SPECIFICATIONS

PROJECT:

VALLEY STREET APARTMENTS
GILMAN STREET
PORTLAND, MAINE

OWNER:

315 VALLEY STREET L.P.
P. O. BOX 560
PORTLAND, MAINE 04112

ARCHITECT:

ARCHETYPE, P.A.
48 UNION WHARF
PORTLAND, MAINE 04101

November 21, 2005

SECTION 00100

INDEX TO
PROJECT MANUAL

Section:

Division 1- General Requirements

Division 2 – Site Work

Division 3- Concrete

Division 4 - Masonry

Division 5 – Metals

Division 6 - Wood & Plastics

Division 7 - Thermal & Moisture Protection

Division 8 - Doors & Windows

Division 9 - Finishes

Division 10 - Specialties

10550 Postal Specialties (Mailboxes)
10670 Storage Shelving
10800 Toilet & Bath Accessories

Division 11 – Equipment

11450 Residential Equipments and Kitchens

Division 12 - Furnishings

12500 Window Treatment

Division 13 – Special Construction

13900 Automatic Wet Pipe Sprinkler System
13935 Dry Pipe Sprinkler System – Parking Garage

Division 14 - Conveying System

14240 Hydraulic Elevator

Division 15 – Mechanical

15010 Basic Mechanical Requirements

Division 16 – Electrical

16000 Basic Electrical Requirements
16721 Fire Alarm Systems

END OF SECTION

SECTION 00200

INVITATION TO BID

Proposal for the construction of Valley Street Apartments, Portland, Maine will be available to the General Contractor on 11/21/05. Proposals should be addressed to:

315 Valley Street, LP
P.O. Box 560
Portland, ME 04112

The project consists of a 24-Unit Apartment Building.

Qualified bids will be rejected.

Performance and Payment Bonds are required. See AIA Document A311 included in the Specifications.

The Owner will apply for and pay for the Building Permit from the City of Portland,

Proposals will be received at the office of the Architect by 2:00 PM on 12/09/05.

Archetype, P.A
48 Union Wharf
Portland, ME 04101
(207) 772-6022
Fax (207) 772-4056

Contract Bid Documents may be viewed at the office of the Architect, Archetype, P.A. or at Xpress Copy, Portland, ME. One set of documents will be given to General Contractor, additional sets may be ordered from Xpress Copy, Portland, ME (207) 775-2444 at a cost of $110.00

The Owner reserves the right to accept or reject any or all bids.

END OF SECTION

SECTION 00300

BID FORM

BIDDERS PROPOSAL

DATE: _____

TO: 315 Valley Street, LP
P.O. Box 560
Portland, ME 04112

In response to your invitation for bids, and subject to all the consideration thereof, the undersigned

_____

_____

_____

A corporation organized and existing under the laws of the state of _____

a partnership consisting of _____

or an individual trading as _____

of the city or town of _____

state of _____: Hereby proposes to furnish all labor and

materials and to perform all work required for the construction of the Valley Street Apartments,

Portland, ME.

In strict accordance with the specifications, plans and the articles of contract, therein and dated

11/21/05_____ for the consideration of _____

_____Dollars.

Construction Start Date: On or about January 1, 2006.

Construction completion date to be December 20, 2006, after which liquidated damages will be incorporated at a cost of $1,200 per calendar day and bonus of $900 per calendar day.

The undersigned bidder agrees to execute the contract for the amount of the total of this bid within ten (10) calendar days from the date when the written notice to commence construction (Notice To Proceed) is delivered to him at the address given on this proposal.

Contractor

By: _____

Title: _____

Business Address: _____

_____

_____

END OF SECTION

SECTION 00400

SIGNATURE PAGE

Owner: _____ Date: _____

Developer: _____ Date: _____

Architect: _____ Date: _____

Contractor: _____ Date: _____

Maine State Housing Authority: _____ Date: _____

Banknorth: _____ Date: _____

END OF SECTION

AIA Document A101

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a

STIPULATED SUM

1987 EDITION

THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES; CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION OR MODIFICATION.

The 1987 Edition of AIA Document A201, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

This document has been approved and endorsed by The Associated General Contractors of America.

AGREEMENT

made as of the day of in the year of
Nineteen Hundred and

BETWEEN the Owner: 315 Valley Street, LP
(Name and address) PO Box 560
Portland, ME 04112

and the Contractor:
(Name and address)

The Project is:
(Name and location) Valley Street Apartments
Gilman Street, Portland, ME

The Architect is:
(Name and address) Archetype, PA
48 Union Wharf
Portland, ME 04101

The Owner and Contractor agree as set forth below.

ARTICLE 1
THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2
THE WORK OF THIS CONTRACT

The Contractor shall execute the entire Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others, or as follows:

ARTICLE 3
DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 The date of commencement ~~is the date from which the Contract Time of Paragraph 5.2 is measured, and shall be the date of this Agreement, as first written above, unless a different date is stated below or provision is made for the date to be fixed in a notice to be~~ ~~to proceed~~ issued by the Owner.

(Insert the date of commencement, if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

~~Unless the date of commencement is established by a notice to proceed issued by the Owner, the Contractor shall notify the Owner in writing not less than five days before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.~~

3.2 The Contractor shall achieve Substantial Completion of the entire Work not later than December 20, 2006

(Insert the calendar date or number of calendar days after the date of commencement. Also insert any requirements for earlier Substantial Completion of certain portions of the Work, if not stated elsewhere in the Contract Documents.)

, subject to adjustments of this Contract Time as provided in the Contract Documents.

(Insert provisions, if any, for liquidated damages relating to failure to complete on time.)

Construction completion date to be December 20, 2006, after which liquidated damages will be incorporated at a cost of $1,200 per calendar day and bonus of $900 per calendar day.

ARTICLE 4
CONTRACT SUM

4.1 The Owner shall pay the Contractor in current funds for the Contractor's performance of the Contract the Contract Sum of
Dollars
($), subject to additions and deductions as provided in the Contract Documents.

4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

(State the numbers or other identification of accepted alternates. If decisions on other alternates are to be made by the Owner subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date until which that amount is valid.)

4.3 Unit prices, if any, are as follows:

ARTICLE 5
PROGRESS PAYMENTS

5.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

5.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

5.3 Provided an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than days after the Architect receives the Application for Payment.

5.4 Each Application for Payment shall be based upon the schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work and be 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.

5.5 Applications for Payment shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

5.6 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

5.6.1. Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of ten percent for the first fifty percent of work completed, released at Substantial Completion percent (10 %). Pending final determination of cost to the Owner of changes in the Work, amounts not in the dispute may be included as provided in Subparagraph 7.3.7 of the General Conditions even though the Contract Sum has not yet been adjusted by Change Order;

5.6.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of percent (%). See Above

5.6.3 Subtract the aggregate of previous payments made by the Owner; and

5.6.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Paragraph 9.5 of the General Conditions.

5.7 The progress payment amount determined in accordance with Paragraph 5.6 shall be further modified under the following circumstances:

5.7.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to One Hundred percent (100 %) of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work and unsettled claims; and

5.7.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Subparagraph 9.10.3 of the General Conditions.

5.8 Reduction or limitation of retainage, if any, shall be as follows:

(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Subparagraphs 5.6.1 and 5.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

ARTICLE 6
FINAL PAYMENT

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when (1) the Contract has been fully performed by the Contractor except for the Contractor's responsibility to correct nonconforming Work as provided in Subparagraph 12.2.2 of the General Conditions and to satisfy other requirements, if any, which necessarily survive final payment; and (2) a final Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

ARTICLE 7
MISCELLANEOUS PROVISIONS

7.1 Where reference is made in this Agreement to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

7.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

(Usury laws and requirements under the Federal Truth in Lending Act, similar state and local consumer credit laws and other regulations at the Owner's and Contractor's principal places of business, the location of the Project and elsewhere may affect the validity of this provision. Legal advice should be obtained with respect to deletions or modifications, and also regarding requirements such as written disclosures or waivers.)

7.3 Other provisions:

ARTICLE 8
TERMINATION OR SUSPENSION

8.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of the General Conditions.

8.2 The Work may be suspended by the Owner as provided in Article 14 of the General Conditions.

ARTICLE 9
ENUMERATION OF CONTRACT DOCUMENTS

9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

9.1.1 The Agreement is this executed Standard Form of Agreement Between Owner and Contractor, AIA Document A101, 1987 Edition.

9.1.2 The General Conditions are the General Conditions of the Contract for Construction, AIA Document A201, 1987 Edition.

9.1.3 The Supplementary and other Conditions of the Contract are those contained in the Project Manual dated , and are as follows:

Document	Title	Pages

9.1.4 The Specifications are those contained in the Project Manual dated as in Subparagraph 9.1.3, and are as follows:

(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Section	Title	Pages

See attachment "A" - Index of Project Manual

9.1.5 The Drawings are as follows, and are dated unless a different date is shown below:

(List the Drawings here or refer to an exhibit attached to this Agreement.)

Number	Title	Date
See Attachment "B" - Index of Drawings		

9.1.6 The addenda, if any, are as follows:

Number	Date	Pages

Portions of addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

9.1.7 Other documents, if any, forming part of the Contract Documents are as follows:

(List here any additional documents which are intended to form part of the Contract Documents. The General Conditions provide that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

This Agreement is entered into as of the day and year first written above and is executed in at least three original copies of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner.

OWNER	CONTRACTOR
_____	_____
(Signature)	*(Signature)*
_____	_____
(Printed name and title)	*(Printed name and title)*

CAUTION: You should sign an original AIA document which has this caution printed in red. An original assures that changes will not be obscured as may occur when documents are reproduced.

Attachment "A"
Index to Project Manual

Section:

END OF SECTION

Attachment "B"

Index of Drawings

INDEX OF DRAWINGS

---	Title Sheet, Location Plan, Code Analysis
---	Survey
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4 of 7	Landscape Plan
5 of 7	Details
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7 of 7	Details
S.1	Pile Layout Plan, General Notes
S.2	Pile Cap/Tie Beam Plan and Details
S.3	Foundation Wall Plan, 2nd Floor Framing Plan
S.4	3rd & 4th Floor Framing Plans, Roof Framing Plan
S.5	Foundation Sections and Details
S.6	Framing Sections and Details
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A.2	Fourth Floor Plan, Roof Plan
A.3	Detail Unit Plans - 2nd Floor
A.3a	Detail Unit Plans - 3rd & 4th Floors
A.4	Exterior Elevations
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A.5b	Building Section
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A.5d	Building Section
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P.2	Foundation, First Floor Plumbing Plans
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E.2	2nd & 3rd Floor Electrical Plans
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E.4	4th Floor Electrical Lighting Plan
E.5	Elec. Details, Notes, Schedules and Diagrams
E.6	Elec. Details, Notes, Schds., & Riser Diagrams

AIA Document A201

General Conditions of the Contract for Construction

THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES; CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS MODIFICATION

1987 EDITION

TABLE OF ARTICLES

This document has been approved and endorsed by the Associated General Contractors of America.

INDEX

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 Subsubcontractor 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 a 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 requirements 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, Subsubcontractor 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, Subsubcontractor 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 or 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 this 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 omissions 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 condition 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 or 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 customarily secured after execution of the Contract and 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 Contractor 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 3.8.2.2 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 for 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 Architect's 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 of 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, to 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 attorneys' 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 arbitration.

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 and 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 Con-

tractor, 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.

4.2.5 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 Certificates 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 the 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 judgment 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, of 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 which differ materially from those indicated in the Contract Documents or (2) unknown 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, Claim 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 not 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 the 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 concerned.

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 on 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 agreements 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-subcontractors.

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 action 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 acknowledgment 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 the 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 Change 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 a 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 costs 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 costs 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 costs 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 day 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 Contractor 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 requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders.

9.3.1.2 Such applications may not include requests for payment of amounts the Contractor does not intend to pay to 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 suitably 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 for 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 or 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 desig-

nated 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 notification 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 fix the time within which the Contractor 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 11.3.11 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 unreasonably 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 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 cancelled or allowed to expire until at 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, claims, 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 attorneys' fees.

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 attorneys' 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 part by 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, or 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 of 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 10.2.1.3, 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 so 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 cancelled 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.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

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 form 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, falsework, 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 cancelled 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 of 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 subrogation by endorsement or otherwise. A waiver of subrogation 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.

11.3.11 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

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 of 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 observation 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, costs 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 by the period of time between 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, that 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 of 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 or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be 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 Subparagraphs 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 statute 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 statute 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 statute 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 scheduled 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 jus-

tify 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.

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A311

Performance Bond

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Contractor, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, in the amount of

Dollars ($),

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Contractor has by written agreement dated 19 , entered into a contract with Owner for

(Here insert full name, address and description of project)

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

PERFORMANCE BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

1) Complete the Contract in accordance with its terms and conditions, or

2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this day of 19

	(Principal) (Seal)
(Witness)	
	(Title)
	(Surety) (Seal)
(Witness)	
	(Title)

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A311

Labor and Material Payment Bond

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Principal, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the amount of

(Here insert a sum equal to at least one-half of the contract price) Dollars ($),

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Principal has by written agreement dated 19 , entered into a contract with Owner for

(Here insert full name, address and description of project)

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

LABOR AND MATERIAL PAYMENT BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this day of 19

(Witness) (Principal) (Seal)

(Title)

(Witness) (Surety) (Seal)

(Title)

SECTION 00500

SUPPLEMENTARY CONDITION OF THE CONTRACT FOR CONSTRUCTION

1. GENERAL

1.1 CHANGE ORDERS

A. Delete Subparagraph 7.2.2 and substitute the following:

7.2.2 The General Contractor will be allowed the following Profit and Overhead on Change Orders: OH&P General Contractor = 10% on own work, 5% on Subcontractors and Sub-subcontractors.

1.2 INSURANCE

A. Refer to General Conditions, Article 11, Insurance and Bonds for general provisions concerning insurance.

B. Amend, General Conditions, Article 11, as follows:

1. Add to Sub-sub-paragraph 11.1.1.7 the following: Liability insurance shall include all major divisions of coverage, and be on a comprehensive basis including:

   a. Premises operations (including XCU as applicable).
   b. Independent contractors' protective.
   c. Products and completed operations.
   d. Personal injury liability with employment exclusion deleted.
   e. Contractual, including specified provisions for Contractor's obligation under Paragraph 4.18.
   f. Owned, non-owned, and hired motor vehicles.
   g. Broad form property damage, including completed operations.
   h. Umbrella excess liability.

