnish manufacturer's standard color sample chart for selection by ENGINEER.

2.09 GRILLES, REGISTERS AND DIFFUSERS

A. Performance of all units shall be based on tests conducted in accordance with ADC Standards 1062 R4 "Air Diffusing Equipment Certification, Rating and Test Material" and ASHRAE 70-72 "Methods of Testing for Rating the Air Flow of Performance of Outlets and Inlets." Units shall be sized in accordance with the recommendations of the manufacturer; sizes indicated on Drawings are for guidance only. Neck velocities shall not exceed maximum levels indicated on the drawings.

B. Grilles, registers and diffusers shall be of the manufacture, type, size and finish as indicated on the Drawing with a gasket to prevent leakage, and shall be securely fastened in place with screws.

C. Grilles, registers and diffusers shall be manufactured by Metalaire, Tuttle and Bailey, Carnes, Krueger, Waterloo or approved equal.

2.10 FANS

A. Fans shall be complete with motors, motor starters and drives. Fans shall deliver the specified air quantities at the specified pressures when tested in accordance with the requirements of AMCA and shall bear AMCA certified rating seal. All fans shall be statically and dynamically balanced.

B. When V-belt drives are used, motor shall be provided with adjustable rails or bases. Motor sheaves shall be adjustable to provide not less than 20 percent speed variation. Sheaves shall be of the synchronized adjustment type. Belt guards shall be provided.

C. In-line centrifugal fans shall have welded tubular steel casing, centrifugal backward inclined cast aluminum blades, stationary discharge conversion vanes, internal and external guards, and adjustable motor mounts. Air shall enter and leave the fan axially. Inlets shall be streamline with conversion vanes to eliminate turbulence and provide smooth discharge air flow. Fan bearings and drive shafts shall be enclosed and isolated from the air stream. Fan bearings shall be sealed against dust and dirt, and shall be permanently lubricated. Motors shall have drip-proof enclosure and NEMA 1 disconnect switch shall be provided. Two speed motor to be provided where specified on the schedule. Fans shall be provided with spring hanging vibration isolators, discharge guard 1/2 x 1/2 galvanized welded wire on galvanized frame) and gravity backdraft damper.

2.11 Gas Radiant Heaters: As specified on the Drawings.

2.12 Rooftop HVAC Unit: As specified on the Drawings.

2.13 ROOF FAN CURBS

A. Curbs for roof fans shall be supplied by the fan manufacturer. Curbs shall be factory fabricated of 0.081-inch sheet aluminum with all joints heliarc welded, or 18 gauge galvanized steel. Cants and roof flanges shall be an integral part of the curb. The inside of the curb shall be insulated with glass fiber thermal and acoustical lining of 1-1-/2-inch minimum thickness with a neoprene or equal coating for protection from erosion. The lining shall conform to NFPA 90A Standards, with a flame spread and fuel contributed rating not exceeding 25, and a smoke developed rating not exceeding 10. Pressure treated wood nailers shall be provided at the tops of the curbs. Curbs shall be a minimum of 12 inches high (except for kitchen exhaust fans which shall have 18-inch high curbs).

PART 3 EXECUTION

3.01 INSTALLATION OF EQUIPMENT AND MATERIALS

A. Ductwork shall be installed in accordance with the HVAC Duct Construction Standards.

B. Casings, housing and plenums for fans, coils, filters and other equipment shall be installed in accordance with Chapter 6 of the HVAC Duct Construction Standards.

C. Flexible connections at fans shall be in accordance with Figure 2-17 of the HVAC Duct Construction Standards.

D. All equipment shall be installed in strict accordance with the manufacturer's recommendations. Differences between the manufacturer's recommendations and the Drawings shall be referred to the ENGINEER for resolution.

E. Necessary supports shall be provided for equipment unless otherwise indicated.

1. Floor Stands: Stand for floor mounted equipment shall be constructed on structural steel members or steel pipe and fittings; brace and fasten with flanges grouted and bolted to floor.

2. Ceiling or Wall Mounting: Suspended platform or strap hangers, bracket or shelf, whichever is most suitable for equipment and its location, shall be provided. It shall be constructed of structural steel members, steel plates, rods as required, braced and fastened to building structures or to inserts as approved.

3. Suspended air handling units (including air conditioning and unit ventilators) shall be installed in accordance with Figure 4-9 of the HVAC Duct Construction Standards.

F. Grilles, registers and diffusers shall be installed in accordance with Figures 2-14 and 2-15 of the HVAC Duct Construction Standards.

G. All ductwork openings shall be covered during construction to prevent debris from getting into the system.

3.02 PIPE CONNECTIONS

A. Equipment water pipe connections shall be in accordance with the piping requirements in Section 15050, Basic Materials and Methods.

B. Provide a trap and drain for drip pans under coils. Traps shall have a seal below the drip pan of at least twice the static pressure rating of the fan. Drains shall be extended to the closest floor or roof drain.

3.03 CLEANING AIR HANDLING AND DISTRIBUTION SYSTEMS

A. Air handling systems shall not be activated until all filters have been installed, construction work has been completed, and debris removed from the areas served by the system. All ducts, casings, plenums and equipment shall be thoroughly cleaned and filters changed at substantial completion.

3.04 SPARE PARTS

A. The CONTRACTOR shall deliver to the OWNER one extra set of filters and belts for each air handling unit after the systems have been tested and accepted.

3.05 AUTOMATIC TEMPERATURE CONTROLS

A. Provide electric-electronic operated systems of temperature control, as noted on the drawings and as specified. Provide all necessary relays, mounting brackets, gages, switches and accessories required, even though not specifically called for, so as to result in complete workable systems.

B. Control Wiring: Install complete control wiring systems in accordance with applicable electric sections included in this specification.

C. General Notes:
   1. Install specified temperature control equipment as required for a complete and operable temperature control system.
   2. Install and properly support all ductstats, dial thermometers, thermostat bulbs, temperature controllers in the center of duct cross section, in a straight duct run.
   3. Provide averaging type elements for sensing mixed air temperatures in ductwork, with sufficient length or sufficient number of elements, so as to efficiently measure the air temperature through the entire cross section of duct.
   4. Test all electric and electronic equipment provided under this Section.

3.06 PERFORMANCE

A. Sequence of Operations: As Specified on the Drawings.

3.07 FIELD QUALITY CONTROL

A. Provide the services of a qualified engineer, in the employ of the control systems manufacturer, for the initial start-up and calibration of control systems, and the instruction of the owner.

B. Upon completion of the installation, adjustment and operational testing of control systems, a Company Field Advisor in the employ of the control systems manufacturer, shall for a period of 2 hours, instruct duly authorized owner' in the operation and maintenance of the installed systems. The aforementioned hours of instruction shall not include any time spent by field engineers in the start-up, adjustment or calibration of the systems, and this instruction time shall be as scheduled and recorded by the Owner's Representative.

END OF SECTION

SECTION 15850

ELECTRIC HEATING CABLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Division 15 shall furnish heat tracing cables and controls. Division 15 shall be responsible for installation of heating cables on piping as indicated on the Drawings and installation of low voltage control wiring. Division 16 shall be responsible for installation of controllers and group control power distribution panel and all associated power wiring and devices indicated on the electrical drawings and specifications.

1.02 REFERENCE STANDARDS

A. National Electrical Code NFPA-70.

B. Underwriters Laboratories UL 508A - Control Panels.

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 01340.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Electric Heating Cables and Controls:

1. Raychem

2. Chromalox

B. Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution by following the procedures in Section 01630.

C. Where catalog numbers are indicated in this Specification, the intent is to establish the standard of quality or to define the basic features of the product. It does not prohibit the use of equivalent equipment produced by other manufacturers. Raychem catalog numbers are used to establish the basis of design.

2.02 PIPE FREEZE-PROTECTION HEATING CABLES

A. Self-regulating heating cable shall be constructed with #16 AWG copper bus wire, temperature sensitive semi-conductive core, overall tinned copper shield and outer polyolefin chemical-resistant jacket. Heating cables shall be listed by Factory Mutual or other Nationally Recognized Testing Laboratory.

B. Service voltage: 277 volts, single phase.

C. Nominal ratings:

1. For use with 8-inch diameter steel sprinkler pipe and 6-inch diameter cast iron drain pipes: 5 watts per linear foot, similar to Raychem type 5BTV2-CR.

2. For use with 3-inch diameter copper domestic water service pipe: 3 watts per linear foot, similar to Raychem type 3BTV2-CR.

D. Furnish accessory items required by manufacturer, including feed and termination kits, mounting tape and heat trace warning labels.

2.03 SINGLE CIRCUIT CONTROLLER

A. Provide two single circuit controllers, complete with all required accessories, one for the 8-inch diameter steel sprinkler pipe and one for the 3-inch diameter copper domestic water service pipe.

B. Each controller be a self-contained unit with password protected programmable electronic circuitry to measure the pipe temperature with an RTD sensor, turn the heating cable on and off, monitor system operation and generate alarms in case of system malfunction. The NEMA 4X enclosure shall have visible digital display, status LED lights and operator controls that can be observed and operated without opening the enclosure. External connections shall consist of:

1. Input power, 277 VAC
2. RTD sensor input wiring.
3. Switched 277 VAC output to heating cable protected by adjustable ground fault trip circuit breaker.
4. Common alarm output contact, selectable as normally-open or normally closed.

C. Adjustable operation and alarm settings shall include:

1. Temperature settings for heat cable on and off control.
2. High and low temperature alarm settings.
3. Separate ground fault alarm and breaker trip settings.
4. High and low current alarm setpoints for monitoring power output to heating cable.
5. Adjustable time interval on system diagnostics to verify electrical integrity of system

D. Furnish accessory items required by manufacturer, including RTD sensor and cable, junction boxes and interconnection wiring.

E. Controller shall be similar to Raychem MoniTrace 1000 Controller.

2.04 GROUP CONTROL POWER DISTRIBUTION PANEL

A. Provide one unitized control assembly consisting of incoming line circuit breaker, main contactor, Hand-Off-Auto control switch, distribution panelboard with equipment ground fault branch circuit breakers to control the heating cable on multiple 6-inch diameter cast iron drain pipes. Furnish complete with ambient sensing thermostat to control system in AAuto@ mode.

B. System shall operate automatically when ambient sensing thermostat closes at preset temperature and energizes all the heating cable circuits simultaneously. When the ambient temperature rises above the thermostat setpoint, the system shall turn off. Should any branch circuit breaker trip, a common alarm contact shall close.

C. Incoming power shall be 480/277 volts, 3 phase, 4 wire. Each branch circuit to the heating cables shall be 277 volts, single phase. See Drawings for breaker ratings.

D. Group control power distribution panel shall be similar to Raychem type HTPG.

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish and install heating cable, including required accessory items, in accordance with manufacturer=s instructions.

B. Mount equipment at locations indicated on the Drawings.

C. Connect alarm contacts to Building Management System, as directed by OWNER. Verify alarm operation.

D. Program operational and alarm parameters into each single circuit controller. Verify proper operation.

E. Conduct operational tests of entire system to verify proper operation of each heating cable section.

END OF SECTION

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DIVISION 16 - ELECTRICAL

Section

16050 - Basic Electrical Materials and Methods

16110 - Raceways

16114 - Cable Trays

16120 - Wires and Cables

16130 - Pull and Junction Boxes

16140 - Wiring Devices

16190 - Supporting Devices

16195 - Electrical Identification

16440 - Disconnect Switches

16450 - Grounding

16461 - Dry-Type Distribution Transformers - General Purpose

16470 - Panelboards

16490 - Automatic Transfer Switches

16500 - Lighting System

16501 - Site Lighting

16520 - Lighting Controls

16670 - Transient Voltage and Surge Suppression

16680 - Lightning Protection System

16721 - Fire Alarm System

16722 - CCTV System

16740 - Telephone Service

16741 - IP-Based Communication System (PBX)

16762 - Emergency Phone Communication System

16950 - Testing, Adjusting and Balancing

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Complying with the applicable provisions of the General Conditions, Supplementary Conditions, Special State Conditions and other provisions of the Contract Documents that apply to the Work included in Division 16.

B. Complying with requirements of codes and regulatory agencies.

C. Arranging for and paying all fees for permits and inspections.

D. Installing equipment furnished by others:

1. Installing and connecting electrically operated equipment, cabinets, starters, controls, and related items furnished under other Divisions.

2. Installing conduit and wiring as required for such equipment.

1.02 WORK NOT INCLUDED

A. Digging, backfilling, blasting, pumping, shoring, concrete and work furnished by other trades.

B. Furnishing and/or installing temperature control for mechanical trades.

C. Furnishing and/or installing control devices for mechanical trades unless specified herein or on the Drawings.

D. Work specifically indicated to be done by OWNER or others.

1.03 REFERENCE STANDARDS

A. National Electrical Code (NEC.) NFPA-70.

B. Requirements of Underwriters' Laboratories, Incorporated for all items installed for which UL standards have been established.

C. State Building Code.

D. Local ordinances and regulations.

E. Utility company requirements.

F. The Standard Specifications which are referred to herein shall be the latest revisions of such Specifications.

1.04 QUALITY ASSURANCE

A. Codes and standards:

1. Comply with National Electrical Code requirements for electrical materials and installations.

2. Keep copy of National Electrical Code in field office for duration of project.

3. Provide products and components which have been UL listed and labeled, including UL marks indicating special type usage wherever applicable.

4. In each case, codes are minimum requirements.

5. It shall be understood that all codes and standards mentioned shall be those in force at the time the Contract is signed. If any code is changed during the construction period, these specifications may be changed by mutual agreement between the ENGINEER and CONTRACTOR.

6. Work shall be in accordance with regulations and rulings of all authorities having jurisdiction over the work. Any changes required to accomplish the intent of these specifications shall be the CONTRACTOR'S responsibility as to accomplishment and any extra cost for performing work.

B. Inspection certificates:

1. Deliver to the ENGINEER two (2) copies of the Electrical Inspector's certificate of approval showing acceptability of work done under this Contract.

2. Deliver to the ENGINEER two (2) copies of any other certificates of approval.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protection: Use all means necessary to protect electrical system materials before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the ENGINEER and at no additional cost to the OWNER. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the ENGINEER, at the cost and expense of the CONTRACTOR, or shall be replaced by the CONTRACTOR at his own expense.

C. Protect the work of other trades. Restore any damage caused to other trades to the condition existing prior to damage at no additional cost to the OWNER.

D. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the building.

1.06 PROJECT CONDITIONS

A. Existing conditions:

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that the electrical installation may be made in complete accordance with all pertinent codes and regulations and the original design.

3. In the event of discrepancy, immediately notify the ENGINEER.

4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

B. Coordination:

1. Coordinate the installation of electrical items with the schedules for work of other trades to prevent unnecessary delays in the total work.

2. Coordinate with all utility and telephone companies and make all installations for their services in accordance with all utility company requirements.

3. Any changes shall be done at the CONTRACTOR'S expense.

4. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, furnish and install all required supports and wiring to clear the encroachment.

5. Any work installed contrary to or without approval of the ENGINEER shall be subject to change as directed by the ENGINEER, and no extra compensation will be allowed the CONTRACTOR for making these changes.

C. Accuracy of data:

1. The Drawings are diagrammatic and functional only, and are not intended to show exact circuit layouts, number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical systems shown. Install additional circuits wherever needed to conform to the specific requirements of the equipment.

2. The locations of equipment, fixtures, outlets, and similar devices shown on the Drawings are approximate only. Field measurements shall take precedence over scaled dimensions from Drawings. Exact locations shall be as approved by the ENGINEER during construction. Obtain in the field all information relevant to the placing of electrical work and, in case of any interference with other work, proceed as directed by the ENGINEER and furnish all labor and materials necessary to complete the work in an approved manner.

3. Verify sizes and ratings of motors and other electrically operated devices supplied by others.

4. Check with ENGINEER before installation of work for outlets not specified as to location or for work that interferes with other trades.

1.07 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Indicated: The term Aindicated@ refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as Ashown,@ Anoted,@ Ascheduled@ and Aspecified@ are used it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as Adirected,@ Arequested,@ Aauthorized,@ Aselected,@ Aapproved,@ Arequired@ and Apermitted@ mean Adirected by the ENGINEER,@ Arequested by the ENGINEER@ and similar phrases.

D. Approve: The term Aapproved,@ when used in conjunction with the ENGINEER=S action on the CONTRACTOR=S submittals, applications and requests, is limited to the ENGINEER=S duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term ARegulations@ includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the Work.

F. Furnish: The term Afurnish@ is used to mean Asupply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation and similar operations.@

G. Install: The term Ainstall@ is used to describe operations at the Project Site including the actual Aunloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.@

H. Provide: The term Aprovide@ means Ato furnish and install, complete and ready for the intended use.@

I. Installer: An AInstaller@ is the CONTRACTOR or another entity engaged by the CONTRACTOR, either as an employee, subcontractor, or contractor of lower tier, for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term Aexperienced,@ when used with the term AInstaller,@ means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

2. Trades: Using terms such as Acarpentry@ is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as Acarpenter.@ It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

J. OWNER: The term AOWNER@ is used to mean Portland International Jetport.

K. Remove: The term Aremove@ means to take away, to extract, do away with and eliminate from the Project Site. All removed materials, hardware, equipment, devices, poles and related items shall be disposed of in an approved and legal manner.

L. Testing Laboratories: A Atesting laboratory@ is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.08 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards may establish different or conflicting requirements for minimum quantities or quality

levels. Refer requirements that are different but apparently equal and uncertainties to the ENGINEER for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the ENGINEER for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction of the Project is required to be familiar with industry standards applicable to that entity=s construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity, the CONTRACTOR shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Names and addresses can be furnished to the CONTRACTOR if requested.

1.09 WARRANTY

A. Guarantee all work performed and materials and equipment installed to the full extent required by the Drawings and Specifications to be free from inherent defects of material and workmanship for a period of one (1) year from the date of final acceptance.

B. Replace any material and equipment prior to the final acceptance which is corroded or otherwise damaged through the mechanical contractor=s failure to properly operate and maintain the installation during construction or retesting.

C. Keep the work in repair and replace any defective materials, equipment or workmanship upon notice from the ENGINEER or OWNER=S representative for a period of one year from date of acceptance.

D. Consider defective all material or equipment requiring excessive service during the first year of operation.

E. The date of acceptance of the project appears on the ENGINEER=S certificate of substantial completion.

1.10 INSURANCE

A. The CONTRACTOR shall, during the life of the Contract, maintain in force such insurance as is required of the General Contractor in the General Conditions of the Contract; and shall furnish the General Contractor and the OWNER with certification of such insurance before beginning work on this section of the Contract.

1.11 COOPERATION BETWEEN TRADES

A. The CONTRACTOR shall provide full information sufficiently in advance of this work so that all necessary work by other trades may be planned and installed without any delays or conflicts. The CONTRACTOR shall furnish and locate all sleeves, supports, and anchors. Failure of the CONTRACTOR to give timely notice of and to locate openings and furnish sleeves for his work shall cause him the extra expense of cutting these openings, all at no additional expense to the OWNER. The CONTRACTOR shall locate all necessary access panels, wall and floor sleeves,

and conduit penetrations through roof to complete work in advance without delay to the other trades.

B. It is not the intention of the Drawings to show every item, piece of equipment, and detail. Provide complete operating systems.

C. Install work as closely as possible to layouts shown on Drawings. Modify work as necessary to meet job conditions and to clear other equipment. Consult ENGINEER before making changes which affect the function of systems or appearance.

D. Dimensions, elevations, and locations are shown approximately. Verify all measurements in the field prior to installation.

E. ENGINEER reserves the right to order changes in layout of such items as lighting layouts, and equipment, if such changes do not substantially affect costs and if affected items have not been fabricated or installed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials and equipment shall be listed by Underwriters' Laboratories unless it can be demonstrated that no UL standards exist for a specific item or class of equipment.

B. All control panels, whether fabricated by CONTRACTOR or furnished as part of a manufactured equipment assembly, shall be constructed to standards of and contain only products and components that have been tested and labeled by UL, ETL, FM, or other OSHA approved independent testing laboratory. All control panels shall be UL listed as a complete assembly or be a UL Field Evaluated Product. The CONTRACTOR shall bear all costs related to the UL field evaluation, panel modifications and follow-up evaluations. Control panels failing to meet UL listing standards shall be removed and replaced by listed panels at no cost to the OWNER.

C. All other materials, not specifically described but required for a complete and operable electrical installation, shall be new, first quality of their respective kinds, specification grade or better, and as selected by the CONTRACTOR subject to the approval of the ENGINEER.

2.02 INTERCHANGEABILITY

A. In all design and purchasing, interchangeability of items of equipment, subassemblies, parts, motors, starters, relays and other items is essential. All similar items shall be of the same manufacturer, type, model and dimensions.

B. For ease of maintenance and parts replacement, to the maximum extent possible, use equipment of a single manufacturer.

C. The ENGINEER reserves the right to reject any submittal which contains equipment from various manufacturers if suitable materials can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.

2.03 ACCESSIBILITY

A. Verify the sufficiency and the size of shafts and chases, and adequate clearance in double partitions and hung ceilings for the proper installation of the work. Coordinate and cooperate with all other trades whose work is within the same space.

B. Locate all equipment which must be serviced, operated, or maintained in full accessible positions. Equipment shall include but not be limited to motors, controllers, switchboard and panels.

2.04 CONNECTIONS TO EQUIPMENT AND FIXTURES

A. Rough-in and make final connections of electrical to all equipment furnished under other sections. Connections shall include necessary disconnect switches, etc. Contractor shall obtain approved rough-in drawings for equipment before starting work. Rough-in work done without approved drawings shall be relocated at Contractor's expense.

2.05 PAINTING AND CLEANING

A. Painting shall be under the Architectural Sections except as stated below.

B. Metal surfaces (conduit hangers, supports, etc.) exposed to outdoors shall be given two (2) coats of rust inhibiting paint by the installing Contractor per manufacturer's instructions.

C. Conduit, steel, bolts, etc. installed in earth or below vapor barrier shall be given two (2) coats of black asphaltum. Material embedded in concrete need not be painted. Conduit protruding through concrete floors shall be plastic or bitumastic coated at the point of breach.

2.06 ELECTRICAL EQUIPMENT CLEARANCES

A. General Requirements: Provide clearance spaces between and around mechanical and electrical equipment for operation, maintenance and replacement of equipment. Minimum clearances for each item or piece of equipment shall be as stated in the manufacturer's printed recommendations or as shown on the manufacturer's printed drawings. Coordinate clearance requirements among various pieces of equipment that will be installed in close proximity with one another to eliminate equipment conflicts and interference. Prepare and submit shop drawings showing proposed equipment layouts and clearances.

B. NEC Code clearances shall be maintained at all times and shall be considered the minimum clearances allowed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all equipment and fixtures in complete accordance with the manufacturer's recommendations and all pertinent codes and regulations.

B. Thoroughly inspect all items of equipment and any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match original finish.

1. All items so repaired and refinished shall be brought to the attention of the ENGINEER for inspection and approval.

C. Upon completion of all installation, lamping, and testing, thoroughly inspect all exposed portions of the electrical installation and completely remove all exposed labels, soil, markings and foreign material.

3.02 CUTTING AND PATCHING

A. All cutting and patching shall be as described under Architectural Sections.

3.03 FLOOR AND WALL PENETRATIONS

A. Provide, locate and set all sleeves and inserts as required for this work. Prepare dimensioned floor and wall penetration drawings, showing the size and location of each penetration on every floor and in every wall which is to accommodate this work. The penetration drawings shall include, but not be limited to hangers, inserts, conduits, raceways, and curbs.

   Drawings shall be submitted to the ENGINEER in advance of the work to be done in order that adjustments may be made to the reinforcing steel, structural framing and other related work without interruption to the construction schedule. All sleeves, collars, hangers, inserts, etc. shall be installed in accordance with the penetration drawings prior to constructing floors and walls. Each contractor shall be responsible for any drilling and as approved by ENGINEER.

B. Should the penetration drawings be incomplete the contractor shall bear the full cost of all work for the cutting and patching required to make the correction.

C. Where sleeves are placed in exterior walls below grade, the space between the conduit and the sleeve shall be packed with "Link-Seal" and made completely watertight.

D. Where conduit motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement. Check floor and wall construction finish to determine proper length of sleeves for various locations, make actual length to suit the following:

   1. Terminate sleeves flush with walls, partitions, and ceiling.

   2. In areas where conduit is concealed, as in chases, terminate sleeves flush with floor.

   3. In all areas where conduit is exposed, extend sleeves 1/4" above finished floor, except in rooms having floor drains, where sleeves shall be extended 3/4" above floor.

E. Sleeves shall be constructed of 24 gauge galvanized sheet steel with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of galvanized steel pipe.

F. Fasten sleeves securely in floors, walls, etc. so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.

G. Where conduits pass through floors or rated walls, the openings around the conduits shall be sealed with 3M fire sealing compound. Conduit floor penetrations within rated chases shall be sealed with smoke barrier sealants. The 3M type sealant used shall be approved by the local authorities having jurisdiction and carry U.L. listing for rating of assembly.

3.03 ELECTRICAL CONNECTIONS TO EQUIPMENT AND SYSTEMS

A. Equipment wiring shall be as follows:

   1. All wiring shall be provided under Division 16 except the following which shall be provided under Division 15:

      a. All associated temperature control wiring as described under Section 15950.
      b. All associated control wiring for equipment described under Section 15950 and other control wiring required to be provided by Division 15.

   2. All starters for HVAC and plumbing systems not factory mounted on equipment shall be furnished under Division 16 and installed under Division 16. Heating elements for starters shall be provided under Division 16 and installed under Division 16.

3. All control items connected shall be marked plainly by painted letters or approved nameplate on the equipment that is controlled, to the approval of the ENGINEER.

4. The horsepower rating of all starters shall be checked against actual motor to be controlled, before installation, and correct size overload elements shall be provided in all starters based on nameplate and manufacturer's recommendation.

5. After all circuits are energized and completed, the power wiring responsibility shall be under the Division 16 and control wiring responsibility under the Division 15. Motors and controllers shall be provided for voltage and current characteristics as indicated in Division providing the equipment. In the event that equipment provided is of different electrical characteristics than the ones specified, any increase in electrical feeders, conduits, circuit breakers, etc., including increase of labor cost shall be the responsibility of the Division which provided the equipment of different characteristics than those specified.

6. All power wiring complete from power source to motor or equipment junction box, including power wiring through starters shall be furnished and installed under Division 16.

B. Life safety equipment and wiring including related to emergency lighting fixtures and exit signs also fire alarm system shall be separately wired from normal branch circuit wiring related to general lighting and power circuits.

1. Fire Alarm System Interfaces:

a. The following shall be furnished under Division 15; installed and wired by Division 16.

(1) Duct mounted smoke and/or fire detectors related with mechanical systems (i.e., as required in ducts, plenums, air shafts, air handling units, etc.). Detectors shall be mounted under Division 15; wired by Division 16.

(2) Provide all wiring and necessary appurtenances to perform the necessary functions for shut down of equipment as required by NFPA 90A.

(3) Duct mounted smoke and/or fire detectors related with mechanical systems shall have additional contacts as required for the fire alarm system connection under Division 16.

C. Elevator: Power connections to elevator equipment shall be as follows:

1. The following shall be provided under Division 16:

a. Power to disconnect switch for each elevator motor, controller and car lights. Connect from each disconnect switch to the associated elevator controller. Coordinate with elevator equipment supplier.

b. Power and telephone outlets at midpoint of car travel and elevator machine room.

c. Furnish and install lights, disconnects, auxiliary contacts, cut-off switches, and receptacles in the elevator pits, shafts and elevator machine room per National Electrical Code, ANSI Elevator Code and local code requirements. Provide necessary elevator recall appurtenances as required for a functional system and interface to fire alarm system.

d. Coordinate all electrical work in connection with the elevators with the elevator contractor. Obtain information on power requirements, voltage, HP, and phone prior to installation of equipment supplied under the architectural section specifying the elevator equipment. Provide ground fault protected duplex receptacle, as well as wall

mounted vapor-tight incandescent lighting fixture and switch within the elevator pit as required by elevator manufacturer.

e. Provide, install and connect required smoke and fixed temperature fire alarm detectors as required by elevator code/state codes including necessary shunt-trip requirements for feeder servicing elevator equipment. Provide necessary control wiring and related devices for a functional system.

END OF SECTION

SECTION 16110

RACEWAYS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing conduit and couplings.

B. Furnishing flexible conduit.

C. Furnishing nonmetallic conduit.

D. Furnishing underground ducts.

E. Installation.

1.02 REFERENCE STANDARDS

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. NEMA RN1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

D. NEMA TC2 - Electrical Plastic Tubing and Conduit.

E. NEMA TC3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

F. NEMA TC14 - Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings.

G. National Electrical Code, NFPA-70.

H. UL 1 - Flexible Metal Conduit.

I. UL 5 - Surface Metal Raceways and Fittings.

J. UL 6 - Rigid Metal Conduit.

K. UL 360 - Liquid-Tight Flexible Steel Conduit.

L. UL 514B - Fittings for Conduit and Outlet Boxes.

M. UL 651 - Schedule 40 and 80 Rigid PVC Conduit.

N. UL 797 - Electrical Metallic Tubing.

O. UL 886 - Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

P. UL 1242 - Intermediate Metal Conduit.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Conduit:

1. General Electric
2. National
3. Republic
4. Triangle
5. Carlon
6. RobRoy Industries

B. Fittings:

1. Appleton
2. Crouse-Hinds
3. Killark
4. Pyle-National
5. Thomas & Betts
6. O.Z. Gedney

C. Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution.

2.02 MATERIALS AND COMPONENTS

A. Conduit:

1. Rigid threaded, galvanized steel, ANSI C80.1, UL 6.
2. Intermediate galvanized metal conduit (IMC), UL 1242.
3. Electrical metallic tubing (EMT), ANSI C80.3, UL 797.
4. Rigid PVC, schedule 40, NEMA TC2, UL 651.
5. Plastic-coated rigid steel and IMC conduit, NEMA RN1, Type 40 (40 mils thick), with matching PVC coated fittings.

B. Fitting and couplings:

1. Threaded for rigid and IMC.
2. Compression for EMT.
3. Solvent weld for PVC, NEMA TC3.
4. Ferrous fittings shall be cadmium or zinc-coated, UL 514B.
5. Fittings for use in hazardous locations, UL 886.
6. Watertight fittings shall be utilized in the garage.

C. Flexible conduit:

1. Flexible steel conduit, UL 1.
2. Flexible steel conduit with liquid tight PVC jacket and liquid tight connectors, UL 360.

D. Surface metal raceway and fittings, UL 5, two-piece painted steel, totally enclosed, snap cover type. Provide multiple outlet-type raceway with grounding-type receptacles where indicated. Color by ARCHITECT.

E. Nonmetallic duct:

1. Rigid PVC, Schedule 40, NEMA TC2, UL 651.

2. Duct spacers: Fabricated plastic.

F. Bushings:

1. Bushings for 1-inch conduit and smaller shall be self-extinguishing thermoplastic type, 150EC temperature rating.

2. Bushings for 1-1/4-inch conduit and larger shall be malleable iron body grounding type with 150EC insulating ring. Insulating material shall be locked in place and nonremovable.

2.03 TYPE

A. Use rigid steel conduit for:

1. All conduit installed in and on parking garage.

2. Runs mounted on exterior wall or on exterior yard structures subject to damage.

3. Masonry penetrations. Pierced walls above grade may be continued on either side with EMT connected by couplings designed for tight fitting EMT to rigid connections.

B. Intermediate metal conduit may be used in place of rigid at exposed above grade not subject to damage.

C. Make connections to motors and equipment with PVC jacketed flexible conduit and liquidtight connectors. Minimum size 1/2 inch for motor connections. Provide sufficient length of flexible conduit to avoid transmission of vibration. Liquidtight jacket is not required in dry, non-process locations for lighting fixture connections or motor connections.

D. For underground conduits under slabs or between buildings and yard structures, use rigid PVC conduit or fiberglass duct with plastic spacers and concrete encasement or sand encasement as per the drawings.

E. Utilize electrical metallic tubing for feeders to panels or branch circuits above hung ceilings or within wall assemblies where type MC cable is not used in elevator lobbies and elevator room

F. Use PVC conduit for lighting protection system down conductors.

2.04 MANHOLES AND HANDHOLES

A. Manholes shall be specified under Section 03480, Precast Manholes.

B. Handholes shall be specified under Section 16130, Pull and Junction Boxes.

PART 3 EXECUTION

3.01 INSTALLATION

A. All wiring, including low voltage systems, fire alarm and security systems shall be in conduits or raceways where type MC is not used. Minimum conduit size shall be 3/4-inch unless indicated otherwise.

B. Install conduit as indicated on the Drawings; conceal wherever possible.

C. For exposed runs, attach surface mounted conduit with approved type clamps. Rigid steel conduit clamps shall be cast type.

D. Exposed conduits in equipment areas shall be supported at least every 10 feet and as required using galvanized or corrosion resistant hangers such a Kindorf, Steel City or Globe Strut. Suspended conduits shall have sway bracing. Exposed conduits shall be run parallel or perpendicular to building walls, structural members and building lines.

E. Install conduit free from dents and bruises. Plug ends to prevent entry of dirt or moisture with devices made for such purposes; newspapers, rags, etc., not allowed.

F. The complete conduit system in the area involved shall be installed complete before conductors are pulled.

G. Clean out conduit before installation of conductor. Alter conduit routing to avoid structural obstructions, minimizing crossovers.

H. Allow minimum of 6 inches clearance at heat sources.

I. Coordinate installation of conduit in masonry work.

J. Use conduit unions where union joints are required, do not use running threads.

K. Install accessible pull boxes (in building interior) in runs over 100 feet or with more than three 90E bends or equivalent.

L. All empty conduits smaller than 2-inch shall have a nylon (#18 twisted nylon twine) pull wire and terminate in accessible junction boxes or have accessible capped ends for future use.

M. Use E.Y.S. seal fittings for all conduits leaving hazardous areas.

3.02 CONDUITS

A. Provide protection for conduit in areas subject to vehicle traffic.

B. Where conduits are installed in concrete slabs, on the ground, underground, or exposed to the weather, make all joints liquid tight and gas tight.

C. When installed in concrete or underground, apply two coats of approved asphaltum paint to metallic conduits.

D. Bury all underground conduit, except under concrete slabs placed on fill, to a depth of at least two feet below finished grade unless otherwise indicated on the Drawings.

E. Slope ducts to drain away from buildings into manholes and/or handholes. Adjust final slopes to coordinate with existing site utilities.

F. Install on undisturbed soil where possible. Concrete encase/sand encasement for conduits as shown on Drawings. Use pit run gravel and sand, placed 8 in. lifts and compacted for backfill.

G. After installation, clean and swab ducts.

H. Cap spare ducts with an approved cap.

I. Do NOT install conduit larger than one inch in concrete slabs.

J. Install UL approved expansion fittings complete with grounding jumpers where conduits cross building expansion joints. Provide bends or offsets in conduit adjacent to building expansion joints where conduit is installed above suspended ceilings.

K. Install accessible pull boxes in runs over 150 feet at exterior locations or with more than three 90E bends or equivalent.

L. CONTRACTOR shall provide and install UL approved fire seals and/or firestopped methods between ceilings, partitions and fire resistance rated walls around openings used for electrical penetrations. In no case shall openings remain where conduits for panel feeders/branch circuits are routed between walls and/or floors.

M. Seal conduit with approved sealing compound where conduits leave heated area and enter unheated area.

N. Provide flashing and pitchpockets making watertight joints where conduits pass through roof of waterproofing membranes.

O. Conduits shall be free of any burrs, foreign objects and water prior to conduit installation.

P. Conduit placed against concrete or masonry above ground shall be fastened to the concrete or masonry with pipe straps or one screw clamp attached to the concrete by means of expansion screw anchors and screws. "Caddy Clip" type hangers or straps will be permitted only in nonexposed areas and restricted to 1/2-inch and 3/4-inch conduit or for type "MC" cable where permitted.

Q. Conduits run to and from cabinets shall be run neatly, in accurate manner, and shall emerge from the floors and ceilings at right angles thereto.

R. Provide wall flanges and gasketing on conduits entering fan housings to minimize air leakage at points of penetration of housing.

S. Conduit risers shall be rigidly supported on the building structure, using appropriate supports only.

T. Installation of conduit in concrete structure shall conform to the requirements of ACI "Standard for Reinforced Concrete," unless other indicated.

U. Conduit embedded in concrete shall be located by the trades concerned, between the bottom and top reinforcements. Where cross-overs are necessary, they shall not displace reinforcement from its required position. Conduit parallel to reinforcing steel shall not be supported by or tied directly to the steel. It shall be supported on bar chairs or support bars provided solely for that purpose.

V. Conduit stub-ups and stub-downs shall be arranged in a neat and orderly manner and shall emerge at right angles to floors or ceilings.

W. Conduits shall be separated by at least 12" from parallel runs of hot water piping.

X. In equipment spaces, such as fan rooms, plenums, etc., conduits and outlets may be exposed, but shall avoid interference with ventilating ducts, piping, etc.

Y. Exposed conduit installed on or adjacent to ventilating ducts shall be installed after the ducts are in place, and shall be run from ceiling or wall junction boxes in such manner as to retain accessibility to junction box covers and to permit future removal or replacement of ducts.

Z. Conduits and other electrical items shall not be fastened to or supported from ventilating ducts, but shall be separately supported. The method of supporting and details of the supporting members shall be reviewed by the Owner's Representative. In no case shall screws penetrate the sheet metal of the ducts.

AA. Exposed conduit run on surface shall be supported according to code with 3'-0" of each outlet, junction box or cabinet, by galvanized malleable conduit clamps and clamp backs. Suspended conduits shall be supported every 5'-0" by conduit hangers and round rods or, where 2 or more conduits are run parallel, by trapeze hangers suitably braced to prevent swaying.

BB. Screws for exposed exterior work shall be stainless steel, unless noted otherwise.

CC. Cadmium plated steel screws may be used for interior dry locations only.

DD. No running threads shall be cut or used.

EE. Flexible connections, where required, shall be made with flexible metallic tubing 1/2-inch minimum size or sized in accordance with code, except in areas where such connections will be exposed to oil, grease, water, or where installed out of doors. In those areas of adverse exposure, flexible connections shall be made with UL listed liquid tight flexible steel conduit. Grounding conductors with green colored insulation shall be extended through all flexible connections including fixture "whips", and fastened to terminals within the first junction boxes on either side of the flexible length.

FF. Conduit shall be installed in such manner as to insure against the collection of trapped condensation, and runs of conduit shall be without traps wherever possible. Drill 1/8-inch diameter weep hole where necessary.

GG. Joints in conduit run underground or in slabs on ground shall be made watertight with copper base anti-corrosive conductive compound.

HH. Conduits larger than 2-inch which are installed at this time and left empty for future use and which are 5 feet or more in length, including all telephone and communication conduits shall have a non-ferrous, 600 lb. Tensile strength drag line left in place for future use. All empty conduits including conduit stubs shall be tagged at all exposed ends with tags identifying the location of the end of conduit.

II. In all instances where recessed type panelboards are installed, provide four 1" spare conduits. These conduits shall extend between the panelboard cabinet and a junction box located accessible above the ceiling construction.

JJ. Where conduit is installed in wet locations, vertical runs or exposed to the weather, use watertight fittings.