2. Sub-paragraph 11.1.2, add Sub-sub-paragraph 11.1.2.1 as follows: "11.1.2.1: Insurance required by Sub-paragraph 11.1.1 shall be written for not less than following, or greater if required by law:

   a. Statutory Workman's Compensation and Employer's Liability.
   b. Comprehensive General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations' Broad Form Property Damage):
      i. Bodily Injury:

$1,000,000 each person
$3,000,000 annual aggregate

ii. Property Damage
$1,000,000 each occurrence
$3,000,000 annual aggregate

iii. Products and Completed Operations shall be maintained for two years after final payment.

iv. Property Damage Liability Insurance shall provide X, C, and U coverage (explosion, collapse, underground utilities) as applicable.

c. Contractual Liability:
i. Property Injury:
$1,000,000 each occurrence

ii. Property Damage:
$1,000,000 each occurrence
$3,000,000 annual aggregate

d. Personal Injury, with Employment Exclusion deleted:
$1,000,000 annual aggregate

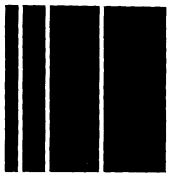
e. Comprehensive Automobile Liability:
i. Bodily Injury:
$1,000,000 each occurrence
$3,000,000 annual aggregate

ii. Property Damage:
$1,000,000 each occurrence

f. Umbrella Excess Liability
i. $1,000,000 over primary insurance
$ 3,000 retention for self-insured hazards, each occurrence

END OF SECTION

Sebago Technics
Engineering Expertise You Can Build On



Report on Subsurface and Foundation Investigation

Proposed Apartments and House
Valley Street
Portland, Maine

for

Shalom House
P.O. Box 560
Portland, ME 04112-0560

July 27, 2005
Revised November 9, 2005

One Chabot Street, P.O. Box 1339, Westbrook, Maine 04098-1339 Ph. 207-856-0277 Fax 856-2206

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July 27, 2005
Revised November 9, 2005
04040

Mr. William Floyd
Shalom House
P.O. Box 560
Portland, ME 04112-0560

Report on Subsurface and Foundation Investigation
Proposed Apartments and House, Valley Street, Portland, Maine

Dear Mr. Floyd:

This report presents the results of our subsurface and foundation investigation for the proposed apartment building and house on Valley Street in Portland. We provided these services in accordance with our proposal dated May 31, 2005.

In summary, it is our opinion that the apartment building and house may be supported on treated timber piles. In addition, a slab-on-grade may be used for the lowest ground floor. Specific recommendations regarding subsurface conditions and foundation requirements are presented below.

Introduction

The approximately 0.5-acre site is located between Valley and Gilman Streets approximately 250 feet north of Congress Street. The site is open and covered in grass. Ground surface elevations vary from approximately El. 19 along Valley Street to El. 29 at the southeast corner at Gilman Street.

We understand that the apartment building will be a four story building containing 24 residential units. The lowest (ground) floor will be at approximately El. 21.2 and will be primarily at-grade parking with bituminous concrete pavement. The building will be steel or concrete framed at the parking level, with a concrete deck above parking and wood framed above the concrete deck. We understand that the parking entrance will be at grade at Valley Street and approximately 8 feet below grade at the Gilman Street side. The house will consist of a two-story, single-family house with basement having a plan area of approximately 1,750 square feet.

Subsurface Explorations

During the period June 13 to 15, 2005, Maine Test Borings, Inc. (MTB) of Brewer, Maine, drilled five borings, B1 to B5, at the site at locations shown on Sheet 1, Subsurface Exploration Plan. MTB drilled the borings to depths below ground surface varying from 27.0 feet to 50.0 feet. Sebago Technics, Inc. monitored the borings and prepared the logs included in Appendix A. Table I summarizes the results of borings. MTB backfilled the borings with the drilled material.

Borings were drilled using 2.5-inch inside diameter hollow-stem augers. Samples were generally recovered at 5-foot intervals in the borings. Standard Penetration Resistance (N) was measured at each sample interval in accordance with ASTM Test D1586. Field vane shear tests of the clay were performed at various depths in the borings.

Sebago Technics determined the locations of borings by pacing from existing site features. We determined the ground surface elevations at borings by linear interpolation between ground surface contours at the plotted locations.

The boring logs and related information depict the 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 test pits. The passage of time may result in a change in groundwater conditions at the explorations.

Subsurface Conditions

The borings encountered six principal soil units at the site: fill, upper sand, silt, clay, lower sand and glacial till. Encountered thickness and generalized descriptions of the strata encountered are presented below in order of increasing depth below ground surface. Due to the complexity of the deposition process, strata thickness will vary and may be absent at specific locations.

Fill – Fill consists of loose to medium dense, brown silty SAND (SM); to brown well-graded SAND (SW); to black ASH with varying amounts of bricks, glass, wood and concrete. Encountered thickness varied from 5.0 feet to 16.9 feet. Up to 9.0 feet of ash was encountered in the borings.

Upper Sand – The upper sand consists of loose to medium dense, brown to gray silty SAND (SM) to well-graded SAND (SW). Encountered thickness varied from 2.8 feet to 9.0 feet.

Silt – Silt consists of medium stiff to very stiff, gray brown to gray sandy SILT (ML). Encountered thickness varied from 3.0 feet to 5.0 feet.

Clay – Clay consists of medium stiff to very stiff, gray brown to gray lean CLAY (CL) with occasional sand seams and partings. Encountered thickness varied from 6.0 feet to 16.6 feet.

Lower Sand – The lower sand consists of loose to dense, brown to gray poorly-graded SAND (SP); to well-graded SAND (SW); to silty SAND (SM). Borings penetrated up to 6.2 feet into the sand.

Glacial Till – Glacial till was encountered in B3 and consists of very dense, brown to gray silty SAND with gravel (SM). The boring penetrated 7.0 feet into the glacial till.

Water was observed in the borings at depths below ground surface varying from 9.2 feet to 20.4 feet. Observations of water were made over a relatively short period of time and may not reflect the stabilized groundwater level. In addition, water levels at the site will vary with season, precipitation, temperature and construction activity in the area. Therefore, water levels during and following construction will vary from those observed in the borings.

Strength and Compressibility Characteristics of Clay Stratum

The stress history of the clay deposit, as developed from correlations with shear strength of similar clays in the area, is summarized on Figure 1. The undrained shear strength of the clay stratum was determined by field vane shear tests in the borings. Measured undrained shear strength varied from 590 psf to 1,080 psf. The stress history of the deposit was estimated by comparing the measured undrained shear strength with correlations for strength and stress history of clay from other projects with similar conditions.

The stress-strain or compressibility characteristics (settlement) of clays are highly dependent upon their stress history. If clay is stressed within the limits of the maximum previous stress, σ_{vm}, the strain (settlement) will be a function of the recompression ratio (RR) of the clay. If the applied stress exceeds the maximum previous stress, the strain will be proportional to the virgin compression ratio (CR). The compression ratio is typically 10 to 15 times the recompression ratio.

The stress history and appropriate compression ratios were estimated for the clay deposit as discussed above. The correlations indicate that the deposit is significantly overconsolidated; that is, the existing overburden stress is considerably less than the maximum previous stress. The deposit likely became overconsolidated due to desiccation (drying) resulting from a lowering of the groundwater level at some time in the geologic past which also increased the effective overburden stress throughout the stratum.

Recommendations for Foundation Design

Recommended Foundation Type and Design Criteria

The fill is not considered suitable for support of the buildings and in its present condition, the ground floor slab. In our opinion, the building should be supported on foundations which penetrate through the fill and bear on the underlying naturally deposited, inorganic soil. Due to the presence of ash in the fill, we evaluated options for disposal of the ash and concluded that treated timber piles were the most cost effective foundations.

We conducted chemical testing on a composite sample of the ash recovered from the borings. Test results are summarized in Table II and test data are included in Appendix B. Based on the test results, it is our opinion that the ash would be considered special waste and would require disposal in a facility licensed to dispose of special waste.

We recommend that all columns and walls be founded on 25 ton capacity treated timber piles driven into the underlying sand, silt and clay. Piles should be driven to a minimum embedment length of 30 feet in the naturally deposited soil. Equivalent lengths may be on the order of 40 to 45 feet. Piles should be spaced at least 3 feet on center when pile groups are required. We also recommend the piles supporting walls be grouped in 2-pile groups to better accommodate misalignment during driving.

Piles should be specified as southern yellow pine or Douglas fir timber piles treated to a minimum retention of acceptable treatment. The minimum tip diameter should be 8 inches.

Piles should be driven with a hammer delivering a minimum of 8,000 foot-pounds of energy per blow for air or steam hammers, or a minimum of 10,000 foot-pounds of energy per blow for diesel hammers. Piles may be accepted for less than the minimum 30 feet of embedment provided the pile demonstrates an average penetration resistance equal to six blows per inch for the final six inches of driving. If an abrupt refusal is encountered in the naturally deposited soils, driving may be terminated when the pile penetration is less than ½ inch in six successive blows. The penetration resistance recommended above should be in addition to the observed resistance to penetration as the tip enters the naturally deposited soils.

The bottom of pile caps should be constructed at least 4.5 feet below the lowest adjacent ground surface exposed to freezing.

Prior to installation of any production piles, we recommend that a test pile program consisting of six piles at randomly selected locations within the footprints of the buildings be driven to the recommended embedment length or penetration resistance.

We estimate that settlement of any of the pile foundations discussed above will be less than 1 inch with differential settlement less than ½ inch. We anticipate that settlement of this magnitude is acceptable. However, Structural Design Consultants should determine final acceptability of settlement.

Ground Floor Slab

In our opinion, the existing fill in its present condition is not suitable for support of the slab or bituminous concrete. We recommend that the lowest level floor be designed as an earth-supported slab-on-grade, or bituminous pavement bearing on a minimum 18 inches of compacted structural fill. All fill containing debris should be removed from within the building limits and the existing fill be compacted by Intensive Surface Compaction (ISC) prior to placing structural fill. All fill placed below the floor slab or pavement for raises-in-grade should consist of compacted structural fill. Normal dampproofing and vapor barriers should be provided below concrete slabs.

ISC should be performed using a minimum 25,000 lb. vibratory roller operating at 30 cycles per second (Hz) and a forward speed of 1 to 2 feet per second. Compaction should consist of 10 coverages of the vibratory roller. The direction of each two successive coverages should be rotated perpendicular to the previous two coverages. Following intensive surface compaction, a minimum of two coverages of the roller should be applied without vibration to recompact the upper portion of the fill. Fill containing debris and wood and organics should be removed and replaced with structural fill prior to surface compaction. Any soft or unsuitable areas encountered should be excavated and replaced with compacted structural fill.

We recommend that a perimeter foundation drain with invert below the lowest floor level of El. 21.2 be constructed on the outside of the foundation wall where the final exterior grade is above the lowest floor level. The drain should consist of 4-inch diameter perforated pipe surrounded by ¾-inch crushed stone and non-woven geotextile filter fabric. Gravity discharge and normal dampproofing and vapor barriers should be provided for the foundation walls. The final 12 inches of fill adjacent to the foundation should consist of low permeability fill to minimize water infiltration next to the wall. Grading should provide for runoff away from the building.

Seismic Design Considerations

We recommend that the buildings be designed in accordance with the seismic requirements of the latest edition of the International Building Code. The site classification is Class E; the site response coefficient F_a is 2.1 for a short period spectral response acceleration S_s of 0.37g; the site response coefficient F_v is 3.5 for the 1-second period spectral response acceleration S_1 of 0.10g.

Lateral Foundation Loads

We recommend that lateral loads be resisted by earth pressure against pile caps and grade beams as follows:

$$P_r = (1/2\ \gamma\ K_p\ H^2)\ 1/3$$

where P_r = Passive force in pounds per feet of beam or cap
γ = Soil unit weight in pounds per cubic feet (use γ = 110)
K_p = Passive earth pressure coefficient (use 3.0)
H = Thickness of pile cap or depth of grade beam below ground surface

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 foundation walls which are restrained at the top and backfilled be designed to resist a lateral earth pressure calculated on the basis of an equivalent fluid unit weight of 55 pounds per cubic feet. This fluid unit weight assumes an at rest earth pressure coefficient of 0.45, a free-draining granular backfill, and an effective drainage system.

Backfill Materials

Structural fill used below foundations and floor slabs and bituminous pavement and for backfill adjacent to 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
6 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 eight 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 maximum particle size should be reduced to 3 inches and the loose layer thickness should be reduced to 6 inches, and compaction performed by hand-guided vibratory equipment.

Compacted structural fill on the outside of the foundation and basement walls should extend laterally a minimum of 2 feet from the wall. Backfill beyond this limit may consist of common fill. The top 12 inches of fill on the exterior of the building should consist of low permeability material to minimize water infiltration next to the building. Grading should provide for runoff away from the building.

Common fill may consist of inorganic mineral soil that can be placed in layers and compacted. Common fill should be placed and spread in layers not exceeding 12 inches in thickness and compacted with a minimum of two systematic passes of the equipment placing the fill.

Pavement Section

We recommend the following pavement section for parking areas:

Automobile Parking Areas
3 in. bituminous concrete, placed in two layers
3 in. base course
12 in. sand or gravel subbase course

Base and subbase course materials should conform to the following gradations:

Base Course

Screened or Crushed Gravel (Maine DOT Standard Specification, Highways and Bridges; Section 703.06a, Type A)

Sieve Size	Percent Finer by Weight
2 inches	100
½ inch	40-70
¼ inch	30-55
No. 40	0-20
No. 200	0-5

Subbase Course

Sand or Gravel (Maine DOT Standard Specification, Highways and Bridges; Section 703.06b, Type D)

Sieve Size	Percent Finer by Weight
6 inches	100
¼ inch	25-70
No. 40	0-30
No. 200	0-7

(Note: Compacted structural fill may be substituted for gravel subbase course.)

Fill required below the pavement section should consist of compacted structural fill. Structural fill should be placed in layers not exceeding 8 inches in thickness and compacted to a dry density of at least 95 percent of maximum dry density, as determined in accordance with ASTM Test Designation D1557. In our opinion, based on results of the test borings, the existing granular fill, if excavated, is not suitable for structural fill.

Subbase course material should be placed in maximum 8-inch thick loose lifts and compacted at approximately optimum moisture content to a dry density of at least 95 percent of maximum dry density, as determined in accordance with ASTM Test Designation D1557. Base course material should be placed in one lift and compacted with a minimum of two coverages with self-propelled vibratory compaction equipment.

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

Excavations up to 10 feet or more below existing grade will be required for foundation construction along Gilman Street. We anticipate that excavation support will require sheeting and bracing to support the existing sidewalks and streets. Temporary excavations should be made in accordance with all OSHA and other applicable regulatory agency requirements. We recommend that the Contractor's proposed method for excavation support be designed by a registered professional engineer and submitted to the Owner or Owner's Representative for review and comment.

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 concrete or pavement. 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 is required to enable the geotechnical engineer to keep in contact with procedures and techniques used in construction. Therefore, we recommend that a person qualified by training and experience be present to provide monitoring at the site during pile installation, intensive surface compaction, and placement of compacted structural fill.

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 buildings 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.

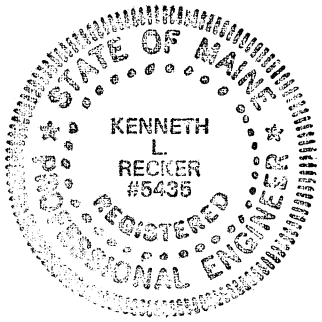
The recommendations presented herein are based in part on the data obtained from the referenced test borings. The nature and extent of variations between the explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

We request that we be provided 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 need additional information.

Sincerely,

SEBAGO TECHNICS, INC.



Kenneth L. Recker, P.E.
Geotechnical Engineering Manager

KLR:klr/jc
Enclosures:

Table I	- Summary of Test Borings
Table II	- Summary of Soil Testing Results
Sheet 1	- Subsurface Exploration Plan
Figure 1	- Stress History
Appendix A	- Logs of Test Borings
Appendix B	- Results of Laboratory Chemical Tests

04040

TABLE I
SUMMARY OF BORINGS
PROPOSED SHALOM HOUSE APARTMENTS
PORTLAND, MAINE

Boring Number	Depth (Ft)	Ground Sur. El. (Ft)	Depth to Water (Ft)	Strata Thickness (Ft)					
				Fill	Sand	Silt	Clay	Sand	Glacial Till
B1	27.0	20.0	16.3	10.0	--	--	10.8	6.2*	--
B2	35.0	18.9	9.2	10.0	9.0	5.0	6.0	5.0*	--
B3	50.0	19.9	9.5	16.9	8.3	--	16.6	1.2	7.0*
B4	32.0	23.0	20.4	10.7	2.8	--	12.8	5.7*	--
B5	27.0	27.7	18.2	5.0	--	3.0	13.0	6.0*	--

NOTES:

1. -- INDICATES STRATUM NOT ENCOUNTERED WITHIN DEPTH OF BORING.
2. * INDICATES DEPTH OF PENETRATION INTO STRATUM.

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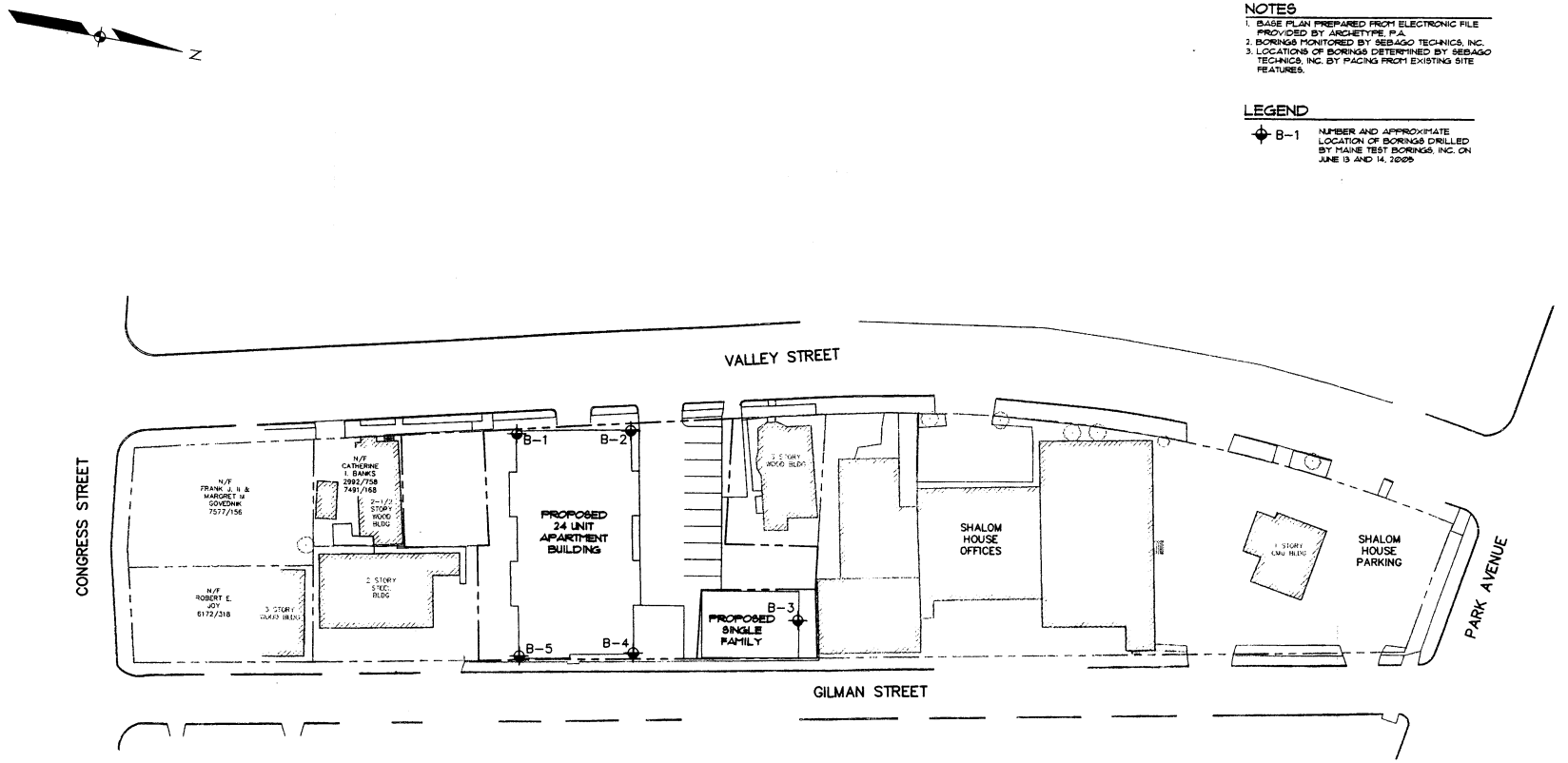
TABLE II
SUMMARY OF SOIL TESTING RESULTS
SHALOM HOUSE

Parameter	Sample	Maine Remedial Action Guidelines		
	S1 Composite	Residential	Trespasser	Adult Worker
Semi-Volatile Organic Compounds (mg/kg)				
Naphthalene	16.0	245	1710	325
2-Methylnaphthalene	8.9	NA	NA	NA
Acenaphthylene	ND	NA	NA	NA
Acenaphthene	20.0	NA	NA	NA
Fluorene	26.0	NA	NA	NA
Phenanthrene	110.0	NA	NA	NA
Anthracene	39.0	NA	NA	NA
Fluoranthene	90.0	NA	NA	NA
Pyrene	97.0	NA	NA	NA
Benzo (a) anthracene	42.0	NA	NA	NA
Chrysene	40.0	NA	NA	NA
Benzo (b) fluoranthene	27.0	NA	NA	NA
Benzo (k) fluoranthene	16.0	NA	NA	NA
Benzo (a) pyrene	29.0	2	9	7
Ideno (1,2,3-cd) pyrene	20.0	NA	NA	NA
Jibenzo (a,h) anthracene	ND	NA	NA	NA
Benzo (g,h,i) perylene	12.0	NA	NA	NA
TCLP Metals (mg/kg)				
Arsenic	ND	NA	NA	NA
Barium	0.74	10000	10000	10000
Cadmium	ND	NA	NA	NA
Chromium	ND	NA	NA	NA
Lead	0.52	375	700	700
Mercury	ND	NA	NA	NA
Selenium	ND	NA	NA	NA
Silver	ND	NA	NA	NA
Ignitability (Degrees Centigrade)	>71	<60	<60	<60

Notes:

1. Guidelines from "Procedural Guidelines for Establishing Action Levels and Remediation Goals for the Remediation of Oil Contaminated Soil and Ground Water in Maine, MEDEP, 3/13/00

ND - Not detected above laboratory Practical Quantitation Limit (PQL)



GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

NOTES
1. BASE PLAN PREPARED FROM ELECTRONIC FILE PROVIDED BY ARCHETYPE, P.A.
2. BORINGS MONITORED BY SEBAGO TECHNICS, INC.
3. LOCATIONS OF BORINGS DETERMINED BY SEBAGO TECHNICS, INC. BY PACING FROM EXISTING SITE FEATURES.

LEGEND

B-1 NUMBER AND APPROXIMATE LOCATION OF BORINGS DRILLED BY MAINE TEST BORINGS, INC. ON JUNE 13 AND 14, 2005

REV:	BY:	DATE:	STATUS:
-	-	-	-

THIS PLAN IS NOT TO BE USED WITHOUT PERMISSION FROM SEBAGO TECHNICS, INC. ANY ALTERATIONS MADE TO THIS PLAN WITHOUT THE WRITTEN AUTHORIZATION OF SEBAGO TECHNICS, INC. SHALL BE AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO SEBAGO TECHNICS, INC.

Sebago Technics
Engineering Expertise You Can Build On
Westbrook, Maine 04092-1339
Tel (207) 856-0277

PROJECT NO.	FIELD BOOK	DESIGN	CHKD	DRAWN
04040	-	KLR	KLR	MAL

SUBSURFACE EXPLORATION PLAN
OF:
PROPOSED APARTMENTS AND SINGLE FAMILY RESIDENCE
VALLEY STREET
PORTLAND, MAINE
FOR:
SHALOM HOUSE, INC.
P.O. BOX 560
PORTLAND, MAINE 04112-0560

DATE	SCALE
7-27-05	1"=30'

SHEET 1 OF 1

04040

STRESS HISTORY
SHALOM HOUSE APARTMENTS
PORTLAND, MAINE

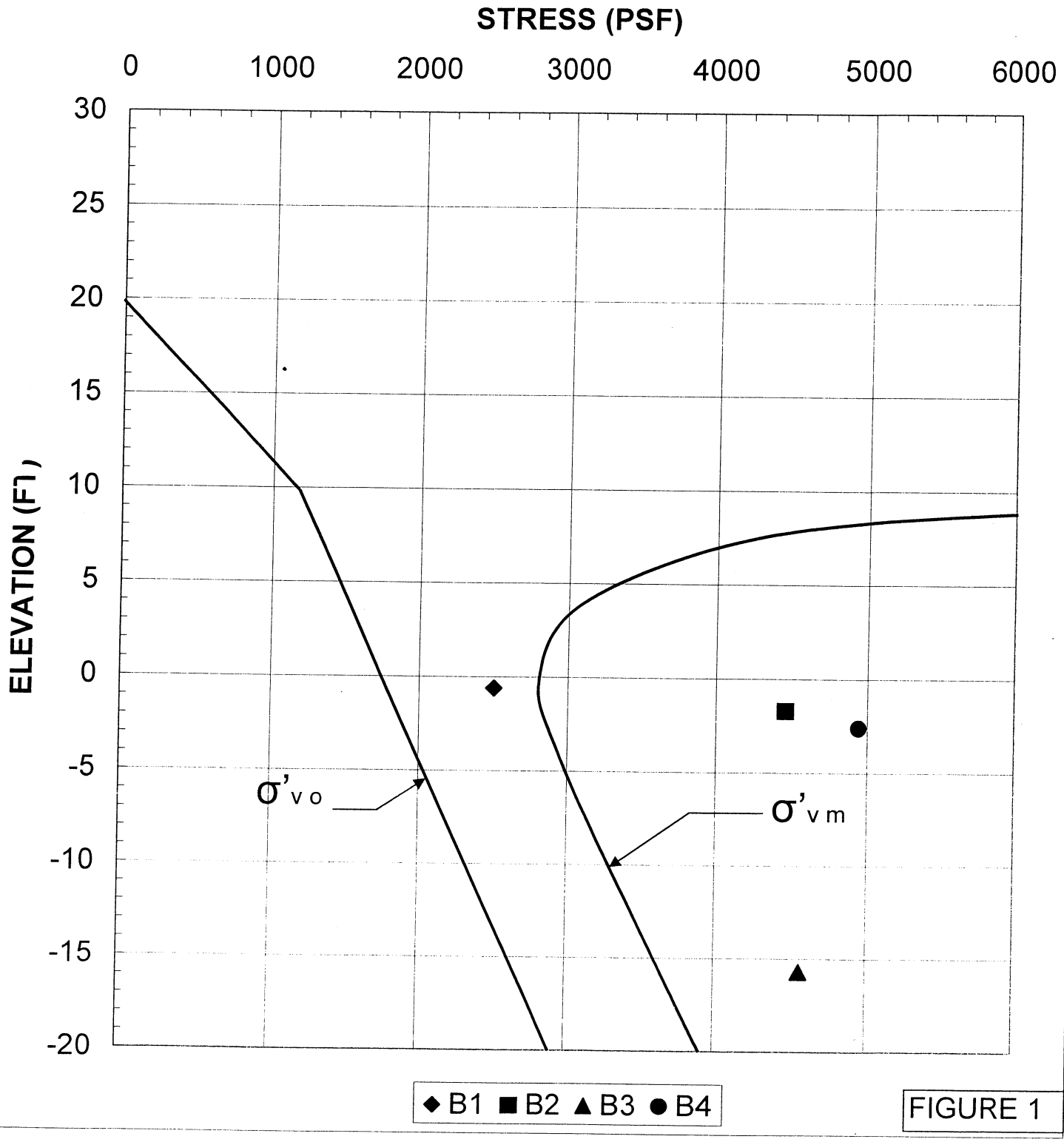


FIGURE 1

Appendix A

Logs of Test Borings

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. B1

Page 1 of 1

PROJECT	PROPOSED SHALOM HOUSE APARTMENTS	**STI JOB NO.**	04040
LOCATION	VALLEY STREET, PORTLAND, MAINE	**PROJECT MGR.**	K. RECKER
CLIENT	SHALOM HOUSE	**FIELD REP.**	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	**DATE STARTED**	6/13/2005
DRILLER	M. PORTER	**DATE FINISHED**	6/13/2005

Elevation 20.0 ft. **Datum** **Boring Location** See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	--
Inside Diameter (in.)	2.5	1 3/8	--
Hammer Weight (lb.)	--	140	
Hammer Fall (in.)	--	30	

Rig Make & Model Mobile B47

☐ 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: HSA/SPIN/25.0

Drilling Notes: 2.0 in. x 7.0 in. Field Vane

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					0.2		-BITUMINOUS CONCRETE-										
	5 7 6 11	S1 8	0.6 2.6		0.7	SM	Medium dense, brown silty SAND (SM), mps = 0.5 in., dry -FILL- Medium dense, black ASH, brick and glass fragments, dry -FILL-		5	10	10	60	15				
5	1 2 3 4	S2 1	5.0 7.0				Loose, black ASH, china fragment, dry -FILL- Note: no return of auger cuttings from 0.6 to 10.0 ft.										
10	2 8 9 12	S3 18	10.0 12.0		10.0	CL	Very stiff, gray-brown mottled lean CLAY (CL), damp -MARINE DEPOSITS-						100	N	M	M	
15	6 10 12 11	S4 24	15.0 17.0		16.5	CL	Very stiff, gray-brown mottled lean CLAY (CL), frequent sand partings to seams, mps = 0.02 in., damp					10	90	N	M	M	
						CL	Very stiff, gray lean CLAY (CL), damp Note: probably pushed gravel fragment from above with spoon -MARINE DEPOSITS-						100	N	M	M	
20	HDR. PUSH 6 14 17	FV1 S5 24	20.0-20.6 20.0 22.0		20.8	CL	FV1 from 20.0 to 20.6 ft. = 16/1 ft. lb., Su = 590 psf Medium stiff, gray lean CLAY (CL), occasional sand seams, mps = 0.02 in., wet					10	90	N	M	M	
					22.5	SM	Medium dense, brown silty SAND (SM), frequent clay and silt seams, mps = 0.02 in., wet -MARINE DEPOSITS-					80	20				
25	2 18 27 51	S6 24	25.0 27.0			SW	Dense, brown well-graded SAND (SW), mps = 0.2 in., wet -MARINE DEPOSITS-		10	20	70						
							Bottom of exploration at 27.0 ft. below ground surface No refusal Note: running sand conditions- sand at 19.6 ft. in augers										
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
6/13/2005	1506	--	20.0	22.0	16.3
6/13/2005	1640	--	--	8.0	Dry