KK. All conduit or raceways passing through walls, floors, partitions, slabs, etc., shall be tightly sealed.

LL. At each building expansion joint and in each straight uninterrupted run of surface mounted conduit and vertical risers in excess of 200' an appropriate expansion fitting shall be provided, and the distance between fittings as installed shall not exceed 200 linear feet.

END OF SECTION

SECTION 16114

CABLE TRAY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing cable tray system.

B. Furnishing associated fittings, supports, ground straps and hardware for a complete and functional system.

C. Installation.

1.02 REFERENCE STANDARDS

A. National Electrical Code, NFPA-70.

1.03 SUBMITTALS

A. Submit catalog information data in accordance with Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Cable Tray:

1. Square D
2. B-Line Systems
3. PW
4. Chalfant
5. Cope
6. Atlas

2.02 MATERIALS

A. Cable trays shall be of ventilated ladder-type construction with widths and depths as indicated. The tray shall be center supported or wall mounted.

1. Cable tray:

a. Tray shall be a ladder-type tray constructed of carbon steel pregalvanized or post-galvanized. Rungs shall be spaced at 9" O.C.

b. Nominal depth: 4 inches.

c. Nominal width: 24 inches/12 inches per drawings.

d. Finish shall be elector-plated zinc galvanizing applied to an average thickness of 0.7 mils to 0.8 mils.

e. Loading: Cable tray shall be installed and supported per manufacturer's suggested span load criteria. Tray shall have a NEMA loading class of 12B.

f. Provide as part of shop drawings sway and seismic bracing design. The design shall be based on 1999 BOCA codes for a seismic hazard exposure group 3. Use an effective peak velocity related acceleration (A) of 0.10.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cable tray shall be ceiling hung and supported at least every 8 feet and as required by the manufacturer using galvanized or corrosion resistant threaded rod and galvanized steel channel. The cable tray shall be run parallel or perpendicular to building walls, structural members and building lines. Install sway and seismic bracing.

B. Install tray free from dents.

C. The complete tray system in the area involved shall be installed complete before conductors are installed.

D. The tray system shall be installed per the manufacturer's installation instructions.

E. At each building expansion joint and in each straight uninterrupted run of cable tray an appropriate expansion fitting shall be provided or the tray shall be interrupted by a minimum of 3-inch gap between tray and the distance between fittings as installed shall not exceed 200 linear feet.

F. Coordinate height of tray and location with mechanical ducts and piping systems to allow access to the cable tray as well as maintaining a flat assembly above the suspended ceiling.

END OF SECTION

SECTION 16120

WIRES AND CABLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing wires and cables.

B. Furnishing wire connections.

C. Installation.

1.02 REFERENCE STANDARDS

A. National Electrical Code (NEC) NFPA-70.

B. UL 83 - Thermoplastic Insulated Wires and Cables.

C. UL 486A - Wire Connectors for Use with Copper Conductors.

D. UL 486 C - Splicing Wire Connectors.

E. UL 510 - Insulating Tape.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Building wiring:

1. General Cable
2. Pirelli
3. National
4. Rome
5. Triangle
6. American Insulated Wire
7. Houston Wire & Cable

B. Fire alarm wiring:

1. Belden
2. Alpha
3. Clifford
4. Carol

C. Wire connectors and splices:

1. Ideal

2. Buchanan
3. Minnesota Mining (3M)

4. Burndy
5. Ilsco
6. Etcon

D. Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution.

2.02 MATERIALS

A. Service entrance conductors (in conduit):

1. 98 percent conductivity copper.
2. 600 volt insulation, type RHH/RHW-2, USE-2.
3. Stranded per ASTM B-8.
4. Temperature 90°C.
5. Voltage: 600 V.

B. Building wiring (in conduit):

1. 98 percent conductivity copper.
2. 600 volt insulation, type THWN-THHN.
3. Stranded conductor: #12 AWG and larger.
4. Minimum branch circuit: #12 AWG.
5. Minimum control wiring: #14 AWG, unless otherwise indicated.
6. Temperature: THHN 90°C dry and THWN 75°C wet.
7. Voltage: 600 V.
8. Where installed in cable tray, cable shall also be UL listed for such use.

C. Fire alarm:

1. Wiring for fire alarm system shall be #18 through #12 AWG, copper stranded (as required by system installed) type FPL, 105°C identified as power limited protective signaling, circuit cable (UL) 300 volt. Wiring shall be of the type/style as approved by the State of Maine, UL listed 1569 and be rated as plenum rated where used in air handling plenums in the building.

D. Multi-conductor cable (type MC):

1. Type MC (metal clad cable) may be used for branch circuits and feeders including power, lighting, and control per Article 330 of NEC where systems are concealed within ceilings and walls.

2. Type MC cable shall bear UL 1569 listing and be rated 600 volt, 90°C. Size per drawings.

3. Jacket: Galvanized steel armor or aluminum armor.

4. Assembly: Complete with binder tape, marker tape and THHN conductors including green insulated ground wire.

5. Where MC cable is used for branch circuits supplying computer system, utilize cable manufactured by AFC complying with U.L. 1569 size #12 AWG for the power wiring, #12

AWG for the neutral, #12 AWG for isolated ground, and #12 for equipment ground. An individual neutral is required for each branch circuit, no shared neutrals.

E. Data/voice multi-conductor cable:

1. Install and provide as indicated on plans and risers.

F. Splices:

1. No. 10 and smaller with 600 volt pressure type insulated connector of wire-nut type, or equal; soldered and crimped type not allowed. Ideal type "wire nut" Buchanan type "B-Cap" and Minnesota Mining (3M) type "Scotchlok."

2. No. 8 and larger with solderless lugs or solderless connectors of Lock-tite or similar type properly taped with plastic insulating tape, Minnesota Mining Co. #33, or equal, then two half-lap servings of friction tape, Manson, or equal.

3. Wire connector systems for use with underground conductors shall be UL listed specifically for such use.

PART 3 EXECUTION

3.01 INSTALLATION

A. Wire and cables:

1. All power wiring and cables shall be installed in conduit of size and type indicated on Specifications and Drawings or be of type MC cable where concealed in ceilings or walls.

2. Wire and cables shall be carefully drawn without injury to insulation and cable covering. Tails of ample length (not less than 8 inches) for splicing and connections shall be left. Pulling lubricant shall consist of soap, talc, mica or the like designed to have no deleterious effect on the cable.

3. Conductors shall be of the same size from panels to every outlet except where homeruns are to be increased for voltage drop.

4. For power wiring, No. 12 wire shall be the smallest used on the job and all wire on the Drawings is that size unless otherwise shown on the Drawings or specified herein under various uses. L.V. cable shall be plenum type and may be permitted to be run without conduit except where protection is needed at exposed locations.

5. Green shall be used for grounding conductors only and shall not be current carrying conductors.

6. All feeder and branch circuit wiring shall be color coded at all termination and splice locations. System neutrals shall be designated in addition to phase conductors. Equipment grounds shall be green.

7. The number of conductors shown on the Drawings is not necessarily the correct number required. As many conductors as are required in each case shall be installed. Grounding conductors are not scheduled.

8. Unless otherwise specified, all conduits, wires, and cables that are required to make the electrical connections to equipment, shall be furnished and installed. All connections to equipment shall be made as shown, specified, and directed, and in accordance with the approved shop and setting Drawings.

9. In general, control wiring is not shown on the Plans. Refer to individual equipment specifications, manufacturer's shop drawings for information.

10. Control wiring for low voltage wiring systems shall be color coded with tracers, no solid colors, 300 volt minimum insulation, #20 AWG minimum size. Where wiring extends outside equipment, provide overcurrent protection in accordance with wire size per NEC Low voltage control wiring, fire alarm wiring and security wiring shall be run with conduit and routed in a neat and workmanlike manner.

11. Control wire color coding shall be colors other than used for branch circuits and shall be a different color for different circuits in entering and leaving the same enclosure.

12. Lace or clip groups of feeder conductors at distribution enters, handholes, pullboxes and wireways.

13. Provide copper grounding conductors and straps.

14. Use wire pulling lubricant for pulling No. 4 AWG and larger wire.

15. Install wire in conduit runs after concrete and masonry work is complete and after moisture is swabbed from conduits.

B. Low voltage control/fire alarm system wiring:

1. Wiring shown on the Drawings or as required by the manufacturer of the fire alarm or low voltage system shall be routed through the equipment as required by the manufacturer of those systems.

2. The CONTRACTOR shall furnish and install all conduit, junction boxes, pull boxes, fittings, supports, wire, cable and all appurtenances and connections for complete, operable systems.

C. Splices:

1. Splice only in accessible junction or outlet boxes. Junction and outlet boxes shall be so located within 18 inches of the accessible suspended ceiling as to provide access to the enclosed wiring systems.

2. Insulate all splices with a minimum of two half-lapped layers of vinyl plastic electrical tape when insulation is required.

3. Tape all joints with rubber tape, 1-1/2 times the thickness of the conductor insulation, then cover with friction tape or vinyl plastic electrical tape.

4. Matching UL listed insulating covers for use with connectors shall be acceptable in lieu of taped joints.

5. Use UL listed splices for all underground wires: Direct buried, in conduits and in ducts. Connectors and splices shall be waterproof.

D. Data/voice system wiring:

1. A minimum separation between pathways and power wiring of 208/480 volts or less shall conform to the following table:

SEPARATION OF TELECOMMUNICATIONS PATHWAYS FROM 208/480V POWER LINES

Condition	Minimum Separation Distance <2 kVA	2-5 kVA	>5 kVA
Unshielded power lines or electrical equipment in proximity to open or non-metal pathways.	127 mm (5 in.)	306 mm (12 in.)	610 mm (24 in.)
Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway.	64 mm (2.5 in.)	152 mm (6 in.)	305 mm (12 in.)
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway.	--- ---	76 mm (3 in.)	152 mm (6 in.)

3.02 COLOR CODE

A. 208Y/120 volt, three phase, four wire system:

1. Hot phase A - Black.
2. Hot phase B - Red.
3. Hot phase C - Blue.
4. Neutral - White.
5. Switch leg - Other than phase wire color.
6. Ground - Green, if insulated.
7. Isolated ground - Green with white tracer/or with other approved method of identification.

B. 480Y/277 volt, three phase, four wire system:

1. Hot phase A - Brown.
2. Hot phase B - Orange.
3. Hot phase C - Yellow.
4. Neutral - Gray.
5. Switch leg - Other than phase wire color.
6. Ground - Green, if insulated.

C. 240/120 volt, single phase, three wire system:

1. Hot phase A - Black
2. Hot phase B - Red
3. Neutral - White
4. Switch leg - Other than phase wire color
5. Ground - Green, if insulated
6. Isolated ground - Green with white tracer/or with other approved method of identification.

END OF SECTION

SECTION 16130

PULL AND JUNCTION BOXES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnishing outlet boxes.

B. Furnishing pullboxes.

C. Furnishing junction boxes.

D. Installation.

1.2 REFERENCE STANDARDS

A. UL 50 - Cabinets and Boxes.

B. UL 514A - Metallic Outlet Boxes.

C. UL 514B - Fittings for Conduit and Outlet Boxes.

D. UL 886 - Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Steel boxes:

1. Appleton
2. Raco
3. Steel City

B. Cast boxes:

1. Crouse-Hinds, type FS.
2. Killark
3. Appleton

C. Plastic boxes (PVC):

1. Carlon

D. In-ground pull and junction boxes:

1. Quazite "Composolite" (Strongwell)

E. Substitutions: Products of equal quality, detail, function and performance are acceptable.

2.2 MATERIALS

A. Outlet boxes:

1. Boxes: Hot dip galvanized, 1.24 oz. per square foot or cadmium plated, conform to UL requirements.
2. Interior boxes in and on parking garage: Cast type, heavy duty.
3. Exterior boxes: Cast, deep type.
4. For flush mounting in walls: Boxes with matching plaster cover for single or two-gang outlets. For larger boxes, use solid type or special units. In masonry use deep boxes.
5. Boxes shall be not less than 1-1/2 inches deep, of physical size as required by NEC for the number and size of conductors involved; shall be securely mounted to the building structure with supporting facilities independent of the raceways entering or leaving. Gang boxes shall be used on multiple outlets.
6. Outlet boxes and covers shall be sheet steel knockout type, zinc-coated or cadmium-plated and shall be of proper code size for the number of wires of conduits passing through or terminating therein, but in no case shall any box be less than 4 inches square, or boxes at end of a run and containing a single device may be of the "hard box" type. Covers for flush outlets shall finish flush with plaster or other finished surface. Approved factory-make knockout seals shall be used in all boxes where knockouts are not intact. Boxes in concrete shall be a type which will allow the placing of conduit without displacing the reinforcing bars. Additional pull boxes shall be installed as required to facilitate pulling of wires.
7. Outlet boxes for lighting fixtures shall be equipped with fixture supporting devices.
8. Sheet steel type outlet boxes for switches shall be of the gang type.
9. Outlet boxes for exterior use shall be of the weatherproof cast metal type, with threaded hubs.
10. Boxes shall be separated to prevent sound transmission. Back-to-back boxes shall not be used. All raceway interconnecting common area rooms shall be sealed with duct seal.
11. Outlet boxes shall be provided with suitable plaster rings and covers or plates.
12. Unused knockout holes shall remain closed and those opened by error shall be closed with snap-in blanks.
13. Outlet boxes shall not be smaller than required by code for the number and size of wires to be installed.
14. Outlet boxes installed in plenum ceilings shall be in accordance with applicable codes.
15. Outlet boxes for exposed interior work and all exterior work shall be cast metal or alloy with screw-fastened covers and gaskets, and with threaded conduit connections. Fasteners shall be stainless steel or brass.

B. Pull and junction and boxes:

1. Pullboxes and junction boxes: Metal construction, conforming to National Electrical Code (NEC) with screw-on or hinged cover.
2. Flush mounted pullboxes: Provide overlapping covers with flush-head cover retaining screws, prime coated.
3. Enclosure types shall be used as follows:

a. NEMA 1 - Interior locations, dry.

b. NEMA 3R/12 - Exterior and wet locations on outdoor structures where moisture is present or as indicated on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Outlet boxes:

1. Surface mount outlet boxes for exposed conduit runs and above accessible type suspended ceilings. Junction and outlet boxes, above accessible type suspended ceilings, shall be so located within 18 inches of the suspended ceiling to provide access to the enclosed wiring system.

2. Adjust position of outlets in finished masonry walls to suit masonry course lines.

3. Coordinate cutting of masonry walls to achieve neat openings for boxes. Use rotary cutting equipment to cut masonry work for installation of electrical fittings.

4. Locate boxes in masonry walls so that only a corner need be cut from masonry units.

5. Do not use sectional or handy boxes unless specifically requested.

6. Adjust outlet mounting height to agree with required location for equipment served.

7. Outlet boxes for switches, receptacles, telephones, etc. shall be concealed.

8. Wall boxes in block construction shall be masonry boxes with inside ears and shall be concrete tight.

9. Outlet boxes shall be installed at all lighting fixtures.

10. Outlet boxes with vertical runs of conduit shall

B. Pull and junction boxes.

1. Locate pullboxes and junction boxes as required. All junction boxes for circuit homeruns are to be located above the suspended ceiling in an accessible location. At no time shall a junction box for a circuit homerun be located in the wall.

2. Steel enclosed wireways and auxiliary gutter may be used at grouped equipment locations and at other locations where multiple circuits are run, when such use is accepted by the ARCHITECT.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing wall switches.

B. Furnishing receptacles.

C. Furnishing cover plates.

D. Installation.

1.02 REFERENCE STANDARDS

A. NEMA WD1 - Wiring Devices.

B. UL 20 - General-Use Snap Switches.

C. UL 498 - Attachment Plugs and Receptacles.

D. UL 943 - Ground Fault Circuit Interrupters.

1.03 SUBMITTALS

A. Submit catalog information in accordance with Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Wall switches, receptacles and cover plates:

1. Arrow Hart
2. Pass & Seymour
3. Bryant
4. Hubbell
5. Leviton
6. General Electric

B. Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution by following the procedures in Division 1.

2.02 MATERIALS

A. Provide factory-fabricated wiring devices complying with NEMA Standards Publication WD 1, unless otherwise indicated.

B. Wall switches:

1. Wall switches: NEMA specification heavy-duty class; rated at 20 amperes, 120/277 volts; AC quiet slow-make, slow-break design; toggle handle with totally enclosed case; mounting yoke insulated from mechanism; side and back wiring, metal plaster ears.

Provide matching two poles, 3-way and 4-way switches. Hubbell cat. series 1221, 1222, 1223, 1224

2. Switches shall be horsepower rated when used to control motor loads.

C. Receptacles:

1. Standard heavy-duty specification grade duplex receptacles: NEMA heavy-duty class; 2-pole, 3-wire grounding with green hexagonal equipment ground screw; ground terminal and poles internally connected to mounting yoke; rated at 20 amperes, 125 volts, back wiring, metal plaster ears; NEMA configuration 5-20R unless otherwise indicated. Hubbell cat. 5362.

2. Ground fault interrupter receptacles: Rated 20 amperes and include built-in test and reset buttons. Feed through feature shall protect standard receptacles located downstream. Hubbell cat. GF-5362.

3. Surge suppression receptacles: Specification grade rated 20 amperes, 125 volt, as specified on the drawings. Hubbell cat. 5352-S.

4. Isolated ground receptacles: Specification grade rated 20 amperes, 125 volt, as specified on the Drawings. Color - orange. Hubbell Cat. IG5362.

5. Special purpose outlets: NEMA heavy-duty class, grounding type; with matching plug.

D. Cover plates:

1. Provide plates for all outlets with opening configuration suitable for devices to be covered.

2. Design and finish of switch and receptacle plates in the same area shall match in all respects.

3. Covers for "FS" or "FD" boxes shall be corrosion resistant.

4. Device wall plates in general shall match the device in color. In mechanical areas such as equipment spaces, steel plates shall be used. Weatherproof plates shall be used where exposed to the weather.

5. In general, the color of devices and plates shall be as selected by the ARCHITECT. Verify with architectural finish schedule.

6. Exterior and interior wet locations: Plastic, conforming to NEC Art. 406.8(B); weather-proof; gasketed lift lids for devices; corrosion resistant screws to match plate cover finish. Tay Mac standard cover style - vertical mount.

7. One-piece construction with matching screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

1. The location of all devices shall be subject to the acceptance of the ENGINEER. The Drawings show approximate locations only.

2. Install cover plates on wiring devices.

3. Where groups of devices are shown, they shall be installed in approved gangable boxes with one piece faceplates.

B. Switches:

1. Mount switches at height shown on drawings. Height shall conform to ADA guidelines.

2. Coordinate switch mounting location with architectural detail/mechanical equipment.

C. Receptacles:

1. Mount receptacles vertically at height shown on drawings, with grounding pole at top.

2. Adjust outlet mounting height to agree with required location for equipment served.

3. Outlets shall be located to agree with architectural features/ mechanical equipment and shall not interfere with work by other trades.

4. For outlets mounted above counters, coordinate location and mounting heights with built-in units. Adjust outlet mounting height to agree with required location for equipment served.

D. Device plates:

1. Finished areas shall be color selected by the ENGINEER with openings as required.

2. Mechanical areas shall be galvanized steel with openings as required.

3. Exterior locations shall be weatherproof with openings as required.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing conduit supports.

B. Furnishing equipment and lighting supports.

C. Installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable U-channel strut manufacturers:

1. Allied Tube & Conduit Corp.
2. B-Line Systems Inc.
3. Unistrut Corp.
4. Electrical Products Div. of Midland-Ross Corp.

2.02 MATERIALS

A. Conduit supports:

1. Single run hangers: Cast steel conduit straps or cast metal beam clamps on all rigid steel conduit. Perforated straps and spring steel clips and clamps will not be permitted. Galvanized steel conduit straps or clamps on EMT type conduit.

2. Group run hangers: Minimum 12-gauge galvanized preformed U- channel rack with conduit fittings; 25 percent spare capacity.

3. Hanger rods: Threaded steel, 3/8-inch diameter.

4. Vertical run supports: Minimum 12-gauge galvanized preformed U- channel struts with conduit fittings.

5. Provide slotted galvanized inserts in concrete construction for hanger rods. Rods shall be screwed into or extended through frame construction (with washer and nut). Supports shall secure conduit in place, and shall prevent vibration, provide for expansion and contraction and shall make neat appearance. Strap hangers or chains are not permitted.

B. Equipment and lighting supports:

1. U-channel: 12-gauge galvanized preformed U-channel struts with fixture and conduit fittings, as applicable.

2. Loose angles, channels, plates and tubing: As specified in Section 05500.

C. Anchors:

1. Hollow masonry: Toggle bolts or spider type expansion anchors. Rawl or Diamond manufacturer or equal.

2. Solid masonry: Lead expansion anchors or preset inserts. Rawl or Diamond manufacturer or equal.

3. Metal surfaces: Machine screws, bolts, or steel clamps as required for application.

4. Wood surfaces: Wood screws.

5. Concrete surfaces: Self-drilling anchors or power-driven studs. Star, Diamond or Rawl manufacturer or equal.

D. Locations

1. Anchor bolts, sleeves, inserts, hangers and supports required for the electrical work shall be furnished and installed under Division 16.

2. Coordinate with other trades the locations of anchors, sleeves, inserts and supports and insure that they are properly installed.

3. Openings and sleeves shall be set true to line, level, plumb and position and shall be so maintained during construction. Where sleeves and openings are provided in poured concrete, inspect same during and after concrete is poured to insure proper position and correct any deviation.

E. Lighting fixture, electrical equipment and device supports:

1. No electrical items shall rest on, or depend for support on suspended ceiling media (tiles, lath, plaster, splines, etc.).

2. In suspended ceilings, support conduits directly from structural slabs, decks (or framing members). Do not support conduits on ceiling suspension members.

3. Support surface or pendant lighting fixtures:

   a. From an outlet box by means of an interposed metal strap, where weight is less than 5 lbs and shall conform to requirements of NEC Article 314.

   b. From an outlet box by means of a hickey or other direct threaded connection, so designed and intended to support a fixture of this weight where weight is from 5 to 50 lbs.

   c. Directly from structural slab, independent from outlet box, deck or framing member, where weight exceeds 50 lbs.

4. In addition to the above, provide cushioned, swivel type hangers with appropriate outlet boxes for pendant fixtures in mechanical areas. Such hangers shall have a support rating at least twice that of the load supported.

5. Support recessed lighting fixtures.

   a. Support fixtures directly from building structure by steel wire hangers and inserts or headers supported from framing structure or other approved methods.

b. Directly from structural slab, deck or framing members, where weight is 60 lbs. or more.

6. Provide weight-distribution facilities, where required so as not to exceed the load- bearing capabilities of floors or walls that bear the weight of, or support, electrical items.

7. For point-of-attachment weight of 100 lbs. or less, fasten items as follows:

   a. On wood, use wood screws.

   b. On concrete and solid masonry that is already in place, use self-drilling concrete anchors or expansion bolt and couplings.

   c. On hollow construction, use toggle bolts.

   d. On solid metal, use machine screws in tapped holes, or welded studs.

   e. On structural steel, use beam clamps.

8. For point-of-attachment weights from 100 lbs. to 300 lbs., provide supports as follows:

   a. At cast-in-place concrete slabs, use concrete inserts in bottom of slab, with 18" slip-through steel rods set transverse to the reinforcing steel.

   b. At concrete slab already in place, use 16" x 8" x 1/2" steel plates at top of slab, with through bolts welded in place. The plates shall be chased in and grouted flush, where no fill is to be applied.

9. For point-of-attachment weights over 300 lbs., provide supports as follows:

   a. At cast-in-place concrete slabs, use 16" x 8" x 1/2" steel plate, with through bolts welded in place. Top of plate shall be 1-1/2" below top of slab, or on top of slab where a fill slab is to be installed.

10. Hangers and supports shall be hot dipped galvanized, unless noted otherwise.

11. Equipment shall not be held in place by its own dead weight. Provide base anchor fasteners in each case.

12. Trapeze type hangers may be used where several conduits are to be installed at the same elevation. The spacing of such trapeze hangers shall be in accordance with the NEC for the smallest conduit in the run.

13. Vertical conduits shall be supported by heavy wrought iron clamps or collars anchored to construction at each floor.

PART 3 EXECUTION

3.01 INSTALLATION

A. Layout to maintain headroom, neat mechanical appearance and to support equipment loads required.

B. Install supports, anchors, sleeves and seals to rigidly fasten conduit and equipment.

C. Support conduit at intervals not to exceed 8 feet.

1. Install wall supported conduit with a clearance of not less than 1/4-inch from wall.

2. Install U-channel vertical run supports in conduit not supported by wall, column, conveyor system, or equipment.

D. Welding supports to building structural members of fastening supports to roof deck, panels or other conduit or pipe will not be permitted.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing equipment, wire and cable markers.

B. Furnishing nameplates.

C. Furnishing equipment and conduit labels.

D. Installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Nameplates and cable markers:

1. Seton Name Plate Company.
2. Brady
3. Thomas and Betts
4. Panduit
5. Almetek

B. Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution by following the procedures in Division 1.

2.02 MATERIALS

A. Wire and cable markers: Wires smaller than No. 4 shall be marked with vinyl cloth, self-sticking wrap-around wire markers equal to Panduit PCM series. Wire sizes No. 4 and larger and multi-conductor cables shall be marked with one-piece, nylon locking marker ties equal to Panduit PLM series.

B. Nameplates: Laminated plastic with beveled edges: 1/16-inch thick; black face ply engraved through to expose contrasting white core ply lettering, minimum 3/8-inch height; punched for riveted fastening.

C. Equipment and conduit labels: Self-adhesive vinyl labels with high contrast black printing on orange background as required for OSHA compliance.

2.03 EQUIPMENT AND CONDUIT IDENTIFICATION

A. Equipment identification marking shall be applied over finish painting and shall comply with ANSI specification, local codes or as herein described, whichever is the most stringent.

B. The CONTRACTOR shall identify all conduit stub-ups and insides/outsides of outlet and junction boxes for the purpose of easy site verification by OWNER'S Representative. Identification shall be means of painting 2 inches at the end of each conduit stub-up and painting insides of outlet and junction boxes. Color code shall be as follows for the various electrical systems:

1. Power - Not color coded/manufacturer's standard color and finish
2. Lighting - White
3. Emergency Call System - Blue
4. Emergency Power and Lighting - Orange
5. Fire Alarm - Red
6. Telephone - Green
7. Closed Circuit Television (C.C.T.V.) - Blue
8. Computer/Data - Yellow

Where power and lighting outlet and junction boxes are installed the branch circuit identification shall be marked with a permanent marker in a neat and legible manner on the cover of all junction/ splice boxes.

C. High voltage feeder conduits (over 500 volts) shall be identified by the words "DANGER - HIGH VOLTAGE" in black letters 2 inches high at the transformer pad and concrete encasing conduits as per local code requirements.

D. Electric cabinets, disconnecting switches, remote control switches, individual motor starters and control stations shall be identified. Panelboards and other electrical equipment located in finished areas, such as offices, shall have the identification placed on the inside of the cabinet doors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Wire and cable markers:

1. Tag control circuit conductors at both ends and at junction box splices using wire and cable markers with identification numbers as designated on wiring diagrams.

2. Identify spare conductors, individually, at both ends and at junction box splices with numbers between 1 and 999. Do not duplicate numbers.

3. Identify wire numbers on terminal block marking strips.

4. Provide permanent plastic nametag indicating load for each feeder for all junction boxes, handholes and manholes. Label all motor wires to yard lighting and power circuits in handholes and manholes.

B. Nameplates:

1. Attach laminated plastic nameplates to motor starters, circuit and motor disconnects, contactors, relays, control stations, and panelboards.

2. Identify motor starters and disconnects with lettering corresponding to designations on single line diagrams.

3. Identify panelboards with lettering corresponding to designations on single line diagrams.

4. Attach nameplates with rivets.

C. Adhesive labels:

1. Identify conduits and junction boxes to designate voltage and phase of the conductors within.

D. Power and lighting outlet and junction boxes are to be identified with a permanent marker in a neat and legible manner indicating the circuit number and panel identification.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing motor disconnects.

B. Furnishing circuit disconnects.

C. Installation.

1.02 REFERENCE STANDARDS

A. NEMA KS1 - Enclosed Switches.

B. UL 198E - Class R Fuses.

1.03 SUBMITTALS

A. Submit catalog information data in accordance with General Requirements in Division 1.

1.04 INTERFACE WITH MECHANICAL EQUIPMENT

A. Provide and install disconnect switches which are not furnished as an integral part of electric motor driven equipment. Coordinate with Division 15.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Disconnect switches:

1. General Electric, "TH" series
2. Square D, "H" series
3. Siemens, "HD" series
4. Westinghouse/Cutler-Hammer

B. Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution.

2.02 COMPONENTS

A. Motor and circuit disconnects shall have an Underwriters' Laboratory label and comply with NEMA KS1, heavy-duty type. NEMA 3R weatherproof if installed outside; NEMA 1 for interior.

B. Visible blades in OFF position.

C. Arc suppressors that permit access to line side lugs without removal.

D. Fused or nonfused as required.

E. Quick-make and quick-break operating mechanism, box mounted. Cover mounted devices are not acceptable.

F. Interlocked cover to prevent opening in the ON position except by means of special interlock release mechanism.

G. Handles suitable to accept three padlocks, having heavy duty industrial shackles, in the OFF position.

H. Switches shall be horsepower rated and need not be fused when used with starters equipped with overload protection. All other safety switches shall be properly fused.

I. Fuses shall be Class RK1 unless otherwise noted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Safety switches shall be complete with approved mounting boards and located subject to the acceptance of the ENGINEER.

B. Provide all necessary conduit, wiring, etc. for the proper operation of the equipment.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing power system grounding.

B. Installation.

1.02 REFERENCE STANDARDS

A. National Electrical Code (NEC) NFPA-70.

B. UL 467 - Grounding and Bonding Equipment.

1.03 QUALITY ASSURANCE

A. Comply with NEC requirements for electrical materials and installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide each electrical grounding system with assembly of materials required for complete installation including wires/cables, connectors, lugs, clamps, ground rods, bonding jumpers and accessories.

B. Provide electrical grounding conductors for grounding connections matched to power supply wiring materials and sized according to NEC.

C. Provide electrical connectors, lugs, clamps, bonding jumpers and accessories as recommended by the respective manufacturer for the particular application, unless other indicated.

D. Ground rods: Solid copper, 5/8-inch diameter by 10 feet long.

E. Insulated conductors: Green in color.

PART 3 EXECUTION

3.01 GROUNDING AND BONDING

A. Ground main service entrance distribution panel ground bus or lug to neutral of incoming service, to enclosure, to building steel and to main cold water pipe. Install grounding bushings on service conduits. Each building column shall be banded together using a minimum #2/0 AWG copper ground wire and tied to main cold water pipe as well as a ground rod at each corner of the building (minimum of four at 10 feet long) and connected to main service ground.

B. Install grounding bushings on conduits at both primary and secondary entrances to transformers. Ground transformer enclosures to bushings.

C. Ground transformer secondaries and enclosures to nearest grounded building steel or alternate ground per NEC.

D. Install bonding jumper for flexible metal conduit unless fittings are approved for grounding or otherwise comply with NEC.

1. Size jumper to match over-current device.
2. Green insulation.
3. Connect to grounding bushing at each end.

E. Ground each metal lighting pole or standard with a common bare copper equipment grounding conductor run with the circuit conductors.

F. Ensure that entire electrical system is electrically continuous and permanently and effectively grounded, including all electrical equipment and motors.

G. Provide and install properly sized ground wire for use by the telephone company, if required, from the main service grounding electrode system to the telephone backboard service entrance. Coordinate with the telephone company on exact size and termination required.

3.02 BONDING FOR OTHER TRADES

A. Signal raceways, water piping, heating piping and metallic air ducts shall be bonded together and to the grounding conductor with No. 8 soft drawn bare solid conductors. Connections to pipes shall be made with cast clamps of like material as the pipes to which attached, to ducting terminated in a secure manner by best practical means, bonding across any flexible or insulated connections.

B. All bonding conductors shall be installed in a neat and workmanlike manner, properly shaped for contour of surface involved and properly supported. At locations remote from the switchgboard, bond to the largest raceway nearby.

END OF SECTION

SECTION 16461

DRY-TYPE DISTRIBUTION TRANSFORMERS - GENERAL PURPOSE

PART 1 GENERAL

1.01 SCOPE

A. The CONTRACTOR shall furnish and install single-phase and three-phase energy efficient style general purpose individually mounted dry-type transformers of the two-windings type, self-cooled as specified herein and as shown on the contract drawings.

1.02 REFERENCES

A. The transformers and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of ANSI and NEMA.

B. The transformers shall comply with NEMA Standard TP-1 for optimum energy efficiency at 35% load.

1.03 SUBMITTALS--FOR REVIEW/APPROVAL

A. The following information shall be submitted to the ENGINEER:

1. Dimension drawing.

2. Technical certification sheet.

3. Conduit entry/exit locations.

4. Transformer ratings including:

a. Voltage.
b. Continuous current.
c. Basic Impulse level for equipment over 600 volts.
d. kVA.
e. Impedance.

B. Submit six (6) copies of the above information.

1.04 SUBMITTALS--FOR INFORMATION

A. When requested by the ENGINEER the following product information shall be submitted:

1. Descriptive bulletins.

2. Product sheets.

1.05 SUBMITTALS--FOR CLOSEOUT

A. The following information shall be submitted for record purposes prior to final payment.

1. Final as-built drawings and information for items listed section 1.4.

2. Certified production test reports.

3. Installation information.

4. Seismic certification and equipment anchorage details.

B. Submit six (6) copies of the above information.

1.06 QUALIFICATIONS

A. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.

B. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the ENGINEER, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.07 REGULATORY REQUIREMENTS

A. All transformers shall be UL-listed and bear the UL label.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.09 FIELD MEASUREMENTS

A. Measure primary and secondary voltages and make appropriate tap adjustments.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Six (6) copies of the equipment operation and maintenance manuals shall be provided prior to final payment.

B. Operation and maintenance manuals shall include the following information:

1. Instruction books and/or leaflets.

2. Recommended renewal parts list.

3. Drawings and information required by section 1.6.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cutler-Hammer/Westinghouse.

B. Square D

C. General Electric

D. Acme Transformer

2.02 RATINGS

A. KVA and voltage ratings shall be as shown on the drawings.

B. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.

C. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings:

Up	to	9 kVA	40 db
10	to	50 kVA	45 db
51	to	150 kVA	50 db
151	to	300 kVA	55 db
301	to	500 kVA	60 db
501	to	700 kVA	62 db
701	to	1000 kVA	64 db

2.03 CONSTRUCTION

A. Insulation Systems:

1. Transformers shall be insulated as follows:

   2 kVA and below: 150°C insulation system based upon 80°C rise.

   3 to 15 kVA: 185°C insulation system based upon 115°C rise.

   15 kVA and above: 220°C insulation system based upon 80°C rise (energy efficient type).

2. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40°C maximum ambient.

3. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

B. Core and Coil Assemblies:

1. Transformer core shall be constructed with high-grade, nonaging, grain-oriented silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the highest tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical grade aluminum with continuous wound construction.

2. On units rated 30 kVA and below the core and coil assembly shall be completely encapsulated in a proportioned mixture of resin and aggregate to provide a moistureproof, shock-resistant seal. The core and coil encapsulation system shall minimize the sound level. Taps shall be two steps below nominal voltage in 5% increments.

3. On units rated 45 kVA and above the core and coil assembly shall be impregnated with non-hydroscopic, thermosetting varnish and cured to reduce hot spots and seal out moisture. The assembly shall be installed on vibration-absorbing pads. Taps shall be two steps above and 4 steps below nominal voltage in 2.5% increments.

C. Electrostatic Shielding:

1. Where shown on the drawings, provide isolation transformers with electrostatic shielding.

2. An electrostatic shield consisting of a single turn of aluminum shall be placed between the primary and secondary winding and grounded to the transformer core.

2.04 WIRING/TERMINATIONS

A. Recommended external cable shall be rated 90°C for encapsulated and 75°C for ventilated designs. Connectors should be selected on the basis of type and cable size used to wire the specific transformer.

2.05 ENCLOSURE

A. The enclosure shall be made of heavy-gauge steel. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90°C. The core of the transformer shall be grounded to the enclosure.

B. On units rated 30 kVA and below encapsulated the enclosure construction shall be totally enclosed, non-ventilated, NEMA 3R, with lifting eyes.

C. On units rated 45 kVA and above the enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting holes. All ventilation openings shall be protected against falling dirt.

2.06 NAMEPLATE

A. The nameplate shall include the following ratings:

1.	kVA Rating	AA/FA
2.	Impedance	Manufacturer's standard impedance
3.	HV	Volts Delta
4.	HV BIL	kV
5.	HV taps	As specified
6.	LV	Volts Wye

2.07 FINISH

A. Enclosures shall be finished with ANSI 61 color weather-resistant enamel.

2.08 ACCESSORIES

A. On outdoor units provide suitable weathershields over ventilation openings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 16950.

3.02 FACTORY TESTING

A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

1. Ratio tests at the rated voltage connection and at all tap connections.

2. Polarity and phase relation tests on the rated voltage connection.

3. Applied potential tests.

4. Induced potential test.

5. No-load and excitation current at rated voltage on the rated voltage connection.

3.03 INSTALLATION

A. The CONTRACTOR shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.04 FIELD QUALITY CONTROL

A. The CONTRACTOR shall verify the rating, connections and voltage output prior to connecting any loads. Downstream loads shall be verified for voltage requirements.

3.05 FIELD ADJUSTMENTS

A. Adjust taps to deliver appropriate voltage.

3.06 FIELD TESTING

A. Measure primary and secondary voltages for proper tap settings.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing branch circuit panelboards.

B. Installation.

1.02 REFERENCE STANDARDS

A. FS W-C-375B - Circuit Breakers, Molded Case Branch Circuit and Service.

B. NEMA PB1 - Panelboards.

C. UL 50 - Cabinets and Boxes.

D. UL 67 - Panelboards.

E. UL 869 - Service Entrance Equipment.

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with the General Requirements in Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Panelboards:

1. Square D.
2. General Electric.
3. Westinghouse/Cutler-Hammer

B Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution.

2.02 ENCLOSURES

A. Enclosures shall be fabricated from code gauge galvanized or equivalent rust-resistant steel with rust-inhibiting primer and baked enamel finish.

B. Panels shall be furnished with standard doors and lock. Key all locks alike and furnish two sets of keys.

2.03 PANELBOARDS

A. Panelboards shall be of a dead-front safety type, equipped with thermal-magnetic molded case circuit breakers as indicated on the Drawings. All panels shall be of same manufacture, complying with UL 67. Panels shall include UL label as well as UL listed short circuit rating (Integrated Equipment Rating). Minimum rating shall be 14 KAIC.

B. Circuit breakers shall be thermal-magnetic type with quick-make, quick-break, trip-free mechanism, per Fed. Spec. W-C-375B.

C. Furnish molded case circuit breakers in panelboards as indicated on Drawings.

D. Panelboards shall have full capacity neutral bus, ground bus, isolated insulated ground bus (where indicated) and bolt-on circuit breakers.

E. Panelboards for use as service disconnecting means shall additionally conform to UL 869.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide mounting brackets, busbar drillings, and filler pieces for unused spaces.

B. Prepare and affix typewritten directory to inside cover of panelboard indicating loads controlled by each circuit.

C. Mount all surface mounted panels securely on 3/4-inch exterior plywood mounting boards painted dark gray on both sides and mounted on Kindorf, Steel City or Globe-Strut channel. Flush mounted panels shall be carefully installed within wall cavities.

D. Unless otherwise indicated on the Drawings, install all panels with the top of the trim 6'-3" above the finished floor.

END OF SECTION

SECTION 16490

AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing automatic transfer switches.

B. Installation.

1.02 REFERENCE STANDARDS

A. UL 1008 - Standard for Automatic Transfer Switches.

1.03 SYSTEM DESCRIPTION

A. The transfer switches shall be surface mounted as shown on the Drawings.

1.04 SUBMITTALS

A. Submit shop drawings and product data in accordance with Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Automatic transfer switches:

1. Automatic Switch Company (ASCO) Type 7000.

B. Substitutions: Items of equal quality, function and performance may be proposed for substitution by following the procedures outlined in Division 1.

2.02 AUTOMATIC LOAD TRANSFER CONTROL

A. The automatic load transfer control shall be rated as shown on the Drawings, 3-pole for 480 volts, 3 phase, 4-wire power with accessories specified herein. The automatic transfer switches shall be listed per Underwriter's Laboratories Standard No. 1008 as a recognized component for emergency systems and rated for all classes of loads when installed in a nonventilated enclosure. The short circuit withstand rating shall be 22,000 rms symmetrical amperes minimum.

B. Transfer switch mechanism shall be electrically-operated by a single solenoid and mechanically held. Locking shall be accomplished without the use of latching solenoids, toggle mechanisms or gear arrangements. Operation shall be inherently double-throw with normal and emergency contacts moving simultaneously. Operating transfer time shall not exceed one-half of a second.

C. Main switch contacts shall be segmented and the configuration shall be designed such that fault currents provide increased main contact pressure. Separate arcing contacts are required and visual inspection and replacement of main and separate arcing contacts, both stationary and movable, shall be possible from the front of the switch without any disassembly of operating linkages or power conductors. Main contacts consisting of adapted devices, such as

subassemblies or contactors, not originally designed for transfer switch application are not acceptable.

D. The transfer switch shall be equipped with the following accessories:

1. Adjustable time delay to override momentary dips in normal source, 0-10 seconds.

2. Full phase voltage relay supervision of the normal source (65- 70% dropout and 92-95% pickup) with at least one close differential relay (83-85% dropout and 92-95% pickup) to detect "brownout" conditions.

3. Voltage/frequency lockout relay (90% pickup, nominal) to prevent premature transfer to emergency source.

4. System test switch, momentary type.

5. Gold plated engine starting control contacts for 2-wire control.

6. Auxiliary pilot contacts rated 10 amperes at 120 VAC, two closed on normal and two closed on emergency.

7. Adjustable (2-25 minutes nominal) time delay on retransfer to normal.

8. Adjustable time delay (5 to 15 minutes, nominal) on shutdown of engine-generator after retransfer of the load to normal.

9. Automatic engine exerciser with load/no load selector switch and 7-day clock with adjustments for time, day and duration of generator exercise period.

10. Pilot lights mounted on exterior of enclosure doors: Green (normal) and red (emergency).

11. Complete AL-CU lugs (UL listed) shall be provided for normal, emergency and load positions. Full rated neutral bar with lugs shall be provided.

12. NEMA 1 enclosure.

13. In-phase monitor to prevent transfer unless both sources are in phase.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation shall be made in complete accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 16500

LIGHTING SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing interior light fixtures.

B. Furnishing exterior light fixtures.

C. Life safety lighting system.

D. Installation.

1.02 REFERENCE STANDARDS

A. NEMA LE1 - Fluorescent Luminaries.

B. NEMA LE2 - HID Lighting System Noise Criterion.

C. NEMA SH5 - Tubular Steel, Aluminum and Prestressed Concrete Roadway Lighting Poles.

D. NEMA TT 1 - Tapered Tubular Steel Structures.

E. UL 57 - Electric Lighting Fixtures.

F. UL 844 - Electrical Lighting Fixtures for Use in Hazardous Locations.

G. UL 924 - Emergency Lighting Equipment.

H. UL 935 - Fluorescent Lamp Ballasts.

I. UL 1029 - High Intensity Discharge Lamp Ballasts.

J. UL 1570 - Fluorescent Lighting Fixtures.

K. UL 1571 - Incandescent Lighting Fixtures.

L. UL 2572 - High Intensity Discharge Lighting Fixtures.

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with Division 1.

B. Submit manufacturer's specifications for lighting pole anchor bolt materials and installation instructions.

1.04 ACCEPTABLE MANUFACTURERS

A. USI

B. Thomas

C. Lithonia

D. Cooper

E. As detailed on fixture schedule on Drawings.

1.05 QUALITY ASSURANCE

A. Furnish products and components that have been UL listed and labeled, including UL marks indicating special type usage where applicable.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Prevent physical or corrosive damage to lighting equipment at all times.

1.07 PROJECT CONDITIONS

A. Confirm compatibility and interface of other materials with luminaire and ceiling system. Report discrepancies to the ENGINEER, and defer ordering until clarified.

B. Supply plaster frames, trim rings and backboxes to other trades.

C. Coordinate with other trades to avoid conflicts between luminaries, supports, fittings, and mechanical equipment.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fixture types indicated on the drawings serve to indicate the type and quality desired and do not exclude the use of equal quality items by other manufacturers, subject to acceptance by ENGINEER.

B. Lamps: As indicated on the fixture schedule on Drawings.

C. Ballasts:

1. MagneTek.
2. Advance Transformer Co.
3. General Electric Co. Lighting Business Group.
4. Jefferson Electric Div. of Litton Industries.
5. Universal Mfg. Corp.

D. Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution.

1. If requested by ENGINEER, submit samples of both specified and proposed fixtures for comparison.

2. If requested by ENGINEER, provide complete photometric data and heat dissipation reports from an independent testing laboratory.

2.02 INCANDESCENT LAMPS

A. Incandescent lamps:

1. Halogen type.
2. 120 volts.

3. Standard service.
4. 1000 hours minimum average life.
5. Energy savings type, General Electric "Watt-Miser" or equal.

2.03 HIGH INTENSITY DISCHARGE LAMPS

A. High-pressure sodium: HPS type as specified on the plans.

B. Metal Halide: MH type as specified on the plans.

2.04 HIGH INTENSITY DISCHARGE BALLASTS

A. Ballasts: Single lamp of the constant wattage regulator type, high power factor.

B. Select exterior ballasts for reliable starting to -20°F (-29°C).

C. Voltage rating shall be as indicated.

2.05 INCANDESCENT FIXTURES

A. Track luminaries: To match track manufacturer.

B. In grade luminaries: Prewired assembly.

2.06 HIGH INTENSITY DISCHARGE FIXTURES

A. Provide exterior fixtures of corrosion-resistant construction with UL wet location label.

B. Coordinate exterior lighting fixtures to present a continuous lighting theme.

C. Provide fixtures complete with gaskets forming weatherproof assembly.

PART 3 EXECUTION

3.01 INSTALLATION

A. Verify exact locations and elevations of lighting fixtures with ENGINEER prior to installation, where dimensions are not indicated. Coordinate with other trades.

B. Install rubber grommets to reduce noise transmission from HID ballasts.

C. Mount fixtures level with edges aligned parallel to building walls, unless otherwise indicated. Center wall fixtures above mirrors, sinks, etc., when present.

D. Mount continuous rows of fixtures in straight line. Use alignment clips between reflectors, where applicable.

E. Securely mount fixtures tight to surface without distortion of surface.

F. Furnish straps, mounting plates, nipples, brackets or accessories required for proper installation.

G. Install lamps of the designated rating in accordance with manufacturer's instructions.

H. Verify aiming of directional fixtures/lampheads with ENGINEER prior to setting direction.

I. All fixture wiring shall be in accordance with NEC Art. 410 whenever high temperature insulation is required instead of normal branch circuit wiring.

J. Install fixtures to dissipate ballast and lamp heat per manufacturer's instructions and UL listing requirements.

3.02 SUPPORTS

A. Support fluorescent fixtures other than lay-in style directly from building structure by steel wire hangers and inserts or metal angle headers supported from framing structure or other approved methods.

B. Support fixtures more than 2 feet wide by two hangers per luminaire minimum independent of ceiling structure or tee bars.

C. Wall mounted fixtures shall be supported in accordance with manufacturer's recommendations, including any recommended junction boxes and mounting hardware.

3.03 RECESSED FIXTURES

A. Install recessed fixtures to permit removal from below, to gain access to outlet or prewired fixture box.

B. Connect recessed fixtures to boxes with 6 feet extra of flexible metal conduit and wiring with bonding jumper, to allow future adjustment of fixture location by ENGINEER.

C. Install insulation spacers if required to avoid heat buildup.

D. Fire rated ceilings: Install back box constructed of ceiling material or equivalent protection as recommended by fixture manufacturer to maintain ceiling fire rating. Coordinate with ENGINEER on fire rated ceiling types/locations.

3.04 ALIGNMENT

A. Align luminaries and clean diffusers prior to final acceptance.

B. All fixtures shall be hung straight and true and shall be located symmetrically as indicated on the Drawings.

END OF SECTION

SECTION 16501

SITE LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing exterior light fixtures, poles, and pole bases.

B. Relocating, cleaning, and relamping exterior light fixtures and poles.

D. Installation.

1.02 REFERENCE STANDARDS

A. NEMA LE2 - HID Lighting System Noise Criterion.

B. NEMA SH5 - Tubular Steel, Aluminum and Prestressed Concrete Roadway Lighting Poles.

C. UL 57 - Electric Lighting Fixtures.

D. UL 1029 - High Intensity Discharge Lamp Ballasts.

E. UL 2572 - High Intensity Discharge Lighting Fixtures.

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with Division 1.

B. Submit manufacturer's specifications for lighting pole anchor bolt materials and installation instructions.

1.04 QUALITY ASSURANCE

A. Furnish products and components that have been UL listed and labeled, including UL marks indicating special type usage where applicable.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Prevent physical or corrosive damage to lighting equipment at all times.

1.06 PROJECT CONDITIONS

A. Confirm compatibility and interface of other materials with lighting equipment and poles. Report discrepancies to the ARCHITECT, and defer ordering until clarified.

B. Coordinate with other trades to avoid conflicts between luminaries, poles, supports, conduits, ground rods and related equipment.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fixture types indicated on the drawings serve to indicate the type and quality desired and do not exclude the use of equal quality items by other manufacturers, subject to acceptance by the ARCHITECT.

B. Lamps:

1. General Electric.
2. Sylvania.
3. North America Phillips Lighting Corp.
4. Osram.

C. Ballasts:

1. Advance Transformer Co.
2. General Electric Co. Lighting Business Group.
3. Jefferson Electric Div. of Litton Industries.
4. Universal Mfg. Corp.

D. Substitutions: Products of equal quality, detail, function and performance may be proposed for substitution by following the procedures in Division 1.

1. If requested by ARCHITECT, submit samples of both specified and proposed fixtures for comparison.

2. If requested by ARCHITECT, provide complete photometric data and heat dissipation reports from an independent testing laboratory.

2.02 HIGH INTENSITY DISCHARGE LAMPS

A. High pressure sodium:

1. Wattage rating as specified on the plans.
2. High pressure sodium lamp equal to General Electric "Lucalox".
3. Minimum rated average life of 24,000 hours.

2.03 POLES

A. Poles are indicated on the plans.

B. Cover shall be two piece, heavy wall aluminum construction to entirely conceal anchor base.

C. Poles shall be designed to a minimum 80 mph wind speed including the projected areas of the fixture or fixtures as shown on the Drawings.

D. Grounding provision, anchor bolt template, cable support shall be furnished on all poles.

2.04 HIGH INTENSITY DISCHARGE BALLASTS

A. Ballasts: Single lamp of the constant wattage auto transformer type, high power factor.

B. Select exterior ballasts for reliable starting to –20° F. (-29°C.).

2.05 HIGH INTENSITY DISCHARGE FIXTURES

A. Provide exterior fixtures of corrosion-resistant construction with UL wet location label. Fixtures shall be of cast die aluminum construction and welded seams.

B. Coordinate exterior lighting fixtures to present a continuous lighting theme.

C. Provide fixtures complete with gaskets forming weatherproof assembly where utilized outdoors.

2.06 POLE BASES

A. Pole base construction details are indicated on the plans.

B. Concrete shall be as specified under Section 03300 and shall be 4,000 PSI, 3/4-inch maximum aggregate size.

PART 3 EXECUTION

3.01 INSTALLATION

A. On existing fixtures and poles designated to be removed the contractor shall dismantle remove and store the fixtures and poles on airport property at a place designated by the ARCHITECT. Care shall be taken during dismantling so the fixtures and poles may be salvaged.

B. On existing fixtures and poles designated to be relocating, the contractor shall clean and relamp the fixtures after the fixtures and poles have been erected in their final location.

C. Verify exact locations and elevations of lighting fixtures with ARCHITECT prior to installation, where dimensions are not indicated. Coordinate with other trades.

D. Install rubber grommets to reduce noise transmission from HID ballasts.

E. Securely mount fixtures tight to pole without distortion of surface.

F. Furnish straps, mounting plates, nipples, brackets or accessories required for proper installation.

G. Install lamps of the designated rating in accordance with manufacturer's instructions.

H. Verify aiming of directional fixtures/lampheads with ARCHITECT prior to setting direction.

I. Install fixtures to dissipate ballast and lamp heat per manufacturer's instructions and UL listing requirements.

3.02 ALIGNMENT

A. Align luminaries and clean diffusers prior to final acceptance.

B. All fixtures shall be hung straight and true and shall be located symmetrically as indicated on the Drawings.

END OF SECTION

SECTION 16520

LIGHTING CONTROLS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and The Construction Contract Clauses of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes manual and programmable, low-voltage lighting controls.

1.03 SUBMITTALS

A. Product Data: Include dimensions and data on features, components, and ratings for lighting controls.

B. Shop Drawings: Detail assemblies of standard components, custom assembled for specific application on Project. Indicate dimensions, weights, arrangement of components, and clearance and access requirements.

1. Wiring Diagrams: Detail specific systems tailored to this Project and differentiate between manufacturer-installed and field-installed wiring.

C. Operational Documentation: For software and firmware.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Maintenance Data: For lighting control equipment and system components to include in maintenance manuals specified in Division 1. Include software operating manuals.

F. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing programmable lighting controls similar to those indicated for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain low-voltage lighting control system components from a single manufacturer.

1. Provide total responsibility for compatibility of system components.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.

D. Comply with 47 CFR, Subparts A and B, for Class A digital devices.

E. Comply with NFPA 70.

1.05 COORDINATION

A. Coordinate features of equipment and system components to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions.

B. Coordinate lighting controls specified in this Section with work specified in other Sections.

1.06 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive the OWNER of other rights which they may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of programmable lighting controls that fail in materials or workmanship within specified warranty period.

C. Special Warranty Period for Programmable Systems: Two years from date of Substantial Completion.

D. Special Warranty Period for Electrically Held Relays: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Crestron Electronics, Inc.
2. Cutler-Hammer Products; Eaton Corporation.
3. GE Lighting Controls.
4. Honeywell, Inc; Home and Building Controls.
5. ILC-Enercon.
6. Intermatic, Inc.
7. Johnson Controls, Inc.; Controls Group Div.
8. Lithonia Control Systems.
9. Lutron Electronics Co., Inc.
10. MicroLite Group.
11. Paragon Electric Co., Inc.
12. Square D Co.; Power Management Organization.
13. Sterner Lighting Systems, Inc.
14. Tork, Inc.
15. Touchplate.

2.02 GENERAL REQUIREMENTS

A. Expansion Capability of System: Adequate to increase the number of control functions in the future by 25 percent more than those indicated. This applies to equipment ratings, housing volumes, spare relays, terminals, and control cable conductor quantities.

B. Line-Voltage Surge Protection: Include in all 120/277 V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

C. Comply with UL 916.

2.03 FUNCTIONAL SYSTEM DESCRIPTION

A. The objective of this section is to ensure the proper installation of the lighting control system so that lighting may by operated manually by the occupant, automatically by time schedule and/or by commands from other connected systems, computer software or controlling devices.

B. The general automatic control of lighting loads shall be by circuit using the following control sequence:

1. Interior lighting - automatic on and shut off with after-hour override.
2. Exterior lighting - photocell or astro on/time off, time on/photocell or astro off.

C. During hours when the facility is not occupied, interior lighting shall have the ability to provide a warning blink prior to automatically shutting off. Operation of the local switches on each floor shall allow override of the interior lighting shut-off event. No additional override switch shall be required.

D. Exterior lighting shall remain off when sufficient ambient light is available and shall self-adjust on/off times with the seasons using an exterior light sensor or astronomical clock calculation of sunrise/sunset.

2.04 SYSTEM COMPONENTS

A. Control Module Description: Programmable, microprocessor-based control unit mounted in pre-assembled modular relay panel. Low-voltage-controlled, latching type, single-pole lighting circuit relays are prime output circuit devices. Where indicated, a limited number of digital or analog, low-voltage control circuit outputs are supported by control unit and circuit boards associated with relays. Control unit receives inputs from indicated sensors and other sources. Line-voltage components and wiring are separated from low-voltage components and wiring by barriers. Control module is locally programmable. Modules and their associated control panels include the following features:

1. System Memory, Nonvolatile: Reboots program and resets time automatically without errors after power outages up to 90 days' duration.

2. Confirmation: Each relay or contactor device operated by system has auxiliary contacts connected to provide a confirmation signal to the system of on or off status of device.

   a. Software interprets status signals, provides for their display, and initiates failure signals.

   b. Lamp or light-emitting diode at control module or display panel identified status of each controlled circuit.

3. Remote Communications Capability: Allows programming, data-gathering interrogation, status display, and controlled command override from Johnson Controls, Inc. "Metasys: facility management system at a remote location over telephone or data lines. System includes modem, communications and control software, and remote computer compatibility verification for this purpose. Microcomputer is not in this Contract.

4. Local Override Capability: Manual, low-voltage control devices override programmed shutdown of lighting and override other programmed control for intervals that may be duration programmed.

5. Automatic battery backup provides power to maintain program and system clock operation for 90 days' minimum duration when power is off.
6. Flick Warning: Programmable momentary turn-off of lights warns that programmed shutoff will occur after a preset interval. Warning is repeated after a second preset interval before end of programmed override period.

7. Diagnostics: When system operates improperly, software initiates factory-programmed diagnosis of failure and displays messages identifying problem and possible causes.

B. Mechanically Held, Modular Single-Pole Relays: Split-coil, momentary-pulsed type:

1. Low-Voltage Leads: Five-pin plug connector.
2. Pilot Contacts: Single pole.
3. Rated Capacity (mounted in relay panel): 20 A, 125-Vac for tungsten filaments and 20A, 277 Vac for ballasts.
4. Endurance: 50,000 cycles at rated capacity.
5. Mounting: Knockout in modular relay panel, unless otherwise indicated.

C. Electrically Held, Modular Single-Pole Relays: As follows:

1. Rated Capacity (mounted in relay panel): 20 A, 120 and 277-Vac for all types of fluorescent and HID ballasts; and 15 A, 120-Vac for tungsten filaments.

2. Operating Coil: DC.

3. Mounting: Modular printed circuit board. Board is held in place in modular relay panel by quick-release spring pins, unless otherwise indicated.

4. Pilot Device: Provides positive relay position indication.

5. Special Warranty: See Part 1 of this Section.

D. Modular Relay Panels: Steel cabinets, preassembled with modular single-pole relays, power supplies, and accessory components required for specified performance.

1. Barriers separate low-voltage and line-voltage components.
2. Cover: Hinged, lockable type.
3. Directory: Mounted on back of door. Identifies each relay as to bunch loads controlled, and each programmed pilot device, if any.
4. Control Power Supply: Transformer and full-wave rectifier with filtered DC output.

2.05 MANUAL SWITCHES AND PLATES

A. Switches: Specification-grade, modular, momentary pushbutton, low-voltage type.

1. Color: White, unless otherwise indicated.
2. Integral Pilot light: Indicates when circuit is on. Use where indicated.
3. Locator Light: Internal illumination helps locate switch in the dark. Use where indicated.
4. Wall Plates: Match those specified in Division 16 Section – Wiring Devices to materials, finish and color. Use multigang plates if more than one such switch is indicated at a location.
5. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment level and plumb and according to manufacturer's written instructions.

B. Mount control equipment according to manufacturer's written instructions and requirements in Division 16 Section - Basic Electrical Materials and Methods.

C. Mounting heights indicated are to bottom of unit for suspended items and to center of unit for wall mounted items.

3.02 CONTROL WIRING INSTALLATION

A. Install wiring between control devices as specified in Division 16 Section – Wires and Cables.

B. Wiring Method: Install all wiring in raceway as specified in Division 16 Section - Raceways.

C. Wiring Method: Install all low-voltage wiring in raceway as specified in Division 16 Section – Raceways or in cable tray in accessible ceiling space.

D. Bundle, train, and support wiring in enclosures.

E. Ground equipment.

F. Connections: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.03 IDENTIFICATION

A. Identify components and power and control wiring according to Division 16 Section – Electrical Identification.

B. Label each system control module with a unique designation. Make designations on elevated components readable from floor.

3.04 FIELD QUALITY

A. Manufacturer's Field Services: Engage a factory-authorized service representative to test, adjust, and program lighting control system.

B. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.

C. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

D. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:

1. Operational Tests: Set and operate controls to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.

E. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

F. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

G. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.05 CLEANING

A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

END OF SECTION

SECTION 16670

TRANSIENT VOLTAGE AND SURGE SUPPRESSION

PART 1 GENERAL

1.01 DESCRIPTION:

A. This section describes the materials and installation requirements for transient voltage surge suppressors (TVSS) for the protection of AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

1.02 SUBMITTALS

A. Submit shop drawings, product data and manufacturer's installation instructions.

B. The surge suppression submittals shall also include:

1. Dimensional drawing of each suppressor type indicating mounting arrangements.

2. Specification format completed as outlined by NEMA Standard 5 -18 - latest edition.

3. UL 1449 clamp voltage documentation by mode.

PART 2 PRODUCTS

2.01 SERVICE ENTRANCE

A. Suppressors shall be listed in accordance with UL 1449, UL 1283, NEMA Standard LS1 and ANSI/IEEE C62.41 and C62.45 Standard for Safety, Transient Voltage Surge Suppressors.

B. Suppressors shall be tested with the category C3 high exposure waveform (1.2 x 50 Φsec., 20kv open circuit voltage, 8 x 20 Φsec. short circuit current) per ANSI/IEEE C62.41 - 1991 and C62.45.

C. Suppressors shall provide suppression elements between each phase conductor and the system neutral and between the neutral conductor and ground.

D. Visible indication of proper suppressor connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable.

E. The mounting position of the suppressor shall permit a short lead length between the suppressor and the point of connection.

F. Suppressors shall meet or exceed the following criteria (refer to Drawings for ratings):

Maximum Continuous Operating Voltage (MCOV)

Voltage	MCOV	Voltage	MCOV
120V	150V	347V	420V
220V	275V	480V	640V
277V	320V	600V	840V

Clamping Voltage Data

System Voltage	Mode	B3 Ringwave	6kV 500A Comb. Wave	B3/C1 Comb. Wave	C3 Comb. Wave
120/240 120/208	L-N	325/350	325/325	400/450	625/750
	L-G	400/425	325/325	400/500	625/800
	N-G	350/350	325/325	450/425	725/700
	L-L	375/475	600/600	725/825	925/1200
277/480	L-N	550/600	700/700	850/850	1100/1150
	L-G	850/875	725/725	825/850	1025/1175
	N-G	700/675	650/650	875/825	1200/1050
	L-L	650/750	1350/1375	1625/1675	1900/2100

Note: The clamping voltage data shall be in compliance with test and evaluation procedures outlined in NEMA LS 1-1992, paragraphs 2.210 and 3.10. Values following slash (/) indicate typical clamping voltage data for units provided with integral disconnect.

Single/Repetitive Surge Current Capacities

Protection Mode	Single pulse surge current capacity/mode	Repetitive surge current capacity/mode
Line-to-Neutral	300,000 amps	7,500 impulses
Line-to-Ground	300,000 amps	7,500 impulses
Neutral-to-Ground	300,000 amps	7,500 impulses
Line-to-Line	300,000 amps	7,500 impulses
Per Phase	600,000 amps	N/A

G. Capacities shall be in compliance with NEMA LS 1-1992. Suppression filter systems shall be tested for single pulse surge current in all modes at rated currents of the product by an industry-recognized independent test laboratory. Single pulse surge current capacities of 200,000 amps or less shall be established by single-unit testing of all components within each mode.

H. Single pulse surge current capacities over 200,000 amps shall be established via testing of individual components or sub-assemblies within a mode. Per ANSI/IEEE C62.41-1991 and ANSI/IEEE C62.45-1992.

I. The TVSS shall be constructed using surge current modules (MOV based). Each module shall be externally fused.

J. Terminals shall be provided for all of the necessary power and ground connections. Each terminal shall accommodate wire sizes of #10 to #1 AWG.

K. Each unit shall be furnished with an integral disconnect with safety interlock to prevent accidental exposure to energized components.

L. Each unit shall be furnished with phase indicator lights, LED indicator, dry contacts, test switch pad, LED status indicator, audible alarm/alarm disable switch, alarm disable indicator, low battery indicator and disturbance counter.

M. The suppressors will have a warranty guarantee for a period of five years or longer.

N. Suppressors shall be by Current Technology, LEA International, Leibert or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install TVSS suppressors at each utility service entrance and at panels/equipment as shown on the Drawings according to manufacturer's recommendations.

B. Suppressor shall be installed on the line side of the service entrance and as indicated on the Drawings.

C. Conductors between suppressor and point of attachment shall be kept as short and straight as possible.

D. Suppressor's ground shall be bonded to the building systems ground grid.

END OF SECTION

SECTION 16680

LIGHTNING PROTECTION SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. General Conditions and Supplementary Conditions apply to this Section.

1.02 WORK INCLUDED

A. Furnish and install a complete lightning protection system for the new facility.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 16050 - Basic Materials

B. Section 16950 - Testing, Adjusting and Balancing

1.04 DESCRIPTION OF SYSTEM

A. Furnish and install a multi-point Faraday type lightning protection system, consisting of terminals, cables, building grounding, and appurtenances as necessary for a complete lightning protection system and in accordance with applicable codes.

1.05 QUALITY ASSURANCE

A. System component supplier shall regularly be engaged in production of lightning protection equipment that has been installed, inspected, and certified for UL Master Labels.

B. The Installation contractor shall be acceptable to manufacturer of the lightning protection system components.

C. Requirements of Regulatory Agencies:

1. Install lightning protection system to meet requirements of state having jurisdiction.

2. National Fire Protection Association, Lightning Protection Code, NFPA 780.

3. Underwriter's Laboratories, Inc. master labeled lightning protection system using class (I), (II), (III) materials. (Class of materials shall be as required by Codes.)

4. U.S. Bureau of Standard Handbook, H-26.

D. All material and workmanship shall be first class in every respect.

E. All material and equipment shall be new in every respect.

1.06 SUBMITTALS

A. Submittals shall be provided for the following items:

Items	Prefix
A	System Layout including type, size, and locations for all equipment, grounds, and cable routings
B	Equipment, Devices, Components, including catalog data, and samples as required by reviewers of shop drawings
C	Master Label C.

In addition to the item indicated hereinbefore, submit Manufacturer's instruction and construction coordination details, including concealed conduits, in accord with UL 96A.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials with Underwriter's Laboratory's and manufacturer's labels intact and legible.

B. Store packaged materials in original un-opened package or container.

C. Protect materials from damage and corrosion until used.

D. Keep UL labels affixed.

E. Remove broken or damaged material from project site.

1.08 JOB CONDITIONS

A. Inspection.

1. Examine areas for conditions under which work is to be performed. Report in writing to Owner's Representative all conditions contrary to those shown on the drawings or specified herein and all other conditions that will affect satisfactory execution of work such as improperly constructed substrates or adjoining work. Do not proceed with work until unsatisfactory conditions have been corrected.

2. Starting work constitutes acceptance of the conditions under which work is to be performed. After such acceptance this contractor shall at his expense, be responsible for correcting all unsatisfactory and defective work resulting from such unsatisfactory conditions.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials and Fittings: Resistant to corrosion or protected against corrosion.

B. Materials in combination with each other or building surfaces: Not forming galvanic couple.

C. Materials below grade to 18 in. above grade: Copper.

D. Bonding devices, cable splicers, and miscellaneous connectors shall be cast bronze with bolt pressure connections to cable. Cast or stamped crimp devices are not acceptable.

2.02 AIR TERMINALS

A. Copper Air Terminals

1. Class I Elevations (75 feet or less)

a. Solid round copper bar 3/8" diameter by 12" tall

2. Class II Elevations (over 75 feet)

a. Solid Round Copper Bar 1/2" diameter by 12" tall

3. In all locations, air terminals shall project 10" minimum above the objects protected.

4. Air Terminal bases shall be cast bronze with bolt pressure cable connections.

B. Aluminum Air Terminals (used on light standards)

1. 1/2" diameter by 24" tall with aluminum top mount base.

2. Follow manufacturers and designers instructions for mounting the aluminum air terminals to light standards, and connecting copper conductor to the air terminals.

2.03 FASTENERS AND ATTACHMENTS

A. Same materials as air terminals.

2.04 MAIN CONDUCTORS DOWN LEADS

A. Class I Conductor weight requirements: 190 lbs/1,000 ft. minimum.

Typical Conductor: 29 strands of #17 gauge strand
32 strands of #17 gauge strand

B. Class II Conductor weight requirements: 375 lbs/1,000 ft

Typical Conductor: 28 strands of #14 gauge strand

2.05 SECONDARY CONDUCTORS

A. Class I: 7 strands of #14 strand #6 ground wire

B. Class II: 29 strands of #17 gauge strand
32 strands of #17 gauge strand

2.06 FASTENERS

A. All fasteners shall be substantial in construction, not subject to breakage and shall be of the same material as the conductor or of such nature that there will be no serious tendency toward electrolytic corrosion in the presence of moisture.

B. All miscellaneous hardware shall be brass, bronze, or stainless steel. Galvanized hardware is not acceptable.

2.07 CONNECTORS AND DISCONNECTORS

A. Only bolt compression type are acceptable.

2.08 DEPTH INDICATOR TAGS

A. Copper.

2.09 GROUND RODS

A. 10 ft. copper clad steel rods 5/8" diameter. The proportion of copper on copper-clad rods shall be approximately 30 percent of the weight of the rod. Ground rods shall be driven vertically.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install system in accord with manufacturer's and designer=s instruction and UL requirements.

B. Install a perimeter cable around the entire roof of each building. Each perimeter shall be connected to downleads not to exceed 100 feet OC around the perimeter of any level to be protected. Downleads shall be in concealed conduit. Install lightning protection system following the layout drawing.

C. Install Air Terminals in plumb position securely fastened to withstand overturning. Deviations from layout drawing must be approved by the owner representative. Provide the required number of air terminals around each perimeter protected and all prominent parts of the building. Perimeter air terminals shall be placed at intervals not exceeding 20'-0" around perimeter of building, and shall extend a 10" minimum distance above the object they are to protect. Air terminals shall be located within 2' of outside corner edge. Mid roof air terminals shall be placed at 50' maximum spacing.

D. All metallic masses above the structure which are a permanent part of the building, with the exception of those of comparatively small size and not within six feet of the lightning conductor or another metal body. shall be made a part of the lightning protection system by interconnection with the system, or shall be independently grounded unless these metallic masses are inherently grounded. Plumbing vent stacks, fan housings fences and other metallic masses high in the building shall be permanently and effectively grounded by bonding to the lightning conductor.

1. The lightning protection system shall be bonded to the domestic and fire water lines.

2. Main conductors shall connect air terminals, and large metallic masses such as exhaust fans, HVAC equipment

   Down leads will use main conductors.

   Secondary conductors will connect small metallic masses within 6' of the lightning conductor to the lightning protection system. Items such as roof drains and flashing are examples.

   Refer to Sections 2.05 and 2.06 for main and secondary conductor sizes.

3. Down leads shall be run in 1" PVC conduit to the ground rods. The conduits shall be concealed in the building construction as much as possible.

4. A lightning arrestor, protector, or antenna discharge unit will be installed on each electric and telephone service, and radio and television antenna lead-in by the electrical contractor per NFPA-70.

5. The electrical contractor is responsible for the installation of transient protection necessary to protect sensitive equipment. The electrical contractor must either provide this protection equipment, or be assured the manufacturer of the sensitive equipment has provided it in the equipment itself. (Examples of such equipment are computers and monitors.)

E. Conductors: Shall be fastened and run as follows:

1. Fasten conductors to building at 3 ft. maximum intervals Use electrolytically compatible materials.

2. On masonry set fasteners in brick, block, or stone but not in mortar joints.

3. Bend to radii greater than 8 in.

4. Limit angle of turns to 90 degrees.

5. Route horizontal conductors around obstruction in horizontal plane.

6. Route conductor in horizontal or vertical planes only.

7. Do not form obstructions to ice or snow.

8. Connect main conductor to metal bodies of conductance using bolt tension fittings.

9. Connect conductor to metal bodies of inductance located within 6 ft., by secondary conductor.

10. Place depth indicator tags on each down lead between 3 ft. and 6 ft. above grade. Stamp each tag to indicate depth of ground and whether connection is to water pipe or common ground.

11. Install disconnector on all but one down lead, located one (1) foot above grade. Use a (2) bolt cast bronze clamp to attach ground wire to ground rod. Make connections to ground rod not less than 1' below finished grade, and 2' away from foundation wall.

12. Protect down conductors subject to damage with guards to 6 ft. above grade level.

13. Bond nonferrous metal guards to conductors at top.

14. Protect down conductors entering acidic soil with lead pipe leads extending not less than 3 ft. above grade and 3 ft. below grade.

15. Bare copper materials shall not be installed on aluminum surfaces, and aluminum materials shall not be installed on copper surfaces.

END OF SECTION

SECTION 16721

FIRE ALARM SYSTEM

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the Contract Documents, including the General and Supplementary General Condition and Division 1 - General Requirements shall apply to the work of this section.

1.02 SCOPE

A. The work covered by this Section of the Specification shall include all labor, equipment, materials and services to furnish and install a complete fire alarm system of the addressable zoned, non-coded general alarm type. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using a plug-in programmer. The system shall be an expansion of the existing Notifier 400 System which consists of, but not limited to the following:

1. Fire alarm control panel.
2. Remote Annunciator.
3. Addressable manual fire alarm stations.
4. Addressable analog and conventional area smoke detectors.
5. Addressable analog and conventional duct smoke detectors.
6. Addressable analog and conventional heat detectors.
7. Sprinkler waterflow alarm switches.
8. Audible notification appliances; horns.
9. Visual notification appliances; strobes.
10. Central station alarm connection control.
11. Air handling systems shutdown control.
12. Dry pipe sprinkler release valve/deluge valve control.
13. Sprinkler supervisory switches and tamper switch supervision.
14. Dry pipe sprinkler release valve/deluge valve supervision.
15. Emergency generator supervision.
16. Battery standby.
17. Remote annunciator.

1.03 APPLICABLE CODES AND STANDARDS

A. All equipment shall be UL listed for its intended use.

B. NFPA Standards 72

C. The National Electric Code.

D. All other local codes and authorities having jurisdiction.

1.04 RELATED DOCUMENTS

A. Secure permits and approvals prior to installation.

B. Prior to commencement and after completion of work notify Authorities Having Jurisdiction.

C. Submit letter of approval for installation before requesting acceptance of system.

1.05 RELATED WORK

A. The CONTRACTOR shall coordinate work in this Section with all related trades. Work and/ or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:

1. Sprinkler waterflow and supervisory switches shall be furnished and installed by the plumbing contractor, but wired and connected by the electrical contractor.

2. Duct smoke detectors shall be furnished, wired and connected by the electrical contractor. The HVAC contractor shall furnish necessary duct opening to install the duct smoke detectors.

3. Air handling system fan control circuits and status contacts to be furnished by the HVAC control equipment.

4. Elevator recall control circuits to be provided by the elevator control equipment.

5. Dry pipe/deluge sprinkler system release valve control circuits and supervision contacts shall be provided by the dry pipe/deluge sprinkler system control equipment.

6. Emergency generator supervision contacts to be provided by the emergency generator control equipment.

7. Raceways: Section 16110.

8. Wire and Cables: Section 16120.

1.06 SUBMITTALS

A. Provide list of all types of equipment and components provided.

B. Provide description of operation of the system, similar to that provided in Part 2 of this Section of the Specifications, to include any and all exceptions, variances or substitutions listed at the time of bid. Any such exceptions, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.

C. Provide manufacturer's printed product data, catalog cuts and description of any special installation procedures.

D. Provide samples of various items when requested.

E. Provide shop drawings as follows:

1. Drawing of the fire alarm control panel.

2. Single line riser diagram showing all equipment and type, number and size of all conductors.

3. Detailed wiring diagram of complete system.

1.07 WARRANTY

A. Manufacturer shall guarantee the system equipment for a period of one (1) year from date of final acceptance of the system.

B. The CONTRACTOR shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for one (1) year from date of final acceptance of the system.

C. Upon completion of the installation of fire alarm system equipment, the electrical contractor shall provide to the ENGINEER a signed written statement, substantially in form as follows: "The undersigned, having engaged as the Electrical Contractor on the Addition to 444 Mt. Support Road project confirms that the fire alarm system equipment was installed in accordance with the wiring diagrams, instructions and directions provided to us by the manufacturer."

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The existing system is a Notifier 400 System. All new components shall be compatible with the existing system as listed by the existing equipment manufacturer. Fire alarm system- Notifier contact Norris Inc. 207-883-3473 (Dave Gagnon).

B. Equipment of another manufacturer may be submitted for approval as equal provided the Contractor shall, at the time of bid, list all exceptions taken to these Specifications and all substitutions of operating capabilities or equipment called for in these Specifications. Said list shall be forwarded to the Engineer. The complete Fire Alarm System including the existing system and new expansion must be completely compatible and be UOJZ listed. This may require replacement of the existing control panel, annunciator and other devices as required to all the same manufacturer to achieve this listing. Final determination of compliance with these Specifications shall rest with the Engineer, who, at his discretion, may require proof of performance.

C. Approved manufacturers:

1. Notifier
2. Edwards Systems Technology (EST).
3. Simplex.
4. FCI.
5. Siemens

2.02 CIRCUITING GUIDELINES

A. Each addressable analog loop shall be circuited as shown on the drawings but device loading is not to exceed 80% of loop capacity in order to leave for space for future devices. The loop shall have Class A operation.

B. Where it is necessary to interface conventional initiating devices provide intelligent input modules to supervise Class A zone wiring.

C. For conventional zone annunciation at the control panel zones shall be as shown on the Drawings, but shall be typically as follows:

1. Manual Fire Alarm Stations: Provide one (1) alarm zone for each floor and the lobby

2. Area Smoke Detectors: Provide one (1) alarm zone for each floor and the lobby.

3. Elevator Lobby Smoke Detectors: Provide one (1) alarm zone for each floor.

4. Area Heat Detectors: Provide one (1) alarm zone for each floor or area.

5. Sprinkler Waterflow Switches: Provide one (1) alarm zone for each waterflow switch or floor.

6. Duct Smoke Detectors at HVAC Air Handling Units: Provide one (1) alarm zone for each air handling unit (supply and return as indicated).