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.)	27.0
Rock Cored (Linear ft.)	--
Number of Samples	6S

BORING NO. B1

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.** B2
		Page 1 of 2

PROJECT	PROPOSED SHALOM HOUSE APARTMENTS	**STI JOB NO.**	04040
LOCATION	VALLEY STREET, PORTLAND, MAINE	**PROJECT MGR.**	K. RECKER
CLIENT	SHALOM HOUSE	**FIELD REP.**	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	**DATE STARTED**	6/13/2005
DRILLER	M. PORTER	**DATE FINISHED**	6/14/2005

Elevation 18.9 ft. **Datum** **Boring Location** See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	--
Inside Diameter (in.)	2.5	1 3/8	--
Hammer Weight (lb.)	--	140	
Hammer Fall (in.)	--	30	

Rig Make & Model Mobile B47

☐ 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: HSA/SPIN/35.0

Drilling Notes: 2.0 in. x 7.0 in. Field Vane

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	6	S1	0.0		0.2	SM	Medium dense, brown silty SAND (SM), mps = 0.4 in., grass roots, dry -TOPSOIL/FILL-	5	5	50	15	10	15				
	9																
	7				1.5		Medium dense, black ASH, rusty discolorations, dry										
	7	18	2.0			SW	Medium dense, brown well-graded SAND (SW), mps = 0.3 in., lenses gray sandy clay, trace ash, dry		5	30	40	25					
5					5.0												
	24	S2	5.0		5.5	CL	Medium stiff, gray-brown lean CLAY (CL), dry					10	90	N	M	M	
	5						Loose, black ASH, slight odor, dry -FILL-										
	3																
	6	6	7.0				Note: gravel and ash in auger cuttings to 10.0 ft.										
10					10.0												
	2	S3	10.0			ML	Medium stiff, gray sandy SILT (ML), occasional clay seams, brown sand seam with organic fibers 10.5 to 10.7 ft., mps = 0.02 in., damp					40	60		L	L	
	2																
	4						-MARINE DEPOSITS-										
	4	18	12.0														
15							Note: attempted FV at 15.0 ft.- could not advance vane										
	9	S4	15.0			SM	Dense gray-brown mottled silty SAND (SM), frequent silt to clay seams, mps = 0.02 in., damp					60	40				
	18																
	25						-MARINE DEPOSITS-										
	20	18	17.0		17.5												
20																	
	WOR	FV1	20.0-20.6				FV1 from 20.0 to 20.6 ft. = 26/6 ft. lb., Su = 960 psf										
	2	S5	20.0			SM	Loose gray silty SAND (SM), frequent clay seams, mps = 0.02 in., wet					60	40				
	2																
	3	17	22.0				-MARINE DEPOSITS-										
					24.0												
25							Attempted FV at 25.0 ft.- could not advance vane										
	WOH	S6	25.0			CL	Stiff, gray lean CLAY (CL), frequent sand seams, one 0.75 in. gravel piece at 26.2 ft., wet					15	85	N	M	M	
	3																
	3						-MARINE DEPOSITS-										
	4	24	27.0														
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
6/14/2005	0835	--	30.0	28.0	15.5
6/14/2005	0919	--	--	24.0	9.2

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.)	35.0
Rock Cored (Linear ft.)	--
Number of Samples	7S

BORING NO. B2

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. **B2**

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
30					30.0												
	4	S7	30.0		30.5	SM	Loose, gray-brown silty SAND (SM), frequent clay seams, mps = 0.02 in., wet -MARINE DEPOSITS-					60	40				
	3																
	4																
	20	24	32.0			SP	Loose, brown poorly-graded SAND (SP), mps = 0.1 in., wet				5	95					
							-MARINE DEPOSITS-										
35							Note: advanced HSA to 35.0 ft. Running sand conditions in augers.										
							Bottom of exploration at 35.0 ft. below ground surface No refusal										
40																	
45																	
50																	
55																	
60																	
65																	
70																	

NOTES:

FILE NO. 04040

BORING NO. B2

*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. B3

PROJECT	PROPOSED SHALOM HOUSE APARTMENTS	**STI JOB NO.**	04040
LOCATION	VALLEY STREET, PORTLAND, MAINE	**PROJECT MGR.**	K. RECKER
CLIENT	SHALOM HOUSE	**FIELD REP.**	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	**DATE STARTED**	6/14/2005
DRILLER	M. PORTER	**DATE FINISHED**	6/14/2005

Elevation 19.9 ft. **Datum** **Boring Location** See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	--
Inside Diameter (in.)	2.5	1 3/8	--
Hammer Weight (lb.)	--	140	
Hammer Fall (in.)	--	30	

Rig Make & Model Mobile B47

☐ 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: HSA/SPIN/50.0

Drilling Notes: 2.0 in. x 7.0 in. Field Vane

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	2	S1	0.0		0.2	SM	Medium dense, dark brown silty SAND (SM), mps = 0.75 in., grass roots, damp -TOPSOIL/FILL-		5	50	15	15	15				
	7				0.7		Medium dense, brown well-graded SAND with gravel (SW), mps = 1.0 in., damp	5	10	30	40	15					
	9					SM	Medium dense, brown silty SAND (SM), mps = 0.75 in., brick, ash, wood, gravel, damp	5	10	10	10	50	15				
	15	14	2.0				-FILL-										
					4.5		Note: brick and gravel in auger cuttings from 0 to 5.0 ft.										
5	2	S2	5.0				Loose, gray ASH, trace brick, wet										
	2						-FILL-										
	2																
	1	1	7.0														
10	1	S3	10.0				Loose, gray ASH, trace wood, wet										
	2				11.0		-FILL-										
	2					SM	Loose, gray to black silty SAND (SM), trace ash, mps = 0.02 in., wet					85	15				
	2	8	12.0				-FILL-										
15	1	S4	15.0			SM	Loose, gray silty SAND (SM), frequent silt to clay seams, mps = 0.02 in., wet					80	20				
	3				16.1												
	4				16.9	OL/OH	Medium stiff, dark brown PEAT, damp -ORGANIC DEPOSITS-										
	18	22	17.0			SM	Loose, gray silty SAND (SM), trace organic fibers, mps = 0.02 in., wet					85	15				
							-MARINE DEPOSITS-										
20	7	S5	20.0			SM	Medium dense, gray silty SAND (SM), mps = 0.02 in., wet					85	15				
	14				20.7	CL	Very stiff, gray-brown mottled lean CLAY (CL), frequent sand partings, mps = 0.02 in., wet					10	90	N	M	M	
	15						-MARINE DEPOSITS-										
	15	18	22.0														
25	WOR	S6	25.0		25.0												
	WOR				25.5	SM	Very loose, gray silty SAND (SM), frequent clay seams, mps = 0.02 in., wet					85	15				
	1				26.5	CL	Medium stiff, gray lean CLAY (CL), frequent sand partings, shells, mps = 0.02 in., wet					10	90	N	M	M	
	2	24	27.0			SM	Very loose, gray silty SAND (SM), frequent clay seams, trace gravel, mps = 0.75 in., wet		40	20	20	20					
							-MARINE DEPOSITS-										
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
6/14/2005	1017	--	10.0	10.4	9.1
6/14/2005	1430	--	--	37.4	9.5

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.)	50.0
Rock Cored (Linear ft.)	--
Number of Samples	10S

BORING NO. B3

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. B3

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
30	WOH	S7	30.0		30.5	SM	Very loose, gray silty SAND (SM), trace clay, mps = 0.2 in., wet			5	20	55	20				
	2					CL	Stiff, gray lean CLAY (CL), frequent black streaks, wet						100	N	M	M	
	3				31.6		-MARINE DEPOSITS-										
	6	24	32.0			CL	Stiff, gray lean CLAY (CL), occasional black streaks, frequent sand partings, mps = 0.02 in., wet					10	90	N	M	M	
							-MARINE DEPOSITS-										
35	WOR	FV1	35.0-35.6				FV1 from 35.0 to 35.6 ft. = 28/10 ft. lb. Su = 1,040 psf										
	WOH	S8	35.0			CL	Stiff, gray lean CLAY (CL), frequent sand partings, occasional black streaks, mps= 0.02 in., wet					10	90	N	M	M	
	WOH																
	8	24	37.0				-MARINE DEPOSITS-										
40	WOR	S9	40.0			CL	Very stiff, gray lean CLAY (CL), frequent sand partings to seams, mps = 0.02 in., wet					15	85	N	M	M	
	9				41.8												
	9					SM	Medium dense, brown silty SAND (SM), frequent clay seams, mps = 0.1 in., wet				10	70	20				
	8	24	42.0		43.0		-MARINE DEPOSITS-										
45	22	S10	45.0			SM	Very dense, brown to gray silty SAND with gravel (SM), mps = 1.3 in., wet	10	15	30	20	10	15				
	48																
	87						-GLACIAL TILL DEPOSITS-										
	85	21	47.0				Note: advanced HSA to 50.0 ft. Running sand conditions in augers.										
50							Bottom of exploration at 50.0 ft. below ground surface										
							No refusal										
55																	
60																	
65																	
70																	

NOTES:

FILE NO. 04040

BORING NO. B2

*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. B4

PROJECT	PROPOSED SHALOM HOUSE APARTMENTS	**STI JOB NO.**	04040
LOCATION	VALLEY STREET, PORTLAND, MAINE	**PROJECT MGR.**	K. RECKER
CLIENT	SHALOM HOUSE	**FIELD REP.**	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	**DATE STARTED**	6/14/2005
DRILLER	M. PORTER	**DATE FINISHED**	6/14/2005

Elevation 23.0 ft. **Datum** **Boring Location** See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	--
Inside Diameter (in.)	2.5	1 3/8	--
Hammer Weight (lb.)	--	140	
Hammer Fall (in.)	--	30	

Rig Make & Model Mobile B47

- ☐ 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: HSA/SPIN/30.0

Drilling Notes: 2.0 in. x 7.0 in. Field Vane

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	4 15 23 20	S1 20	0.0 2.0		0.3	SM	Dense, brown silty SAND (SM), mps = 0.1 in., grass roots, damp -TOPSOIL/FILL-				10	75	15				
						SM	Dense, brown silty SAND with gravel (SM), mps = 1.3 in., damp Note: bricks in auger cuttings. Obstruction at 3.7 ft.- possible concrete. HSA refusal at 4.0 ft. below ground surface. Moved boring 4.0 ft. north.	10	10	30	20	15	15				
5	3 3 4 3	S2 12	5.0 7.0			SM	Loose, brown silty SAND (SM), ash, brick, mps = 0.1 in., wet -FILL-			10	15	60	15				
10	1 2 6 7	S3 15	10.0 12.0		10.7	SM	Loose, brown silty SAND (SM), ash, cinders, mps = 1.0 in., wet -FILL-		5	10	10	60	15				
						SW	Loose, brown well-graded SAND (SW), mps = 0.2 in., wet -MARINE DEPOSITS-			40	35	20	5				
15	3 4 5 7	S4 24	15.0 17.0		13.5	CL	Stiff, gray-brown mottled lean CLAY (CL), trace fine sand, damp -MARINE DEPOSITS-						100	N	M	M	
20	WOH WOH WOH 3	S5 24	20.0 22.0		20.0	CL	Medium stiff, gray lean CLAY (CL), concretions at 20.8 ft., wet -MARINE DEPOSITS-						100	N	M	M	
25	WOR WOH 4 10	FV1 S6 24	25.0-25.6 25.0 27.0		25.0 26.3	CL SM	FV1 from 25.0 to 25.6 ft. = 29/12 ft. lb., Su = 1,080 psf Stiff, gray lean CLAY (CL), occasional sand partings, mps = 0.02 in., wet Very loose, brown silty SAND (SM), frequent gray clay seams, mps = 0.02 in., wet -MARINE DEPOSITS-					5	95	N	M	M	
											85	15					
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
6/14/2005	1640	--	25.0	26.5	20.4
6/14/2005	1745	--	--	11.4	Dry

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.)	32.0
Rock Cored (Linear ft.)	--
Number of Samples	7S

BORING NO. B4

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. B4

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
30																	
	1	S7	30.0		30.2	SM	Medium dense, brown silty SAND (SM), frequent clay seams, mps = 0.02 in., wet					85	15				
	4																
	14					SW	Medium dense, brown well-graded SAND (SW), mps = 0.1 in., wet			10	40	50					
	26	24	32.0				-MARINE DEPOSITS-										
							Bottom of exploration at 32.0 ft. below ground surface No refusal Note: running sand conditions- sand at 24.0 ft. in augers.										
35																	
40																	
45																	
50																	
55																	
60																	
65																	
70																	

NOTES:

FILE NO. 04040

BORING NO. B4

*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. B5

Page 1 of 1

PROJECT	PROPOSED SHALOM HOUSE APARTMENTS	**STI JOB NO.**	04040
LOCATION	VALLEY STREET, PORTLAND, MAINE	**PROJECT MGR.**	K. RECKER
CLIENT	SHALOM HOUSE	**FIELD REP.**	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	**DATE STARTED**	6/15/2005
DRILLER	M. PORTER	**DATE FINISHED**	6/15/2005

Elevation 27.7 ft. **Datum** **Boring Location** See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	--
Inside Diameter (in.)	2.5	1 3/8	--
Hammer Weight (lb.)	--	140	--
Hammer Fall (in.)	--	30	--

Rig Make & Model Mobile B47

- ☐ 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: HSA/SPIN/25.0

Drilling Notes: 2.0 in. x 7.0 in. Field Vane

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	3 5 22 80/.2	S1 6	0.0 1.7		0.1 1.0 2.0	SM SM	Medium dense, brown silty SAND (SM), mps = 0.1 in., grass roots, wet -TOPSOIL/FILL- Medium dense, brown silty SAND (SM), roots, mps = 0.2 in., wet Note: several yards of geotextile fabric beneath ground surface -FILL-				10	75	15				
					5.0		Note: brown silty sand with gravel in auger cuttings, trace wood at 4.9 ft. -FILL-			20	30	35	15				
5	5 9 12 20	S2 12	5.0 7.0		8.0	ML	Very stiff, gray-brown mottled sandy SILT (ML), mps = 0.02 in., damp -MARINE DEPOSITS-					25	75		L	N	
10	3 6 7 9	S3 24	10.0 12.0			CL	Stiff, gray-brown mottled lean CLAY (CL), occasional sand partings, mps = 0.02 in., damp -MARINE DEPOSITS-					5	95	N	M	M	
15	2 4 5 5	S4 24	15.0 17.0		15.3	CL	Stiff, gray-brown mottled lean CLAY (CL), occasional sand partings, mps = 0.02 in., damp					5	95	N	M	M	
						CL	Stiff, gray lean CLAY (CL), occasional sand partings, brown sand seam at 16.0 ft., mps = 0.02 in., wet -MARINE DEPOSITS-					10	90	N	M	M	
20	1 9 10 17	S5 24	20.0 22.0		21.0	CL	Note: attempted FV at 20.0 ft.- could not advance vane Very stiff, gray lean CLAY (CL), frequent sand seams, mps = 0.02 in., wet					15	85	N	M	M	
					23.0	SM	Medium dense, brown silty SAND (SM), frequent clay and silt seams, mps = 0.02 in., rusty discolorations, wet -MARINE DEPOSITS-					80	20				
25	3 9 12 31	S6 24	25.0 27.0			SP	Medium dense, brown poorly-graded SAND (SW), mps = 0.1 in., wet -MARINE DEPOSITS-			20	80						
30							Bottom of exploration at 27.0 ft. below ground surface No refusal Note: running sand conditions- sand at 23.5 ft. in augers										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
6/15/2005	0836	--	20.0	20.0	18.2
6/15/2005	0955	--	--	15.6	Dry

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.)	27.0
Rock Cored (Linear ft.)	--
Number of Samples	6S

BORING NO. B5

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.

Appendix B

Results of Laboratory Chemical Tests

Katahdin
ANALYTICAL SERVICES

nelac
Cert. No. E87604

July 1, 2005

Ms. Kathie Stephenson
Sebago Technics
One Chabot Street
P.O. Box 1339
Westbrook,ME 04098-1339

RE: Katahdin Lab Number: WV2946
Project ID: VALLEY ST.
Project Manager: Mrs. Andrea Colby
Sample Receipt Date(s): June 17, 2005

Dear Ms. Stephenson:

Please find enclosed the following information:

* Report of Analysis (Analytical and/or Field)
* Chain of Custody (COC)
* Login Report

A copy of the Chain of Custody is included in the paginated report. The original COC is attached as an addendum to this report.

Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact the project manager listed above. This cover letter is an integral part of the ROA.

We certify that the test results provided in this report meet all the requirements of the NELAC standards unless otherwise noted in an attached technical narrative or in the Report of Analysis.

We appreciate your continued use of our laboratory and look forward to working with you in the future. The following signature indicates technical review and acceptance of the data.

Sincerely,

KATAHDIN ANALYTICAL SERVICES

Susie Dimond
Authorized Signature

07-01-05
Date

received
7.5.05

56 Exchange Street • P.O. Box 720, Westbrook, ME 04098 • Tel: (207) 874-2400 • Fax: (207) 775-4029 • www.katahdinlab.com

DATA QUALIFIERS

U	Indicates the compound was analyzed for but not detected above the laboratory Practical Quantitation Limit.
*	Compound recovery outside of quality control limits.
D	Indicates the result was obtained from analysis of a diluted sample. Surrogate recoveries may not be calculable.
E	Estimated value. This flag identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument for that specific analysis.
J	Estimated value. The analyte was detected in the sample at a concentration less than the laboratory Practical Quantitation Limit (PQL), but above the Method Detection Limit (MDL).
B	Organics- Indicates the analyte was detected in the laboratory method blank analyzed concurrently with the sample. Metals- Indicates the analyte was detected in the sample at a concentration greater than the instrument detection limit, but less than the laboratory's Practical Quantitation Level.
N	Presumptive evidence of a compound based on a mass spectral library search.
A	Indicates that a tentatively identified compound is a suspected aldol-condensation product.
P	Used for Pesticide/Aroclor analyte when there is a greater than 25% difference for detected concentrations between the two GC columns.
MCL	Maximum Contaminant Level
NL	No limit

Report of Analytical Results

Client: Sebago Technics
Project: VALLEY ST.
PO No:
Sample Date: 06/14/05
Received Date: 06/17/05
Extraction Date: 06/28/05
Analysis Date: 29-JUN-2005 19:47
Report Date: 06/30/2005
Matrix: SOIL
% Solids: 81.2

Lab ID: WV2946-1REDL
Client ID: S1 COMP
SDG: WV2946
Extracted by: JFC
Extraction Method: SW846 3540
Analyst: JCG
Analysis Method: SW846 8270C
Lab Prep Batch: WG18253
Units: ug/Kg

Compound	Flags	Results	DF	PQL	Adj.PQL
Naphthalene		16000	20	330	8100
2-Methylnaphthalene		8900	20	330	8100
Acenaphthylene	U	8100	20	330	8100
Acenaphthene		20000	20	330	8100
Fluorene		26000	20	330	8100
Phenanthrene		110000	20	330	8100
Anthracene		39000	20	330	8100
Fluoranthene		90000	20	330	8100
Pyrene		97000	20	330	8100
Benzo(a)anthracene		42000	20	330	8100
Chrysene		40000	20	330	8100
Benzo(b)fluoranthene		27000	20	330	8100
Benzo(k)fluoranthene		16000	20	330	8100
Benzo(a)pyrene		29000	20	330	8100
Indeno(1,2,3-cd)pyrene		20000	20	330	8100
Dibenzo(a,h)anthracene	U	8100	20	330	8100
Benzo(g,h,i)perylene		12000	20	330	8100
Nitrobenzene-D5		D			
2-Fluorobiphenyl		D			
Terphenyl-D14		D			

Katahdin
ANALYTICAL SERVICES

REPORT OF ANALYTICAL RESULTS

Client: Kathie Stephenson
Sebago Technics
One Chabot Street
P.O. Box 1339
Westbrook, ME 04098-1339

Lab Sample ID: WV2946-001
Report Date: 6/30/2005
PO No.:
Project: VALLEY ST.

Sample Description	Matrix	Filtered	Date Sampled	Date Received
S1 COMP	AQ	No(Total)	06/14/2005	06/17/2005

Parameter	Result	Units	Adjusted PQL	Dilution Factor	PQL	Analytical Method	Analysis Date	By	Prep Method	Prepped Date	By	QC	Notes
ARSENIC, TCLP	U 0.008	mg/L	0.008	1	0.008	SW846 6010	6/23/05	MRG	SW846 3010	6/22/05	JWM	VF22ICW0	
BARIUM, TCLP	0.740	mg/L	0.0050	1	0.005	SW846 6010	6/23/05	MRG	SW846 3010	6/22/05	JWM	VF22ICW0	
CADMIUM, TCLP	U 0.0100	mg/L	0.0100	1	0.01	SW846 6010	6/24/05	MRG	SW846 3010	6/22/05	JWM	VF22ICW0	
CHROMIUM, TCLP	U 0.015	mg/L	0.015	1	0.015	SW846 6010	6/24/05	MRG	SW846 3010	6/22/05	JWM	VF22ICW0	
LEAD, TCLP	0.524	mg/L	0.005	1	0.005	SW846 6010	6/23/05	MRG	SW846 3010	6/22/05	JWM	VF22ICW0	
MERCURY, TCLP	U 0.20	ug/L	0.20	1	0.2	SW846 7470	6/23/05	MW	SW846 7470	6/22/05	MW	VF22HGW0	
SELENIUM, TCLP	U 0.010	mg/L	0.010	1	0.01	SW846 6010	6/23/05	MRG	SW846 3010	6/22/05	JWM	VF22ICW0	
SILVER, TCLP	U 0.0150	mg/L	0.0150	1	0.015	SW846 6010	6/24/05	MRG	SW846 3010	6/22/05	JWM	VF22ICW0	

Report of Analytical Results

Client: Kathie Stephenson
Sebago Technics
One Chabot Street
Westbrook,ME 04098-1339

Lab Sample ID: WV2946-1
Report Date: 27-JUN-05
Client PO:
Project: VALLEY ST.
SDG: WV2946

Sample Description	Matrix	Date Sampled	Date Received
S1 COMP	SL	14-JUN-05	17-JUN-05

Parameter	Result	Adj PQL	Anal. Method	QC.Batch	Anal. Date	Prep. Method	Prep. Date	Analyst	Footnotes
Ignitability	>71. Deg. C	71	SW846 1010	WG18176	24-JUN-05 08:10:00	N/A	N/A	SJC	
Total Solids	81. %	.1	CLP SOW 788	WG18174	22-JUN-05 09:03:00	CLP SOW 788	21-JUN-05	JF	

FORM 4

SEMIVOLATILE METHOD BLANK SUMMARY

CLIENT SAMPLE ID

WG18253-BLANK

Lab Name: KATAHDIN ANALYTICAL SERVICES Lab Code: KAS

Project: VALLEY ST.

SDG No.: WV2946

Lab File ID: U1417

Lab Sample ID: WG18253-1

Instrument ID: GCMS-U

Date Extracted: 06/28/50

Matrix: (soil/water) SOIL

Date Analyzed: 06/29/05

Level: (low/med) LOW

Time Analyzed: 1734

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS and MSD:

	CLIENT SAMPLE ID	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	S1 COMP	WV2946-1REDL	U1420	06/29/05	1947
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
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21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

COMMENTS:

FORM IV SV

KATAHDIN ANALYTICAL SERVICES
Report of Analytical Results

Client:
Project: VALLEY ST.
'O No:
ample Date:
Received Date:
Extraction Date: 06/28/50
Analysis Date: 29-JUN-2005 17:34
Report Date: 06/30/2005
Matrix: SOIL
% Solids: 100

Lab ID: WG18253-1
Client ID: WG18253-Blank
SDG: WV2946
Extracted by: JFC
Extraction Method: SW846 3540
Analyst: JCG
Analysis Method: SW846 8270C
Lab Prep Batch: WG18253
Units: ug/Kg

Compound	Flags	Results	DF	PQL	Adj.PQL
Naphthalene	U	330	1.0	330	330
2-Methylnaphthalene	U	330	1.0	330	330
Acenaphthylene	U	330	1.0	330	330
Acenaphthene	U	330	1.0	330	330
Fluorene	U	330	1.0	330	330
Phenanthrene	U	330	1.0	330	330
Anthracene	U	330	1.0	330	330
Fluoranthene	U	330	1.0	330	330
Pyrene	U	330	1.0	330	330
Benzo(a)anthracene	U	330	1.0	330	330
Chrysene	U	330	1.0	330	330
Benzo(b)fluoranthene	U	330	1.0	330	330
Benzo(k)fluoranthene	U	330	1.0	330	330
Benzo(a)pyrene	U	330	1.0	330	330
Indeno(1,2,3-cd)pyrene	U	330	1.0	330	330
Dibenzo(a,h)anthracene	U	330	1.0	330	330
Benzo(g,h,i)perylene	U	330	1.0	330	330
.trobenzene-D5		52%			
2-Fluorobiphenyl		61%			
Terphenyl-D14		76%			

ADDENDUM
ORIGINAL CHAIN OF CUSTODY

Katahdin
ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04092
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE BEAR DOWN AND PRINT LEGIBLY IN PEN

Page 1 of 1

nt	Contact	Phone #	Fax #
SEBAGO TECHNICS INC	KATHIE STEPHENSON	(207)856-0277( )	
r	City	State	Zip Code
chase Order #	Proj. Name / No. VALLEY ~~Farm~~ ST.		Katahdin Quote #
(if different than above)	Address		
npler (Print / Sign) Kathie B. Stephenson	KATHIE B. STEPHENSON		Copies To:

AB USE ONLY WORK ORDER #: WV2946

KATAHDIN PROJECT NUMBER

MARKS:

PPING INFO: ❒ FED EX ❒ UPS ❒ CLIENT

BILL NO:

MP°C ❒ TEMP BLANK ❒ INTACT ❒ NOT INTACT

Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	ANALYSIS AND CONTAINER TYPE PRESERVATIVES: Filt. ❒Y ❒N — Flashpoint	Filt. ❒Y ❒N — TCLP Metals	Filt. ❒Y ❒N — Total PAH	Filt. ❒Y ❒N	Filt. ❒Y ❒N	Filt. ❒Y ❒N	Filt. ❒Y ❒N	Filt. ❒Y ❒N	Filt. ❒Y ❒N	Filt. ❒Y ❒N
S1 Comp.	6/14/05 1600	Soil	1	✓	✓	✓							
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MENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
Stephenson	6/17/05 1435				
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

Sebago Technics
Engineering Expertise You Can Build On

sebagotechnics.com
One Chabot Street
P.O. Box 1339
Westbrook, Maine
04098-1339
Ph. 207-856-0277
Fax 856-2206

October 6, 2005
04040

Mr. William Floyd
Shalom House
P.O. Box 560
Portland, ME 04112-0560

Ash Handling and Disposal Plan, Proposed Apartments, Valley Street, Portland, Maine

Dear Mr. Floyd:

This letter presents the Ash Handling and Disposal Plan to be used during construction of the apartments on Valley Street.

Discussion

As you know, subsurface explorations disclosed up to 9 feet of black ash in the fill overlying the naturally deposited soils at the site. Chemical tests performed on a representative sample of the ash, indicates that the material is classified as a special waste. Earthwork and foundation construction, such as utility construction and excavations for foundations, may encounter the ash. The following plan presents our recommendation for handling and disposal of the excess ash, if encountered.

Ash Handling Plan

1. Review and comment on contractor's worker health and safety plan.

2. Meet with contractor to review this Ash Handling and Disposal Plan.

3. Have contractor determine an area on site to stockpile ash and/or ash contaminated soil and obtain sufficient tarpaulins to cover the ash completely.

4. Assign personnel qualified by training and experience to observe on-site excavated material and identify ash or ash-contaminated soil.

5. Have contractor engage a licensed waste-disposal contractor to arrange for transportation of the ash material, in lined roll-off containers, to a licensed disposal facility. If signature of property owner is required by disposal site, make arrangements for manifests to be signed by property owner or authorized representative.

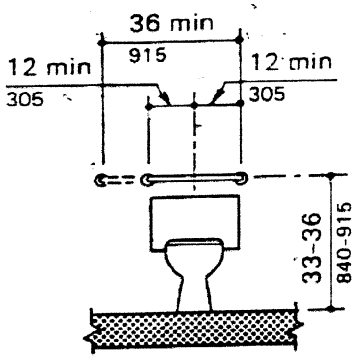
4.16.3* Height. The height of water closets shall be 17 in to 19 in (430 mm to 485 mm), measured to the top of the toilet seat (see Fig. 29). Seats shall not be sprung to return to a lifted position.

4.16.4* Grab Bars. Grab bars for water closets not located in stalls shall comply with Fig. 29 and with 4.24.

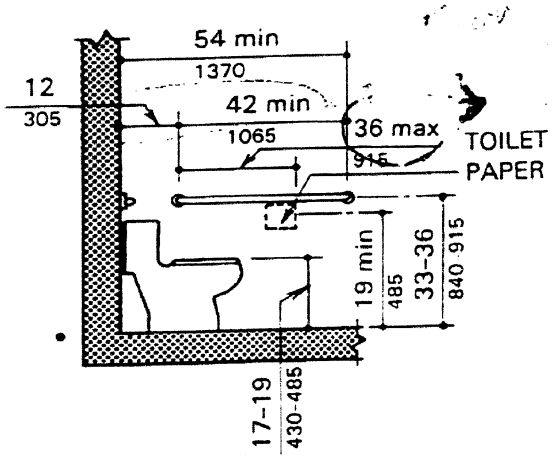
*See Appendix for additional information.