7. Provide one (1) alarm zone for each of the following special areas/equipment:

   a. The electric switchboard room.
   b. The emergency generator room.
   c. The mechanical equipment rooms.
   d. The elevator machine room.
   e. Each dry pipe/deluge system control panel.
   f. Each communication/data room.
   g. Each stair tower.
   h. Elevator shaft.
   i. Elevator equipment room.

D. Each of the following types of devices or equipment shall be provided with supervised circuits as shown on the drawings but shall be typically as follows:

1. Sprinkler Valve Supervisory Switches: Provide one (1) supervisory module circuit for each sprinkler valve supervisory switch or floor.

2. Emergency Generator: Provide two (2) supervisory module circuits: one (1) for "Emergency Generator On."

3. Dry Pipe/Deluge Sprinkler Release Valves: Provide one (1) releasing module circuit for each dry pipe/deluge sprinkler release valve.

4. Communications/Data Room Smoke Alarm Control Panels: Provide one (1) alarm module circuit for each communication/data room smoke alarm control panel.

E. Each of the following types of alarm notification appliances shall be circuited as shown on the drawings but shall be typically as follows:

1. Audible Signals: Provide one (1) notification appliance circuit for each twenty (20) horns or as recommended by the fire alarm system manufacturer.

2. Visual Signals: Provide one (1) notification appliance circuit for each 3.4 A of signal load connected direct to the control panel NACs, and 1.7A of signal load for each NAC connected to a remote signal module.

F. Each of the following types of remote equipment associated with the fire alarm system shall be provided with a control relay contact as shown on the drawings, but shall be typically as follows:

1. HVAC Fan Systems: Provide one (1) shutdown control relay contact for each HVAC fan system.

2. HVAC Supply Fans: Provide one (1) shutdown control relay contact for each HVAC supply fan.

3. HVAC Return Fans: Provide one (1) shutdown control relay contact for each HVAC return fan.

4. HVAC Exhaust Systems: Provide one (1) shutdown control relay contact for each HVAC exhaust fan.

2.03 FIRE ALARM SYSTEM SEQUENCE OF OPERATION

A. The system shall identify any off normal condition and log each condition into the system database as an event.

1. The system shall automatically display on the control panel Liquid Crystal Display the first event of the highest priority by type. The priorities and types shall be alarm, supervisory, trouble, and monitor.

2. The system shall have a Queue operation, and shall not require event acknowledgment by the system operator. The system shall have a labeled color coded indicator for each type of event; alarm - red, supervisory - yellow, trouble - yellow, monitor - green. When an unseen event exists for a given type, the indicator shall flash. When all events of a given type have been displayed, the indicator shall change from flashing to steady.

3. For each event, the display shall include the current time, the total number of events, the type of event, the time the event occurred and up to a 40 character custom user description.

4. The user shall be able to review each event by simply selecting scrolling keys (up-down) for each event type.

5. New alarm, supervisory, or trouble events shall sound a silenceable audible signal at the control panel.

B. Operation of any alarm initiating device shall automatically:

1. Update the control/display as described above.

2. Sound all alarm signals throughout the building.

3. Turn on all strobe lights throughout the building.

4. Turn on a red alarm zone LED at the fire alarm control panel.

5. Start the reset/alarm silence disable timer to guarantee that alarm signals will sound for a minimum period of enter integer time between 0-99 minutes.

6. Start the alarm signal cutoff timer to turn the signal off after a minimum period of enter integer time between 0-99 minutes.

7. Operate the alarm relay contacts to initiate the transmission of an alarm to the OWNER=S central monitoring station and city master box connection.

8. Operate control relay contacts to shutdown all HVAC units serving the floor of alarm initiation.

9. Operate control relay contacts to return all elevators that serve the floor of alarm initiation to the ground floor. If the alarm originates from the ground floor, operate control circuits

contacts to return all elevators to the floor above or to a level as directed by the local fire department.

10. Visually annunciate the zone of alarm on the annunciator panel. The visual indication shall remain on until the alarm condition is reset to normal.

C. Activation of a sprinkler supervisory initiating device shall:

1. Update the control/display as described above.

2. Turn on a yellow zone LED at the fire alarm control panel.

3. Operate the supervisory relay contacts to initiate the transmission of an alarm to the OWNER=S monitoring station and if requested by the City of Portland to the city system.

4. Visually annunciate the zone of alarm on the annunciator panel. The visual indication shall remain on until the alarm condition is reset to normal.

D. The entire fire alarm system wiring shall be electrically supervised to automatically detect and report trouble conditions to the fire alarm control panel. Any opens, grounds or disarrangement of system wiring and shorts across alarm bell/strobe wiring shall automatically:

1. Update the control/display as described above.

2. Operate the supervisory relay contacts to initiate the transmission of an alarm to the OWNER=S monitoring station as selected by the OWNER and to the municipal master fire alarm box.

3. Visually and audibly annunciate a general trouble condition, on the remote annunciator panel. The visual indication shall remain on until the trouble condition is repaired.

2.04 SUPPORT FOR INSTALLER AND OWNER MAINTENANCE

A. Provide a coded one man walk test feature. Allow audible or silent testing. Signal alarms and troubles during test. Allow receipt of alarms and programmed operations for alarms from areas not under test.

B. Provide internal system diagnostics and maintenance user interface controls to display/ report the power, communication, and general status of specific panel components, detectors, and modules.

C. Provide loop controller diagnostics to identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the circuit wiring of remote module shall be identified by device address.

D. Allow the user to display/report the condition of addressable analog detectors. Include device address, device type, percent obscuration, and maintenance indicator. The maintenance indicator shall provide the user with a measure of contamination of a device upon which cleaning decisions can confidently be made.

E. Allow the user to report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity. Include Facility Name, Licensee, Project Program Compilation date, Compiler Version, Project Revision Number, and the time and date of the History Report.

F. Allow the user to disable/enable devices, zones, actions, timers and sequences. Protect the disable function with a password.

G. Allow the user to activate/restore outputs, actions, sequences, and simulate detector smoke levels.

H. Allow the service user to enter time and date, reconfigure an external port for download programming, initiate auto programming and change passwords. Protect these functions with a password.

2.05 EQUIPMENT

A. Fire Alarm Control Panel/ (Existing):

1. The fire alarm control panels shall incorporate all control electronics, relays, and necessary modules and components in a surface mounted cabinet. The operating controls and zone/ supervisory indicators shall be located behind locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified. The cabinet shall be steel. The assembly shall contain a base panel, system power supply and battery charger with optional modules suitable to meet the requirements of these specifications.

2. System circuits shall be configured as follows: Addressable analog loops Class A Initiating Device Circuits Class A; Notification Appliance Circuits Class A.

3. Single-stage operation.

4. The system shall be supervised, site programmable, and of modular design with expansion modules to serve up to 96 detectors and 94 remote modules, and a minimum of four notification appliance circuits (NACs) convertible to power risers to serve remote multiple NAC modules for zoned signal applications.

5. The system shall store all basic system functionality and job specific data in non-volatile memory. The system shall survive a complete power failure intact.

6. The system shall have built-in automatic system programming to automatically address and map all system devices and provide a minimum default single stage alarm system operation with support of alarm silence, trouble silence, drill, lamp test, and reset common controls.

7. The system shall allow down loading of a job specific custom program created by system application software. It shall support programming of any input point to any output point. The system shall support the use of Bar Code readers to assist custom programming functions. It shall allow authorized customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms.

8. The system shall support distributed processor intelligent detectors with the following operational attributes; integral multiple differential sensors, automatic device mapping, electronic addressing, environmental compensation, pre-alarm, dirty detector identification, automatic day/night sensitivity adjustment, dual normal/alarm LEDs, relay bases, and isolator bases.

9. The system shall use full digital communications to supervise all addressable loop devices for placement, correct location, and operation. It shall allow swapping of Asame type@ devices without the need of addressing and impose the Alocation@ parameters on replacement device. It shall initiate and maintain a trouble if a device is added to a loop and clear the trouble when the new device is mapped and defined into the system.

10. The system shall have a UL Listed Detector Sensitivity test feature, which will be a function of the smoke detectors and performed automatically every 4 hours.

11. The system shall support 100% of all remote devices in alarm and provide support for a 100% compliment of detector isolator bases.

12. All panel modules shall be supervised for placement and return trouble if damaged or removed.

13. The system shall have a CPU watchdog circuit to initiate trouble should the CPU fail.

14. The system evacuation signal rate shall be continuous.

15. Provide a signal silence inhibit feature set to enter integer time between 0-99 minutes and an automatic signal silence timer set to enter integer time between 0-99 minutes. Audible notification appliances shall be affected by signal silence features. Visual signal appliance shall not be affected by signal silence features.

16. The system program shall meet the requirements of this project, current codes and standards, and satisfy the local Authority Having Jurisdiction.

17. Passwords shall protect any changes to system operations.

18. The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 4A continuous for notification appliance circuits. The power supply shall be capable of providing 10A to output circuits for a maximum period of 50 ms. Auxiliary power shall be 24 Vdc at 500 mA. All outputs shall be power limited. The battery shall be sized to support the system for 4 hours of supervisory and trouble signal current plus general alarm for 5 minutes.

19. The LCD Display Module shall be of membrane style construction with a 4 line by 20 character Liquid Crystal Display. The LCD shall use supertwist technology and backlighting for high contrast visual clarity. In the normal mode display the time, the total number of active events and the total number of disable points. In the alarm mode display the total number of events and the type of event on display. Reserve 40 characters of display space for user custom messages. The module shall have visual indicators for the following common control functions; AC Power, alarm, supervisory, monitor, trouble, disable, ground fault, CPU fail, and test. There shall be common control keys and visual indicators for; reset, alarm silence, trouble silence, drill, and one custom programmable key/indicator. Provide four pairs of display control keys for selection of event display by type (alarm, supervisory, monitor and trouble) and forward/backward scrolling through event listings. The operation of these keys shall be integrated with the related common control indicators to flash the indicators when undisplayed events are available for display and turn on steady when all events have been displayed. Allow the first event of the highest priority to capture the LCD for display so that arriving fire fighters can view the first alarm event Ahands free@. Provide system function keys; status, reports, enable, disable, activate, restore, program, and test. The module shall have a numeric keypad, zero through nine with delete and enter keys.

20. The Main Controller Module shall control and monitor all local or remote peripherals. It shall support the LCD Display Module, power supply, remote LCD and zone display

annunciators, strip and carriage printers, and support communication interface standard protocol (CSI) devices such as color computer annunciators and color graphic displays. The RS-485 port shall be capable of supporting up to 32 remote annunciators. The MCM shall provide one loop controller circuit, two notification appliance circuits, and common form >C= contacts for alarm, supervisory, and trouble. Contact ratings shall be 24Vdc at 1A.

21. The panel shall have:

    a. An Expander Loop Module with one additional loop controller circuit and two notification appliance circuits to expand the system capability to 192 detectors and 188 modules.

    b. An interface module for remote site monitoring. The module shall have a local energy municipal loop and reverse polarity connections for each of alarm, supervisory and trouble.

    c. Digital alarm communicator transmitter (DACT) module to transmit alarm, supervisory and trouble signals to a OWNER=S Monitoring Station. The DACT shall support dual telephones lines, 20 PPS 4/2 communications, and configured for dual tone multi-frequency (DTMF) or pulse modes. It shall be possible to delay AC power failure reports, auto test call, and site program using a touch tone phone and password.

    d. Zone display indicator modules to annunciate zones per the fire alarm zoning schedule.

    e. An RS-232 isolator card to isolate grounded peripheral devices (such as printers and CRTs) from the control panel.

2.06 COMPONENTS

A. Intelligent Devices - General

1. Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, number of alarms and troubles, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.

2. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device=s address by physical means shall not be necessary.

B. Intelligent Detectors -- General

1. The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable.

2. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.5 seconds.

3. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the analog loop controller. A red LED shall flash to display alarm status.

4. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.

5. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings.

6. Each detector microprocessor shall contain an environmental compensation algorithm which identifies and sets ambient AEnvironmental Thresholds@ approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminates as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24 hour long term and 4 hour short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the Alearned@ base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour.

7. The intelligent analog detectors shall be suitable for mounting on any Signature Series detector mounting base.

C. Fixed Temperature Heat Detector

1. Provide intelligent fixed temperature heat detectors. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The heat detector shall have a nominal alarm point rating of 135°F (57°C). The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

D. Fixed Temperature/Rate of Rise Heat Detector

1. Provide intelligent combination fixed temperature/rate-of-rise heat detectors. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be

acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate-of-rise alarm point of 15°F (9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

E. Ionization Smoke Detector

1. Provide intelligent ionization smoke detectors SIGA-IS. The analog ionization detector shall utilize a unipolar ionization smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC. The ion detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The ion smoke detector shall be rated for operation in constant air velocities from 0 to 75 ft/min. (0-0.38 m/sec) and with intermittent air gusts up to 300 ft/min. (1.52m/sec) for up to 1 hour.

2. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 0.7% to 1.6%. The ion detector shall be suitable for operation in the following environment:

   a. Temperature: 32°F to 120°F (0°C to 49°C)
   b. Humidity: 0-93% RH, non-condensing
   c. Elevation: Up to 6,000 ft. (1828 m)

F. Photoelectric Smoke Detector

1. Provide intelligent photoelectric smoke detectors. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes.

2. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The photo detector shall be suitable for operation in the following environment:

   a. Temperature: 32°F to 120°F (0°C to 49°C)
   b. Humidity: 0-93% RH, non-condensing
   c. Elevation: no limit

G. Standard Detector Mounting Bases

1. Provide standard detector mounting bases, suitable for mounting on North American 1-gang, 3-1/2@ or 4@ octagon box and 4@ square box. The base shall, contain no electronics, support all same series detector types and have the following minimum requirements:

   a. Removal of the respective detector shall not affect communications with other detectors.

   b. Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.

   c. The base shall be capable of supporting one (1) Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.

H. Relay Detector Mounting Bases

1. Provide relay detector mounting bases, suitable for mounting on North American 1-gang, 3-1/2A or 4@ octagon box and 4@ square box. The relay base shall support all same series detector types and have the following minimum requirements:

   a. The relay shall be a bi-stable type and selectable for normally open or normally closed operation.

   b. The position of the contact shall be supervised.

   c. The relay operation shall be exercised by the detector processor upon power up.

   d. The relay shall automatically de-energize when a detector is removed.

   e. The operation of the relay base shall be controlled by its respective detector processor. Detectors operating standalone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor shall not be acceptable.

   f. Form Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for Apilot duty@.

   g. Removal of the respective detector shall not affect communications with other detectors.

   h. Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.

I. Isolator Detector Mounting Bases

1. Provide isolator detector mounting bases, suitable for mounting on North American 1-gang, 3-1/2A or 4@ octagon box and 4@ square box. The operation of the isolator base shall be controlled by its respective detector processor. Isolators which are not controlled by a detector processor shall not be accepted. Following a short circuit condition, each isolator/detector shall be capable of performing an internal self-test procedure to re-establish normal operation. Isolator/detectors not capable of performing independent self tests shall not be acceptable. The isolator base shall support all Signature Series Detector types and have the following minimum requirements:

   a. The isolator shall operate within a minimum of 23 msec. of a short circuit condition on the communication line.

b. When connected in Class A configuration the Loop Controller shall identify an isolated circuit condition and provide communications to all non isolated analog devices.

c. Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.

J. Detector Mounting Plate

1. Provide detector mounting plate assemblies to facilitate mounting a same series detector for direct insertion into a low velocity duct 3 ft (0.91m) high and 3 ft (0.91m) wide, ceiling plenum, or raised floor. Mounting plate shall be code gauge steel with corrosion resistant red enamel finish. The detector mounting plate shall support an intelligent analog Photoelectric Detector or 3D Multisensor Detector, or 4D Multisensor Detector along with a standard, relay or isolator detector mounting base. .

K. Duct Detector Housing

1. Provide smoke detector duct housing assemblies to facilitate mounting an intelligent analog Photoelectric Detector, or 3D Multisensor Detector, or 4D Multisensor Detector along with a standard, relay or isolator detector mounting base. Provide for variations in duct air velocity between 300 and 4000 feet per minute (300 to 1000 feet per minute for ion-photo-heat detector). Protect the measuring chamber from damage and insects. Provide an air exhaust tube and an air sampling inlet tube which extends into the duct air stream up to ten feet. Provide drilling templates and gaskets to facilitate locating and mounting the housing. Provide five one gang knockouts for mounting optional Signature Series modules. Finish the housing in baked red enamel. Provide Remote Alarm LED Indicators and Remote Test Stations as shown on the plans.

L. Intelligent Modules - General

1. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

a. Temperature: 32°F to 120°F (0°C to 49°C)
b. Humidity: 0-93% RH, non-condensing

M. Single Input Module

1. Provide intelligent single input modules. The Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2-1/2@ (64mm) deep 1-gang boxes and 1-1/2@ (38mm) deep 4@ square boxes with 1-gang covers. The single input module shall support the following circuit types:

a. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)

b. Normally-Open Alarm Delayed Latching (Waterflow Switches)
c. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
d. Normally-Open Active Latching (Supervisory, Tamper Switches)

N. Dual Input Module

1. Provide intelligent dual input modules. The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2-1/2@ (64mm) deep 1-gang boxes and 1-1/2@ (38mm) deep 4@ square boxes with 1-gang covers. The dual input module shall support the following circuit types:

a. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
b. Normally-Open Alarm Delayed Latching (Waterflow Switches)
c. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
d. Normally-Open Active Latching (Supervisory, Tamper Switches)

O. Monitor Module

1. Provide intelligent monitor modules. The Monitor Module shall be factory set to support one (1) supervised Class B Normally-Open Active Non-Latching Monitor circuit. The monitor module shall be suitable for mounting on North American 2-1/2" (64mm) deep 1-gang boxes and 1-1/2@ (38mm) deep 4@ square boxes with 1-gang covers.

P. Waterflow/Tamper Module

1. Provide intelligent waterflow/tamper modules. The Waterflow/Tamper Module shall be factory set to support two (2) supervised Class B input circuits. Channel A shall support a Normally-Open Alarm Delayed Latching Waterflow Switch circuit. Channel B shall support a Normally-Open Active Latching Tamper Switch. The waterflow/tamper module shall be suitable for mounting on North American 2-1/2@ (64mm) deep 1-gang boxes and 1-1/2@ (38mm) deep 4@ square boxes with 1-gang covers.

Q. Single Input Signal Module

1. Provide intelligent single input signal modules. The Single Input (Single Riser Select) Signal Module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. When selected as a telephone power selector, the module shall be capable of generating its own Aring tone@. The module shall be suitable for mounting on North American 2-1/2@ (64mm) deep 2-gang boxes and 1-1/2@ (38mm) deep 4@ square boxes with 2-gang covers. The single input signal module shall support the following operations:

a. Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25Vrms @50w or 70 Vrms @ 35 Watts of Audio)

b. Telephone Power Selector with Ring Tone (Fire Fighter=s Telephone)

R. Dual Input Signal Module

1. Provide intelligent dual input signal modules. The Dual Input (Dual Riser Select) Signal Module shall provide a means to selectively connect one of two (2) signaling circuit power risers to one (1) supervised output circuit. The module shall be suitable for mounting on North American 2-1/2@ (64mm) deep 2-gang boxes and 1-1/2@ (38mm) deep 4@ square

boxes with 2-gang covers, or European 100mm square boxes. The dual input signal module shall support the following operation:

a. Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25 Vrms @ 50w or 0 Vrms @ 35w of Audio)

S. Control Relay Module

1. Provide intelligent control relay modules. The Control Relay Module shall provide one form AC@ dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on North American 2-1/2@ (64mm) deep 1-gang boxes and 1-1/2@ (38mm) deep 4@ square boxes with 1-gang covers.

T. Universal Class A/B Module

1. Provide intelligent class A/B modules. The Universal Class A/B Module shall be capable of a minimum of fifteen (15) distinct operations. The module shall be suitable for mounting on North American 2-1/2@ (64mm) deep 2-gang boxes and 1-1/2@ (38mm) deep 4@ square boxes with 2-gang covers. The universal class A/B module shall support the following circuit types:

a. One (1) form AC@ dry relay contact rated at 2 amps @ 24 Vdc.
b. One (1) supervised Class A Normally-Open Alarm Latching.
c. One (1) supervised Class A Normally-Open Alarm Delayed Latching.
d. One (1) supervised Class A Normally-Open Active Non-Latching.
e. One (1) supervised Class A Normally-Open Active Latching.
f. One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
g. One (1) supervised Class A 2-wire Smoke Alarm Verified
h. One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.

U. Isolator Module

1. Provide intelligent fault isolators modules. The Isolator Module shall be capable of isolating and removing a fault from a class A data circuit while allowing the remaining data loop to continue operating. The module shall be suitable for mounting on North American 2-1/2@ (64mm) deep 2-gang boxes and 1-1/2@ (38mm) deep 4@ square boxes with 2-gang covers.

V. Intelligent Manual Pull Stations - General

1. It shall be possible to address each same series fire alarm pull station without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The manual stations shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground faults. The fire alarm pull station shall be suitable for operation in the following environment:

a. Temperature: 32°F to 120°F (0°C to 49°C)
b. Humidity: 0-93% RH, non-condensing

2. Notification Appliances B General

a. All appliances shall be UL Listed for Fire Protective Service.

b. All strobe appliances or combination appliances with strobes shall be capable of providing the AEquivalent Facilitation@ which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971, and ULC S526 Listed.

c. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers= instructions.

d. Any appliances which do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers which clearly states that their equipment (as submitted) are 100% compatible with each other for the purposes intended.

3. Self-Synchronized Strobes

a. 1-Gang Strobes, 202 Series

Provide strobes. In - Out screw terminals shall be provided for wiring. The strobes shall have a red plastic face plate. They shall provide 15/75 cd synchronized flash outputs. Strobes shall mount in a North American 1-gang box. The strobe shall have lens markings oriented for wall mounting. It shall be possible to replace the lens markings with lens marking kits. Removal of an installed strobe to change the lens markings shall not be acceptable. Provide weatherproof wall boxes for outdoor mounting.

4. Horn/Strobes

a. Mini-Horn/Strobes, 692 Series

b. Provide electronic horn/strobes. The horn/strobe shall have a red plastic housing. A sound output level of 91 dBA average shall be provided.

c. The strobe shall provide 15, 75, or 110 cd synchronized flash outputs as indicated on the Drawings. The strobe shall have lens markings oriented for wall mounting. It shall be possible to replace the lens markings with lens marking kits. Removal of an installed Horn/Strobe to change the lens markings shall not be acceptable.

d. Horn/strobe shall mount to a North American 1-gang masonry electrical box (2-1/2@ deep).

5. Ancillary Devices B General

a. Ancillary devices submitted for use must have written proof of their compatibility for the purposes intended.. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.

6. Remote Relays

a. Multi-Voltage Control Relays

Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

b. Multi-Voltage Control Relays

Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

c. Multi-Voltage Control Relays

Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 12 Vdc, 12 Vac, 24 Vdc, or 24 Vac. A red LED shall indicate the relay is energized.

d. Multi-Voltage Control Relays

Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, or 24 Vac, or 115 Vac. A red LED shall indicate the relay is energized.

e. Manual Override Control Relays

Provide remote control relays each with manual override feature connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac or 24 Vdc. A single relay may be energized from a voltage source of 24 Vdc or 24 Vac. A red LED shall indicate the relay is energized.

f. Heavy Duty Power Relays

Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 30 amperes at 300 Vac or 2 HP motor load. A single relay may be energized from a voltage source of 24 Vac 115 Vac. A metal enclosure shall be provided.

PART 3 EXECUTION

3.01 INSTALLATION

A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram. The CONTRACTOR shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the manufacturer, approved by the local Fire Department, and shall be installed in rigid, threaded conduit throughout.

All penetration of floor slabs and fire walls shall be fire stopped in accordance with all local fire codes.

End of Line Resistors shall be furnished as required for mounting as directed by the manufacturer.

All wiring shall be color coded throughout, to National Electrical Code standards.

The system shall be arranged to receive power from one three wire 277 Vac, 15 A supply. All low voltage operation shall be provided from the fire alarm control panel.

3.02 FIELD QUALITY CONTROL

A. The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the function as specified.

3.03 TESTS

A. Reports of any field testing during installation shall be forwarded to the ENGINEER. Each individual system operation on a circuit by circuit basis shall be tested for its complete operation. The procedure for testing the entire fire alarm system shall be set forth with the consent of the code enforcement official, the ENGINEER and the manufacturer.

3.04 GUARANTEE AND FINAL TEST

A. The CONTRACTOR shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for a period of one year from the date of final acceptance. Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:

1. The CONTRACTOR'S site representative, in the presence of a representative of the manufacturer, a representative of the OWNER, and the fire department shall operate the building fire alarm devices to ensure proper operation, correct annunciation at each remote annunciator and the control panel. One-half of all tests shall be performed on battery standby power. Where applying heat would destroy any detector, they may be manually operated. The station/ thermo-detector circuit and the signaling circuits shall be opened in at least two locations per zone to check for the presence of correct supervisory circuitry. When the testing has been completed to the satisfaction of both the CONTRACTOR'S representative and the representatives of the manufacturer and OWNER, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the OWNER. Without additional expense to the OWNER, the CONTRACTOR shall replace any defective materials or equipment provided by him under this contract within one year from the date of final acceptance by the awarding authority. Prior to final test, the fire department must be notified within a reasonable time of test date (at least 24 hours).

B. As-built drawings and testing and maintenance instructions:

1. Operating and instruction manuals shall be submitted prior to testing of the system. Six (6) complete sets of operating and maintenance manuals shall be delivered to OWNER upon completion.

2. A complete set of reproducible as-builts, showing installed wiring and color coding and wire tag notations, exact locations of all installed equipment, specific interconnections between all equipment and internal wiring of the equipment shall be delivered to the OWNER upon completion of the system.

3. Complete, simple, comprehensive, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete troubleshooting manual explaining what might be wrong if a certain malfunction occurs and explaining how to test equipment, shall be delivered to the OWNER upon completion of the system.

4. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

   a. Instruction on replacing any components of the system, including internal parts.

   b. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.

   c. A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and the manufacturer's authorized distributor.

C. Installation shall be made in complete accordance with the manufacturer's recommendations and instructions.

D. The supplier of the equipment shall provide, with no additional charge, any information, supervision and testing required for the proper installation and operation of the equipment.

E. The CONTRACTOR shall coordinate with the Portland Fire Department having jurisdiction on the approvals for the alarm system and obtain their approval on the system.

END OF SECTION

SECTION 16722

CCTV SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish CCTV cameras and connection medium.

B. Installation.

1.02 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 01300.

B. No equipment and material shall be ordered or shop work started until the ENGINEER'S acceptance of shop drawings has been given.

C. Include wiring diagram, manufactures system specifications and all product data for all equipment.

D. Where manuals include manufacturer's catalog pages, clearly indicate the specific items included in this installation and delete or otherwise clearly indicate all extraneous data which does not apply.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Surveillance System:

1. Contact Griffon Security Technologies
207.793.4897 (Tim Barrett)

B. Substitutions: Items of same function and performance are acceptable in conformance with Division 1 - General Requirements.

2.02 COMPONENTS

A. General:

1. Furnish CCTV system complete and ready to use. The system shall include CCTV cameras, associated enclosures, mounting equipment, hardware, and connection medium necessary to connect cameras to recording and monitoring equipment in the terminal building.

2. Furnish CCTV system complete and ready to use. The system shall include all cameras, power supply, and associated equipment necessary to integrate parking garage cameras to existing monitoring and recording equipment in jetport terminal.

3. Show satisfactory evidence that the supplier is an authorized distributor for the equipment proposed and that he maintains a fully equipped service department for maintenance of the system, including standard replacement parts. The supplier shall be prepared to offer

a service contract for the maintenance of this system after the guarantee period.

4. Provide a set of operating instructions, circuit diagrams and other information necessary for proper installation, maintenance and operation of the system.

5. All equipment including wiring and cabling furnished and installed under these specifications shall be guaranteed for a period of one year from the date of final acceptance. Included under the guarantee shall be all electrical and mechanical defects or failures, except that which can be proven to have been caused by misuse or abuse. All service and parts shall be the responsibility of the CONTRACTOR during the period of guarantee.

6. All wiring for the CCTV system shall be the same as specified for lighting and power circuitry. Raceways containing the security system conductors shall not contain any other conductors and **no** AC current carrying conductors will be allowed in the same raceway with the security system conductors.

B. General requirements:

1. System operation:

a. CCTV System: The CCTV system shall monitor the designated areas of the parking garage. Video cameras will be mounted in locations shown on the Drawings. All cameras will send their information to existing monitoring and recording equipment in the terminal building.

b. If possible, the cameras will terminate in the parking garage and continue to the terminal building by some multiplexed means.

C. Equipment:

1. CCTV System: Furnish and install a CCTV system. The complete system shall be UL listed.

2. The system shall include but not be limited to the following:

a. The cameras shall be Pelco Model ICS111-CDV39A color, low light DSS, high resolution mini-dome cameras in environmental enclosure with integral heater, clear dome cover and 3-9mm vari-focal auto-iris lens.

b. The CCTV cameras provided shall connect to existing monitoring and recording equipment in the jetport terminal. The equipment being specified for the parking garage are the cameras, enclosures, mounting equipment, hardware, connection medium, and communications equipment necessary to get the camera signals to the jetport terminal and integrate the cameras into the existing CCTV system in the jetport terminal.

c. The camera power supply shall be Pelco Model MCS16-10 UL Listed, 24VAC, 240VA camera power supply with 16 individually fused outputs and overload protection.

d. The camera recorder shall be American Dynamics Intellex Model ADD6R0DVD050 16 channel, rack mount, deluxe model w/500 GB.

3. Wiring:

   a. Furnish and install all wiring for the system whether or not indicated on the Drawings, to guarantee a complete operational system.

   b. Wire and cable required to perform the herein specified systems shall be run in strict accordance with manufacturer's recommendations.

   c. Wiring shall conform to the National Electrical Code Article 725.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the system in accordance with applicable codes and safety precautions. The system shall be designed by acceptable manufacturer as shown in 2.01 A. The installation of all work shall be neat. All boxes, equipment, etc., shall be plumb and square.

B. All equipment locations and mountings shall meet the OWNER'S AND ENGINEER'S approval.

C. It shall be the responsibility of the CONTRACTOR to cooperate with other trades in order to achieve well-coordinated progress and satisfactory final results. He shall watch for conflicts with work of the contractors on the job and execute, without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.

D. All equipment shall be firmly held in place. All switches, connector jacks, outlets, etc., shall be clearly, logically, and permanently marked during installation.

E. The manufacturer's authorized representative will be required to provide supervision of final system panel connections, perform a complete functional test of the system and submit a written report to the CONTRACTOR attesting to the proper operation of the system.

END OF SECTION

SECTION 16740

TELEPHONE SERVICE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing telephone service.

B. Coordinating with Telephone Company.

C. Furnishing conduit system for interior and exterior telephone wiring.

D. Furnishing telephone wiring as shown on the Drawings.

E. Installation.

1.02 REFERENCE STANDARDS

A. National Electrical Code (NEC) - NFPA-70.

B. ANSI/EIA/TIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces.

C. ANSI/TIA/EIA-607 - Commercial Building Grounding and Bonding Requirements for Telecommunications.

D. ANSI/TIA/EIA-568A - Commercial Building Telecommunications Cabling Standard.

E. ANSI/TIA/EIA-606 - Administration Standard for Telecommunications Infrastructure of Commercial Buildings.

1.03 SUBMITTALS

A. Submit information data in accordance with Division 1.

1.05 QUALITY ASSURANCE

A. Copies of the referenced standards shall be made available if requested by the ARCHITIECT/ ENGINEER. All requirements shall be followed of said standards during the installation of the wiring under this Specification.

PART 2 PRODUCTS

2.01 CONDUIT

A. EMT, minimum size 3/4-inch interior, installed by electrical contractor.

B. Refer to Section 16111 -Conduits.

2.02 WIRING

A. Data/voice multi-conductor cable (level 5): Cable shall be 4 pair (8 conductor) or 25 pair where indicated #24 AWG, level 5 high quality grade UTP cabling, plenum rated, color by OWNER. Cabling shall conform to all levels 5, 10-100 MB EIA/TIA Standards. No splicing shall be permitted.

B. Refer to Section 186120 – Wires and Cables.

2.03 OUTLET BOXES

A. 2-gang flush mounted (4" square - 2.25" deep nominal) with 1/2" dual gang mud ring, installed by electrical contractor.

B. Refer to Section 16134 - Outlet Boxes.

2.04 COVER PLATES

A. One-gang with openings for voice/data outlet.

B. Color to match device plates.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide and install required conduit and accessory items to accomplish the work involved in providing the telephone raceway system as shown on the drawings.

B. The CONTRACTOR shall coordinate service work with the OWNER/ENGINEER and telephone company.

C. Furnish and install all electrical conduit for the telephone service and accessory items necessary to accomplish the work detailed herein and on the Drawings.

D. Install each voice/data telephone outlet in double gang box with single gang plaster ring at locations shown on the Drawings.

E. Connect and install each connector within outlet to 4 pair cable and route to existing punch-down terminal block.

F. Voice/data cabling shall be routed to existing punchdown terminal blocks and network hub stations utilizing cable tray system to its maximum.

G. The maximum run length on each line (data) should not exceed 320 feet to respective network hub station.

H. Any data and voice lines failing the cable testing requirements must be reworked until they meet the referenced standards.

I. Two sets of printed and bound test results of newly installed cable should be created into a set of books (3-ring binders) at the completion of project testing. The following information shall be on these printouts:

1. Data wire assigned #
2. Capacitance
3. Loop resistance
4. Impedance
5. Attenuation (signal loss)
6. Length of run
7. Wire map
8. Next (near end cross talk)
9. Attenuation to cross talk ratio

J. A qualified testing agency/contractor shall provide the testing for the voice/data cabling systems. Refer to Section 16950.

END OF SECTION

SECTION 16741

IP-BASED COMMUNICATION WITH
CIRCUIT-SWITCHED COMMUNICATION SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Coordinate with Siemens Communications, Inc.
Siemens contact: Mr. Earl Baumgardner; TEL: (978) 848-4605

B. Furnishing conduit and wiring for interior and exterior system. Final cable terminations and connections to the HiPath 4000 system shall be accomplished by Siemens.

C. Assist Siemens in the Installation of the HiPath 4000.

1. Coordinate with the Siemens Installer.
2. Inventory all part numbers and verify correct quantizes have arrived on site.
3. Unpack the HiPath 4000 and prep it in the room for installation by the Installer.

D. Siemens will provide a HiPath 4000 Real-Time IP System Product and associated installation Services.

1.02 REFERENCE STANDARDS

A. National Electrical Code (NEC) - NFPA-70.

B. Safety UL60950-1 – Information Technology and Telecommunications Equipment

C. ANSI/TIA/-968-A – Telecommunications - Telephone Terminal Equipment - Technical Requirements for Connection of Terminal Equipment to the Telephone Network

D. FCC Part 68 – Terminal Equipment (TE) to the Public Switched Telephone Network (PSTN)

1.03 SUBMITTALS

A. Submit information data in accordance with Division 1.

1.05 QUALITY ASSURANCE

A. Copies of the referenced standards shall be made available if requested by the ARCHITIECT/ ENGINEER. All requirements shall be followed of said standards during the installation of the wiring under this Specification.

PART 2 PRODUCTS

2.01 IP-BASED COMMUNICATION SYSTEM

A.	HiPath 4000 19 inch Basic Materials:	Quantity: 1
B.	Basic Digital Station including license and port:	Quantity: 3
C.	Standard Digital Station including license and port:	Quantity: 1
D.	Advanced Digital Station including license and port:	Quantity: 10

E.	Key Modules, Application Modules:	Quantity: 8
F.	Board For Analog Card with license, NO PHONE:	Quantity: 5
G.	Number of Local Trunk Connections:	Quantity: 44
H.	Number of CorNet Trunk Connections:	Quantity: 4

2.01 SHOPPING LIST

A.	CSU, DSU, Modems T1 ESF/SF CSU Ace Package	Quantity: 2
B.	AMP-Handset/Analog Phone (Brown)	Quantity: 25
C.	Adapter Music on Hold:	Quantity: 1
B.	Page Adapter Expandable STTN Level	Quantity: 1

2.02 LOCATION STATIONS/CONNECTION SUMMARY

A.	Analog Stations:	Quantity: 120
B.	Digital Stations:	Quantity: 14
C.	Number of Local Trunk Connections:	Quantity: 44
D.	Number of CorNet Trunk Connections:	Quantity: 4

2.03 ADDITIONAL MATERIAL

A.	4 Post Open Frame Racks	Quantity: 4
B.	Fiber Interface At Garage IPDA	Quantity: 1
C.	Fiber Interface At HiPath 4000	Quantity: 1
D.	Fiber Interface At Terminal IPDA	Quantity: 1

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish and install required conduit, wiring and accessory items to accomplish the work involved in providing the communication as detailed herein and shown on drawing E-5-0.

B. Provide the required connections to the following summary of Connection/Location Stations:

1.	Analog Stations:	Quantity: 120
2.	Digital Stations:	Quantity: 14
3.	Number of Local Trunk Connections:	Quantity: 44
4.	Number of CorNet Trunk Connections:	Quantity: 4

C. The CONTRACTOR shall coordinate service work with the OWNER/ENGINEER, SIEMENS, and Telephone Company.

D. A qualified testing agency/contractor shall provide the testing for the voice/data cabling systems.

Refer to Section 16950.

END OF SECTION

SECTION 16762

EMERGENCY PHONE COMMUNICATION SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnishing a new emergency phone communication system.

B. Installation.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code

B. ADAAG - Americans with Disabilities Act Accessibility Guidelines.

1.03 APPLICABLE SECTIONS

A. 16050 - Basic Electrical Materials and Methods.

B. 16110 - Raceways.

C. 16120 - Wires and Cables.

1.04 SUBMITTALS

A. Submit catalog information data in accordance with Division 1. Submittal shall include layout, quantities and wiring diagram of complete system.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Emergency Phone Communication System Equipment:

1. Talk-A-Phone Contact Norris Inc.
207-883-3473 (Dave)
2. Code Blue Contact Norris Inc.
207-883-3473 (Dave)

B. Substitutions: Items of same function and performance are acceptable in conformance with Division 1 - General Requirements.

2.02 EQUIPMENT

A. General:

1. All wiring for the emergency phone communication system shall be subject to the same restrictions as hereinbefore specified for lighting and power circuitry.

Raceways containing the security system conductors shall not contain any other

conductors and no AC current-carrying conductors over 24 VAC will be allowed in the same raceway with the emergency phone communication system conductors.

2. Provide a complete emergency phone communication system to be installed, connected, tested and left in first-class operating condition. All equipment herein specified shall be that of Talk-A-Phone, Blue Code, or approved equal. The system shall be supplied by a single source.