4.16.5* Flush Controls. Flush controls shall be hand operated or automatic and shall comply with 4.25.4. Controls for flush valves shall be mounted for use from the wide side of the toilet stall and shall be no more than 44 in (1120 mm) above the floor.

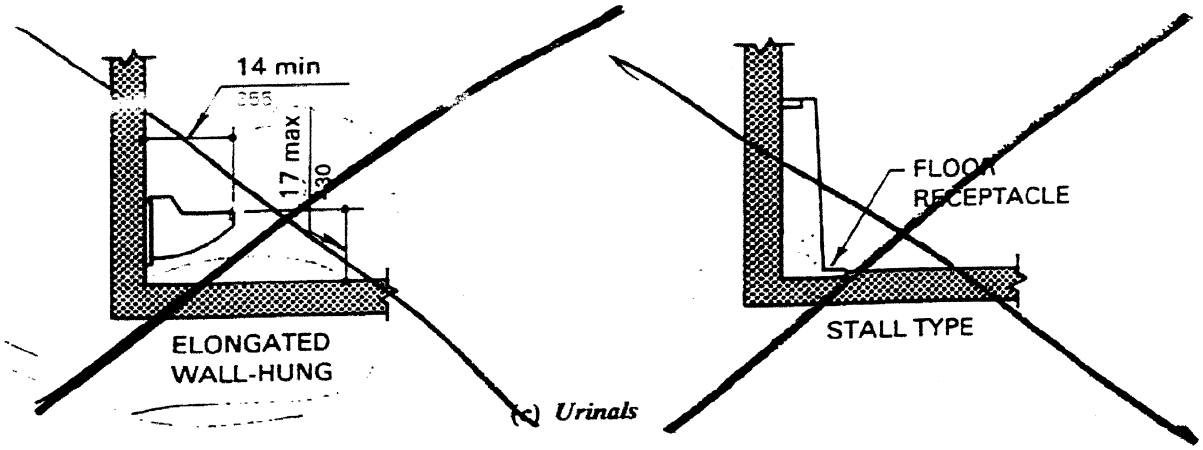
4.16.6 Dispensers. Toilet paper dispensers shall comply with 4.25.4 and shall be installed within reach, as shown in Fig. 29(b).



(a) Back Wall

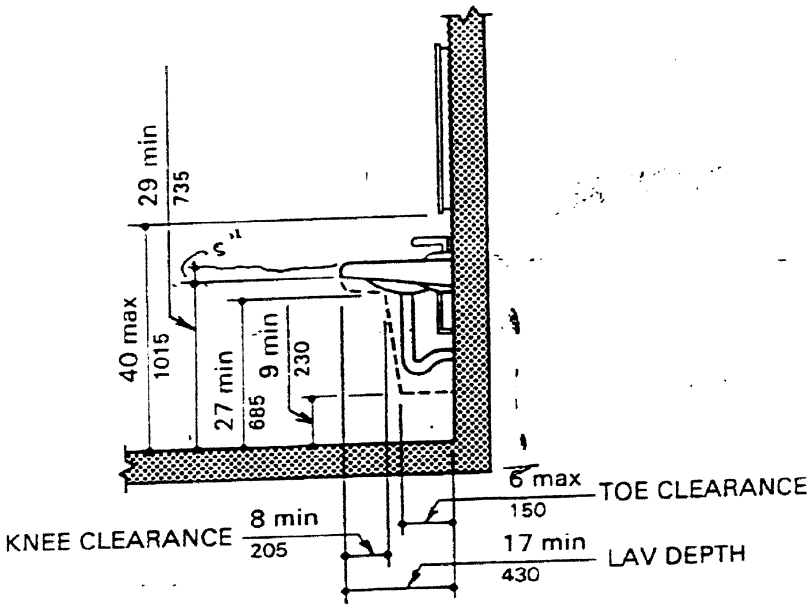


(b) Side Wall



(c) Urinals

Fig. 29
Water Closets and Urinals



NOTE: Dashed line indicates dimensional clearance of optional underlavatory enclosure.

Fig. 31
Lavatory Clearances

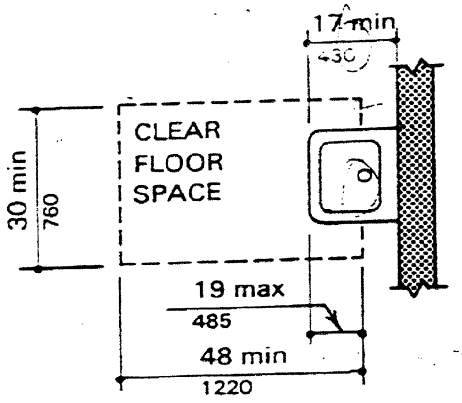
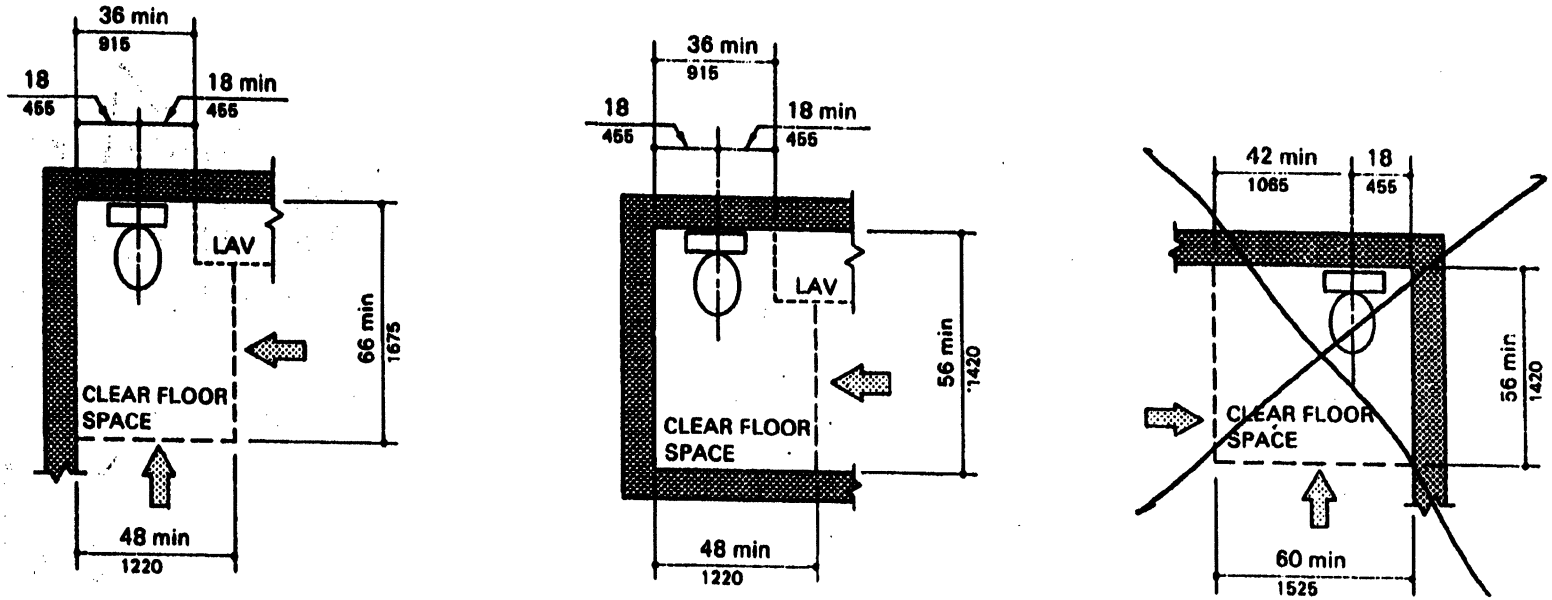
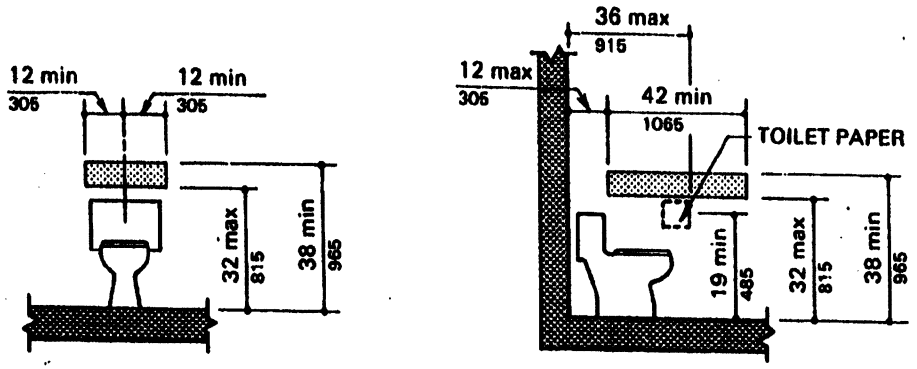


Fig. 32
Clear Floor Space at Lavatories



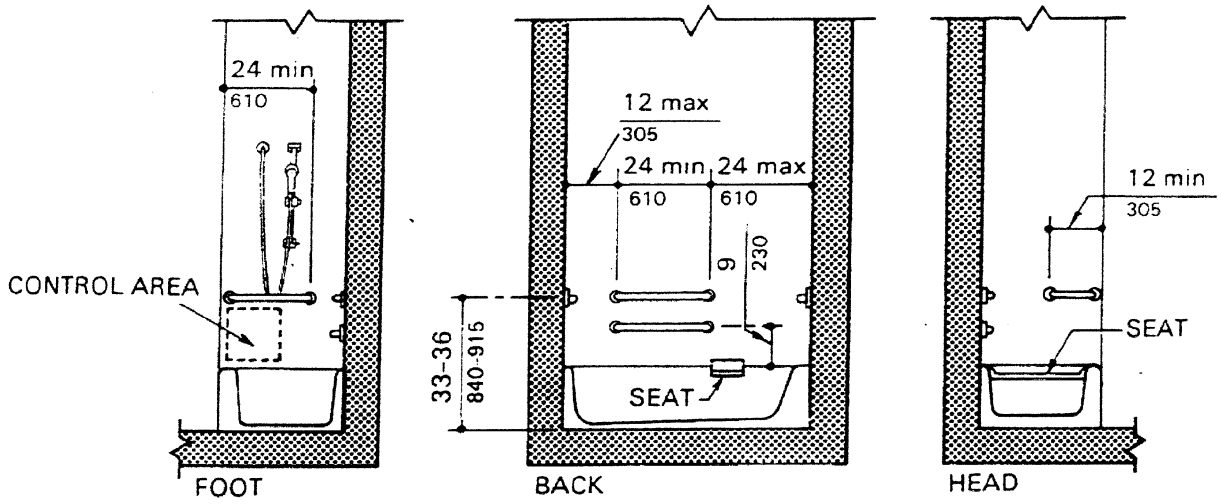
(a) Clear Floor Space for Adaptable Bathrooms



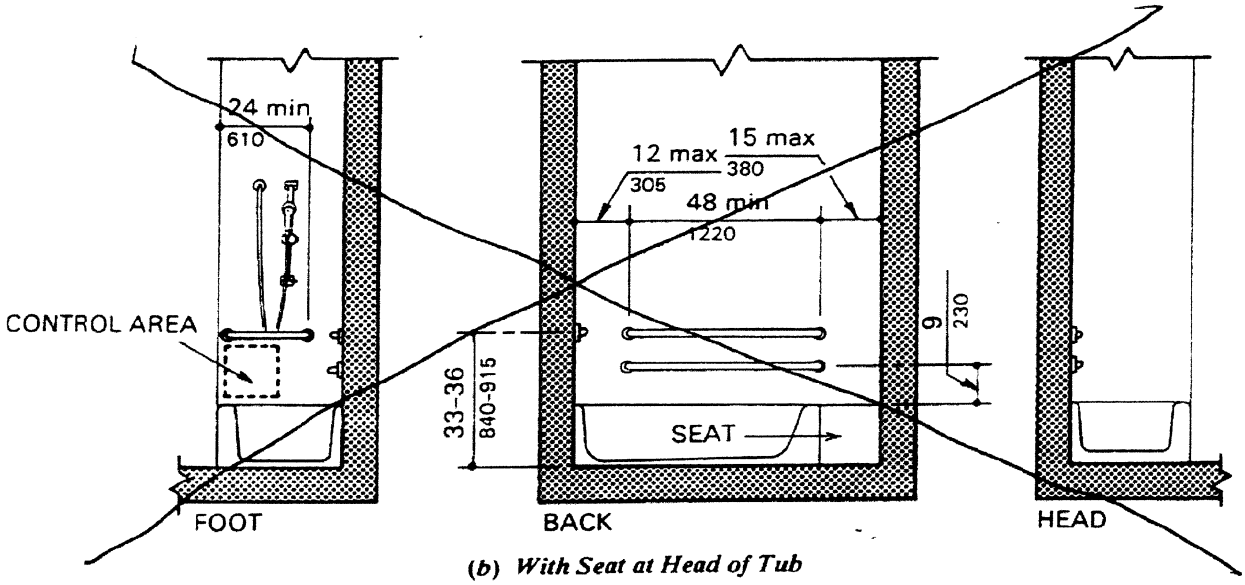
NOTE: The lightly shaded areas are reinforced to receive grab bars.

(b) Reinforced Areas for Installation of Grab Bars

Fig. 47 Water Closets in Adaptable Bathrooms



(a) With Seat in Tub



(b) With Seat at Head of Tub

Fig. 34
Grab Bars at Bathtubs

SECTION 01010

SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 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.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of construction of a fully sprinkled, 24 unit, (4) four story apartment building and related site work. The building includes enclosed parking at the lower level and three levels of apartments above.

1. Project Location: Valley Street, Portland, Maine

B. Owner: 315 Valley Street, LP, P.O. Box 560, Portland, Maine 04112.

C. Architect: The Contract Documents were prepared for the Project by Archetype, P.A., 48 Union Wharf, Portland, Maine. Contact: John Shields, Architect.

The Work includes, but is not limited to:

- Wood pile foundation system with concrete pile caps and grade beams.
- Lower level poured in place concrete bearing walls with brick veneer and precast concrete base.
- Lower level precast concrete beam and column system.
- First level concrete plank floor system with topping.
- Upper level wood stud bearing walls with cement board finish and trim.
- At Gilman Street entry facade - wood stud bearing wall with brick veneer.
- Precast concrete base, sills, headers, cornice and trim.
- Wood truss upper level floor framing and roof framing.
- Fully adhered EPDM roofing with rigid insulation, crickets and scuttle.
- Metal and glass entry canopy.