B. Emergency Phone Communication Device:

1. This ADA compliant, emergency phone is designed for indoor, outdoor use. The face plate and the enclosure of the unit will be stainless steel The unit will have a metal vandal resistant call button, and a vandal resistant speaker and microphone. The unit shall have an LED that lights when the call has been placed, and a LED that lights when the call is received by the monitoring station.

2. All signage shall be ADA compliant.

C. Blue Light/Strobe Device:

1. Each area of refuge shall be provided with a blue light strobe consisting of the following:

a. A blue light constantly illuminated shall identify each emergency phone location.

b. This light will strobe when the emergency telephone is active.

c. The strobe brightness shall be approximately 1.5 million candle power, with a strobe frequency of approximately 70 Hz.

D. Scream Alert Activation Device:

1. Designated emergency call phones (see Drawings) will have a device that detects human screams.

a. This device shall activate the emergency phone when a scream is detected. Only security pager will be dialed; 911 will not be dialed.

b. The device shall have a stainless steel faceplate, and be capable of surface or flush mount.

c. The unit shall have an auto recharge battery back-up.

d. The sound level the unit activates at shall be adjustable. The duration required for activating sound shall be adjustable.

2.03 SYSTEM REQUIREMENTS

A. The emergency phone system shall tie into the Siemens HiCom300E telephone switch in the jetport terminal.

B. The emergency phone will be capable of dialing "911" and/or the security personnel's pager depending on whether the unit was activated by the pushbutton, or the scream alert device.

C. The ability to provide an alphanumeric message on the security personnel's pager, as well as a number to call must be coordinated with the appropriate parties.

D. Each area of rescue assistance station is to have high-brightness LED indicators and a pulsing audible signal. One red LED for AHelp Requested@ and one red LED for AHelp Coming@ or similar operation.

E. Pushbutton on area of rescue assistance station shall be 3" round stainless steel, heavy-duty vandal-resistant. It shall be a domed or similar non-enclosed pushbutton that is large and easy to push. Pushbutton shall protrude as the highest element on the panel and not to be obstructed by other hardware. Pushbutton shall have engraved APush for Help@ lettering in a contrasting color so it is easily visible. Station shall employ a mechanism similar to a fire alarm pull station that requires it to be manually reset.

F. Each area of rescue assistance station is to have instructional signage for its use in a stainless steel frame. Text is to conform to ADA requirements for text size and style.

G. Stations shall not protrude from the wall more than 4" as per ADA code.

2.04 SYSTEM OPERATION

A. The system shall be activated in one of two ways:

1. Pressing button unit.

2. Activation of scream detection device (at designated locations).

B. Activation by pressing button:

1. The emergency phone shall dial 911, and the pager of the security personnel.

C. Activation by scream detection (at designated locations):

1. The unit shall dial the pager of the security personnel only.

D. When the responding party answers, two-way communication will commence. The calling phone will be reset when the responding party hangs up.

E. The system must be capable of allowing incoming calls to reach emergency boxes.

F. The emergency phone shall have an ADA compliant light to indicate the call has been placed, and that the call has been received.

PART 3 EXECUTION

3.01 INSTALLATION

A. Area of Rescue Assistance Call-In Stations:

1. Each area station shall be interconnected in conduit as indicated. Each area station shall be connected to terminal telephone equipment with wiring called for by manufacturer.

2. The blue light/strobe shall be mounted so it can be viewed above tall vehicles.

3.02 TESTING

A. System shall be fully tested after installation. All alarm functions shall be tested. Installing contractor shall provide written report to building owner stating that he has tested the system

and its functions and has given the building owner the operating instructions. An example of an appropriate form is shown on the following pages.

B. The CONTRACTOR shall maintain adjustments for one year at no charge.

END OF SECTION

SECTION 16950

TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. General Conditions and Supplementary Conditions apply to this Section.

1.02 WORK INCLUDED

A. The testing, adjusting and balancing of all equipment power and lighting and signal systems and equipment, devices, cables and connections.

1.03 MATERIALS

A. All equipment and materials required to perform all tests as specified herein. The following systems shall be tested for continuity of conduits, power supply and grounding requirements only.

1. Section 16740 - Telephone Service.

1.04 SUBMITTALS

A. Records of all tests shall be kept in tabulated, permanent, reproducible form, completely indexed and explained, indicating the specific test performed, environmental conditions, such as temperature and humidity, date of performance, results obtained, corrective actions taken (if any), final results, and comments, if required four (4) copies of all tests shall be delivered to the Owner's Representative within two weeks after test is performed.

1.05 DELIVERY, STORAGE AND HANDLING

A. Not applicable.

1.06 JOB CONDITIONS

A. Inspection:

1. Examine areas for conditions under which work is to be performed. Report in writing to Owner's Representative all conditions contrary to those shown on the drawings or specified herein and all other conditions that will affect satisfactory execution of work such as improperly constructed substrates or adjoining work. Do not proceed with work until unsatisfactory conditions have been corrected.

2. Starting work constitutes acceptance of the conditions under which work is to be performed. After such acceptance this contractor shall at his expense, be responsible for correcting all unsatisfactory and defective work resulting from such unsatisfactory conditions.

B. All tests shall be performed after all equipment and systems are completely installed and in full operating conditions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Furnish meters, instruments, cable connections, equipment or apparatus deemed necessary for conducting all tests.

B. All instruments shall be calibrated and maintained in good working order.

PART 3 EXECUTION

3.01 INSPECTION AND GENERAL TESTS

A. In addition to specific test requirements for systems indicated hereinafter, all equipment components and systems shall be tested as follows:

1. Polarity:

a. A verification of polarity shall be made, and it shall be ensured that all fuses, circuit breakers and control devices are connected in the line side (hot) conductors only. Bayonet and Edison socket lamp holders shall have their outer shell connected to the neutral. Polarity of all receptacles shall be verified.

2. Ground Continuity Test:

a. A ground continuity test shall be made between main ground system and equipment frame, and system neutral. A minimum of ten amps D.C. shall be used between ground reference and each ground point tested. Resistance shall be calculated and shall not exceed 25 ohms.

3. Insulation:

a. This test shall be made before the installation is complete. The installation may be divided into sections containing up to 50 outlets. A DC voltage of 1000 VDC shall be applied for the measurement of insulation resistance.

b. When insulation resistance must be determined with all switchboards, panelboards, fuse holders, switches and overcurrent devices in place, the insulation resistance when tested at 500 VDC shall be no less than 1 megohm for No. 14 and No. 12 AWG and 250k ohm for circuits 25 amps and above. Perform insulation resistance test of each cable with respect to ground and adjacent cable.

c. Wherever practicable, so that all parts of the wiring may be tested, all lamps shall be removed and all current-using apparatus shall be closed; where the removal of lamps and/or the disconnection of current-using apparatus is impracticable, the local switches controlling such lamps and/or apparatus shall be open. This test is not applicable to grounded concentric wiring systems.

d. Where apparatus is disconnected for the tests, the insulation resistance between the case of framework and all live parts of each item of fixed apparatus shall be measured separately and shall be not less than 0.5 megohm.

4. Phase Balancing:

a. All feeders are branch circuits shall be connected to panelboards, main distribution panels, and switchboard, so that loads are distributed equally on all phases.

3.02 GROUND ELECTRODE RESISTANCE

A. Prior to installing the ground electrode system, the CONTRACTOR shall carry out ground resistance tests for all relevant locations.

B. The total resistance of each ground electrode system shall be 25-ohm maximum between earth and ground.

3.03 SWITCHBOARD ASSEMBLIES AND PANELBOARDS

A. Visual and Mechanical Inspection:

1. Compare equipment nameplate data with Drawings and Specifications.

2. Inspect physical, electrical and mechanical condition.

3. Confirm correct application of manufacturer=s recommended lubricants

4. Verify appropriate anchorage, required area clearances, physical damage and correct alignment.

5. Inspect all doors, panels and sections for paint, dents, scratches, fit and missing hardware.

6. Verify that fuse and/or circuit breaker sizes and types correspond to Drawings and coordination study as well as to the circuit breaker=s address for microprocessor-communication packages.

7. Verify that current and potential transformer ratios correspond to Drawings.

8. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer=s published data.

9. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

a. Attempt closure on locked-open devices. Attempt to open locked-closed devices.

b. Make key exchange with devices operated in off-normal positions.

10. Clean switchgear.

11. Inspect insulators for evidence of physical damage or contaminated surfaces.

12. Verify correct barrier and shutter installation and operation.

13. Exercise all active components.

14. Inspect all mechanical indicating devices for correct operation.

15. Verify that filters are in place and/or vents are clear.

B. Electrical Tests:

1. Perform ground-resistance tests in accordance with Section 16950.

2. Perform resistance tests through all bus joints with a low-resistance ohmmeter. Any joints that cannot be directly measured due to permanently installed insulation wrap shall be indirectly measured from closest accessible connection.
3. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground.

4. Determine accuracy of all meters and calibrate watt-hour meters. Verify multipliers.

5. Potential transformer circuits: Verify secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.

C. Test values:

1. Bolt-torque levels shall be in accordance with manufacturer=s specifications.

2. Compare bus connection resistance to values of similar connections.

3.04 DISTRIBUTION CABLES

A. All main distribution cables shall be subjected to 1000 volt megger tests between phase - phase and phase - earth. The minimum resistance acceptable shall be 1 megohm measured under damp conditions.

B. Tests on cables shall be carried out after installation and jointing.

3.05 DRY TYPE TRANSFORMERS

A. Factory tests shall be performed in accordance with NEMA Standards and transformers shall comply with OSHA Standards U/L and National Electrical Code (NEC) requirements.

B. Visual and Mechanical Inspection:

1. Compare equipment nameplate data with Drawings and Specifications.

2. Inspect physical and mechanical condition.

3. Verify that control and alarm settings on temperature indicators are as indicated.

4. Verify that cooling fans operate correctly and that fan motors have correct overcurrent protection.

5. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer=s published data. Perform thermographic survey.

6. Perform specific inspections and mechanical tests as recommended by manufacturer.

7. Make a close examination for shipping brackets or fixtures that may not have been removed during installation. Insure that resilient mounts are free.

8. Verify that winding core, frame, and enclosure groundings are correct.

9. Verify that as-left tap connections are as specified.

3.06 CIRCUIT BREAKERS

A. Visual and Mechanical Inspection:

1. Compare nameplate data with Drawings and Specifications.

2. Inspect circuit breaker for correct mounting.

3. Operate circuit breaker to insure smooth operation.

4. Inspect case for cracks or other defects.

5. Verify tightness of accessible bolted connections and/or cable connections by calibrated torque-wrench method in accordance with manufacturer=s published data.

6. Inspect mechanism contacts and arc chutes in unsealed units.

B. Electrical Tests:

1. Verify correct operation of any auxiliary features such as trip and pickup indicators, and electrical close and trip operation.

3.07 LIGHTING

A. Demonstrate to Owner's Representative that all lighting, ballasts, wiring, and equipment are in proper operating condition. All fixtures shall be complete with clean and undamaged conditions.

3.08 SURGE PROTECTION SYSTEM

A. Ground Continuity

1. Ground Continuity tests shall be performed in accordance with applicable lightning protection system installation instruction requirements.

2. Test surge protection device in accordance with manufacturer's installation instructions.

3.09 COMMUNICATION SYSTEM

A. Upon completion of the installation demonstrate to the ENGINEER that all raceway systems have been installed.

3.10 FIRE ALARM SYSTEM

A. Wiring shall be checked and tested by the contractor in accordance with the instructions provided by the manufacturer to assure that the system is free of grounds, opens and shorts.

B. Upon completion of the installation, a factory-trained technician shall perform necessary electrical test and adjustments, and demonstrate the operation of the system to the ENGINEER/OWNER and Local Code Authorities.

C. At the completion of this installation, the manufacturer shall issue a letter to the ENGINEER and the electrical contractor certifying that the system is installed and operating in accordance with the Contract Documents and requirements of the local authorities. At that time, he shall submit to the OWNER a proposal for a testing and maintenance contract, conducted as a regular service to OWNER by factory-trained technical representative of the manufacturer of the system, as required by local codes.

3.11 ADJUSTMENTS

A. Adjustments of the system(s) shall be accomplished to the complete satisfaction of the OWNER=S Representative at the time installation is complete.

END OF SECTION

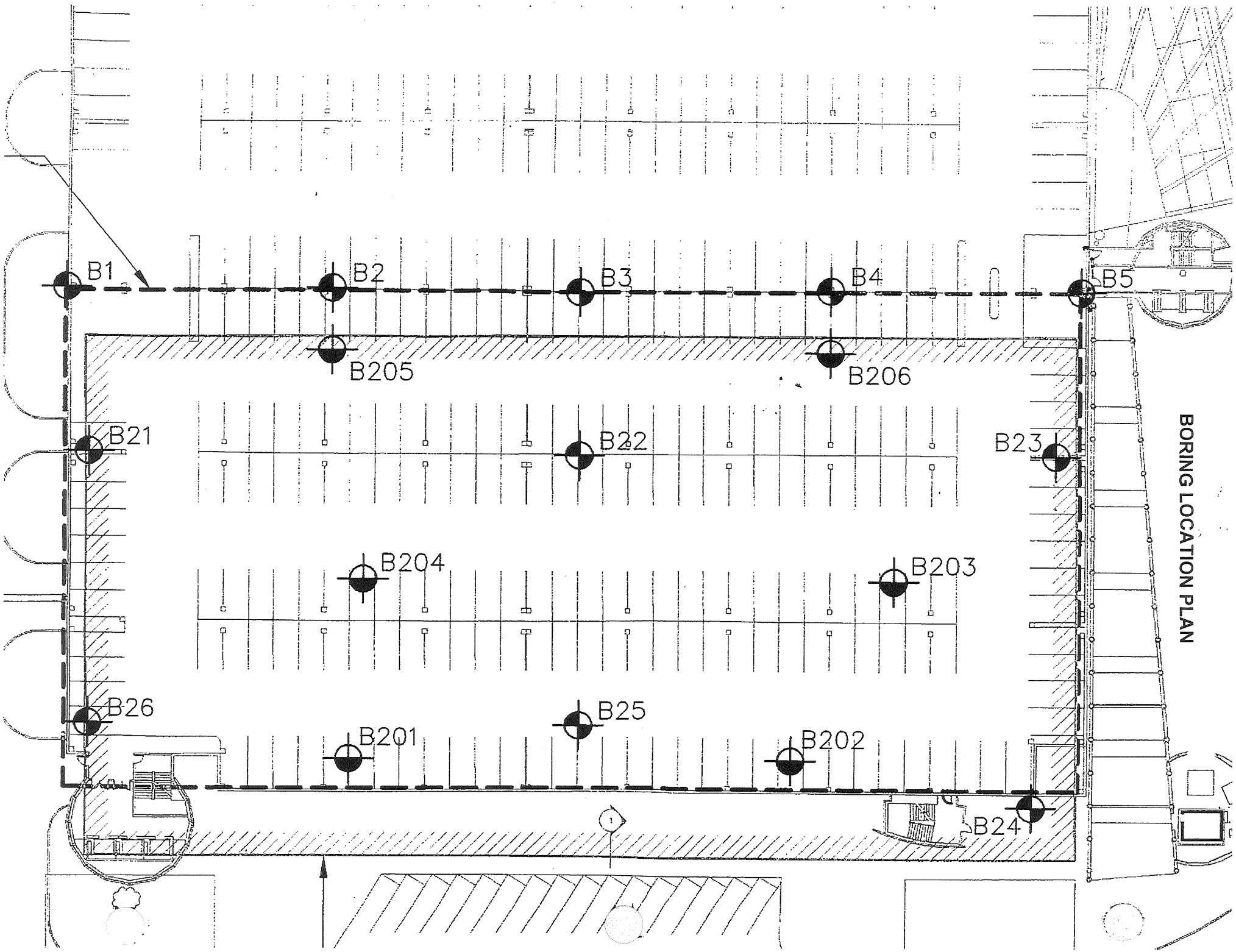
APPENDIX A : BORING LOGS

BORING LOCATION PLAN

2000 BORING LOGS

2006 BORING LOGS

FOUNDATION DRAIN DETAIL


B1
B2
B3
B4
B5
B205
B206
B21
B22
B23
B204
B203
B26
B25
B201
B202
B24
BORING LOCATION PLAN

[redacted]	CLIENT HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-1
DRILLER MEL COFFIN	PROJECT NAME PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER 00-121	LOCATION PORTLAND, MAINE	OFFSET
GROUND WATER OBSERVATIONS AT FT. AFTER HOURS AT FT. AFTER HOURS		DATE START 05/22/00 / DATE FINISH 05/22/00 SURFACE ELEVATION 63.5

	HSA	SS	
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8'	
HAMMER WT.		140	
HAMMER FALL		30"	

SAMPLE					BLOWS PER 6" ON SAMPLER				
1D	2"	24"		4.0	2	2	3	4	
2D	2"	24"		7.0	1	1	1	1	
3D	2"	24"		12.0	2	10	9	7	
4D	2"	24"		17.0	6	19	19	25	

0.2	TAR
2.0	BROWN SILTY SAND -FILL-
5.5	BROWN MOTTLED SILTY CLAY -MARINE DEPOSIT-
10.0	GRAY SILTY CLAY -MARINE DEPOSIT-
18.4	GRAY SILTY SAND & GRAVEL -GLACIAL TILL-
	REFUSAL @ 18.4'

SAMPLES
= SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
- WATER @ 12.0' INSIDE AUGERS
OPEN HOLE CAVED & DRY @ 5.5'

COMMENTS BY HALEY + ALDRICH, INC.

HOLE NO. B-1

MERRIMAN BROTHERS, INC. BREWER, MAINE	CLIENT: HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-2
DRILLER: MEL COFFIN	PROJECT NAME: PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER: 00-121	LOCATION: PORTLAND, MAINE	OFFSET
GROUND WATER OBSERVATIONS AT FT. AFTER HOURS AT FT. AFTER HOURS	CASING / SAMPLER / CORE BARREL TYPE: NW / SS SIZE I.D.: 3" / 1 3/8" HAMMER WT.: 300 / 140 HAMMER FALL: 16" / 30"	DATE START: 05/24/00 DATE FINISH: 05/24/00 SURFACE ELEVATION: 63.2

	SAMPLE				BLOWS PER 6" ON SAMPLER						DESCRIPTION
AUGER										0.3	TAR
AHEAD										2.0	BROWN SAND & GRAVEL - FILL -
	1D	2"	24"		4.0	9	11	6	6		
6											
8											
3	2D	2"	24"		7.0	9	9	11	9		GRAY SILTY SAND & GRAVEL
3											
29											
29											-GLACIAL TILL-
	3D	2"	13"		11.1	18	13	35/1"		11.1	
											ROCK
										15.0	
											BOTTOM OF BORING @ 15.0'

SAMPLES
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
INSTALLED WELL @ 14.8'
COMMENTS BY HALEY + ALDRICH, INC

HOLE NO. B-2

MAINE DRILLING & SAMPLING, INC. NEW ENGLAND DIVISION	CLIENT: HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-3
DRILLER: MEL COFFIN	PROJECT NAME: PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
T.T.B. JOB NUMBER: 00-121	LOCATION: PORTLAND, MAINE	OFFSET

GROUND WATER OBSERVATIONS				CASING	SAMPLER	CORE BARREL	DATE START	DATE FINISH
			TYPE	HSA	SS		05/22/00	05/22/00
AT	FT.	AFTER	HOURS	SIZE I.D. 2 1/2"	1 3/8'		SURFACE ELEVATION	
				HAMMER WT.	140		63.6	
T	FT.	AFTER	HOURS	HAMMER FALL	30"			

SAMPLE					BLOWS PER 6" ON SAMPLER					MATERIAL DESCRIPTION
									0.2	TAR
									2.0	BROWN SAND & GRAVEL - FILL -
	1D	2"	24"		4.0	5	7	11	16	BROWN MOTTLED SILTY CLAY - MARINE DEPOSIT -
	2D	2"	24"		7.0	7	9	11	11	
									8.5	GRAY SILTY CLAY - MARINE DEPOSIT -
									10.5	BROWN MOTTLED SILTY CLAY - MARINE DEPOSIT -
	3D	2"	24"		12.0	1	1	2	2	12.5
	4D	2"	24"		17.0	4	12	13	13	GRAY SILTY SAND & GRAVEL - GLACIAL TILL -
	5D	2"	24"		22.0	9	11	16	17	22.0
										BOTTOM OF BORING @ 22.0'

SAMPLES
- SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
- [XX] DRILLER-VISUALLY
- [ ] SOIL TECHNICIAN-VISUALLY
- [ ] LABORATORY TESTS

REMARKS:
WATER @ 16.7' INSIDE AUGERS
OPEN HOLE CAVED & DRY @ 7.8'
COMMENTS BY HALEY & ALDRICH, INC.

HOLE NO. B-3

MAINE TEST BORING, INC. BREWER, MAINE	CLIENT: HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-4
DRILLER: MEL COFFIN	PROJECT NAME: PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER: 00-121	LOCATION: PORTLAND, MAINE	OFFSET

GROUND WATER OBSERVATIONS				CASING	SAMPLER	CORE BARREL	DATE START	DATE FINISH
				TYPE	HSA	SS	05/25/00	05/25/00
AT	FT.	AFTER	HOURS	SIZE I.D.	2 1/2"	1 3/8'	SURFACE ELEVATION	
				HAMMER WT.		140	63.6	
AT	FT.	AFTER	HOURS	HAMMER FALL		30"		

SAMPLE					BLOWS PER 6" ON SAMPLER					STRATUM DESCRIPTION
									0.3	TAR
									2.0	BROWN SAND & GRAVEL - FILL -
	1D	2"	24"		4.0	5	9	13	23	
	2D	2"	24"		7.0	9	9	12	13	BROWN MOTTLED SILTY CLAY - MARINE DEPOSIT -
									9.0	- MARINE DEPOSIT -
									11.5	BROWN SILTY SAND & GRAVEL - GLACIAL TILL -
	3D	2"	24"		12.0	3	4	9	9	
									13.0	
	4D	2"	24"		17.0	5	7	6	7	GRAY SILTY SAND & GRAVEL - GLACIAL TILL -
	5D	2"	13"		21.1	1	3	25/1"		21.1
										REFUSAL @ 21.1'

SAMPLES
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
WATER @ 19.4' INSIDE AUGERS
OPEN HOLE WATER @ 12.4'
CAVED @ 12.7'
COMMENTS BY HALEY + ALDRICH, INC.

HOLE NO. B-4

[illegible]

DRILLER: MEL COFFIN

M.T.B. JOB NUMBER: 00-121

CLIENT: HALEY & ALDRICH, INC.

PROJECT NAME: PROPOSED GARAGE & MASTER PLAN PORTLAND

LOCATION: PORTLAND, MAINE

SHEET 1 OF 1

HOLE NO. B-5

LINE & STATION

OFFSET

GROUND WATER OBSERVATIONS

AT FT. AFTER HOURS

AT FT. AFTER HOURS

	CASING	SAMPLER	
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8'	
HAMMER WT.		140	
HAMMER FALL		30"	

DATE START	DATE FINISH
05/24/00	05/24/00

SURFACE ELEVATION: 62.3

SAMPLE No.					BLOWS PER 6" ON SAMPLER				DEPTH	STRATUM DESCRIPTION
									0.3	TAR
									2.0	BROWN SAND & GRAVEL - FILL-
1D	2"	24"		4.0	5	8	12	12		BROWN SILTY SAND & GRAVEL
									5.5	-GLACIAL TILL-
2D	2"	24"		7.0	13	17	23	35		
										GRAY SILTY SAND & GRAVEL
3D	2"	24"		12.0	7	12	9	6		
D	2"	0"		15.0	25				15.0	- GLACIAL TILL -
										REFUSAL @ 15.0'

SAMPLES
SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
WATER @ 14.0' INSIDE AUGERS
OPEN HOLE WATER @ 10.6'
CAVED @ 10.8'
COMMENTS BY HALEY & ALDRICH, INC.

HOLE NO. B-5

MAINE TEST BORING, INC.	CLIENT HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-21
DRILLER MARK GUNNING	PROJECT NAME PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER 00-121	LOCATION PORTLAND, MAINE	OFFSET
GROUND WATER OBSERVATIONS AT FT. AFTER HOURS AT FT. AFTER HOURS		DATE START 06/13/00 / DATE FINISH 06/13/00 SURFACE ELEVATION 63.3

	BW	SS	
TYPE	BW	SS	
SIZE I.D.	2 3/8"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

SAMPLE NO.	BLOWS PER 6" ON SAMPLER									ELEV.	MATERIAL DESCRIPTION
	1D	2"	18"		2.0	20 *	20 *	23 *		0.35	TAR
										4.6	BROWN SILTY GRAVELY SAND - FILL -

REFUSAL @ 4.6'

* HAMMER DROP LESS THAN 30".

BORING DRILLED WITH TRIPOD EQUIPMENT.

SAMPLES
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
2:00 PM WATER @ 4.0' W/NO CASING

COMMENTS BY HALEY + ALDRICH, INC.

HOLE NO. B-21

MAINE TEST BORING, INC.	CLIENT: HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-22
DRILLER: MEL COFFIN	PROJECT NAME: PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER: 00-121	LOCATION: PORTLAND, MAINE	OFFSET
GROUND WATER OBSERVATIONS AT FT. AFTER HOURS AT FT. AFTER HOURS	CASING / SAMPLER / CORE BRL TYPE: BW / SS SIZE I.D.: 2 3/8" / 1 3/8" HAMMER WT.: 300 / 140 HAMMER FALL: 16" / 30"	DATE START: 06/07/00 DATE FINISH: 06/07/00 SURFACE ELEVATION: 63.1

SAMPLE NO.	TYPE	INCHES DRIVEN	INCHES REC.	BLOWS PER 6" ON SAMPLER					ELEV.	STRATUM DESCRIPTION
									0.3	TAR
1D	2"	18"		2.0	10	15	15			
										BROWN SAND & GRAVEL -FILL-
									5.0	
2D	2"	18"		6.5	30 *	50 *	33 *		6.0	BROWN MOTTLED SILTY CLAY -MARINE DEPOSIT-
									8.0	BROWN SILTY SAND & GRAVEL -MARINE DEPOSIT-
										BROWN MOTTLED SILTY CLAY W/SAND LAYERS -MARINE DEPOSIT-
3D	2"	18"		11.5	6	22	14		11.0	
									12.0	BROWN SILTY SAND -GLACIAL TILL-
4D	2"	18"		13.5	20	25	27		13.5	BROWN SILTY SAND & GRAVEL -GLACIAL TILL-

BOTTOM OF BORING @ 13.5'

* HAMMER DROP LESS THAN 30".

BORING DRILLED WITH TRIPOD EQUIPMENT.

SAMPLES	SOIL CLASSIFIED BY:	REMARKS:
SPLIT SPOON C = 2" SHELBY TUBE S = 3" SHELBY TUBE P = 3½" SHELBY TUBE	[XX] DRILLER-VISUALLY [ ] SOIL TECHNICIAN-VISUALLY [ ] LABORATORY TESTS	COMMENTS BY HALEY + ALDRICH, INC.

HOLE NO. B-22

[redacted]	CLIENT HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-23
DRILLER MARK GUNNING	PROJECT NAME PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER 00-121	LOCATION PORTLAND, MAINE	OFFSET
GROUND WATER OBSERVATIONS AT FT. AFTER HOURS AT FT. AFTER HOURS	[redacted]	DATE START 06/13/00 / DATE FINISH 06/13/00 SURFACE ELEVATION 62.2

	BW	SS	
TYPE	BW	SS	
SIZE I.D.	2 3/8"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

SAMPLE					BLOWS PER 6" ON SAMPLER					[redacted]	
	1D	2"	18"		1.8	15	19	24		0.25	TAR
											BROWN SAND
										4.5	-FILL-
	2D	2"	18"		6.5	32 *	29 *	28 *			BROWN SILTY GRAVELY SAND
	3D	2"	18"		10.0	27	28	32		10.0	-GLACIAL TILL-
											BOTTOM OF BORING @ 10.0'

* HAMMER DROP LESS THAN 30".
BORING DRILLED WITH TRIPOD REQUIREMENT.

SAMPLES
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
11:30 AM WATER @ 4.6' W/NO CASING
COMMENCE BY
HALEY + ALDRICH, INC.

HOLE NO. B-23

MAINE DRILLING & BLASTING, INC.	CLIENT: HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-24
DRILLER: MARK GUNNING	PROJECT NAME: PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER: 00-121	LOCATION: PORTLAND, MAINE	OFFSET

GROUND WATER OBSERVATIONS					CASING	SAMPLER	CORE BARREL	DATE START	DATE FINISH
				TYPE	BW	SS		06/13/00	06/13/00
AT	FT.	AFTER	HOURS	SIZE I.D.	2 3/8"	1 3/8"		SURFACE ELEVATION	
				HAMMER WT.	300	140		6.2.2	
AT	FT.	AFTER	HOURS	HAMMER FALL	16"	30"			

SAMPLE				BLOWS PER 6" ON SAMPLER					STRATUM DESCRIPTION	
1D	2"	18"		1.8	17	16	13		0.25	TAR
										BROWN SILTY GRAVELY SAND -FILL-
2D	2"	18"		6.3	8	5	5		6.5	BROWN C-F SAND, T-SILT -GLACIAL TILL-
									9.7	BROWN GRAVELY SAND, T-SILT -GLACIAL TILL-
3D	2"	18"		11.5	7	11	30		11.5	BOTTOM OF BORING @ 11.5'

BORING DRILLED WITH TRIPOD EQUIPMENT.

SAMPLES	SOIL CLASSIFIED BY:	REMARKS:
= SPLIT SPOON C = 2" SHELBY TUBE S = 3" SHELBY TUBE P = 3½" SHELBY TUBE	[XX] DRILLER-VISUALLY [ ] SOIL TECHNICIAN-VISUALLY [ ] LABORATORY TESTS	OPEN HOLE 0'-2' 3:30 PM WATER @ 5.7' W/NO CASING COMMENTS BY HALEY + ALDRICH, INC.

HOLE NO. B-24

CLIENT: HALEY & ALDRICH, INC.	SHEET 1 OF 1
	HOLE NO. B-25

DRILLER: MARK GUNNING	PROJECT NAME: PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER: 00-121	LOCATION: PORTLAND, MAINE	OFFSET

GROUND WATER OBSERVATIONS				DATE START	DATE FINISH
	TYPE	BW	SS	06/12/00	06/12/00
AT FT. AFTER HOURS	SIZE I.D.	2 3/8"	1 3/8"	SURFACE ELEVATION	
	HAMMER WT.	300	140		
AT FT. AFTER HOURS	HAMMER FALL	16"	30"	62.8	

	SAMPLE					BLOWS PER 6" ON SAMPLER					
	1D	2"	18"		1.8	13	13	13		0.3	TAR
											BROWN GRAVELY SAND, T-SILT - FILL -
										4.0	
										5.0	BROWN F-M SAND, T-SILT - MARINE DEPOSIT -
	2D	2"	18"		6.5	8	7	6		6.5	GRAY BROWN CLAYEY SILTY SAND, T-GRAVEL - MARINE DEP.
											BROWN F-C GRAVELY SAND, SOME SILT
	3D	2"	18"		11.5	15	10	7			
	4D	2"	11"		12.4	15	100			12.4	- GLACIAL TILL -
											BOTTOM OF BORING @ 12.4'
											BORING DRILLED WITH TRIPOD EQUIPMENT.

SAMPLES
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
3:30 PM WATER @ 5.7' W/NO CASING
OPEN HOLE 0'-2'
COMMENTS BY HALEY & ALDRICH, ENG.

HOLE NO. B-25

MAINE TEST BORING CO., INC.	CLIENT HALEY & ALDRICH, INC.	SHEET 1 OF 1 HOLE NO. B-26
DRILLER MARK GUNNING	PROJECT NAME PROPOSED GARAGE & MASTER PLAN PORTLAND	LINE & STATION
M.T.B. JOB NUMBER 00-121	LOCATION PORTLAND, MAINE	OFFSET

GROUND WATER OBSERVATIONS					CASING	SAMPLER	CORE BARREL	DATE START	DATE FINISH
				TYPE	BW	SS		06/13/00	06/13/00
AT	FT.	AFTER	HOURS	SIZE I.D.	2 3/8"	1 3/8"		SURFACE ELEVATION	
				HAMMER WT.	300	140		62.9	
AT	FT.	AFTER	HOURS	HAMMER FALL	16"	30"			

SAMPLE					BLOWS PER 6" ON SAMPLER					STRATUM DESCRIPTION	
	1D	2"	18"		1.9	16 *	23 *	17 *		0.35	TAR
	2D	2"	18"		6.5	7	6	13			BROWN SILTY GRAVELY SAND -FILL-
										9.5	
	3D	2"	18"		10.0	9	20	24		10.0	BROWN F-C GRAVELY SAND -GLACIAL TILL-

BOTTOM OF BORING @ 10.0'

* HAMMER DROP LESS THAN 30".

BORING DRILLED WITH TRIPOD EQUIPMENT.

SAMPLES	SOIL CLASSIFIED BY:	REMARKS:
= SPLIT SPOON C = 2" SHELBY TUBE S = 3" SHELBY TUBE P = 3½" SHELBY TUBE	[XX] DRILLER-VISUALLY [ ] SOIL TECHNICIAN-VISUALLY [ ] LABORATORY TESTS	3:50 PM WATER @ 5.6' W/NO CASING COMMENTS BY HALEY & ALDRICH, ENG.

HOLE NO. B-26

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. **B201**

PROJECT	PHASE II PARKING GARAGE	STI JOB NO.	05477
LOCATION	PORTLAND INTERNATIONAL JETPORT, PORTLAND, MAINE	PROJECT MGR.	K. RECKER
CLIENT	DOMENECH, HICKS & KROCKMALNIC ARCHITECTS	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	1/30/2006
DRILLER	B. ENOS	DATE FINISHED	1/31/2006

Elevation 62.8 ft. Datum | Boring Location See Plan

Item	Casing	Sampler	Core Barrel
Type	BW	SS	
Inside Diameter (in.)	2.5	1.375	
Hammer Weight (lb.)	140	140	
Hammer Fall (in.)	30	30	

Rig Make & Model: Acker Tripod/Mobile Minuteman

☐ Truck ☑ Tripod ☑ Cat-Head
☐ ATV ☐ Geoprobe ☐ Winch
☐ Track ☐ Air Track ☑ Roller Bit
☐ Skid ☐ ☐ Cutting Head

Hammer Type: ☐ Safety ☑ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance: Type Method Depth — BW/DRIVEN/10.0

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0					0.3		-BITUMINOUS CONCRETE-										
	14	S1	0.3			SW	Dense, brown well-graded SAND with gravel (SW), mps = 1.0 in., silty	5	10	15	20	50					
	24						seam from 2.2 to 2.3 ft., dry										
	14																
	13	18	2.3														
							-FILL-										
					4.2												
5	8	S2	5.0			SM	Loose, gray-brown silty SAND (SM), mps = 0.3 in., wet		5	20	25	35	15				
	4																
	5																
	5	18	7.0				-GLACIAL TILL DEPOSITS-										
					8.0												
							Note: broke rollers off roller bit washing from 7.0 to 10.0 ft. Recovered one										
							roller in S3.										
10	16	S3	10.0			SM	Dense, gray-brown silty SAND with gravel (SM), mps = 0.5 in., wet	5	10	20	20	30	15				
	19						-GLACIAL TILL DEPOSITS-										
	12/.2	12	11.2		11.2												
							Probable top of bedrock at 11.2 ft.										
							Bottom of exploration at 11.2 ft. below ground surface										
15																	
20																	
25																	
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
1/31/2006	0930		--	10.5	5.7

Sample ID

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe
FV Field Vane

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (Linear ft.)	11.2
Rock Cored (Linear ft.)	--
Number of Samples	3S
BORING NO.	B201

Field Tests Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. **B202**

PROJECT	PHASE II PARKING GARAGE	STI JOB NO.	05477
LOCATION	PORTLAND INTERNATIONAL JETPORT, PORTLAND, MAINE	PROJECT MGR.	K. RECKER
CLIENT	DOMBNECH, HICKS & KROCKMALNIC ARCHITECTS	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	1/31/2006
DRILLER	B. ENOS	DATE FINISHED	2/1/2006

Elevation 62.6 ft. Datum — Boring Location See Plan

Item	Casing	Sampler	Core Barrel
Type	BW	SS	
Inside Diameter (in.)	2.5	1.375	
Hammer Weight (lb.)	140	140	
Hammer Fall (in.)	30	30	

Rig Make & Model: Acker Tripod/Mobile Minuteman

- ☐ Truck ☑ Tripod
- ☐ ATV ☐ Geoprobe
- ☐ Track ☐ Air Track
- ☐ Skid

- ☑ Cat-Head
- ☐ Winch
- ☑ Roller Bit
- ☐ Cutting Head

Hammer Type: ☐ Safety ☑ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance — Type Method Depth: BW/DRIVEN/10.0

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0					0.4		-BITUMINOUS CONCRETE-										
	14	S1	0.4			SW	Medium dense, brown well-graded SAND with gravel (SW), mps = 1.2 in.,	10	5	25	20	35	5				
	15						dry										
	12																
	12	14	2.4														
							-FILL-										
					4.5												
							Note: no recovery from 5.0 to 7.0 ft. Wood in wash (from upper fill), roller bit										
5							refusal at 6.7 ft. Moved boring 2.0 ft. Drove BW casing to 5.0 ft.										
	3	S2	5.0														
	2					SM	Loose, brown silty SAND (SM), mps = 0.2 in., wet			30	20	35	15				
	2																
	2	10	7.0				-GLACIAL TILL DEPOSITS-										
					9.0												
							-GLACIAL TILL DEPOSITS-										
10	88/.3	S3	10.0		10.2	SM	Very dense, gray silty SAND (SM), mps = 0.3 in., wet		5	30	20	30	15				
		3	10.3		10.3		Very dense, dark gray weathered rock fragments -WEATHERED BEDROCK-										
							Split spoon refusal at 10.3 ft.										
							Bottom of exploration at 10.3 ft. below ground surface										
15																	
20																	
25																	
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
2/1/2006	0817		--	9.2	6.6

Sample ID

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon Sample
- G Geoprobe
- FV Field Vane

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (Linear ft.)	10.2
Rock Cored (Linear ft.)	--
Number of Samples	3S
BORING NO.	B202

Field Tests — Dilatancy: R - Rapid S - Slow N - None; Toughness: L - Low M - Medium H - High; Plasticity: N - Nonplastic L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. **B203**

PROJECT	PHASE II PARKING GARAGE	STI JOB NO.	05477
LOCATION	PORTLAND INTERNATIONAL JETPORT, PORTLAND, MAINE	PROJECT MGR.	K. RECKER
CLIENT	DOMENECH, HICKS & KROCKMALNIC ARCHITECTS	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	2/1/2006
DRILLER	B. ENOS	DATE FINISHED	2/1/2006

Elevation 62.8 ft. Datum

Boring Location: See Plan

Item	Casing	Sampler	Core Barrel
Type	BW	SS	
Inside Diameter (in.)	2.5	1.375	
Hammer Weight (lb.)	140	140	
Hammer Fall (in.)	30	30	

Rig Make & Model: Acker Tripod/Mobile Minuteman

- [ ] Truck
- [x] Tripod
- [ ] ATV
- [ ] Geoprobe
- [ ] Track
- [ ] Air Track
- [ ] Skid

- [x] Cat-Head
- [ ] Winch
- [x] Roller Bit
- [ ] Cutting Head

Hammer Type: [ ] Safety [x] Doughnut [ ] Automatic

Drilling Mud: [ ] Bentonite [ ] Polymer [x] None

Casing Advance: Type Method Depth — BW/DRIVEN/8.0

Drilling Notes: Open hole from 8.0 to 13.9 ft.

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0					0.30		-BITUMINOUS CONCRETE-										
	12	S1	0.3			SW	Medium dense, brown well-graded SAND with gravel (SW), mps = 1.2 in., dry	10	10	20	15	40	5				
	16																
	32																
	26	12	2.3				-FILL-										
5	13	S2	5.0			SW	Dense, brown well-graded SAND with gravel (SW), mps = 1.2 in., dry	10	10	20	15	40	5				
	19																
	25																
	33	16	7.0				-FILL-										
					7.5												
10	8	S3	10.0			SM	Medium dense, gray-brown silty SAND with gravel (SM), mps = 1.2 in., wet	10	5	20	20	30	15				
	6						-GLACIAL TILL DEPOSITS-										
	6				11.7												
	31/0.3	16	11.8		11.8		Very dense, dark gray rock fragments -WEATHERED BEDROCK-										
							Split spoon refusal at 11.8 ft.										
							Bottom of exploration at 11.8 ft. below ground surface										
15																	
20																	
25																	
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
2/1/2006	1645		--	11.5	6.5

Sample ID

O	Open End Rod
T	Thin Wall Tube
U	Undisturbed Sample
S	Split Spoon Sample
G	Geoprobe
FV	Field Vane

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (Linear ft.)	13.7
Rock Cored (Linear ft.)	--
Number of Samples	3S
BORING NO.	B203

Field Tests — Dilatancy: R - Rapid S - Slow N - None; Toughness: L - Low M - Medium H - High; Plasticity: N - Nonplastic L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. **B204**

PROJECT	PHASE II PARKING GARAGE	STI JOB NO.	05477
LOCATION	PORTLAND INTERNATIONAL JETPORT, PORTLAND, MAINE	PROJECT MGR.	K. RECKER
CLIENT	DOMENECH, HICKS & KROCKMALNIC ARCHITECTS	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	2/2/2006
DRILLER	B. ENOS	DATE FINISHED	2/2/2006

Elevation 63.2 ft. Datum | Boring Location See Plan

Item	Casing	Sampler	Core Barrel
Type	BW	SS	
Inside Diameter (in.)	2.5	1.375	
Hammer Weight (lb.)	140	140	
Hammer Fall (in.)	30	30	

Rig Make & Model: Acker Tripod/Mobile Minuteman

- ☐ Truck ☑ Tripod ☑ Cat-Head
- ☐ ATV ☐ Geoprobe ☐ Winch
- ☐ Track ☐ Air Track ☑ Roller Bit
- ☐ Skid ☐ ☐ Cutting Head

Hammer Type: ☐ Safety ☑ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance: Type Method Depth — BW/DRIVEN/5.0

Drilling Notes: Open hole from 5.0 to 11.7 ft.

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0					0.3		-BITUMINOUS CONCRETE-										
	37	S1	0.3			SW	Very dense, brown well-graded SAND with gravel (SW), mps = 1.2 in., dry	10	10	30	15	30	5				
	47																
	36																
	27	15	2.3														
							-FILL-										
					4.0												
5	9	S2	5.0			CL	Very stiff, gray-brown mottled lean CLAY (CL), occasional fine sand partings,					5	95	N	M	M	
	9						mps = 0.02 in., wet										
	13																
	12	20	7.0				-MARINE DEPOSITS-										
					7.7												
10	5	S3	10.0			SM	Medium dense, gray-brown silty SAND with gravel (SM), mps = 1.2 in., wet	15	10	30	10	20	15				
	4						-GLACIAL TILL DEPOSITS-										
	10				11.6												
	50/.2	12	11.7		11.7		Very dense, dark gray weathered rock fragments -WEATHERED BEDROCK-										
							Split spoon refusal at 11.7 ft.										
							Bottom of exploration at 11.7 ft. below ground surface										
15																	
20																	
25																	
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
2/2/2006	1417		--	10.2	5.2

Sample ID

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon Sample
- G Geoprobe
- FV Field Vane

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (Linear ft.)	11.6
Rock Cored (Linear ft.)	--
Number of Samples	3S
BORING NO.	B204

Field Tests

Dilatancy: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. **B205**

PROJECT	PHASE II PARKING GARAGE	STI JOB NO.	05477
LOCATION	PORTLAND INTERNATIONAL JETPORT, PORTLAND, MAINE	PROJECT MGR.	K. RECKER
CLIENT	DOMENECH, HICKS & KROCKMALNIC ARCHITECTS	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	2/2/2006
DRILLER	B. ENOS	DATE FINISHED	2/2/2006

Elevation 63.2 ft. Datum | Boring Location See Plan

Item	Casing	Sampler	Core Barrel
Type	BW	SS	
Inside Diameter (in.)	2.5	1.375	
Hammer Weight (lb.)	140	140	
Hammer Fall (in.)	30	30	

Rig Make & Model: Acker Tripod/Mobile Minuteman

- ☐ Truck ☑ Tripod ☑ Cat-Head
- ☐ ATV ☐ Geoprobe ☐ Winch
- ☐ Track ☐ Air Track ☑ Roller Bit
- ☐ Skid ☐ ☐ Cutting Head

Hammer Type: ☐ Safety ☑ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance: Type Method Depth — BW/DRIVEN/10.0

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0					0.3		-BITUMINOUS CONCRETE-										
	9	S1	0.3			SW	Dense, brown well-graded SAND with gravel (SW), mps = 1.3 in., dry	10	10	35	20	25					
	19						-FILL-										
	19				2.1												
	20	14	2.3			SP-SM	Dense, brown poorly-graded SAND with silt (SP-SM), dry					90	10				
					2.5		-MARINE DEPOSITS-										
5	22	S2	5.0			SW-SM	Very dense, brown well-graded SAND with silt and gravel (SW-SM), mps = 1.3 in., wet	15	10	30	20	15	10				
	68																
	23																
	21	13	7.0				-GLACIAL TILL DEPOSITS-										
					9.0												
10							-GLACIAL TILL DEPOSITS-										
	50/.3	S3	10.0		10.3	SM	Very dense, gray silty SAND with gravel (SM), mps = 1.3 in., wet		5	30	20	30	15				
		3	10.3		10.5		Advanced roller bit into dark gray weathered rock -WEATHERED BEDROCK-										
							Split spoon refusal at 10.3 ft.										
							Roller bit refusal at 10.5 ft.										
							Bottom of exploration at 10.5 ft. below ground surface										
15																	
20																	
25																	
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
2/2/2006	1005		--	10.2	4.6

Sample ID

O	Open End Rod
T	Thin Wall Tube
U	Undisturbed Sample
S	Split Spoon Sample
G	Geoprobe
FV	Field Vane

Well Diagram

Riser Pipe, Screen, Filter Sand, Cuttings, Grout, Concrete, Bentonite Seal

Summary

Overburden (Linear ft.)	10.3
Rock Cored (Linear ft.)	--
Number of Samples	3S
BORING NO.	B205

Field Tests

Dilatancy: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. **B206**

PROJECT	PHASE II PARKING GARAGE	STI JOB NO.	05477
LOCATION	PORTLAND INTERNATIONAL JETPORT, PORTLAND, MAINE	PROJECT MGR.	K. RECKER
CLIENT	DOMENECH, HICKS & KROCKMALNIC ARCHITECTS	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	2/1/2006
DRILLER	B. ENOS	DATE FINISHED	2/1/2006

Elevation 62.7 ft. Datum Boring Location See Plan

Item	Casing	Sampler	Core Barrel
Type	BW	SS	
Inside Diameter (in.)	2.5	1.375	
Hammer Weight (lb.)	140	140	
Hammer Fall (in.)	30	30	

Rig Make & Model: Acker Tripod/Mobile Minuteman

- Truck
- ☑ Tripod
- ☑ Cat-Head
- ATV
- Geoprobe
- Winch
- Track
- Air Track
- ☑ Roller Bit
- Skid
- Cutting Head

Hammer Type: ☐ Safety ☑ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance: Type Method Depth — BW/DRIVEN/8.0

Drilling Notes: Open hole from 8.0 to 13.9 ft.

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0					0.25		-BITUMINOUS CONCRETE-										
	8	S1	0.3			SW	Medium dense, brown well-graded SAND with gravel (SW), mps = 1.0 in.,	10	10	30	25	25					
	10						trace silt, dry										
	11				1.5		-FILL-										
	11	16	2.3			CL	Very stiff, gray-brown mottled lean CLAY (CL), dry						100	N	M	M	
5																	
	6	S2	5.0			CL	Medium stiff, gray-brown mottled lean CLAY (CL), frequent sand partings,					5	95	N	M	M	
	4						mps = 0.02 in., wet										
	3																
	4	24	7.0				-MARINE DEPOSITS-										
					8.5												
						CL	Note: gray clay in wash from 8.5 to 9.5 ft.										
					9.5		-MARINE DEPOSITS-										
10																	
	3	S3	10.0			SM	Medium dense, brown silty SAND with gravel (SM), mps = 1.0 in., wet	10	10	30	15	20	15				
	8																
	9																
	12	24	12.0				-GLACIAL TILL DEPOSITS-										
					13.7												
					13.9		Note: dark gray weathered rock in wash from 13.7 to 13.9 ft.										
							-WEATHERED BEDROCK-										
15																	
							Roller bit refusal at 13.9 ft.										
							Bottom of exploration at 13.9 ft. below ground surface										
20																	
25																	
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
2/1/2006	1645		--	13.5	6.2

Sample ID

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon Sample
- G Geoprobe
- FV Field Vane

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

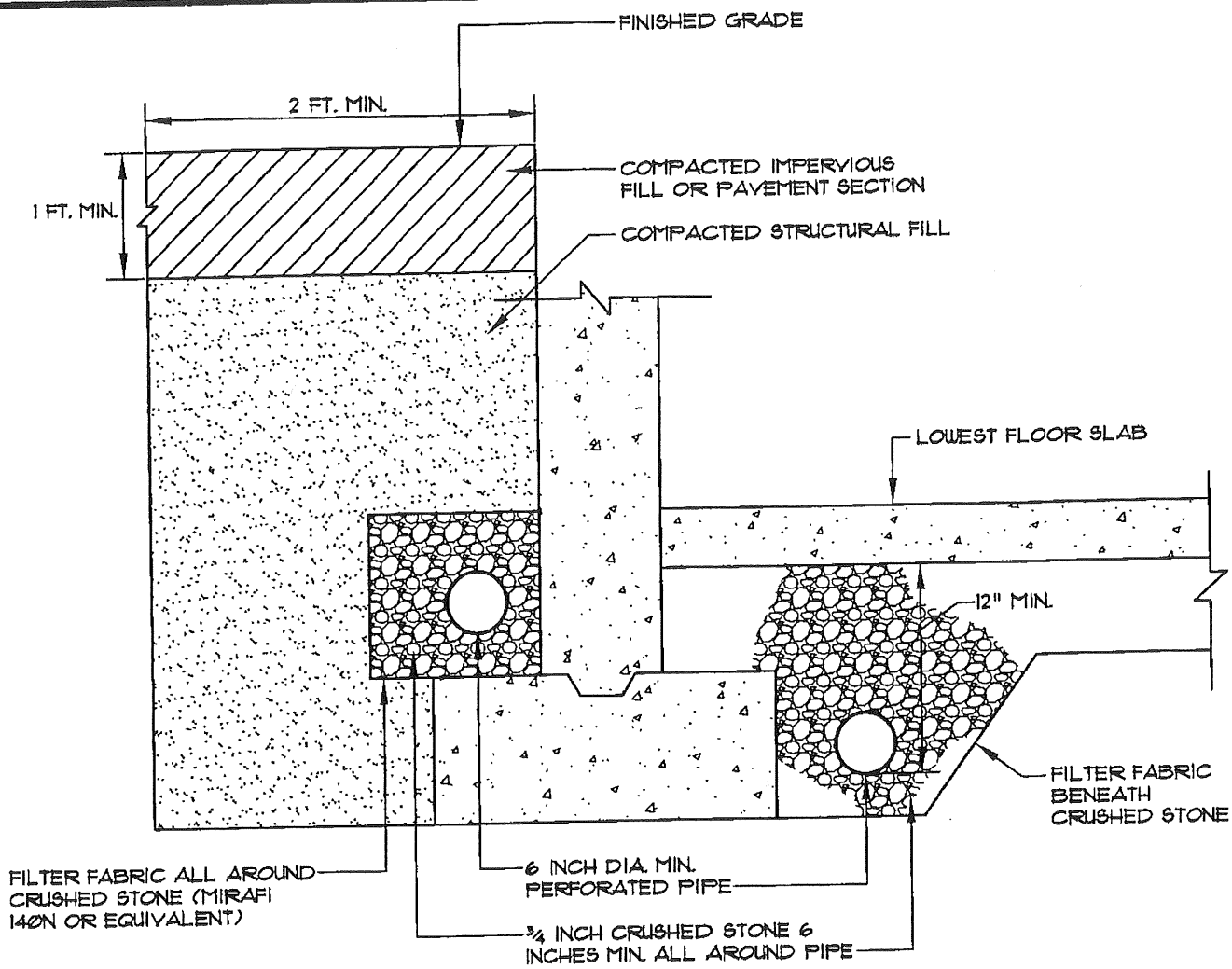
Overburden (Linear ft.)	13.7
Rock Cored (Linear ft.)	--
Number of Samples	3S

BORING NO. B206

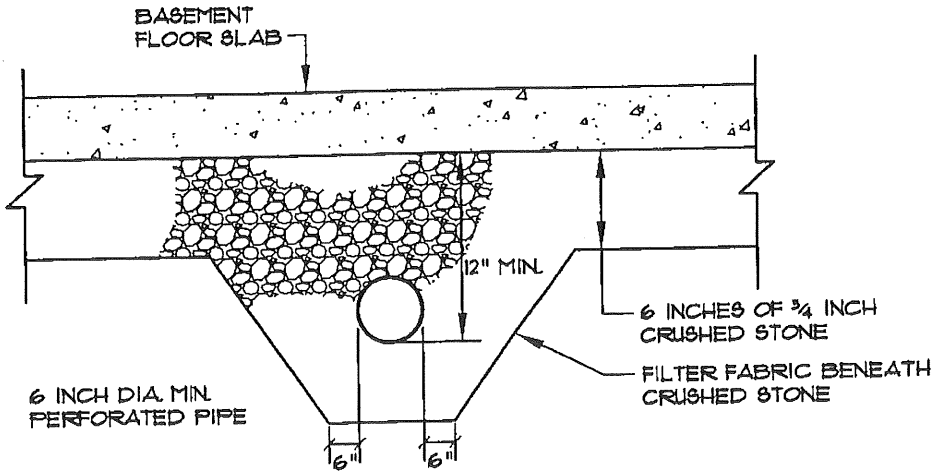
Field Tests — Dilatancy: R - Rapid S - Slow N - None; Toughness: L - Low M - Medium H - High; Plasticity: N - Nonplastic L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.



TYPICAL PERIMETER DRAIN DETAIL



TYPICAL UNDERSLAB DRAIN DETAIL

Sebago Technics
Engineering Expertise You Can Build On
One Chabot Street
Westbrook, Me 04098-1339
Tel (207) 856-0277

FOUNDATION DRAIN DETAILS
OF: PHASE II PARKING GARAGE

SCALE:	NONE
DATE:	2-17-0
SHEET:	FIGURE 1

LOCATION: PORTLAND INTERNATIONAL JETPORT

FOR: DOMENECH HICKS AND KROCKMALNIC ARCHITECTS

05477FIG-1

ATTACHMENT "A"

sebagotechnics.com

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Westbrook, Maine
04098-1339
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February 23, 2006
05477

Mr. George Katsoufis
Domenech Hicks & Krockmalnic Architects
155 Massachusetts Avenue
Boston, MA 02115

Report on Subsurface and Foundation Investigation
Phase II Parking Garage
Portland International Jetport, Portland, Maine

Dear George:

This report presents the results of our subsurface and foundation investigation for the proposed Phase II Parking Garage at the Portland International Jetport in Portland, Maine. These services were provided in accordance with our proposal dated December 12, 2005.

In summary, it is our opinion that the proposed Phase II Garage may be supported on undisturbed, naturally deposited soil and bedrock or on compacted structural fill placed after removal of unsuitable soil. In addition, an earth-supported slab-on-grade may be used for the lowest (ground) floor. An underslab and perimeter foundation drain system will be required to relieve hydrostatic pressure and minimize seepage into the garage. Specific recommendations regarding foundation design and construction considerations are presented below.

Introduction

The site is located at the Portland International Jetport. The Phase II Garage consists of a six-level structure to be built on the south side of the recently constructed Phase I garage. It will occupy most of the area of the existing two-level garage, which will be demolished for Phase II construction.

Proposed Construction

The Phase II Garage will be approximately 360 feet by 180 feet in plan dimension. Phase II will be a five-story structure with the lowest floor level at approximately El. 50.2. There will be six parking levels with parking on the roof. Phase II will be connected to Phase I at all levels. The lowest level will be an extension of the Consolidated Car Rental Facility (CCRF) and the remaining five levels will be for parking. Access to Phase II will be from the existing double helix on the north side of Phase I and the two ramps to the CCRF.

We anticipate that Phase II will be framed as a composite precast and steel system, with steel columns and beams and precast double tee floor slabs, similar to Phase I. There will be double column rows on all interior column lines with single column lines at the exterior. Columns will be typically spaced at approximately 60 feet by 36 feet. Column loads will vary from approximately 745 kips at the exterior to 1490 kips at the interior double columns.

Subsurface Explorations

Explorations in 2000

During the period May 22 to June 13, 2000, Maine Test Borings, Inc. (MTB) of Brewer, Maine drilled 39 borings, B1 to B38 and B7A for the Master Plan and Phase I Garage. Eleven of those borings, B1 to B5 and B21 to B26, are within or adjacent to the Phase II area. Locations of borings are shown on Sheet 1, Subsurface Exploration Plan. MTB drilled the borings to depths below ground surface varying from 4.6 feet to 22.0 feet. A groundwater observation well was installed in completed boring B2.

Borings B1, B3, B4 and B5 were drilled with 2.5-inch inside diameter hollow stem augers. Boring B2 was drilled using 3-inch inside diameter casing. Borings B21 to B26 were drilled using portable (tripod) equipment and 2.5-inch inside diameter casing. Soil samples were typically obtained at 5-feet intervals. Standard Penetration Resistance (N) was measured at each sample interval in accordance with ASTM test designation D1586. Haley & Aldrich, Inc. monitored the borings. Logs of borings, prepared by MTB, are included in Appendix A. Table I summarizes the results of borings.

Dufresne-Henry, Inc. determined locations and ground surface elevations at borings.

Explorations in 2006

During the period January 30 to February 2, 2006, MTB drilled six borings, B201 to B206, at locations shown on Sheet 1. MTB drilled the borings to depths below ground surface varying from 10.3 feet to 13.9 feet. Sebago Technics, Inc. monitored the borings and prepared the logs included in Appendix B. Table I summarizes the results of borings. MTB backfilled the borings with the drilled soil.

Borings were drilled using portable (tripod) equipment and 2.5-inch inside diameter casing. Soil samples were typically obtained at 5-feet intervals. Standard Penetration Resistance (N) was measured at each sample interval in accordance with ASTM test designation D1586.

Sebago Technics, Inc. determined the locations of borings by taping from existing site features. We estimated the ground surface elevations at borings by linear interpolation between previous borings.

The boring logs and related information depict subsurface conditions and water levels encountered at the locations and during the times indicated on the logs. Subsurface conditions at other locations may differ from those encountered in the borings. The passage of time may result in a change in groundwater conditions at the exploration locations.

Subsurface Conditions

The explorations encountered four principal soil units below the surficial bituminous concrete pavement: fill, marine deposit, glacial till, and weathered bedrock. Encountered thickness and generalized descriptions of the soil units are presented below in order of increasing depth below ground surface.

Fill - Fill consists of medium dense to dense, brown, well-graded SAND with gravel (SW). Encountered thickness varied from 1.2 feet to 9.1 feet.

Marine Deposits - Marine deposits generally consist of medium stiff-to-stiff, gray-brown to gray mottled lean CLAY (CL); to dense, brown poorly-graded SAND with silt (SP-SM). Encountered thickness varied from 0.4 feet to 10.5 feet.

Glacial Till – Glacial till generally consists of loose to very dense, brown to gray silty SAND with gravel (SM); to well-graded SAND with silt (SW-SM) with cobbles and boulders. Encountered thickness varied from 3.9 feet to 13.0 feet.

Weathered Rock – Weathered rock was encountered in borings B202 to B206 and generally consists of dark gray weathered rock fragments. Borings B201 to B206, B1, B2, B4, B5 and B21 encountered refusal to boring penetration, which is likely bedrock.

Based on depths to refusal encountered in the explorations, bedrock will likely be encountered in foundation construction for Phase II. Refusals were encountered at elevations varying from El. 42.5 to El. 58.7.

Water levels encountered in the borings ranged from approximately 4.6 feet to 18.7 feet below ground surface. Observation of water was made over a relatively short period of time, after introducing water for drilling, and may not reflect the stabilized groundwater level. Water levels measured in the observation well in B2 between May 30, 2000 and November 3, 2000 varied from El. 56.8 to El. 58.4. Groundwater levels will fluctuate with season, precipitation, temperature and construction activities in the area. Therefore, groundwater levels during and following construction will vary from those encountered in the explorations and observation well.

Recommendations for Foundation Design

Recommended Foundation Type and Design Criteria

The bituminous concrete, fill and marine soils are not considered suitable for support of the garage structure. We recommend that the garage be supported on spread footings bearing on the naturally deposited glacial till and bedrock or on compacted structural fill placed after removal of unsuitable soil.

For uniformity, we recommend that garage footings bearing on glacial till and bedrock or compacted structural fill be proportioned for an allowable bearing stress equal to 2,500 pounds per square foot (psf) multiplied by the least lateral dimension of the footing in feet, up to a maximum of 7,500 psf. All foundations should be at least 2 ft. wide.

Refusals were encountered from El. 48.8 to El. 52.7 inside the existing 2-story garage. Therefore, bedrock may be encountered at or above the proposed bearing level of footings in this area. Individual footings should bear either on soil or bedrock. Footings that would bear both on soil and rock should either be lowered to bear entirely on rock or rock should be overexcavated and replaced with a minimum of 12 inches of structural fill and the footing bear on soil. Continuous footings may span both soil and rock provided a transition from soil to rock is provided. Tapering the bedrock surface to a slope of 4 horizontal to 1 vertical or flatter and backfilling with compacted structural fill to a minimum depth of 1 foot would be acceptable. For uniformity, we recommend that footings be proportioned as discussed above.

Because most of the lower level in the garage will be exposed to freezing temperatures, footings should be founded at least 4.0 ft. below the lowest adjacent ground surface exposed to freezing.

Compacted structural fill supporting footings should extend laterally from the footings to at least the limits defined by 1 horizontal to 1 vertical lines slopped outward and downward from points located at least 2 feet horizontally beyond the bottom edges of the footings.

At the recommended bearing stress, we anticipate that foundation settlement will be less than 1 inch. We anticipate that more than half of this settlement will occur during the construction period. We anticipate that settlement of this magnitude is acceptable. However, Becker Structural Engineers should determine final acceptability of settlement.

Ground Floor Slab

We recommend that lowest level floor slab be designed as an earth-supported slab-on-grade bearing on a minimum of 6 in. of crushed stone. All fill placed below the floor slab for raise-in-grade should consist of compacted structural fill.

Groundwater was encountered at elevations varying from El. 56 to El. 58 in the area of the existing 2-story garage. The lowest floor level will be at approximately El. 50.2, up to 8 feet below the groundwater level. We recommend a perimeter foundation and underslab drain system be constructed on the outside of the foundation walls and below the slab to permanently lower the groundwater level and minimize hydrostatic pressure and seepage into the garage. Typical drain details for foundation walls and underslab are shown on Figure 1.

A foundation and underslab drain system with gravity discharge was constructed for the Phase I garage. If possible, we recommend that the foundation and underslab drain system for the Phase II garage be connected to this existing system.

Seismic Design Considerations

We recommend that the building be designed in accordance with the seismic requirements of the latest edition of the International Building Code, the site classification is Class C; the site response coefficient F_a is 1.2 for a short period spectral response acceleration S_s of 0.37g; the site response coefficient F_v is 1.7 for the 1-second period spectral response acceleration S_1 of 0.10g. The subgrade soils are not considered liquefaction susceptible.

Lateral Foundation Loads

We recommend that lateral loads be resisted by bottom friction on footings and that a coefficient of friction equal to 0.40 be used for footings bearing on soil. If this does not provide sufficient lateral resistance, we will consider the problem in more detail, to take into account other factors.

Lateral Soil Pressure

We recommend that the lower level south and west foundation walls which are restrained at the top and backfilled on the outside be designed to resist a lateral earth pressure calculated on the basis of an equivalent fluid unit weight of 55 pounds per cubic foot. This fluid unit weight assumes an at-rest earth pressure coefficient of 0.45, a free-draining granular backfill and an effective drainage system. Walls within 10 feet of travel lanes or roadways should be designed for a uniform lateral pressure acting over the full height of wall, calculated on the basis of 0.5 times the surcharge stress (traffic load), in addition to the lateral soil pressure recommended above.

Backfill Materials

Structural fill used below foundations and floor slabs and for backfill adjacent to foundation walls should consist of sandy gravel to gravelly sand. It should be free of organic material, loam, trash, snow, ice, frozen soil and other objectionable material, and should conform to the following gradation:

Sieve Size	Percent Finer by Weight
3 inches	100
No. 4	30 to 90
No. 40	10 to 50
No. 200	0 to 8

Compacted structural fill should be placed in layers not exceeding 8 inches in loose measure and compacted by self-propelled vibratory equipment at the approximate optimum moisture content to a dry density of at least 95 percent of the maximum dry density, as determined in accordance with ASTM Test Designation D1557. In confined areas, the loose layer thickness should be reduced to 6 inches and compaction performed by hand-guided equipment.

Compacted structural fill on the outside of the foundation walls should extend laterally a minimum of 2 feet from the wall. Backfill beyond this limit on the outside of the garage may consist of common fill. The top 12 inches of fill on the exterior of the garage should consist of low permeability material to minimize water infiltration next to the garage. Grading should provide for runoff away from the building.

Common fill may consist of inorganic mineral soil that can be placed in layers not exceeding 12 inches in thickness and compacted with a minimum of two systematic passes of the equipment placing the fill.

Construction Considerations

General

The primary purpose of this section of the report is to comment on items related to excavation, earthwork, and related geotechnical aspects of proposed construction. It is written primarily for the engineer having responsibility for preparation of plans and specifications. Since it identifies potential construction problems related to foundations and earthwork, it will also aid personnel who monitor the construction activity. Prospective contractors for this project must evaluate the construction problems on the basis of their own knowledge and experience in the Portland, Maine area, and on the basis of similar projects in other localities, taking into account their proposed construction methods, procedures, equipment and personnel.

Excavation, Lateral Support, and Control of Water

We anticipate that foundation excavation along the west and south sides can be accomplished with sloped open excavation through the overburden soils. Excavation on the north side will remove the existing soil nail wall constructed for the Phase I garage. The pedestrian ramp to the CCRF and an underground vault are located along the east side and therefore lateral support will not be required. Some sloughing and raveling should be anticipated in temporary slopes. However, due to space limitations and the proximity of the excavation to existing roadways along the west and south sides, open excavation may not be feasible and it may be necessary to provide a braced, temporary earth support system.

Several types of lateral support appear to be appropriate: interlocking steel sheet piling with tiebacks, steel soldier beams and lagging with tiebacks or soil nail walls. However, the presence of rock and refusals above, at or near the bottom of excavation along the west and south side of the Phase II garage will make it difficult to drive sheeting to the required depth for embedment below the bottom of excavation.

Excavation for the Phase II garage will encounter the grouted reinforcing bars and the soil nail wall constructed on the south side of the Phase I garage. Any grouted bars extending below excavation level can be cut off and left in place. Excavation will also encounter drilled mini-piles installed in footings along the east side of the 2-story garage. Portions of piles extending below the excavation level may be cut off and left in place.

As discussed above, rock excavation may be required for foundation construction at the lowest levels. Based on the character of bedrock interpreted from the boring refusals, we anticipate that excavation will require systematic drilling and blasting, or mechanical (hoe ram or impact hammer) methods to excavate.

The contractor should conduct all rock excavation activity in such a manner that the peak particle velocity of ground vibration measured at the locations of the nearest structures to the excavation does not exceed the "safe limits" recommended by the U.S. Bureau of Mines as presented on Figure B-1 of Appendix B of BUMINES RI 8507 and the peak airblast overpressure, if blasting used, measured at the location of the nearest above ground occupied structures to the blast (considering wind direction) does not exceed 0.014 pounds per square inch. Blasting mats should be utilized for all blast rounds detonated to prevent the throw of flyrock from the blasting

area. All blasting, if required, should be conducted in accordance with City of Portland ordinances.

Based on measured groundwater levels, dewatering will be required during excavation and foundation construction and until the permanent perimeter foundation and underslab drain system is operational. Groundwater may be as much as 8 to 12 feet above the lowest anticipated excavation level. Subsurface data indicate that excavation will be made in the glacial till and weathered rock. Dewatering during excavation and foundation construction for the Phase I garage was accomplished with sumps and submersible pumps distributed as need through the excavation. We anticipate that this type of system would be acceptable for the Phase II dewatering. Control of groundwater and water from other sources must be done in a manner which will preserve the undisturbed bearing capacity of the bearing soils and permit construction "in-the-dry." Sumps and pumps should be installed with adequate filters to minimize loss of fine-grained soil.

We recommend that the contractors proposed methods for making and dewatering the excavation, whether open or braced cut, be designed by a registered professional engineer and the scheme submitted to the Owner's engineer for review and comment prior to installation.

Subgrade Preparation

The subgrade soil is susceptible to disturbance from construction traffic. Equipment and personnel should not be permitted to travel across exposed footing bearing surfaces or exposed slab subgrades. Any subgrade areas that are disturbed should be recompacted or excavated and replaced with compacted structural fill prior to placing of concrete. Subgrades should be protected against freezing temperatures if exposed during construction. Final excavation to subgrade should be performed using equipment with smooth-edge buckets.

Construction Monitoring

The foundation recommendations contained herein are based on the known and predictable behavior of a properly engineered and constructed foundation. Monitoring of the foundation construction by personnel qualified by training and experience is recommended to enable the geotechnical engineer to keep in contact with procedures and techniques used in construction.

Limitations of Recommendations

This report has been prepared for specific application to the subject project in accordance with generally accepted geotechnical engineering practices. In the event that any changes in the nature, design or location of the Phase II garage are planned, the conclusions and recommendations contained in this report should not be considered valid, unless the changes are reviewed and the conclusions of this report modified or verified in writing.

The recommendations presented herein are based in part upon the data obtained from the referenced explorations. The nature and extent of variations from that disclosed by the explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

We recommend that we be provided with the opportunity for a general review of final design and specifications in order to determine that our earthwork and foundation recommendations have been interpreted and implemented in the design and specifications as they were intended.

It has been a pleasure to work with you on this project. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,

SEBAGO TECHNICS, INC.

Kenneth L. Recker, P.E.
Geotechnical Engineering Manager

KLR:klr/kn
Encl.

Table I	- Summary of Borings
Sheet 1	- Subsurface Exploration Plan
Figure 1	- Typical Foundation Drain Details
Appendix A	- Logs of Explorations in 2000
Appendix B	- Logs of Explorations in 2006

STATE OF MAINE
KENNETH
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RECKER
#5435
REGISTERED
PROFESSIONAL ENGINEER

APPENDIX B :

PRECAST/ PRESTRESSED STRUCTURAL MEMBERS BID PACKAGE #8607

SPECIFICATION SECTION 03410: PLANT-PRECAST STRUCTURAL CONCRETE

SPECIFICATION SECTION 00310: FORM FOR BID

SPECIFICATION SECTION 00531: CONTRACT AGREEMENT

SPECIFICATION SECTION 01010: SUMMARY OF WORK

SECTION 03410

PLANT-PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Fabricators and erectors intending to bid Project shall attend Pre-Bid Conference. See Section "Invitation to Bid and Instructions to Bidders," heading "Pre-Bid Conference." Unless noted otherwise.

B. This Section includes plant-precast structural concrete units, including the following:

1. Long-span units.
2. Structural framing units.

C. Assigned Work

1. Provisions stated herein apply to all plant-precast concrete, whether structural or architectural.

D. Related Sections include the following:

1. Division 03300 Section "Cast-In-Place Concrete."
2. Division 07920 Section "Joint sealants."
3. Division 7 Section "Waterproofing System."

1.3 SYSTEM DESCRIPTION

A. System described here is intended to perform in ACI 362.1R-97 Zone III environment. If maintained per manufacturer's recommendations, system is expected to function satisfactorily for forty years.

B. Drawings show precast member sizes assumed and used as basis for Architectual Drawings and Details and foundation design. Alternate member sizes will be accepted only if structurally required and if no significant effect on foundations or architecture.

C. Design structural reinforcement required to resist handling and erection stresses.

D. See Drawings for:

1. Precast concrete member load requirements.
2. Minimum entrained air.
3. Minimum compressive strength.
4. Maximum water cementious materials ratio.

E. All precast concrete pieces require design by precast concrete manufacturers, unless otherwise noted on Drawings.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, per Section "Cast-In-Place Concrete."

B. Design Mixes: For each concrete mix. Use Mix Design form at end of Division 3, Section "Cast-In-Place Concrete."

C. Shop Drawings:

1. Shop Drawing Preparation: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings is prohibited. Shop drawings created from reproduced Construction Documents will be returned without review. Shop Drawings should include the following;

1. Shop Drawings: Detail fabrication and installation of precast structural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, openings, and types of reinforcement, including special reinforcement.
2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
3. Indicate locations and details of anchorage devices to be embedded in other construction.
4. Precaster shall submit shop drawings for typical pieces only along with reinforcing detail drawing for corresponding calculations.
5. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation.

a. Include calculated fire-resistance analysis.

2. Review of the shop drawings will be made for the size and arrangement of reinforcement. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the Design-Build Contractor. Engineer's review in no way relieves the Design-Build Contractor of this responsibility. Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Design-Build Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.

3. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided all items listed prior. Incomplete submittals will not be reviewed.

D. Samples: For each type of finish indicated on exposed surfaces of precast structural concrete units, in sets of 3, illustrating quality of finishes, colors, and textures; approximately 12 by 12 by 2 inches.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of engineer/architects and owners, and other information specified.

G. Material Certificates: Signed by Manufacturer certifying that each of the following items conforms to requirements.

1. Concrete materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.

H. Proof of certification of precast concrete supplier's plant under Precast/Prestressed Concrete Institute (PCI) plant certification program before award of contract.

J. Proof of precast erector qualification under PCI Field Qualification Program.

a. Letter of Qualification, furnished by Precast/Prestresesed Concrete Institute confirming that erector is fully qualified in Structure Category S2.

K. Proof of precast erector's superintendent's qualification as Certified Field Auuditor.

L. See requirements of Division 1 Section, "Submittals Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.

M. See requirements of Division 1 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

1.5 QUAILTY ASSURANCE

A. "Engineer/Architect" in this Section is defined as Structural Engineer/Architect of Record.

B. Installer Qualifications: Precast concrete erector shall be fully qualified in Structure Category S2 by Precast/Prestressed concrete Institute prior to beginning work.

C. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast structural concrete units similar to those indicated for this Project and with a record of successful in-service performance.

1. Assumes responsibility for engineering precast structural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
2. Professional Engineer Qualifications: A professional Engineer who is legally qualified to practice in Maine and who is experienced in providing engineering services of the kind indicated.
3. Participates in PCI's Plant Certification Program and is designated a PCI-certified pant for Group C, Category C3.
4. Has sufficient production capacity to produce required units without delaying the Work.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, selected and hired by the Fabricator, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

E. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook- Precast and Prestressed Concrete."

F. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations and camber and dimesional tolerances for types of units required, comply with PCI MNL-116, "Manuel for Quality Control for Plants and Production of Precast and Prestressed Concrete Products."

G. Product Options: Drawings indicate size, profiles and diensional requirements of precast concrete units and are based on the specific types of units idicated. Other fabricators' precast concrete units complying with requirements may be considered. Refer to Division 1 Section "Product Substitutions Procedures."

H. Welding: Qualify Procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel"; and AWS D1.4, "Structural Welding Code-Reinforcing steel."

I. Calculated Fire Resistance: Where indicated, provide precast structural concrete floor units whose fire resistance has been calculated according to PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete." and is acceptable to authorities having jurisdiction.

J. Fire-Test-Response Characteristics: Provide precast structural concrete floor units that comply with the following requirements:

1. Fire-response testing was performed by UL, ITS, or another testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Fire-resistance rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from it's "Director of Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
3. Products are identified with appropriate markings of applicable testing and inspecting agency.

K. Concrete Testing:

1. Perform and pay for compression tests for all precast concrete work with in-house Quality Control personnel. Testing is subject to observation by Testing Agency hired by Owner. Use certificate test equipment. Unless otherwise specified, conform with PCI MNL 116.
2. Precast Structural Concrete Testing: Sample, test and report concrete in accordance with PCI MNL 116, with following exceptions:

a. Placement is defined as 50 cu yd (or fraction thereof) placed for each day of production
b. Make six cylinders per placement: 3 at beginning (labeled "A) and 3 at end of placement (labeled "B").
c. Only 1 "A" and 1 "B" cylinder for each placement need be cured per MNL 116. Test these cylinders to verify concrete compressive strength at transfer of prestress.
d. Other cylinders may be moist cured and tested at 28 days to verify design compressive strength of concrete.
e. Discard remaining cylinders after 56 days upon acceptance in writing of Engineer/Architect.

L. Precaster shall provide casting schedule to Engineer/Architect with first shop drawings submittal. Precaster shall notify Engineer/Architect 48 hrs in advance of casting of each piece type (tees, L-beams, spandrel beams, inverted tee beams, columns, wall panels, or other pieces) so that Engineer/Architect may review reinforcement fabrication at precaster's plant before casting. Engineer/Architect may request notification for specific piece marks.

M. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 REFERENCES

A. American Association of State Highway and Transportation Officials (AAASHTO):

1. AASHTO M 251, " Plain and Laminated Elastomeric Bridge Bearings."

B. American Concrete Institute (ACI):
1. ACI 305R, "Hot Weather Concreting" Recommendations, not specifications.
2. ACI 306.1, "Standard Specifications for Cold Weather Concreting."
3. ACI 318, "Building Code Requirements for Structural Concrete."
4. ACI 362.1R-97, "Guide for the Design of Durable Parking Structures." Recommendations, not Specifications.