- Concrete and concrete block elevator shaft.
- Five stop, five opening elevator.
- Elevator smoke doors.
- Wood stud and steel stud interior partition walls.
- Wood, molded and steel doors, wood and steel door frames.
- One motor operated overhead coiling door.
- Polyvinyl chloride windows.
- Alternating tread steel stairs, roof scuttle, steel French balcony, metal hand and guard rails.
- Wood stairs with wood trim and railings.
- Residential kitchen and bath equipment and fixtures.
- Finishes include gypsum board, acoustical ceilings, carpet, sheet vinyl, paint and vinyl base.
- The building is alarmed and sprinkled with a dry system in the parking garage and a wet system in the upper floors.
- An electronic intercom system is provided at the main entry.
- Window treatment and vinyl coated wire shelving is provided.
- Heating includes fin tube radiation and unit heaters, boiler is gas fired.
- Ventilation includes general exhaust, bathroom, parking garage and dryer exhaust.
- Site work includes shoring and bracing, bituminous concrete paving, brick sidewalks, granite curbing, sewer, drains, site piping, manholes, catch basins, ornamental metal fencing and landscape work.

1.3 CONTRACT

A. The contract shall be AIA Document A101 – Standard Form of Agreement Between Owner and Contractor – Stipulated Sum. 1987 Edition. See also AIA 201 General Conditions and Section 00500 Supplementary Conditions.

1.4 BONDS

A. Performance Bond shall be AIA A311 Performance Bond.

B. Labor and Material Payment Bond shall be AIA A311 G Labor and Material Payment Bond

1.5 USE OF PREMISES

A. General: During the entire construction period the Contractor shall have the exclusive use of the premises for construction operations, including full use of the site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

1. GENERAL

1.1 REFERENCES

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

B. Divisions 2 through 16.

1.2 DESCRIPTION OF WORK

A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

B. 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/Safety Limitations: Do not cut-and-patch operational elements and safety components in a manner resulting in decreased performance, shortened useful life, or increased maintenance.

D. Visual/Quality Limitations: Do not cut-and-patch work exposed to view (exterior and interior) in a manner resulting in noticeable reduction of aesthetic qualities and similar qualities, as judged by the Architect/Engineer.

E. Limitation on Approvals: The Architect/Engineer's approval to proceed with cutting and patching does not waive right to later require removal/replacement of work found to be cut-and-patched in an unsatisfactory manner, as judged by the Architect/Engineer.

F. Materials marked to be removed and reused shall be repaired as necessary to maintain their existing condition. When repair is not sufficient, existing materials shall be disposed of and new materials installed to match existing materials.

G. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

H. Unless otherwise specified, requirements of this Section apply to Mechanical and Electrical work. Refer to Divisions 15 and 16 for additional requirements and limitations on cutting and patching of mechanical and electrical work.

1.3 QUALITY ASSURANCE

A. Refer to Section 01631, Products and Substitutions, for general provisions covering product selection, substitutions, material storage and installation.

B. Refer to Section 01400, Quality Control Services, for provisions for testing and inspections.

C. Refer to specific Specification Section covering subject in question for quality assurance requirements.

1.4 SUBMITTALS

A. Issue submittals in accordance with Section 01300, Submittals.

B. Refer to specific Specification Section covering subject in question for submittal requirements.

2. PRODUCTS

2.1 GENERAL

A. Use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

B. Fire-stopping:

1. Seal openings in fire-rated walls and floors to make a tight fit with penetrating items, using appropriate non-combustible filler material. to provide a rating equivalent to wall/floor assemble.

2. Acceptable filler materials include:
   a. Concrete
   b. Cementitious proprietary product: Zonolite Firestop ZF-1
   c. Blanket-type mineral-fiber or ceramic-fiber insulation (glass-fiber insulation is not acceptable)
   d. Fire-resistant sealant: Domtar Fire-Halt, Dow Corning Fire Stop, Hilti CS 240 Firestop, or Nelson CLK or CMP
   e. Fire-resistant silicone foam: Dow Corning RTV Foam Penetration Seal System, Hilti CB 120 Adhesive Filling and Sealing Foam, Tremco Fyre-Sil

f. Flexible intumescent strip wrapped around pipe penetrations: Dow Corning Fire Stop Intumescent Wrap, Hilti CS 24720 Intumescent Wrap, Nelson RSW, Tremco TREMstop WS
g. Intumescent fibrous material enclosed in a polyethylene envelope: Nelson PLW, Tremco TREMstop PS
h. Pliable intumescent putty: Nelson FSP Flameseal, Tremco TREMstop WBM
i. Water-based intumescent fire-protective coating for electrical cables: Nelson CTG

3. Neatly patch and seal exposed-to-view openings, using sealants, tooled mortar joints, escutcheons, or flanged collars, as appropriate.

3. EXECUTION

3.1 INSPECTION

A. Before cutting, examine surfaces to be cut and patched and conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

3.2 TEMPORARY SUPPORT

A. To prevent failure provide temporary support of work to be cut.

3.3 PROTECTION

A. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.4 PERFORMANCE

A. Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect/Engineer, proceed with cutting and patching at the earliest feasible time and complete work without delay.

B. Cutting:
1. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Provide dust barriers to prevent dust from entering existing building beyond immediate work area. Where possible, review proposed procedures with the original installer; comply with original installer's recommendations.

2. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.

3. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.

4. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in walls or partitions to be removed. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.

C. Patching:

1. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.

2. Where feasible, inspect and test patched areas to demonstrate integrity of work.

3. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.

4. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove existing floor and wall coverings and replace with new materials.

5. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coat.

6. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.5 MAINTENANCE OF TRAFFIC, ACCESS, AND UTILITIES

A. Maintain accessibility from street at all times to any fire hydrants within construction area. Ensure that utilities serving adjacent buildings remain in service.

END OF SECTION

SECTION 01300

SUBMITTALS, MEETINGS AND RECORD DOCUMENTS

1. GENERAL

1.1 PRE-CONSTRUCTION MEETING

A. Architect will schedule a pre-construction meeting within 15 days of issuance of Notice to Proceed, to be attended by the owner, all project managers, Contractor's field superintendent, and representatives of major sub-contractors. At this time, Contractor shall make specified pre-construction submittals including following:

1. Typed list of sub-contractors with addresses and telephone numbers.
2. Certificates of insurance.
3. Approved construction schedule. See General Conditions, Paragraph 3.10.
4. Schedule of values.
5. Building permit and similar start-up authorization or certificates.

B. Pre-construction meeting agenda will include following:

1. Processing application for payment.
2. Processing and distribution of submittals.
3. Maintenance of record documents.
4. Procedure for field changes, change estimates, change orders, etc.
5. Site and building security.
6. Location and maintenance of temporary storage areas, field offices, vehicular parking and access, waste disposal, etc.
7. Safety and first-aid procedures.
8. Date and time for regular monthly coordination and progress meeting (to be coordinated with monthly application for payment).

1.2 CONSTRUCTION SCHEDULE

A. Refer to General Conditions, Paragraph 3.10, for general provisions concerning construction progress schedule. Schedule shall show activities, itemized according to specification Section, and be organized in bar-chart or graph form so as to show both projected and actual progress of work.

B. Arrange schedule to indicate required sequencing of units, and to show time allowances for submittals, inspections, and similar time margins.

C. Show critical submittal dates related to each time bar, or prepare a separate coordinated listing of critical submittal dates.

D. Show phases of work within each time bar for major elements which involve purchase lead-time, fabrication, seasonal treatment, mockups, testing, or similar phases as well as installation.

E. Submit updated schedule monthly, together with application for payment.

1.3 SCHEDULE OF VALUES

A. Refer to General Conditions, Paragraph 9.2 for general provisions concerning schedule of values.

B. For these submittals, use AIA Document G702/703, Application and Certificate for Payment.

C. Use specifications Sections as listed in Table of Contents as basis for format for listing costs.

D. Itemize separately general cost items, such as bonds and allowances.

E. Itemize change orders separately as they are approved.

1.4 MEETINGS AND REPORTING

A. Contractor shall conduct general progress and coordination meetings at least once each month, attended by a representative of each primary entity engaged for performance of work. Record discussions and decisions, and distribute copies to those attending and others affected, including Architect/Engineer.

B. Date and time of at least one regular monthly progress and coordination meeting shall be determined at the pre-construction meeting. Timing of this monthly meeting shall be coordinated with payment requests.

1.5 APPLICATION FOR PAYMENT

A. Refer to General Conditions, Paragraph 9.3, for general provisions concerning applications for payment.

B. Use AIA Form G702/703, fully completed and executed.

C. Submit the forms in triplicate including attachment of waivers and similar documentation with one copy.

1.6 SHOP DRAWINGS, PROJECT DATA, SAMPLES

A. Refer to General Conditions, Product Data and Samples, paragraph 3.12, for general provisions covering this type of submittal.

B. Coordinate the preparation and processing of work-related submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities that require sequential activity. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the necessity of reviewing a related submittal.

C. Architect/Engineer Review:

1. Allow ten working days for the Architect/Engineer's initial processing of each submittal. Allow one week for reprocessing each submittal. No extension of time will be authorized because of failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

2. The Architect/Engineer will stamp each submittal to be returned with a uniform, self-explanatory action stamp, appropriately marked and executed to indicate the status of the submittal.

D. Mark each submittal with a permanent label for identification. Provide project name, date, name of Architect/Engineer, name of Contractor, number and title of appropriate specification section and similar definitive information. Provide a space on the label for Contractors and Architect/Engineer's review markings.

E. Package each submittal appropriately for transmittal and handling. Send each submittal from the Contractor to the Architect/Engineer and other destinations using AIA Transmittal Form G810.

F. Provide additional copies of submittals required by governing authorities that are in addition to copies specified for submittal to the Architect/Engineer.

G. Where it is necessary to provide intermediate submittals between the initial and final submittals, provide and process intermediate submittals in the same manner as for initial submittals.

H. Submit as follows:

1. Shop drawings (original drawings prepared by Contractor or sub-contractor illustrating fabrication, layout, erection details, etc.): six prints, or one reproducible transparency and one opaque print, to Architect.

2. Manufacturers' specifications, installation instructions, charts, schedules, catalogs, brochures, etc.: number of copies required by Contractor for distribution, plus one copy for Architect's retention.

3. Samples: one sample to Architect only, unless otherwise specified.

4. In submitting shop drawings and product data to Architect, use separate transmittals for material in different specification Sections, with applicable specification Section clearly numbered.

I. Architect will review submittals within ten working days, measured from date of receipt by Architect until date of mailing. Contractor shall promptly make corrections and resubmit when so directed. Where submittal is marked "Approved as Noted" or similar, assume that all items are approved other than those to which specific exception is taken. Do not delay fabrication, assembly and delivery pending receipt of entirely "Approved" submittal.

J. Distribute approved submittals to job site and record document files, and to suppliers and sub-contractors as required. Samples not designated by Contractor for incorporation into Work shall be kept on file until job completion. Any sample not reclaimed within 30 days after job completion will be considered unclaimed, and will be disposed of as directed by Architect.

1.7 PROJECT RECORD DOCUMENTS

A. Keep on file at job site one complete set of up-to-date Contract Documents, including drawings and specifications, addenda, shop drawings and product data, testing data, change orders, field orders, and other modifications. Documents shall be neatly and securely stored in files or on racks, clearly indexed by trade activity or specification Section, and shall not be used for construction purposes.

B. Legibly mark significant field changes such as following, using colored pencils or felt-tipped pens:

1. Drawings: locations of concealed utilities, field changes of dimension and detail, changes resulting from change order or field order, and details not on original drawings.

2. Specifications: manufacturer and model number of equipment actually installed.

3. Shop drawings and manufacturers' literature: changes made after Architect's review.

C. At completion of Work, deliver completed record documents to Architect. Final payment for Project will not be made until Architect reviews and approves these documents.

1.8 SUBSTANTIAL COMPLETION

A. Refer to General Conditions, Article 9, Substantial Completion, for general provision concerning substantial Completion.

B. Following issuance by Architect/Engineer of Certificate of Substantial Completion, Contractor may submit special payment request, provided the following have been completed:

1. Obtain permits, certificates of inspection and other approval and releases by governing authorities, required for Owner's occupancy and use of project.
2. Submit warranties and similar documentation.
3. Submit maintenance manuals and provide instruction of Owner's operational/maintenance personnel.
4. Complete final cleaning of the work.
5. Submit record documents.
6. Submit listing of work to be completed before final acceptance.

C. Following completion of the following requirements, final payment request may be submitted:

1. Complete work listed as incomplete at time of substantial completion, or otherwise assure Owner of subsequent completion of individual incomplete items.
2. Settle liens and other claims, or assure Owner of subsequent settlement.
3. Submit proof of payment on fees, taxes and similar obligations.
4. Transfer operational, access, security and similar provisions to Owner; and remove temporary facilities, tools and similar items.
5. Completion of requirements specified in "Project Closeout" section.
6. Obtain consent of surety for final payment.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Section Includes:
   1. Submittal procedures.
   2. Product Data, Shop Drawings, and Samples.
   3. Assurance/Control submittals.
      a. Certificates.
      b. Manufacturer's installation instructions.
   4. Architect's action.

B. Related Documents: The Contract Documents, as defined in Section 01110 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

1.2 SUBMITTALS

A. Submit two copies of proposed Schedule of Submittals to Contracting Officer Representative within 30 days after receipt of Notice to Proceed. List all items require submittal for review and approval by Contracting Officer.

B. Submit two copies of final Schedule of Submittals to Contracting Officer Representative within 2 days after receipt of proposed Schedule of Submittals review from Contracting Officer.

C. Submit schedule on Contracting Officer approved form or on a U.S. Postal Service form provided to Contractor by Contracting Officer Representative.

D. Schedule of Submittals: Include the following.
   1. Indicate type of submittal; product data, shop drawing, sample, certificate, or other submittal.
   2. Identify by Specification Section number, Specification paragraph number where item is specified, and description of item being submitted.
   3. Indicate scheduled date for initial submittal, date for approval, and date for possible resubmittal for each submittal.

E. Coordinate Schedule of Submittals with Construction Schedule. Revise and update Schedule of Submittals when required by changes in the Construction Schedule. Provide Contracting Officer Representative with updated schedules within 2 days of date schedule is revised.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with Contracting Officer accepted form. Submit 3 copies of each transmittal.

B. Sequentially number transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Lessor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to comply with scheduling requirements of Construction Schedule

F. For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.

G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

H. Provide space for Contractor and Architect of Record review stamps.

I. Revise and resubmit, identify all changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with provisions.

K. Submittals not requested will not be recognized or processed.

1.4 PRODUCT DATA

A. Product data includes printed information such as catalog cuts, manufacturer's published instructions, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, performance curves and other similar items.

A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by Contracting Officer Representative and Architect of Record.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

C. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.5 SHOP DRAWINGS

A. Submit in the form of one reproducible transparency and one opaque reproduction.

B. Shop Drawings: Submit for review. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above.

C. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.5 SAMPLES

B. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

C. Submit samples of finishes in colors selected, textures, and patterns for Contracting Officer selection.

D. Include identification on each sample, with full Project information.

E. Submit the number of samples specified in individual specification sections; one of which will be retained by the Contracting Officer.

1.6 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer to Contracting Officer, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Contracting Officer.