C. American Society for Testing and Materials (ASTM):

1. ASTM A36, "Specification for Structural Steel."
2. ASTM A108, "Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality."
3. ASTM A123, "Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plated, Bars, and Strips."
4. ASTM A164, "Specification for Electrodeposited Coatings of Zinc on Steel."
5. ASTM A167, "Specification for Stainless and Heat Resistant Chromium Nickel Steel Plate, Sheets and Strips (A304)."
6. ASTM A184 "Standard Specification for Fabricated Deformed, Steel Wire Fabric for Concrete reinforcement."
7. ASTM A185, "Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement."
8. ASTM A276, "Standard Specification for Stainless Steel Bars and Shapes."
9. ASTM A307, " Standard Specification for Carbon Steel Bolts Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength."
10. ASTM A386, "Specification for Zinc Coating (Hot-Dip) on Assembled Steel Products."
11. ASTM A416, "Specification for Uncoated Seven-Wire Stress-Relieved Steel Strand for Prestressed Concrete."
12. ASTM A480, "Standard Specification for Stainless Steel – General Requirements."
13. ASTM A496, "Standard Specification for Steel Wire, Deformed, for Concrete reinforcement."
14. ASTM A497, "Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement."
15. ASTM A500, "Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing Rounds and Shapes."
16. ASTM A615, "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement."
17. ASTM A666, "Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Pate and Flat Bar."
18. ASTM A706, "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement."
19. ASTM A775, "Specification for Epoxy-Coated Reinforcing Steel Bars."
20. ASTM A884, "Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement."
21. ASTM A934, "Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars."
22. ASTM B633, "Specification for Electrodeposited Coatings of Zinc on Iron and Steel."
23. ASTM C42, "Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete."

24. ASTM C144, "Standard Specification for Aggregate for Masonry Mortar."
25. ASTM C150, "Specification for Portland Cement."
26. ASTM C265, "Standard Test Method for Calcium Sulfate in Hydrated Portland Cement Mortar."
27. ASTM C881, "Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete."
28. ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)."
29. ASTM D412, "Standard Test Methods for Vulcanized rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension."
30. ASTM E119, "Standard Test Methods for Fire Tests of Building Construction and Materials."
31. ASTM F593, "Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs."

D. American Welding Society (AWS):

1. AWS D1.1, "Structural Welding Code-Steel."
2. AWS D1.4, "Structural Welding Code-Reinforcing Steel."
3. AWS D19.0, "Welding Zinc-Coated Steel."
4. AWS C2.2, "Recommended Practices for Metallizing with Aluminum and Zinc for Protection of Iron and Steel."

E. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI MSP, "Manual of Standard Practice."

F. Prestressed Concrete Institute (PCI):

1. PCI MNL 116, "Manual for Quality Control from Plants and Production of Precast Prestressed Concrete Products."
2. PCI MNL 120, "Design Handbook Precast Prestressed Concrete." Recommendations, not specifications
3. PCI MNL 129, "Parking Structures – Recommended Practice for Design and Construction." Recommendations, not Specifications.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver precast structural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

B. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

1.8 SEQUENCING

A. Furnish anchorage items to be embedded in other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

B. General Contractor shall coordinate manufacturing, delivery and erection schedules.

C. Allow adequate time for curing of precast pieces prior to erection as required by Part 3.

1.9 ALTERNATIVES

A. Precast superstructure has been designed and detailed as shown on Drawings. No performance type design except for doouble tees has been included in Drawings for precast superstructure. See heading "System Description – Performance Specification" for double tee requirements.

B. Alternate structural systems, if proposed, shall confirm in basic concept to Base Bid as detailed. Structure shall be totally precast with 4 in. thick flange, pretopped double tee deck pieces, column sizes and locations shall remain as shown, and all clearances shall be provided as shown as Drawings. See heading "System Description – Performance Specification." for additional requirements.

C. Precast contractor shall be required to employ or have on staff qualified professional, legally licensed structural Engineer in Maine (referred to as Designer), to perform design of any alternates to Engineer/Architect's design of precast superstructure. Designer will be requested to submit calculations for such alternate to construction for Project. Designer shall also prepare and seal drawings and calculations for which it has design responsibility, for submittal to proper governing authorities required. See heading, "System Description – Performance Specification." for additional requirements.

D. All drawings (include Shop Drawings and other Drawings), calculations and specifications prepared by Designer shall bear seal and signature of Designer before submittal for review. See heading, "System Description – Performance Specification." for additional requirements.

E. Drawings showing construction details for any alternate must be submitted with Bid to Engineer/Architect for review before alternated will be considered. At time of bidding, submittals shall include sufficient detail to show all deviations and add or deduct cost associated with each change.

F. Cost to Owner for engineering and computer fees and any increased construction cost resulting from need to review and accommodate in finished Work such precast superstructure alternated shall be borne by Contractor.

1.10 SYSTEM DESCRIPTION – PERFORMANCE SPECIFICATION

A. Parking structure contract drawings are based on performance type design for precast/prestressed parking deck. An integral part of this project is preparation of final design drawings. Design calculations and shop drawings as required in accordance with this Section, and specifications necessary for fabrication and construction of all precast concrete pieces and required accessories in accordance with all code and engineering requirements.

B. Design Drawings and Specifications: Precast supplier shall employ qualified registered professional Engineer, licensed in Maine to perform such design(herinafter referred to as Designer) and acceptable to Engineer/Architect. Such design shall meet criteria established in these documents. This Designer shall prepare and seal final structural design drawings, design calculations, shop drawings, and specifications (hereinafter referred to as Design Documents) submitted to Engineer/Architect for review. Designer shall be responsible for structural design of the precast/prestressed members for project and will be required to submit design calculations and shop drawings to Engineer/Architect for review prior to any fabrication and Construction for Project. For those pieces for which Designer has design responsibility, Designer shall also prepare and seal drawings and calculations for submittal to proper governing authorities as required.

C. Submission of final design Documents: Precast supplier shall submit final design Documents to Engineer/Architect for review in ample time to allow such review before proceeding with any fabrication or construction. These Design Documents shall be completed in every detail necessary for fabrication and construction of Project, complying with design intent and requirements of Contract Documents. See Division 1 Section "Submittals" for Shop Drawings. These shop drawings shall neither be prepared nor be submitted to Engineer/Architect for review until after design drawings, design calculations, and specifications have been accepted by Engineer/Architect. Upon review, Engineer/Architect's written remark "Reviewed" shall mean that item, design drawings, calculation, or specification has been accepted.

D. Designer's Insurance and Certificate: Designer will be required to furnish Owner a Certificate of Professional Liability Insurance in minimum amount of $2,000,000 per claim. All Design Documents prepared by Designer shall be certified (bear seal and signature of Designer licensed in the State of Maine before they are submitted for review).

E. Minimum Durability Design Requirements:

1. Double tee flange connectors and anchorages: Stainless steel alloy A304.
2. Galvanize entire assembly of all connection hardware (excluding tee to tee connectors) and end bearing plate assemblies. Touch up galvanizing with Z.R.C. and epoxy coating with epoxy coating patching material after field welds are made.
3. Provide extra reinforcing around all openings, including door openings: 2 #5 bars all 4 sides of each opening and extend 2 ft beyond corners or opening. Add 2 #5 bars 4 ft long as diagonal bars at each corner.
4. Connections: Provide hidden galvanized or stainless steel connections at the following locations:

    a. Columns: Minimum of 1 per column to double tees at each supported level.
    b. Exterior Spandrels: Minimum of 1 at each double tee stem in load bearing spandrels and minimum of 1 every 5 ft on center for non-loading bearing spandrels to tee flange.
    c. "Light Wall to Double Tees": Minimum of 1 each double tee stem.
5. Diaphragm Reinforcing: Precaster to provide minimum of 3 #4 continuous galvanized or stainless steel bars and continuous connections at perimeter of all floor diaphragms cast into end of double tee flange unless higher reinforcing is required by design calculations.

F. General Design Criteria:

1. Unless noted otherwise, all design shall be in accordance with governing codes, standards and references listed in Drawing General Notes and in this Section.
2. Maximum self-weights (using normal weight concrete for all pieces) and minimum concrete strengths shall be per sections shown, Drawing General Notes and as noted herin.
3. Pieces shall be designed considering all vertical loads, lateral loads due to wind, seismic, temperature differentials, shrinkage, shortening, and effects due to prestressing.

4. All pieces shall have fire ratings as specified in Drawing General Notes.
5. Ultimate design capacity of inserts, coil rods, and coil bolts in tension shall not be greater than 90% of yield capacity of weakest piece.
6. Minimum concrete cover of reinforcement, prestressing strands, etc. shall be based on ACI 318, Sections 7.7.2 a, and 7.7.3.1, a and b.
9. See heading "Precast System Design Criteria" for additional piece design criteria.

G. Precast System Design Criteria:

1. Double Tees:

a. Design shall include type, number, and location of strands, flange reinforcement, shear reinforcement, cast-in-place concrete topping reinforcement, end bearing plate and confinement reinforcement. Prestress in accordance with provisions of this Specification and referenced standards, codes, etc. Entire assembly of end bearing plates shall be hot dipped galvanized.
b. Design flanges to support design dead load and either uniform (design) live load or 2000 lb concentrated wheel live load acting on area of 20 sq. in. (located to produce maximum stress condition), whichever provides greater stresses.
c. Where permitted by Governing Code, live loads may be reduced. Tributary area used in determination of reduced live loads shall be computed per stem rather than double per tee. Maximum tensile stresses in concrete shall not exceed limits stated in ACI 318, Section 18.4.
d. As determined by project conditions, design as "restrained" or "unrestrained" pieces for purposes of fire rating requirements. Use ASTM E119, Appendix X3 and Table X3.1 to determine restraint conditions. Minimum cover of reinforcement, prestressing strands, etc., and other fire rating design criteria shall be based on this premise.
e. Surface to receive topping shall be rough to allow proper bond per ACI 318, Section 17.5.
f. Flange connections shall be stainless steel alloy A304 "Vector Connector" or approved equal.

1.11 PRODUCT WARRENTY

A. Provide warranty similar to sample below.

B. Sample:

1. Manufacturer warrants what all materials furnished have been manufactured in accordance with the specifications for this project, Manufacturer further warrants that if erection of said material is to be performed by those subject to this control and direction, work will be completed in accordance with the same specifications.
2. In no event shall manufacturer be held responsible for any damages, liability or costs of any kind or nature occasioned by or arising out of the actions or omissions of others; or for inadequate construction of foundations, bearing walls, or other units to which materials furnished by the precast manufacturer are attached or affixed.
3. The period of this warranty shall be 5 yrs., beginning at the date of Beneficial Occupancy. Should any defect develop during the contract warranty period, which can be directly attributed to defect in quality of product or workmanship, precast manufacturer shall, upon written notice, correct defects or replace products without expense to owner and/or contractor.

1.12 REPAIR WARRANTY

A. Furnish Owner with written total responsibility guarantee that repairs will be free of defects, water penetration and deterioration related to repair design, workmanship or material deficiency.

B. Warranty period shall be 5 yrs commencing with date of acceptance of repair.

C. Perform any repair under this warranty at no cost to Owner.

D. Before construction, provide Engineer/Architect with sample of final warranty. Guarantee shall be provided by precaster.

PART 2 – PRODUCTS

2.1 FABRICATORS

A. Fabricators: Subject to compliance with requirements, provide products by one of the following:

1. Blakeslee Prestress, Inc., Route 139, PO Box 510, Branford, CT 06405, P#203-481-5306
2. William Daley, Inc., Airport Road, Shaftsbury, VT 05262, P#802-442-4418
3. Unistress Corp., 550 Cheshire Road, PO Box 1145, Pittsfield, MA 01202, P#413-499-1441
4. Schokbeton Quebec, Inc., 430 Arthur Sauve, Bur. 6030, St. Eusthache, Quebec J7R6V6, P#450-473-6831.
5. JP Carrara & Sons, Inc., 2464 Case St., Middlebury, VT 05753, P#802-388-6363
6. Strescon Limited, 406 Chesley Drive, Saint John, New Brunswick, Canada E2M353 P#506-632-2600

2.2 MOLD MATERIALS

A. Molds: Provide molds and, where required, form-facing materials of metal plastic, wood or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.

C. Epoxy-Coated Reinforcing Bars: ASTM A 775 or ASTM A 934, as follows:

1. Steel Reinforcment: ASTM A 615, Grade 60, deformed.

D. Steel Bar Mats: ASTM A 184, assembled with clips, as follows:

1. Steel Reinforcment: ASTM A 615, Grade 60 or ASTM A 76, deformed bars.

E. Epoxy-Coated-Steel Welded Wire Fabric (ECWWF): ASTM A 884, Class A coated, plain.

F. Plain-Steel Welded Wire Fabric (WWF): ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

G. Structural Synthetic Fiber may be used in addition to WWF to provide resistance against cracking due to impact, temperature, and shrinkage; Fiber dosage designated herein.

H. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manuel of Standard Practice," PCI MNL 116, and as follows:

1. For uncoated reinforcment, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcment, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.4 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416, Grade 250, uncoated, 7-wire, low-relaxation strand, manufactured in USA.

2.5 MATERIALS

A. Ready Mixed Concrete: Per Division 3, Section, "Cast-In-Place Concrete."

B. Precaster: Obtain ASTM C265 test results from cement manufacturer. Do not use cement with SO3 valve greater than 0.5 g/L.

2.6 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36.

B. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

C. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shield.

D. Malleable Steel Castings: ASTM A 47.

E. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706.

F. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.

G. Inserts and Coil Rods:

1. Provide sizes shown on Drawings.
2. Yield strength: 65,000 psi minimum.
3. Galvanizing: Electrodeposited zinc coating, ASTM B 633, Service Condition 1, Tpye III where indicated on Drawings.
4. Acceptable manufacturer, general:

H. Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM a 123, after fabrication, and ASTM A 153, as applicable.

1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20: "ZRC Cold Galvanizing Compound," ZRC Chemical Products Company, Quincy, MA.

I. Welding Electrodes: Comply with AWS standards.

J. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast structural concrete units.

2.7 STAINLESS-STEEL CONNECTION MATERIALS

A. Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.

B. Stainless-Steel Bolts and Studs: ASTM F 593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.

C. Stainless-Steel Headed Studs: ASTM A 276.

D. Elecrodes for Welding Type 304 stainless-steel: E 308.

E. Flange-to-flange field connection plates: ASTM A666, Type 304, of grade suitable for application.

2.8 BEARING PADS

A. Provide bearing pads for precast structural concrete units as follows:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 70 +/- Shore A durometer, minimum tensile strength 2250 psi per ASTM D 412.

2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Performed, randomly oriented syntheitic fibers set in elastomer. Surface hardness of 70 to 90 Sore A durometer.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer.
4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to mild-steel plate, of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

B. Double Tee Stems: Horizontal bearing pads:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 70 +/- Shore A durometer, minimum tensile strength 2250 psi per ASTM D 412.
2. Acceptable manufacturers:

   a. Neosorb," Voss Engineering Co., Chicago, IL.
   b. "Newlon," JVI, Inc., Skokie, IL.

C. Engineered random oriented fiber reinforced bearing pads with properties tested to be orthotropic in pad plane may be substituted for beam and double tee stem bearing pads where shown on Drawings, and if accepted in writing by Engineer.

1. Acceptable Materials:

   a. "Masticord," JVI, Inc., Skokie, Il.
   b. "Fiberlast," Voss Engineering, Inc., Chicago, IL.
   c. "Korolath R.O.F. Bearing Pads," Korolath of New England, Inc., Hudson, MA.

G. Shims for bearing pads: Galvanized or epoxy-coated ASTM A 36 steel. Do not stack steel shims more than 3 high. Tack weld multiple shims together on at leat 2 faces or corners. Touch up galvanizing or epoxy coating damaged by welding. See Section "Cast-In-Place Concrete" for materials.

H. Slide bearing systems at Expansion Joints:

1. Provide slide bearing systems as shown and detailed on Drawings:

   a. Beam and double tee bearings shall be reinforced PTFE: 100% virgin tetrafluoroethylene polymer and ground glass fiber reinforcing aggregate, pre-bonded to stainless teel

and/or preformed fabric (see paragraph "Bearing Pads" under heading "Connection Materials" above) bearing pads. Acceptable slide bearing systems:

1) "Fluorogold," Seismic Energy Products, LP, Pine Brook, New Jersey.
2) "Balco," Balco, Inc, Wichita, Kansas.
3) "Dura-Slide," Tobi Engineering, Inc., Elk Grove Village, Illinois.
4) "Dynalon Slide Bearings with Masticord," JVI, Inc., Skokie, Illinois.

b. Slab and plank bearing shall be ultrahigh molecular weight, high-density polyethylene resin: Acceptable material:

1) "Korolath PE," Korolath Corporation, Hudson, MA.
2) "Tivar-100," Poly-Hi/Menasha Corporation, Fort Wayne, Indiana.
3) "UHMW Econ-o-Shim," Deslausiers, Inc., Bellwood, IL.

2. Backing material for reinforced PTFE slide bearing systems as shown on Drawings:

a. Stainless steel.
b. Reinforced elastomer, having durometer hardness of 90 plus or minus 5 and meeting requirements of Article 2.10.3(L) of AASHTO Standard Specifications for Highway Bridges (1983).

2.9 GROUT MATERIALS

A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application. Acceptable materials:

1. "Hi-Flow Grout," by The Euclid Chemical Company.
2. "Masterflow 928" by Master Builders.

Non-shrink dry-pack grout from these manufacturers may also be used in areas where flowing or fluid grout is not required.

B. A qualified independent testing agency may be engaged by Fabricator for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Requirements for normal-weight concrete mix are shown on Drawings:

1. Compressive strength
2. Slump
3. Water-cementious materials ratio
4. Air content

D. Cementious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementious materials other than Portland cement according to ACI 301 requirements.

E. Air Entrainment:

1. See General Notes on Drawings for total air content (percentage by volume).
2. Air content shall exceed value stated in General Notes on Drawings.
3. Permissible variation for any one test result from specified average total air content 30, + 1.5 %

F. Chloride Ion Content of Mix:

1. Water soluble chloride ion content of mix (including all constituents) shall not exceed 0.06% chloride ions by weight of cement for prestressed concrete and 0.15% for reinforced concrete. Test to determine chloride ion content shall conform to ASMT C 1218.
2. Concrete chloride ion content shall be determined by Testing Agency prior to placement. Cast samples from current production of concrete mix proposed for superstructure.

G. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use corrosion-inhibiting admixture in concrete mixes as indicated in General Notes on Drawings.

4. Use polypropylene/polyethethylene synthetic structural fiber in concrete mixes where indicated.

H. Engineer's acceptance of mix design shall not relieve precast concrete fabricator from responsibility for any variation from requirements of Contract Documents unless precast concrete fabricator has in writing called Engineer's attention to each such variation at time of submission and Engineer has given written approval of each such variation.

I. Adjustment to Concrete Mixes: Mix design adjustments may be requested by precast concrete fabricator when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.

2.11 FABRICATION

A. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines and dimensions indicated, within fabrication tolerances.

1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.
2. Unless forms for precast, prestressed concrete units are stripped before detensioning, design forms so stresses are not induced in precast concrete units because of deformation or movement of concrete during detensioning.

B. Built-In Anchorages: Accurately position built-in anchorages devices and secure to formwork. Locate anchorages where they d not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in units unless approved by Engineer/Architect.

C. Cast-in openings larger than 10 inches in diameter or 10 inches square according to Shop Drawings. Smaller holes may be field cut by trades requiring them, as approved by Engineer/Architect.

D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practices," for fabricating, placing and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Prestress tendons for precast structural concrete units by either pretensioning. Comply with PCI MNL 116.

1. Delay detensioning until concrete has reached at least 70 percent of its compressive strength as established by test cylinders cured under the same conditions as concrete.
2. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
3. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

F. Mix concrete according to PCI MNL 116 and requirements in this Section. After concrete batching, no additional water may be added.

G. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.

H. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116.

I. Comply with ACI 306.1 procedures for cold-weather concrete placement.

J. Comply with ACI 305R recommendations for hot-weather concrete placement.

K. Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint casting date on each precast concrete unit so that it will not show in finished structure.

L. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or accelerated heat curing using low-pressure live steam or radiant heat and moisture.

M. Product Tolerances: Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product tolerances.

N. Form edges of double tee flanges to conform with configurations shown on Drawings:

1. Coordinate joints with expansion joint and control joint in sealant system.
2. Dry-saw unacceptable.
3. All Double Tee flange edges shall be delivered with ¼" tooled or ground edge.

O. Finishes:

1. Structural Precast Concrete: Provide finishes in accordance with MNL-116 and as follows:

a. Formed surfaces: Fill air pockets and holes over 0.25 in. in diameter with sand-cement paste and grind smooth all form offsets or fins over 0.125 in.
b. Double tees:

1) Tee areas with cast-in-place concrete topping: Top surface shall be transverse raked to 0.25 in. depth minimum to insure bond of topping.
2) Tee areas without cast-in-place concrete topping: Top surface shall have medium broom finish in longitudinal direction. All sides, ends and bottom: Smooth dense standard finish.
3) Top surface of block outs for pour strips: Transverse raked to 0.25 in. depth minimum to insure bond of topping.
4) Depressor holes: Filled with non-shrink, non-staining grout.

P. For protection against corrosion, coat exposed ends of prestressing strands in all prestessed pieces with Sonneborn "Hydrocide 600, 700, or 700B," or approved equivalent.

Q. Locate lift loops and erection inserts so as not to be visible in completed construction. Provide all lift loops and erection inserts with 1.5 in. minimum concrete grout cover in completed construction. Any lift loops or erection inserts that must be located in areas that will be exposed to public view in completed construction shall be recessed and patched with:

1. Latex modified concrete grout to match surrounding concrete to within ½" of surface.
2. Remainder to be filled with sealant. See typical detail.

R. Galvanize entire assembly of all inserts, angles and other cast-in-steel devices exposed on surface of precast concrete where shown on Drawings.

S. Permit access by Engineer/Architect, Owner, and Owner's representatives to all parts of manufacturing facility.

T. Mark each piece of precast concrete for identification and date of casting recorded. Marks shall not be visible after erection and completion of Work.

2.12 SOURCE QUALITY CONTROL

A. Owner may employ an independent testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.

1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.

B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.

C. Strength of precast concrete units will be considered deficient if units fail to comply with PCI MNL 116 requirements, including the following:

1. Units fail to comply with compressive-strength test requirements.
2. Reinforcement and prestressed tendons of units do not comply with fabrication requirements.

3. Concrete curing and protection of units against extremes in temperature fail to comply with requirements.
4. Units are damaged during handling and erecting.

D. Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with PCI MNL 116 requirements, Owner will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Engineer/Architect.
2. Cores will be tested in an air-dry condition per ACI 318 if units will be dry under service conditions.
3. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75 percent of the 28-day design compressive strength.
4. Test results will be made in writing on the same day that tests are performed, with copies to the Engineer/Architect, Contractor, and precast concrete fabricator. Test reports will include the following:

   a. Project identification name and number.
   b. Date when tests were performed.
   c. Name of precast concrete fabricator.
   d. Name of concrete testing agency.
   e. Identification letter, name and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at break, corrected for letter-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mix that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Dimensional Tolerances: Units with dimensions smaller or larger than required and not complying with tolerance limits may be subject to additional testing.

1. Precast concrete units with dimensions larger than required will be rejected f the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction.

Repair or remove and replace rejected units, as required, to comply with construction conditions.

G. Precaster's Quality Control inspector shall inspect all pieces immediately after pieces have received final finish.

H. Pieces shall be inspected and defects numbered on back of control tags attached to the back of each piece according to the following system:

1. Foreign material in face.
2. Bug holes.
3. Rough or chipped edges.
4. Cold joints.
5. Form Lines.
6. Cornice details.
7. Uniformity of finish.
8. Uniformity of retarder.
9. Finish at retarder surround.
10. Finish on return surfaces.

I. Precaster's finishers shall correct defects in precaster's plant or yard. As defects correct, finishers shall write an "f" next to the corresponding defect number on the back of the piece control tag.

J. As pieces loaded for shipment, precaster's Quality Control inspector shall reinspect pieces to verify completion of corrections and place an "x" after the letter "f" for each item verified and initial the piece for final approval. Pieces with uncorrected defects shall not be shipped.

K. Defective Work: Precast concrete units do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with concrete units that comply with requirements.

PART 3 – EXECUTION.

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bearing Pads: Install bearing pads as precast concrete units are being erected. Set pads on true, level and uniform bearing surfaces and maintain in correct position until precast concrete units are placed.

B. Install precast structural concrete. Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.

C. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

1. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shield as required.
2. Repair damaged metal surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces.

D. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units unless approved by Engineer/Architect.

E. Erection Tolerances: Install precast concrete units level, plumb, square and true, without exceeding the recommended erection tolerances in PCI MNL 127, "Recommended Practice for Erection of Precast Concrete."

1. Structure shall be brought within tolerances for deviation from plumb shall be checked by General contractor-employed Maine Registered Surveyor before placement of any cast-in-place concrete in superstructure.

F. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at keyways, connections, and joint as follows:

1. Provide forms or other approved method to retain grout in place until hard enough to support itself. Where required, pack spaces with non-shrink, dry-pack grout material, tamping until voids are completely filled. Place grout to finish smooth, level and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surface before it hardens.

3.3 FIELD QUALITY CONTROL

A. As pieces arrive at jobsite, General Contractor's Quality Control inspector shall check the production control tag for each piece to verify that the piece is complete and correct.

B. Any defective Work that cannot be repaired to satisfaction of Engineer/Architect, whether found at site or at shop at any time before completion and acceptance of Project, will be rejected regardless of previous reviews and shall be remade or reconstructed to satisfaction of Engineer/Architect. However, finished accepted at shop will not be rejected at site.

C. Improperly located bearing pads or those of incorrect material will not be accepted by Engineer/Architect and shall be relocated or modified at expense of Contractor, no matter when rejected.

D. Performance Requirements:

1. Conduct Inspections, perform testing, and make repairs or replace unsatisfactory precast pieces as required.
2. Limitations as to amount of patching which will be permitted is subject to acceptance of Engineer/Architect.
3. In-place precast pieces may be rejected for any 1 of the following:

   a. Exceeding specified installation tolerances.
   b. Damaged during construction operations.
   c. Exposed-to-view surfaces which develop surface finish deficiencies.
   d. Other defects listed in PCI MNL 116.

4. Repairs and repaired pieces shall be subject to 5 yr warranty provided by precaster. See Part 1 heading "Repair Warranty."

E. Welds and high-strength bolt connections are subject to inspection and testing by Testing Agency. As minimum, following testing shall be performed:

1. Welds: Visually inspect all welds.

   a. Double tee flange-to-flange connections: Test 5% of welds, if at discretion of Inspector, visual inspection inconclusive.
   b. All other welds: Test 25% of all field fillet welds and 5% of all shop welds.
   c. Testing: Penetrating dye or magnetic particle at Inspector discretion.
   d. One spot test per partial penetration weld using magnetic or ultrasonic testing.

2. Bolted Connections: Visual inspection of all connections. Check proper torque with calibrated torque wrench at minimum of 2 bolts of every connection.

F. Testing Agency has authority to reject materials, welds, and connections not meeting Specifications.

3.4 CLEANING

A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt and stains.

1. Wash and rinsh according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.
3. At completion of Work or at such times as directed by Engineer/Architect, remove all rejected and surplus material, rubbish or apparatus from premises and deliver Work to Engineer/Architect's satisfaction.

END OF SECTION

SECTION 00310

FORM FOR BID

To the Awarding Authority:

A. Pursuant to and in compliance with your Invitation to Bid relating thereto, the undersigned, Brian C. Lent having visited the site, familiarized himself with the conditions present, and carefully examined the Contract Documents dated **May 14, 2007**, prior to closing time for receipt of Bids as prepared by the Architect,

Domenech, Hicks & Krockmalnic
155 Massachusetts Avenue
Boston, MA 02115
617-267-6408

hereby offers and agrees to provide all labor and materials required for construction of

Phase II - Parking Garage
Contract 1:
Precast/prestressed structural members
Portland International Jetport
Portland, Maine
Bid Number 8607

to the satisfaction of the Owner and the Architect and in accordance with the accompanying Contract Documents with all addenda, for the Contract Price specified below, subject to additions and deductions according to the terms of the Contract Documents.

B. Total Lump Sum Price: ($ 2,948,000.00)

Two million Nine Hundred Fourty Eight thousand Dollars
(WRITTEN IN WORDS)

C. CONSENT TO ASSIGNMENT OF CONTRACT TO GENERAL CONTRACTOR:
Contractor, by executing this Bid Form, acknowledges, consents and agrees that the Owner has full intentions to exercise its rights under Assignment provisions of the Contract to assign the work as outlined in the Precast Bid Package to a General Contractor for the duration of the project. Contractor agrees to be bound by the obligations on Contractor's part to be performed pursuant to the Contractor's Agreement and, of the General Contractor.

D. CONTRACTOR'S CONDITIONS
Provide all terms and conditions associated with locking into a production slot. Include all fees, penalties and applicable timetables.

E. The undersigned agrees that, if he/she is selected as Contractor, he/she will within five days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the Awarding Authority, execute the Contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials payment bond, each of a surety company qualified to do business under the laws of the State and satisfactory to the Awarding Authority, and each in the sum of one hundred percent of the Contract Price, or more if so specified elsewhere in the Contract Documents, the premiums for which are to be paid by the Contractor and are included in the Contract Price.

F. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed according to the **milestone schedule** indicated in Section 00841: Special Conditions of this construction bid. The work that he/she performs will comply fully with all laws and regulations applicable to awards.

G. The Awarding Authority is exempt from sales and federal excise tax to the extent permitted under law; bidders should not include such taxes in figuring or in references to any bid.

H. The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

I. Commencement and Completion of Work: The undersigned agrees to commence work on the Contract within seven (7) calendar days from receipt of written notice to proceed issued by the Owner within fourteen (14) calendar days after execution of the Contract Agreement and to thereafter diligently and continuously carry on the work.

1. The undersigned agrees to substantially complete the work on or before the time as specified under Divisions 0 and 1, and/or as indicated on Drawings.
2. If work is not Substantially Complete within this time, undersigned agrees to pay Owner the amount in liquidated damages as stated in Document 00531.

J. Bidder understands that Owner reserves the right to reject any and all bids.

K. The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the State of Maine.

L. Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 60 business days after the scheduled closing for receiving bids.

Date: June 6, 2007

William E. Dailey Precast, LLC
(Name of Bidder)

Signed: [signature]

(Seal)

By: Brian C. Lent V.P.
(Name and Title of Person Signing Bid)

295 Airport Road
(Business Address)

Shaftsbury, Vermont 05262
(City and State)

END OF DOCUMENT

ADDENDUM #1

CITY OF PORTLAND, MAINE
Phase-II Parking Garage Portland International Jetport
Contract 1: Precast/Prestressed Structural Members
Bid #8607

DATE: June 1, 2007

The attention of firms submitting proposals for the work named in the above Invitation is called to the following modifications to the documents as were issued.

The items set forth herein, whether of clarification, omission, addition and/or substitution, shall be included and form a part of the Contractor's submitted material and the corresponding Contract when executed. No claim for additional compensation, due to lack of knowledge of the contents of this Addendum will be considered.

****

ALL BIDDERS ARE ADVISED THAT RECEIPT OF THIS NOTICE MUST BE DULY ACKNOWLEDGED ON THE BID PROPOSAL FORM OR BY THE INSERTION OF THIS SHEET, SIGNED, AND SUBMITTED WITH YOUR PROPOSAL.

****

MATTHEW F. FITZGERALD
PURCHASING AGENT

PLEASE SEE ATTACHED:

Receipt of **Addendum No. 1** to the City of Portland's **Bid #8607:**
Provi Phase-II Parking Garage Portland International Jetport Contract 1:
Precast/Prestressed Structural Members, is hereby acknowledged.

COMPANY NAME: William E. Dailey Precast, LLC

SIGNED BY: [signature] DATE: 6/6/07

PRINT NAME & TITLE: Robert W. Wilcox Adm.

ADDRESS: 295 Airport Road

Shaftsbury, Vt. 05262

Zip Code

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A310

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, that we William E. Dailey Precast, LLC
(Here insert full name and address or legal title of Contractor)

295 Airport Road, Shaftsbury, Vermont 05262

as Principal, hereinafter called the Principal, and Travelers Casualty and Surety Company of America
(Here insert full name and address or legal title of Surety)

One Tower Square, Hartford, Connecticut 06183

a corporation duly organized under the laws of the State of Connecticut
as Surety, hereinafter called the Surety, are held and firmly bound unto City of Portland
(Here insert full name and address or legal title of Owner)

389 Congress Street, Portland, Maine 04101

as Obligee, hereinafter called the Obligee, in the sum of Five Percent of Attached Bid

Dollars (5%),

for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Phase II - Parking Garage, Contract #1: Precast
(Here insert full name, address and description of project)

/Prestressed Structural Members, Portland International Jetport, Portland, ME, Bid Number 8607

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this 6th day of June, 2007

Ruth E Krawczyk
(Witness)

William E. Dailey Precast, LLC
(Principal) (Seal)

Brian Lent
Brian Lent (Title) Vice President

J. Columbus
J. Columbus (Witness)

Travelers Casualty and Surety Company of America
(Surety) (Seal)

T.M. Tyrrell (Title) Attorney-In-Fact

Travelers Casualty and Surety Company of America
Hartford, CT 06183

ATTORNEY-IN-FACT JUSTIFICATION
PRINCIPAL'S ACKNOWLEDGMENT - IF A LIMITED LIABILITY COMPANY

STATE OF VERMONT)
SS:
COUNTY OF BENNINGTON)

On this 6th day of June, 2007 before me personally came Brian Lent, to me known, who, being by me duly sworn, did depose and say that he resides in Shaftsbury, VT; that he is Vice President of William E. Dailey Precast, LLC, a Limited Liability Company, the Company described in and which executed the foregoing instrument, that he executed the foregoing instrument as the act and deed of said Company; and that he had the requisite authority to do so.

Ruth C Kiaugh

SURETY COMPANY'S ACKNOWLEDGMENT

State of New York,
County of Albany} ss

On this 6th day of June, 2007, before me personally appeared T.M Tyrrell; to me known, who, being by me duly sworn, did depose and say: That he/she resides in the City of Albany, New York; that he is Attorney-in-Fact of Travelers Casualty and Surety Company of America, Hartford, Connecticut, a corporation, created, organized and existing under and by virtue of the laws of the State of Connecticut, upon oath did say that the corporate seal affixed to the attached instrument is the seal of the said Company; that the seal was affixed and the said instrument was executed by the authority of its Board of Directors; and he did also acknowledge that he executed the said instrument as the free act and deed of said Company.

Rensselaer County
Comm. Exp. 12/18/2010

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA

HARTFORD, CONNECTICUT 06183

FINANCIAL STATEMENT AS OF DECEMBER 31, 2006

CAPITAL STOCK $ 6,000,000

ASSETS		LIABILITIES & SURPLUS	
CASH & INVESTED CASH	$ 114,080,791	UNEARNED PREMIUMS	$ 724,600,436
BONDS	2,912,711,671	LOSSES	872,911,753
STOCK	14,865,186	LOSS ADJUSTMENT EXPENSES	128,765,154
INVESTMENT INCOME DUE AND ACCRUED	34,978,331	COMMISSIONS	28,073,926
PREMIUM BALANCES	165,157,298	TAXES, LICENSES AND FEES	21,233,762
REINSURANCE RECOVERABLE	3,954,977	OTHER EXPENSES	30,823,925
NET DEFERRED TAX ASSET	42,796,290	DIVIDENDS	7,080,260
CEDED DEPOSIT ASSET	6,134,622	CURRENT FEDERAL AND FOREIGN INCOME TAXES	38,726,832
STATE SURCHARGES RECEIVABLE	149,430	CEDED REINSURANCE NET PREMIUMS PAYABLE	(4,981,682)
OTHER ASSETS	(4,414,060)	FUNDS HELD UNDER REINSURANCE TREATIES	99,054,332
		AMOUNTS WITHHELD / RETAINED BY COMPANY FOR OTHERS	39,095,839
		REMITTANCES AND ITEMS NOT ALLOCATED	60,285,233
		PROVISION FOR REINSURANCE	5,627,014
		PAYABLE TO PARENT, SUBSIDIARIES & AFFILIATES	86,256,776
		PAYABLE FOR SECURITIES	4,975,100
		RETROACTIVE REINSURANCE RESERVE ASSUMED	20,845,771
		OTHER ACCRUED EXPENSES AND LIABILITIES	119,334
		TOTAL LIABILITIES	$ 2,163,513,785
		CAPITAL STOCK	$ 6,000,000
		PAID IN SURPLUS	303,297,402
		OTHER SURPLUS	818,603,349
		TOTAL SURPLUS TO POLICYHOLDERS	$ 1,127,900,751
TOTAL ASSETS	$ 3,291,414,536	TOTAL LIABILITIES & SURPLUS	$ 3,291,414,536

STATE OF CONNECTICUT)

COUNTY OF HARTFORD)SS.

CITY OF HARTFORD)

LAWRENCE A. SIUTA, BEING DULY SWORN, SAYS THAT HE IS CHIEF FINANCIAL OFFICER - TRAVELERS BOND & FINANCIAL PRODUCTS, OF TRAVELERS CASUALTY SURETY COMPANY OF AMERICA, AND THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT STATEMENT OF THE FINANCIAL CONDITION OF SAID COMPANY AS OF THE 31st DAY OF DECEMBER, 2006.

L. A. Siuta

CHIEF FINANCIAL OFFICER - TRAVELERS BOND & FINANCIAL PRODUCTS

SUBSCRIBED AND SWORN TO BEFORE ME THIS
29TH DAY OF MARCH, 2007

Anna P. Nowik

NOTARY PUBLIC

ANNA P. NOWIK NOTARY PUBLIC CONNECTICUT

Anna P. Nowik Notary Public
My Commission Expires June 30, 2011

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

TRAVELERS

POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
Seaboard Surety Company
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 218465

Certificate No. 001557978

KNOW ALL MEN BY THESE PRESENTS: That Seaboard Surety Company is a corporation duly organized under the laws of the State of New York, that St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company and St. Paul Mercury Insurance Company are corporations duly organized under the laws of the State of Minnesota, that Farmington Casualty Company, Travelers Casualty and Surety Company, and Travelers Casualty and Surety Company of America are corporations duly organized under the laws of the State of Connecticut, that United States Fidelity and Guaranty Company is a corporation duly organized under the laws of the State of Maryland, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc. is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

C. C. Leach, F. E. O'Brien Jr., K. J. Furlong, P. J. Clyne, T. M. Tyrrell, T. R. Tyrrell, C. E. Antoinette, and P. D. Tobin

of the City of Albany, State of New York, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 5th day of April, 2007.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
Seaboard Surety Company
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

State of Connecticut
City of Hartford ss.

By: George W. Thompson, Senior Vice President

On this the 5th day of April, 2007, before me personally appeared George W. Thompson, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2011.

MARIE C. TETREAULT NOTARY PUBLIC CONNECTICUT

Marie C. Tetreault, Notary Public

58440-8-06 Printed in U.S.A.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any power of attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such power of attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, Kori M. Johanson, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 6th day of June, 20 07.

Kori M. Johanson, Assistant Secretary

To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.stpaultravelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.

SECTION 00531

CONSTRUCTION CONTRACT

THIS AGREEMENT is made this 15th day of August, 2007, by and between the **CITY OF PORTLAND**, a body politic and corporate having a place of business in the County of Cumberland, State of Maine (hereinafter "**CITY**") and William E. Dailey Precast LLC with a mailing address of 295 Airport Rd Shaftsburg, VT 05262 (hereinafter "**CONTRACTOR**").

WITNESSETH:

WHEREAS, the **CITY** did advertise for Requests for Bids by Bid # 8607 entitled: PHASE-II PARKING GARAGE, PORTLAND INTERNATIONAL JETPORT, CONTRACT 1: PRECAST/PRESTRESSED STRUCTURAL MEMBERS, PORTLAND, MAINE; and

WHEREAS, the **CONTRACTOR** did under date of June 6, 2007, submit a bid for such work; and

WHEREAS, after due consideration of all of the bids the **CITY** did award the bid to the **CONTRACTOR**,

NOW, THEREFORE, in consideration of the mutual promises made by each party to the other, the parties covenant and agree as follows:

1. SCOPE OF WORK.

The **CONTRACTOR** will furnish the materials, supplies, equipment and labor (hereinafter the "Work") required to construct and complete the PHASE-II PARKING GARAGE, CONTRACT 1: PRECAST/PRESTRESSED STRUCTURAL MEMBERS, PORTLAND INTERNATIONAL JETPORT, PORTLAND, MAINE project, all as more fully set forth in:

i. Specifications:

ii. Drawings:

iii. General and Supplemental Conditions

iv. Section 00020-Invitation to Bid, and

v. Any subsequent addenda to the above.

The **CONTRACTOR** hereby acknowledges receipt of the items described in subparagraphs i., ii., iii., iv and v. above. The Specifications, Drawings, General and Supplemental Conditions are incorporated and made a part of this Contract by reference.

2. TIME FOR PERFORMANCE.

The **CONTRACTOR** will commence work within 10 days, after execution of this Contract by the **CITY**. The entire project shall be substantially completed as part of the General Contract's substantial completion. Time for performance may only be extended in writing by **CITY**.

3. MATERIALS.

Unless otherwise stipulated, the **CONTRACTOR** shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation and facilities necessary for the execution and completion of the Work. Material and equipment shall be new, free from defects, perfect and complete, unless otherwise stipulated.

4. CITY'S RIGHT TO TERMINATE CONTRACT.

If the **CONTRACTOR** should be adjudged a bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of its insolvency, or if it should persistently or repeatedly refuse or should fail, except in for cases which extension of time is provided, to supply enough properly skilled workers or proper materials or labor, or persistently disregard laws, ordinances, or otherwise be guilty of a substantial violation of any provision of the Contract, then the **CITY** may, without prejudice to any other right or remedy, and after giving the **CONTRACTOR**, and its surety, seven (7) days' written notice, terminate the employment of the **CONTRACTOR** and take possession of the Premises and of all materials, tools and appliances thereon and finish the Work by whatever method it may deem expedient. In such case, the **CONTRACTOR** shall not be entitled to receive any further payment until Work is finished. If the unpaid balance of the Contract amount shall exceed the expense of finishing the Work, including compensation for additional architectural, managerial and administrative services, such excess shall be paid to the **CONTRACTOR**. If such expense shall exceed such unpaid balance, the **CONTRACTOR** shall pay the difference to the **CITY**.

5. BONDS.

The **CONTRACTOR** shall furnish to the **CITY**, upon execution of the Contract, a Contract Performance Bond and a Contract Labor and Material Payment Bond each for the full amount of the Contract and issued by a surety company or surety companies authorized to do business in the State of Maine and approved by the **CITY**.

The Bonds shall remain in effect for one (1) year after final acceptance of the Work, and protect the **CITY**'s interest in the one (1) year guaranty of workmanship and materials, and also shall insure settlement of claims, for the payment of all bills for labor, materials and equipment by the **CONTRACTOR**.

Any Mechanic's Lien or any other lien which may be filed against the Premises which are the subject of this Contract by reason of the Work described herein shall be defended (by counsel reasonably accepted to the **CITY**) and promptly discharged by the **CONTRACTOR** at its own expense. If the **CONTRACTOR** should fail, either to defend the **CITY** against the lien or to discharge it, then the **CITY** may do so at the **CONTRACTOR**'s expense. In the event of such an undertaking by the **CITY**, the **CONTRACTOR** will promptly reimburse the **CITY** for all of its costs and expenses in so doing, including, but not limited to, reimbursement of the **CITY**'s reasonable counsel fees, as well as costs which may be incurred by it in substituting a bond in place of the lien. This requirement is in addition to, and supersedes any conflicting condition which may appear in the General Conditions.

6. RELEASE OF LIENS.

Neither the final payment nor any part of the retained percentage shall become due until the **CONTRACTOR**, if required, shall deliver to the **CITY** a complete release of all liens which might arise from the Work, or receipts in full in lieu thereof, and if required, in either case, an affidavit reciting that so far as it has knowledge or information, the releases and receipts include all the labor and materials for which a lien

might be filed. The **CONTRACTOR** may, if any subcontractor should refuse to furnish a release or receipt in full, provide a bond, satisfactory to the **CITY**, to indemnify it against any lien. If any lien should remain unsatisfied after all payments have been made, the **CONTRACTOR** shall refund to the **CITY** all monies that the latter may be compelled to pay in discharging such a lien, including all costs and reasonable attorney's fees. This requirement is in addition to and supersedes any conflicting condition which may appear in the General Conditions.

7. **INDEMNIFICATION.**

The **CONTRACTOR** shall indemnify and hold harmless the **CITY**, its officers and employees and agents, and the Architect and its officers, agents and employees, from and against all claims, damages, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense:

a. is attributable to bodily injury, sickness, disease or death, or injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

b. is caused, in whole or in part, by any negligent act or omission of the **CONTRACTOR**, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose act any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

CONTRACTOR hereby expressly agrees that it will defend, indemnify and hold the **CITY** harmless from any and all claims made or asserted by **CONTRACTOR**'s agents, servants or employees arising out of **CONTRACTOR**'s activities under this Contract. For this purpose, **CONTRACTOR** hereby expressly waives any and all immunity it may have under Maine's Workers Compensation Act in regard to such claims made or asserted by **CONTRACTOR**'s agents, servants or employees. The indemnification provided under this paragraph shall extend to and include any and all costs incurred by the **CITY** to answer, investigate, defend and settle all such claims, including, but not limited to, the **CITY**'s costs for attorneys fees, expert and other witness fees, the cost of investigators, and payment in full of any and all judgments rendered in favor of **CONTRACTOR**'s agents, servants or employees against the **CITY** in regard to claims made or asserted by such agents, servants or employees.

8. **INSURANCE.**

CONTRACTOR shall provide all insurance required by the General and Supplemental Conditions to this Contract.

9. **PAYMENT.**

a. **CONTRACTOR** agrees to perform the Work required by this Agreement for the Contract Sum of Two Million Nine Hundred Forty Eight Thousand Dollars ($ 2,948,000.00).

b. All applications for payment and processing of payment shall be in accordance with the terms of the General Conditions to this Contract.

c. **CITY** shall withhold ten percent (10%) of each invoice amount as retainage until the **CONTRACTOR** certifies that the work is seventy-five percent (75%) complete. Upon verification by **CITY**'s Architect that work is seventy-five percent (75%) complete, **CITY** shall reduce the retainage amount held to five percent (5%) of the amounts invoiced.

10. **ASSIGNMENT.**

The **CONTRACTOR** shall not assign the Contract without the written consent of the **CITY**. The **CONTRACTOR** shall not assign any monies due or to become due to it hereunder without the previous written consent of the **CITY**.

The **CITY** will assign this contact, as outlined in this bid package, to a General Contractor for the entire duration of the project. The Owner has not contracted a General Contractor, at this time, but is expected to award a Contract in January 2008. At this time this contract will be assigned to the General Contractor.

The Precast Concrete Contractor shall bear the same responsibility one to the other, as if the Assigned Contract had originally been awarded, by the General Contractor, to the Assigned Contractor. The terms and conditions of the Assigned Contract shall not be altered by virtue of assignment. All costs and expenses related to the assignments must be included in the Contractor's Base Bid.

11. **USE OF PREMISES.**

The **CONTRACTOR** shall confine its equipment, the storage of materials, and the operations of its workers to limits indicated by law, ordinances, permits or directions of the **CITY**, and shall not unreasonably encumber the Premises with such materials.

The **CONTRACTOR** shall not load nor permit any part of the structure to be loaded with a weight that will endanger its safety. The **CONTRACTOR** shall enforce the **CITY**'s instructions regarding signs, advertisements, fires and smoking.

If any part of the structure is completed and ready for occupancy, the **CITY** may, by written and mutual consent, without prejudice to any of the workers' rights or the rights of the **CONTRACTOR**, enter in and make use of such completed parts of the structure. Such use or occupancy shall in no case be construed as any acceptance of any Work or materials.

12. **WORKMANSHIP.**

All workmanship, materials and equipment either at the site or intended for it, shall conform in all respects with the requirements of all of the Contract Documents.

All labor shall be performed by mechanics skilled in their respective trades.

CONTRACTOR shall guarantee the Work against any defects in workmanship and materials for a period of one (1) year from the date of the written acceptance of the project.

13. **CLEANING UP.**

The **CONTRACTOR** shall at all times keep the Premises free from the accumulation of waste materials or rubbish; and, at the completion of the Work, it shall remove all rubbish from and about the Project, all tools, scaffolding and surplus materials, and shall leave the Work "broom clean" or its equivalent, unless more exactly specified. In case of the failure to comply by the **CONTRACTOR**, the **CITY** may perform the clean up and deduct the costs from any monies due the **CONTRACTOR**.

14. **ALTERNATE DISPUTE RESOLUTION.**

If, in the performance of the Contract, there should arise a dispute between the **CITY** and the **CONTRACTOR** which can not be settled, then any such dispute shall be resolved as provided in the General Conditions to this Contract.

15. **TERMINATION FOR CONVENIENCE.**

The **CITY** shall have the right to terminate this Contract at any time for its convenience on prior written notice to **CONTRACTOR**. If Contract should be terminated by **CITY** for such convenience, the **CITY** shall pay **CONTRACTOR** for all Work performed and all materials purchased, pursuant to this Contract, prior to the receipt of such notice.

16. TERMINATION FOR CAUSE.

The **CITY** may terminate this Contract for cause by written notice to the **CONTRACTOR**. In the event of such termination, **CONTRACTOR** shall not be entitled to any further payment under this Contract from the date of receipt of said notice.

IN WITNESS WHEREOF, the said **CITY OF PORTLAND** has caused this Contract to be signed and sealed by Joseph E. Gray, its City Manager, thereunto duly authorized, and William E. Dwyer has caused this Contract to be signed and sealed by John R Peckham its President, thereunto duly authorized, the day and date first above written.

WITNESS:

Lina Bean

CITY OF PORTLAND

By: [illegible], Asst City Mgr
Joseph E. Gray
City Manager

WITNESS:

By:
John R. Peckham
Its President

Approved as to form:

Corporation Counsel's Office

Approved as to funds:

Budget Office

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE 08/15/2007

PRODUCER 412-586-1400

Willis of Pennsylvania, Inc.
444 Liberty Ave
Four Gateway Center
Suite 505
Pittsburgh, PA 15222

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED
William E. Dailey Precast, LLC
20 Haarlem Avenue
White Plains, NY 10603

INSURERS AFFORDING COVERAGE	NAIC#
INSURER A: Liberty Mutual Fire Insurance Company	23035-001
INSURER B: LM Insurance Corporation	33600-001
INSURER C:	
INSURER D:	
INSURER E:	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	X	GENERAL LIABILITY	TB2L15007247057	1/1/2007	1/1/2008	EACH OCCURRENCE	$ 1,000,000
		X COMMERCIAL GENERAL LIABILITY				DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 1,000,000
		CLAIMS MADE X OCCUR				MED EXP (Any one person)	$ 5,000
						PERSONAL & ADV INJURY	$ 1,000,000
						GENERAL AGGREGATE	$ 2,000,000
		GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT X LOC				PRODUCTS - COMP/OP AGG	$ 2,000,000
A		AUTOMOBILE LIABILITY	AS2L15007247037	1/1/2007	1/1/2008	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
		X ANY AUTO				BODILY INJURY (Per person)	$
		ALL OWNED AUTOS				BODILY INJURY (Per accident)	$
		SCHEDULED AUTOS				PROPERTY DAMAGE (Per accident)	$
		HIRED AUTOS					
		NON-OWNED AUTOS					
		GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
		ANY AUTO				OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
		EXCESS/UMBRELLA LIABILITY				EACH OCCURRENCE	$
		OCCUR CLAIMS MADE				AGGREGATE	$
							$
		DEDUCTIBLE					$
		RETENTION $					$
B		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY	WC5L15007247017	1/1/2007	1/1/2008	X WC STATU-TORY LIMITS / OTH-ER	
		ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED?				E.L. EACH ACCIDENT	$ 1,000,000
		If yes, describe under SPECIAL PROVISIONS below				E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
						E.L. DISEASE - POLICY LIMIT	$ 1,000,000
		OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

It is agreed that City of Portland is included as an Additional Insured as respects to General Liability where required by written contract.

CERTIFICATE HOLDER

City of Portland
389 Congress Street
Portland, ME 04101

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

© ACORD CORPORATION 1988

IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

DISCLAIMER

The Certificate of Insurance on the reverse side of this form does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.

SECTION 00610

Bond No. 104934967

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we William E. Dailey Precast, LLC

_____, as Principal
(Name of Contractor)

a Limited Liability Company
(Corporation, Partnership, or Individual)

hereinafter called "Principal" and Travelers Casualty and Surety Company of America
(Surety)

_____ of Hartford, State of Connecticut,

hereinafter called the "Surety", are held and firmly bound into the **City of Portland, Maine**, hereinafter called "Owner", in the penal sum of Two Million, Nine Hundred

Forty-Eight Thousand and no/100th's Dollars ($ 2,948,000.00)

In lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain

contract with the Owner, dated the 15th day of August, 2007, a copy of which is hereto attached and made a part hereof for the construction of

Phase 2 Parking Garage
Portland International Jetport
Precast/prestressed structural members for the
Portland, ME

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.
PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation of this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, the parties to these present have duly executed in this bond on the

Signed and sealed this (S) 15th day of August 2007

WITNESS: CONTRACTOR William E. Dailey Precast, LLC

S. M. Giroux

By _____ (L.S.)

Richard E. Antes, Member

By _____ (L.S.)

_____

By _____ (L.S.)

WITNESS: SURETY: Travelers Casualty and Surety Company of America

S. M. Giroux

By _____ (L.S.)

T. M. Tyrrell, Attorney-in-Fact

By _____ (L.S.)

APPROVED AS TO FORM _____, 2006

BY _____

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF DOCUMENT

Travelers Casualty and Surety Company of America
Hartford, CT 06183

ATTORNEY-IN-FACT JUSTIFICATION
PRINCIPAL'S ACKNOWLEDGMENT - IF LIMITED LIABILITY COMPANY

State of New York,
County of Albany} ss

On this 15th day of August, 2007, before me personally appeared Richard E. Antes, to me known, who: being by me duly sworn, did depose and say: That he/she resides in Somers, New York; that he is a Member of William E. Dailey Precast, LLC, a Limited Liability Company, the Company described in and which executed the foregoing instrument; that he executed the foregoing instrument as the act and deed of said Company; and that he had the requisite authority to do so.

Susan Maguire
Albany County
Comm. Exp: 02/20/2011

SURETY COMPANY'S ACKNOWLEDGMENT

State of New York,
County of Albany} ss

On this 15th day of August, 2007, before me personally appeared T.M. Tyrrell; to me known, who, being by me duly sworn, did depose and say: That he/she resides in the City of Albany, New York; that he/she is Attorney-in-Fact of Travelers Casualty and Surety Company of America, Hartford, Connecticut, a corporation, created, organized and existing under and by virtue of the laws of the state of Connecticut, upon oath did say that the corporate seal affixed to the attached instrument is the seal of the said Company; that the seal was affixed and the said instrument was executed by the authority of its Board of Directors, and he did also acknowledge that he executed the said instrument as the free act and deed of said Company

Susan Maguire
Albany County
Comm. Exp: 02/20/2011

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA

HARTFORD, CONNECTICUT 06183

FINANCIAL STATEMENT AS OF DECEMBER 31, 2006

CAPITAL STOCK $ 6,000,000

ASSETS		LIABILITIES & SURPLUS	
CASH & INVESTED CASH	$ 114,080,791	UNEARNED PREMIUMS	$ 724,600,436
BONDS	2,912,711,671	LOSSES	872,911,753
STOCK	14,865,186	LOSS ADJUSTMENT EXPENSES	126,765,164
INVESTMENT INCOME DUE AND ACCRUED	34,978,331	COMMISSIONS	28,073,926
PREMIUM BALANCES	166,157,296	TAXES, LICENSES AND FEES	21,233,762
REINSURANCE RECOVERABLE	3,954,977	OTHER EXPENSES	30,823,925
NET DEFERRED TAX ASSET	42,796,290	DIVIDENDS	7,060,280
CEDED DEPOSIT ASSET	6,134,622	CURRENT FEDERAL AND FOREIGN INCOME TAXES	38,720,632
STATE SURCHARGES RECEIVABLE	149,430	CEDED REINSURANCE NET PREMIUMS PAYABLE	(4,981,682)
OTHER ASSETS	(4,414,060)	FUNDS HELD UNDER REINSURANCE TREATIES	99,054,332
		AMOUNTS WITHHELD / RETAINED BY COMPANY FOR OTHERS	39,095,839
		REMITTANCES AND ITEMS NOT ALLOCATED	60,285,233
		PROVISION FOR REINSURANCE	5,627,014
		PAYABLE TO PARENT, SUBSIDIARIES & AFFILIATES	86,256,776
		PAYABLE FOR SECURITIES	4,976,100
		RETROACTIVE REINSURANCE RESERVE ASSUMED	20,845,771
		OTHER ACCRUED EXPENSES AND LIABILITIES	119,334
		TOTAL LIABILITIES	$ 2,163,613,785
		CAPITAL STOCK	$ 6,000,000
		PAID IN SURPLUS	303,297,4[illegible]
		OTHER SURPLUS	818,603,[illegible]
		TOTAL SURPLUS TO POLICYHOLDERS	$ 1,127,900,[illegible]
TOTAL ASSETS	$ 3,291,414,536	TOTAL LIABILITIES & SURPLUS	$ 3,291,414,536

STATE OF CONNECTICUT)

COUNTY OF HARTFORD)SS.

CITY OF HARTFORD)

LAWRENCE A. SIUTA, BEING DULY SWORN, SAYS THAT HE IS CHIEF FINANCIAL OFFICER - TRAVELERS BOND & FINANCIAL PRODUCTS, OF TRAVELERS CASUALTY SURETY COMPANY OF AMERICA, AND THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT STATEMENT OF THE FINANCIAL CONDITION OF SAID COMPANY AS OF THE 31st DAY OF DECEMBER, 2006.

CHIEF FINANCIAL OFFICER - TRAVELERS BOND & FINANCIAL PRODUCTS

SUBSCRIBED AND SWORN TO BEFORE ME THIS
29TH DAY OF MARCH, 2007

NOTARY PUBLIC

ANNA P. NOWIK NOTARY PUBLIC CONNECTICUT

Anna P. Nowik Notary Public
My Commission Expires June 30, 2011

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

TRAVELERS

POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
Seaboard Surety Company
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 218465 Certificate No. 001641529

KNOW ALL MEN BY THESE PRESENTS: That Seaboard Surety Company is a corporation duly organized under the laws of the State of New York, that St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company and St. Paul Mercury Insurance Company are corporations duly organized under the laws of the State of Minnesota, that Farmington Casualty Company, Travelers Casualty and Surety Company, and Travelers Casualty and Surety Company of America are corporations duly organized under the laws of the State of Connecticut, that United States Fidelity and Guaranty Company is a corporation duly organized under the laws of the State of Maryland, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc. is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

C. C. Leach, F. E. O'Brien Jr., K. J. Furlong, P. J. Clyne, T. M. Tyrrell, T. R. Tyrrell, C. E. Antoinette, and P. D. Tobin

of the City of Albany, State of New York, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 16th day of May, 2007.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
Seaboard Surety Company
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

State of Connecticut
City of Hartford ss.

By: George W. Thompson, Senior Vice President

On this the 16th day of May, 2007, before me personally appeared George W. Thompson, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2011.

Marie C. Tetreault, Notary Public

58440-8-06 Printed in U.S.A.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary, or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any power of attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such power of attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, Kori M. Johanson, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 15th day of August, 2007

Kori M. Johanson, Assistant Secretary

To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.stpaultravelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.

SECTION 00620

Bond No. 104934967

LABOR AND MATERIALS PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we William E. Dailey Precast, LLC, as Principal
(Name of Contractor)

a Limited Liability Company
(Corporation, Partnership, or Individual)

hereinafter called "Principal" and Travelers Casualty and Surety Company of America
(Surety)

of Hartford, State of Connecticut

hereinafter called the "Surety", are held and firmly bound into **City of Portland, Maine,** acting through the Administration, hereinafter called "Owner", in the penal sum of

Two Million, Nine Hundred Forty-Eight Thousand Dollars ($ 2,948,000.00)

In lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the 15th day of August, 2007, a copy of which is hereto attached and made a part hereof for the construction of:

Phase 2 Parking Garage
Portland International Jetport
Precast/prestressed structural members for the
Portland, ME

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, the parties to these present have duly executed in this bond on this

15th day of August, 2007.

WITNESS: CONTRACTOR William E. Dailey Precast, LLC

S. M. Giroux

By _____ (L.S.)

Richard E. Antes, Member

By _____ (L.S.)

WITNESS: SURETY: Travelers Casualty and Surety Company of America

S. M. Giroux

By _____ (L.S.)

T. M. Tyrrell, Attorney-in-Fact

By _____ (L.S.)

APPROVED AS TO FORM _____, 2007

BY _____

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF DOCUMENT

Travelers Casualty and Surety Company of America
Hartford, CT 06183

ATTORNEY-IN-FACT JUSTIFICATION
PRINCIPAL'S ACKNOWLEDGMENT - IF LIMITED LIABILITY COMPANY

State of New York,
County of Albany} ss

On this 15th day of August, 2007, before me personally appeared Richard E. Antes, to me known, who, being by me duly sworn, did depose and say: That he/she resides in Somers, New York; that he is a Member of William E. Dailey Precast, LLC, a Limited Liability Company, the Company described in and which executed the foregoing instrument; that he executed the foregoing instrument as the act and deed of said Company; and that he had the requisite authority to do so.

Sue Ann Mazzony
Albany County
Comm. Exp. 02/20/2011

SURETY COMPANY'S ACKNOWLEDGMENT

State of New York,
County of Albany} ss

On this 15th day of August, 2007, before me personally appeared T.M. Tyrrell; to me known, who, being by me duly sworn, did depose and say: That he/she resides in the City of Albany, New York; that he/she is Attorney-in-Fact of Travelers Casualty and Surety Company of America, Hartford, Connecticut, a corporation, created, organized and existing under and by virtue of the laws of the state of Connecticut, upon oath did say that the corporate seal affixed to the attached instrument is the seal of the said Company; that the seal was affixed and the said instrument was executed by the authority of its Board of Directors; and he did also acknowledge that he executed the said instrument as the free act and deed of said Company.

Sue Ann Mazzony
Albany County
Comm. Exp. 02/20/2011

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA

HARTFORD, CONNECTICUT 06183

FINANCIAL STATEMENT AS OF DECEMBER 31, 2006

CAPITAL STOCK $ 6,000,000

ASSETS		LIABILITIES & SURPLUS	
CASH & INVESTED CASH	$ 114,060,791	UNEARNED PREMIUMS	$ 724,600,436
BONDS	2,912,711,671	LOSSES	872,911,753
STOCK	14,865,186	LOSS ADJUSTMENT EXPENSES	128,785,154
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PREMIUM BALANCES	166,157,298	TAXES, LICENSES AND FEES	21,233,762
REINSURANCE RECOVERABLE	3,954,977	OTHER EXPENSES	30,823,925
NET DEFERRED TAX ASSET	42,796,290	DIVIDENDS	7,060,260
CEDED DEPOSIT ASSET	6,134,622	CURRENT FEDERAL AND FOREIGN INCOME TAXES	38,720,632
STATE SURCHARGES RECEIVABLE	149,430	CEDED REINSURANCE NET PREMIUMS PAYABLE	(4,981,682)
OTHER ASSETS	(4,414,060)	FUNDS HELD UNDER REINSURANCE TREATIES	99,054,332
		AMOUNTS WITHHELD / RETAINED BY COMPANY FOR OTHERS	39,095,839
		REMITTANCES AND ITEMS NOT ALLOCATED	60,255,233
		PROVISION FOR REINSURANCE	5,627,014
		PAYABLE TO PARENT, SUBSIDIARIES & AFFILIATES	86,256,776
		PAYABLE FOR SECURITIES	4,975,100
		RETROACTIVE REINSURANCE RESERVE ASSUMED	20,845,771
		OTHER ACCRUED EXPENSES AND LIABILITIES	119,334
		TOTAL LIABILITIES	$ 2,163,613,785
		CAPITAL STOCK	$ 6,000,000
		PAID IN SURPLUS	303,297,402
		OTHER SURPLUS	818,603,349
		TOTAL SURPLUS TO POLICYHOLDERS	$ 1,127,900,751
TOTAL ASSETS	$ 3,291,414,536	TOTAL LIABILITIES & SURPLUS	$ 3,291,414,536

STATE OF CONNECTICUT)

COUNTY OF HARTFORD)SS.

CITY OF HARTFORD)

LAWRENCE A. SIUTA, BEING DULY SWORN, SAYS THAT HE IS CHIEF FINANCIAL OFFICER - TRAVELERS BOND & FINANCIAL PRODUCTS, OF TRAVELERS CASUALTY SURETY COMPANY OF AMERICA, AND THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT STATEMENT OF THE FINANCIAL CONDITION OF SAID COMPANY AS OF THE 31st DAY OF DECEMBER, 2006.

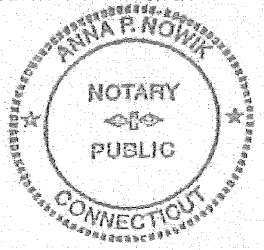
L. A. Siuta

CHIEF FINANCIAL OFFICER - TRAVELERS BOND & FINANCIAL PRODUCTS

Anna P. Nowik

NOTARY PUBLIC

SUBSCRIBED AND SWORN TO BEFORE ME THIS 29TH DAY OF MARCH, 2007



Anna P. Nowik Notary Public
My Commission Expires June 30, 2011

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

TRAVELERS

POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
Seaboard Surety Company
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 218465

Certificate No. 001641528

KNOW ALL MEN BY THESE PRESENTS: That Seaboard Surety Company is a corporation duly organized under the laws of the State of New York; that St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company and St. Paul Mercury Insurance Company are corporations duly organized under the laws of the State of Minnesota; that Farmington Casualty Company, Travelers Casualty and Surety Company, and Travelers Casualty and Surety Company of America are corporations duly organized under the laws of the State of Connecticut; that United States Fidelity and Guaranty Company is a corporation duly organized under the laws of the State of Maryland; that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa; and that Fidelity and Guaranty Insurance Underwriters, Inc. is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

C. C. Leach, F. E. O'Brien Jr., K. J. Furlong, P. J. Clyne, T. M. Tyrrell, T. R. Tyrrell, C. E. Antoinette, and P. D. Tobin

of the City of Albany, State of New York, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 16th day of May, 2007.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
Seaboard Surety Company
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

State of Connecticut
City of Hartford ss.

By: George W. Thompson, Senior Vice President

On this the 16th day of May, 2007, before me personally appeared George W. Thompson, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2011.

Marie C. Tetreault, Notary Public

58440-8-06 Printed in U.S.A.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any power of attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such power of attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, Kori M. Johanson, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 15th day of August, 2007.

Kori M. Johanson, Assistant Secretary

To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.stpaultravelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions, and other Technical Specifications Sections apply to work of this Section insofar as applicable.

1.02 PROJECT IDENTIFICATION AND REQUIREMENTS

A. Project Identification: The name of the Project on Contract Documents is Phase 2, Parking Garage, Portland International Jetport, Portland, Maine. Contracts to be included in Phase 2 include:

- Contract 1, Precast/prestressed structural members
- Contract 2, Phase-II Parking Garage and Site Improvements

B. Scope: The work of this CONTRACT, Contract No.1: precast/prestressed structural members for the Phase 2 Parking Garage includes, but is not limited to all items required for the completion of the Work set forth below, including without limitation, all items incidental to or reasonably inferable from such Work, whether or not expressly shown on the Drawings or expressly set forth in the Specifications.

The Contractor shall provide all materials, and all incidentals, which are required to complete the installation of the Precast Concrete by others per plans and specifications. The Contractor's tasks include, but are not limited, to the following:

Except for those items (if any) specifically noted to be excluded as defined below, the work of this bid shall include all of the work and contract requirements according to and outlined in Section 00720, Construction General Conditions of the Bid Package complete, including all bid requirements, contract requirements, general and special conditions, and general requirements. Should any conflict exist between this written Scope of Work and the Construction General Conditions, or the Technical Specifications, the work required by this bid section description shall govern.

PRECAST STRUCTURE SCOPE

1. Furnish ALL precast/prestressed concrete double-tees (DT) complete per plans and specifications at the General Contractor's primary staging area on the surface lot adjacent to the future Phase-II Parking Garage. During Erection space will be provided for up to 30 DT's on trailers

2. Furnish all embedded and loose hardware to attach DT's to structure per plans and specifications.

3. Furnish and install all steel reinforcement embeds, weld plates, etc. in precast concrete complete per design, approved shop drawings and specifications.

4. Furnish all loose hardware required to complete precast to precast connections.

5. All precast DTs shall be furnished with tooled or ground edges.

6. Furnish and protect all embeds required by other trades per plans and specifications.

7. Provide complete traffic control, including street closure permits, barricades and/or any other signage that may be necessary to allow access for precast delivery trucks, trailers and/or any other equipment required to complete work of this bid category per plans and specifications.

8. Provide concrete sealer where specified.

9. Coordinate delivery of materials with General Contractor (TBD) and Owner's Representative 72 hours in advance of material delivery. During erection precaster shall be capable of delivering/maintaining up to 30 DT's in staging area provided.

10. Provide all layouts complete per plans and specifications in relation to this work.

11. Provide samples and mock-ups in accordance with the technical specifications.

PRECAST STRUCTURE EXCLUSIONS

1. Installation of DTs

2. Sealants and waterproofing

3. Cast-in-place concrete and reinforcing in pour strips

C. Permits: The General Contractor shall obtain and pay for all utility permits and fees, and City Road opening Permits. Fees from Central Maine Power and Verizon shall be paid directly by the Owner.

1.03 WORK UNDER OTHER CONTRACTS

A. Briefly without limitation, the work of Contract 1 includes coordination with and ultimately assignment to the forthcoming general contract expected to perform the following work under a separate contract with the Owner: Contract 2.

The work of Contract 2 Parking Garage & Site Improvements, for the Phase-II Parking Garage includes, but is not necessarily limited to, the construction of:

- a five-story above grade parking garage inclusive of a South stair/elevator tower and canopies associated with the facility;
- a heated truck shed adjacent to the parking operator's building;
- limited modifications to the existing Phase-I parking structure;
- limited modifications of existing surface parking lots;
- limited roadway work inclusive of retaining walls and ramps;
- utility work associated with all of the above;
- landscaping work associated with all of the above;
- signage work associated with all of the above.
- This work shall be undertaken in a phased manner to minimize disruptions at the Jetport. A complete suggested phasing plan is presented in the construction drawings.

B. Work of Other Contracts:

The City of Portland may have other Contractors working on various projects at the Portland International Jetport. The Contractor shall fully coordinate his work with that of other Contractors.

1.04 CONTRACT AND CONTRACT PROVISIONS

A. Contract Coordination: Briefly without limitation, the work of this Contract includes coordination with other contractors performing work under separate contracts with the Owner.

1.05 CONTRACTOR'S USE OF PREMISES

A. Contractor shall have complete and exclusive use of designated areas of the premises for execution of the Work. Contractor's use of premises is limited only to the Owner's right to perform work with his own forces. Contractor lay down areas shall be coordinated with the Facilities Department at the Portland International Jetport

B. Coordinate use of premises under direction of Architect and Owner.

C. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.

D. Move any stored Products, under Contractor's control, which interfere with operations of the building owner, building manager, Owner, or separate contractor.

E. Obtain and pay for the use of additional storage or work areas needed for operations.

F. Coordinate construction areas with all affected utility companies, rental car agencies, Lease holders, and airfield operations over the life of the contract.

1.06 OWNER'S OCCUPANCY

A. Partial Owner Occupancy: The Owner reserves the right to place and install equipment in completed areas of the building prior to Substantial Completion, provided that such occupancy does not interfere with completion of the Work.

1. Execute Certificate of Substantial Completion for each specific Portion of the Work prior to Owner occupancy.

1.07 OWNER-FURNISHED PRODUCTS

A. Products furnished and paid for by the Owner, described in Specification Sections, as determined at a later date.

B. Owner's Responsibilities:

1. Arrange for testing by an independent materials firm.
2. Inspect deliveries jointly with Contractor.
3. Submit claims for transportation damage.

C. Contractor's Responsibilities:

1. Designate delivery date for each Product in the Construction Schedule.
2. Review shop drawings, product data, and samples.
3. Receive and unload Products at the site.

4. Promptly inspect products jointly with Owner, record shortages, damaged, or defective items.
5. Handle Products at the site, including uncrating and storage.
6. Protect Products from exposure to elements, from damage.
7. Assemble, install, connect, adjust, and finish Products, as stipulated in the respective Section of Specifications.
8. Repair or replace items damaged by Contractor.

PART 2 PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

APPENDIX C :

PRECAST/ PRESTRESSED STRUCTURAL MEMBERS BID PACKAGE #8607

CORRESPONDENCE

Please note the following responses to questions we have received regarding the City of Portland's **Bid # 8607 – Precast Prestressed Structural Members for the PIJ Garage Expansion.**

QUESTIONS:

1. In precast spec 03410 page 19 of 28 article G.3.corrosion-inhibiting admixture. Please tell quantities to provide in the concrete mix?

   THIS WOULD BE AS PER MANUFACTURER'S RECOMMENDATIONS.

2. A question concerning section 03410 article 1.2 summary B.2 structural framing units : Please more details concerning meaning of these structural framing unit

   THERE ARE ONLY DT'S INCLUDED IN THIS PACKAGE. STRIKE LINE B.2 FROM THE SPECIFICATION.

3. If we compare section 1/S3-3 & 2/A4-2 we see a piece sitting on the steel beam called 12' high precast on arch drawing & no comments on steel drawings. Is it still in precast?

   THIS SHOULD READ 12" (INCH) HIGH ARCHITECTURAL PRECAST UNITS. THESE ARE NOT INCLUDED IN THIS BID PACKAGE

4. What happened at 1/A4-1 & 2/s3-2 where it seems to disappear?

   THESE UNITS DO NOT EXIST ON THE H-LINE AND AGAIN ARE NOT PART OF THIS BID PACKAGE.

From: " Robin Outwater" <routw@peckham.com>
To: <phb@portlandmaine.gov>
Date: Tue, Sep 25, 2007 1:54 PM
Subject: Portland Jetport Parking Garage: Wm. E. Dailey Precast Project Management

Paul:
Just a note to say that I enjoyed our telephone visit yesterday and that we are looking forward to working closely with you and your team on this project.
Our Project Management Team Members are:

Bob Wilcox
Office Manager
PH: 802-442-4418 ext: 235
Fax: 802-442-0738
bwilc@peckham.com

Jim Altland
Manager, Engineering Department
PH: 802-442-4418 ext: 232
Fax: 802-442-0738
jaltl@peckham

Jared Steller
Coordinator, Engineering Department
Cell PH: 518-573-9145 (until further notice)
Fax: 802-442-0738
jstel@peckham.com

Robin Outwater
Project Manager
PH: 802-442-4418 ext: 308
Cell PH: 802-375-5499
Fax: 802-442-0738
routw@peckham.com

Wm. E. Dailey Precast, LLC
295 Airport Road
Shaftsbury, VT 05262
http://www.wedailey.com

Jared will take the lead on the design/dicovery process and will be the primary author of RFIs. As discussed, Jared will direct them to your attention until request otherwise.

Cordially,
Robin

CC: "Jared Stellar" <jstel@peckham.com>, "Jim Altland" <jaltl@peckham.com>, "Bob Wilcox" <bwilc@peckham.com>

WILLIAM E. DAILEY PRECAST, LLC

Established 1927

PRECAST: Building Systems • Retaining Walls • Parking Structures • Utility Structures

October 26, 2007

Mr. Todd Neal
Becker Structural Engineering, Inc.
75 York Street
Portland, ME 04101-4550

Tel. 207-879-1838
Fax 207-879-1822

RE: Project Update/Contract Drawing Verification.

Todd,

I have started the precast layout of the parking structure and the set of contract drawings being used to do this is the same set that was included in the bid process. This set is missing several sheets, thus making it difficult to complete the layout. When can we expect the updated set of contract drawings?

The following are a few issues I came across when laying out the structure:

1. Dap height verification. Sheet A3-4/detail 5; a dap height of 1'-4" is shown, however on sheet A4-1/detail 1, sheet A4-2/detail 1, and sheets S1-2 through S1-5 show the dap height to be roughly 1'-6". Please verify the correct dap height.
2. Interface between existing parking structure and new parking structure. Sheet A4-2/detail 1 shows a precast wash, we would propose the use of a cast in place wash at this location to ensure proper fit-up between existing and new structures. Also, is there some sort of expansion joint at this location since there will be a 2" gap between the existing and new structure?

Sincerely,

Jared Steller
William E. Dailey Precast, LLC

295 Airport Road
Shaftsbury, VT 05262

Tel: 802-442-4418
Fax: 802-442-0738

BECKER

structural engineers, inc.

RFI Response

TO:	Paul Bradbury, P.E. @ Portland International Jetport
CC:	George Katsoufis @ DHK
FROM:	Todd M. Neal, P.E.
DATE/TIME:	November 2, 2007
PROJECT:	Phase 2 – Parking Garage Portland International Jetport WO 1456
SUBJECT:	W.E. Dailey Questions Dated 10/26/07

See attached letter from W.E. Dailey dated October 26, 2007.

Responses:

1. On drawings S1-2 through S1-5 we have noted a difference of 1.33' from theoretical top of precast and top of steel which matches Detail 5 on A3-4 and Detail 1 on A4-2. The theoretical dap should be 1'-4". There may be some variation to this based on the slope of the steel.
2. We would prefer to keep as much of this precast as possible given the long term maintenance issues associated with CIP. We also have a precast wash on the other side. We are currently looking at joint options. Option 1 is to use a sealant, such as WABO SiliconeSeal and have a cover over the joints where the traffic crosses. This would be forgiving to the inconsistencies in ends of the DT's. Option 2 would be to use a flanged system where we would need a block out at the end of the new DT's and would need to cut out a strip in the existing DT's. We will be forwarding along a detail in the next couple of days. As a minimum Option 2 will be used on Level 5.

I understand that Paul Bradbury has forwarded a copy of updated drawings to W.E. Dailey.

75 York Street, Portland, ME 04101-4701 ■ Tel 207-879-1838 ■ Fax 207-879-1822