1.7 MANUFACTURER INSTALLATION INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Contracting Officer Representative in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.8 CONTRACTING OFFICER ACTION

A. For submittals where action and return is required or requested, Contracting Officer Representative will review each submittal, mark to indicate action taken, and return promptly; generally within 10 calendar days from date of receipt.
   1. Compliance with specified characteristics is the Lessor's responsibility.
   2. Submittals for information, closeout documents, record documents and other submittals for similar purposes, no action will be taken.

B. Action Stamp: Architect of Record will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken.
   1. "Accepted": Final Unrestricted Release. Where submittals are marked "Accepted", that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
   2. "Accepted as Noted": Final-But-Restricted Release. When submittals are marked "Accepted as Noted", that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
   3. "Rejected: Submit Specified Item" or "Revise and Resubmit": Returned for Resubmittal. When submittal is marked "Rejected: Submit Specified Item", "Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
      a. Do not permit submittals marked "Rejected: Submit Specified Item" or "Revise and Resubmit," to be used at the Project site, or elsewhere where Work is in progress.
   4. "Returned - Not Required": Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Returned - Not Required".

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400

QUALITY CONTROL SERVICES

1. GENERAL

1.1 DESCRIPTION

A. Quality control services include inspections and tests performed by independent agencies and governing authorities.

B. Inspection and testing services are intended to determine compliance of the work with requirements specified.

C. Specific quality control requirements are specified in individual specification sections.

1.2 RESPONSIBILITIES

A. Quality control services are the Owner's responsibility, including those specified to be performed by an independent agency.

B. The Owner shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

C. Where results of inspections or tests do not indicate compliance with contract document, retests are the Contractor's responsibility.

D. The Contractor shall cooperate with independent agencies performing inspections or tests. Provide auxiliary services as are reasonable. Auxiliary services include:
   1. Provide access to the work.
   2. Assist taking samples.
   3. Deliver samples to test laboratory.

1.3 COORDINATION

A. The Contractor and independent test agencies shall coordinate the sequence of their activities. Avoid removing and replacing work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections and tests.

1.4 QUALIFICATIONS FOR SERVICE AGENCIES

A. Engage inspection and test service agencies which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories.

B. Each agency shall be employed with the approval of the Architect/Engineer.

1.5 SUBMITTALS

A. Notify the Architect/Engineer of the testing schedule.

B. The quality control agency shall submit a certified written report of each inspection test or similar service, in duplicate to the Architect/Engineer. Submit additional copies of each report to governing authority, when the authority so directs and directed to do so by the Owner.

1.6 REPORT DATA

A. Written inspection or test reports shall include:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples, tests or inspections.
3. Names of individuals present.
4. Complete inspection or test data.
5. Test results.
6. Interpretations.
7. Recommendations.

B. Reports shall be provided to the Architect/Engineer in a timely manner.

C. Testing required by the Specifications includes, but is not limited to, the following.
1. Material gradations and Compaction – 02200, 1.06.
2. Timber Piles – 02459, 3.3.
3. Cast in Place Concrete – 03300, 3.15.

1.7 REPAIR AND PROTECTION

A. Upon completion of inspection or testing repair damaged work and restore substrates and finishes. Comply with requirements for "Cutting and Patching".

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES

1. GENERAL

1.1 DESCRIPTION OF REQUIREMENTS: Provide temporary services and facilities ready for use when first needed to avoid delay in the work. Maintain, expand and modify as needed. Do not remove until no longer needed, or replaced by authorized use of permanent facilities.

1.2 USE CHARGES: Usage charges for temporary services or facilities are not chargeable to the Owner or Architect/Engineer.

1.3 REGULATIONS: Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities.

1.4 STANDARDS: Comply with the requirements of NFPA Code 241, "Building Construction and Demolition Operations", the ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and the NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services".

1.5 INSPECTIONS: Inspect and test each service before placing temporary utilities in use. Arrange for inspections and tests by governing authorities, and obtain certifications and permits for use.

1.6 SUBMITTALS: Submit copies of reports and permits required or necessary for installation and operation, including reports of tests, inspections and meter readings performed on temporary utilities, and permits and easements necessary for installation, use and operation.

1.7 MATERIALS AND EQUIPMENT

A. Provide materials and equipment that are suitable for the intended use.

B. Provide new materials and equipment for temporary services and facilities; if acceptable to the Architect/Engineer, used materials and equipment that are undamaged may be used.

1.8 INSTALLATION

A. Use qualified tradesmen for installation.

B. Locate temporary services and facilities where they will serve the project adequately and result in minimum interference with the work.

1.9 TEMPORARY UTILITY INSTALLATION

A. Engage, or make arrangements if necessary with, the local utility company to make connections to existing service.

B. Arrange with the companies and existing users for an acceptable time when service can be interrupted to make connections.

C. Establish a service implementation and termination schedule. As early as possible change to use of permanent service, to enable removal of the temporary utility and eliminate possible interference with completion of the work.

D. Provide adequate capacity at each stage of construction. Prior to availability at the site, provide, trucked-in services for start up of construction operations.

E. Obtain and pay for easements required to bring temporary utilities to the site, where the Owner's easement cannot be utilized for that purpose.

1.10 ELECTRIC POWER SERVICE

A. Coordinate with Owner to use existing electrical service during construction.

B. Comply with applicable requirements of NEMA, NECA and UL standards and governing regulations.

C. Install temporary lighting of adequate illumination levels to perform the work specified.

D. Comply with NEC pertaining to installation of temporary wiring service and grounding. Provide meters, transformers, and overcurrent protective devices at main distribution panel for power and light circuitry. Provide disconnects for equipment circuits.

1.11 POWER DISTRIBUTION SYSTEM

A. Provide circuits of proper sizes, characteristics, and ratings for each use indicated.

B. Install wiring overhead, and risers vertically where least exposed to damage.

C. Provide rigid steel conduit to protect wiring on grade, floors, decks or other areas exposed to possible damage.

D. Provide 20 amp, 4-gang receptacle outlets, equipped with ground-fault circuit interrupters, reset button and pilot light, spaced that a 100 foot extension cord can reach each area of work. Use only grounded extension cords; use "hard- service" cords where exposed to abrasion and traffic.

E. Provide warning signs at power outlets that are other than 110/120 volt. Provide outlets of proper NEMA configuration to prevent insertion of 110/120 volt plugs into higher voltage outlets.

1.12 TEMPORARY LIGHTING

A. Provide general service incandescent lamps of wattage required for adequate illumination.

B. Protect lamps with guard cages or tempered glass enclosures, where exposed to breakage.

C. Provide exterior type fixtures where exposed to weather or moisture.

D. Provide one 200-watt incandescent lamp per 1000 square feet of floor area for general construction lighting, one 100-watt incandescent lamp every 50 feet in corridors, and one lamp per story, located to illuminate each landing and flight in stairways.

E. Install temporary lighting to fulfill security and protection requirements, without having to operate the entire temporary lighting system.

1.13TEMPORARY TELEPHONES

A. Install telephone for each temporary office and first aid station.

B. At each telephone location post a list of operational and emergency telephone numbers.

1.14 TEMPORARY HEAT

A. Provide temporary heat where needed for performance of work, for curing or drying of recently installed work or for protection of work in place from adverse effects of low temperatures or high humidity.

B. Provide UL or FM tested and labeled heating units known to be safe and without adverse effect upon work in place or being installed. Coordinate with ventilation requirements to produce the ambient condition.

C. Maintain a minimum temperature of 45 deg. F (7 deg. C) in permanently enclosed portions of the building and areas where finished work has been installed.

D. Except where use of the permanent heating system is available and authorized, provide properly vented self-contained LP gas or fuel oil heaters with individual space thermostatic control for temporary heat. Do not use open burning or salamander type heating units.

1.15 FIELD OFFICES

A. Provide standard prefabricated or mobile units, or the equivalent job-built field offices of sufficient size to accommodate required office personnel at the site.

B. Provide insulated, weathertight units with lockable entrances.

C. Provide vented space heater, capable of maintaining an indoor temperature of 68 deg. F (20 deg. C).

1.16 SANITARY FACILITIES

A. Sanitary facilities include temporary toilets.

B. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities.

C. Supply toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility. Provide covered waste containers for used material.

D. Install single occupant self-contained toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with glass fiber reinforced polyester shell. Use of pit-type privies will not be permitted.

E. Provide separate toilet facilities for male and female construction personnel.

F Provide drinking water fountains where and when piped potable water, approved by local authorities, is reasonably accessible from permanent or temporary lines. Otherwise, provide containerized tap-dispenser bottled-water type drinking water units.

1.17 FIRST AID SUPPLIES: Comply with governing regulations and recognized recommendations within the construction industry.

1.18 DEWATERING FACILITIES AND DRAINS

A. For temporary drainage and dewatering facilities and operations not directly associated with performance of work included under other sections, comply with dewatering requirements of applicable Division-2 sections. Where feasible, utilize the same facilities.

B. Maintain the site, excavations and construction free of water.

C. Dispose of rainwater in a lawful manner which will not result in flooding and project or adjoining property, nor endanger either permanent work or temporary facilities.

1.19 TEMPORARY ENCLOSURE

A. Provide temporary enclosure of materials, equipment, work in progress and completed portions of the Work to provide protection from exposure, foul weather, other construction operations, and similar activities.

B. Provide enclosures where temporary heat is needed and the permanent building enclosure is not completed, and there is no other provision for containment of heat. Coordinate with ventilating and material drying or curing requirements to avoid dangerous conditions.

C. Provide temporary enclosures by installing waterproof, fire- resistant, UL labeled tarpaulins with a flame-spread rating of 15 or less, using a minimum of wood framing. Use translucent nylon reinforced laminated polyethylene tarpaulins to admit the maximum amount of daylight. Individual openings of 25 square feet or less may be closed with plywood or similar materials.

D. Close openings through the floor or roof decks and other horizontal surfaces with substantial load-bearing wood-framed or similar construction.

1.20 COLLECTION AND DISPOSAL OF WASTES

A. Establish a system for daily collection and disposal of waste materials. Do not hold collected materials longer than 7 days.

B. Handle waste materials that are hazardous, dangerous, or unsanitary separately from other waste by containerizing.

C. Burying or burning of waste materials on the site or washing waste material down sewers will not be permitted.

1.21 MISCELLANEOUS SERVICES AND FACILITIES

A. Design, construct, and maintain miscellaneous services and facilities as needed to accommodate performance of the work, including temporary stairs, ramps, ladders, staging, shoring, scaffolding, temporary partitions, waste chutes and similar items.

1.22 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Provide a neat and uniform appearance in security and protection facilities acceptable to the Architect/Engineer and the Owner.

B. Maintain site in a safe, lawful and publicly acceptable manner.

C. Take necessary measures to prevent erosion.

D. Except for utilization of permanent fire protection facilities, as soon as available, do not change over to use of permanent facilities until substantial completion.

1.23 TEMPORARY FIRE PROTECTION

A. Until fire protection needs may be fulfilled by permanent facilities, install and maintain temporary fire protection of the types needed to protect against losses.

B. Comply with recommendations of NFPA Standard 10.

C. Locate fire extinguishers where most effective; provide not less than one on each floor at or near each stairwell.

D. Provide type "A" fire extinguishers for temporary offices and spaces where there is minimal danger of electrical or flammable liquid fires, and type "ABC" dry chemical extinguishers elsewhere.

E. Store combustible materials in containers in fire-safe locations.

F. Review fire prevention and protection needs with local fire department officials and establish procedures to be followed in the event of fire. Instruct personnel in procedures and post warnings and information.

G. Maintain unobstructed access to fire extinguishers, temporary fire protection facilities, stairways and other access routes.

H. Prohibit smoking in hazardous areas.

I. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of ignition.

J. At temporary water outlets provide hoses of sufficient length to reach construction areas. Hang hoses with a warning sign, indicating that hoses are for fire protection purposes and are not to be removed.

K. At the earliest feasible date complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel at the site on how to use facilities which may not be self-explanatory.

1.24 BARRICADES, WARNING SIGNS AND LIGHTS

A. Comply with recognized standards and code requirements for erection of substantial, barricades where needed to prevent accidents.

B. Paint with appropriate colors and warning signs to inform personnel at the site and the public, of the hazard being protected against.

C. Provide lighting where needed, including flashing red lights where appropriate.

1.25 SECURITY ENCLOSURE AND LOCKUP: Where materials and equipment must be temporarily stored, and are of substantial value or attractive for possible theft, provide a secure lockup.

1.26 JOB SIGN: Provide and install job sign per detail on Drawing A.8a.

1.27 ENVIRONMENTAL PROTECTION

A. Conduct construction activities, and by methods that comply with environmental regulations, minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result from the performance of work at the site.

B. Avoid the use of tools and equipment which produce harmful noise.

C. Restrict the use of noise making tools and equipment to hours of use that will minimize complaints.

1.28 OPERATION, TERMINATION AND REMOVAL

A. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse. Do not permit temporary installations to be abused or endangered.

B. Operate and maintain temporary services and facilities in good operating condition and in a safe and efficient manner until removal is authorized. Do not overload services or facilities. Protect from damage by freezing temperatures and similar elements.

C. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

D. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24- hour basis where required to achieve indicated results and avoid the possibility of damage to the Work or to temporary facilities.

E. Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation.

F. Remove each temporary service and facility promptly when need has ended, or when replaced by use of a permanent facility, but no later than substantial completion. Complete, or, if necessary, restore permanent work delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces and replace work which cannot be repaired.

G. At substantial completion, clean and renovate permanent services and facilities that have been used to provide temporary services and facilities during the construction period.

END OF SECTION

SECTION 01631

PRODUCTS AND SUBSTITUTIONS

1. GENERAL

1.1 PROCEDURAL REQUIREMENTS

A. Source Limitations:

1. To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work. Where it is not possible to do so, match separate procurements as closely as possible.

2. To the extent that the product selection process is under the Contractor's control, provide products that are compatible with previously selected products.

3. Where standard products are available that comply with specified requirements, provide those standard products that have been used successfully before in similar applications, and that are recommended by the manufacturers for the applications indicated.

1.2 PRODUCT SELECTION LIMITATIONS

A. Product Selections: Comply with the following requirements in the selection of products, materials and equipment:

1. Single Product Name: Where only a single product or manufacturer is named, provide the product, unless it is not available, is incompatible with existing work, or does not comply with specified requirements or governing regulations.

2. Two or More Products Named: Where two or more products or manufacturers are named, the selection is at the Contractor's option, provided the product selected complies with specified requirements.

3. "Or Approved Equal" Provisions": Where products or manufacturers are specified by name accompanied by the term "or approved equal", provide either the product named, or comply with the requirements for gaining approval of "substitutions" for the use of an unnamed product.

4. Compliance with Standards: Where the specifications require only compliance with an imposed standard, code or regulation, the Contractor has the option of

selecting any product that complies with specified requirements provided no product names are indicated.

5. Performance Requirements: Where the specifications require compliance with indicated performance requirements, the Contractor has the option of selecting any product that complies with the specific performance requirements, provided no product names are indicated.

6. Visual Requirements: Where the specifications indicate that a product is to be selected from the manufacturer's standard options, without naming the manufacturer, the Architect/Engineer has the option of making the selection, after the Contractor has determined or selected the manufacturer.

B. Nameplates: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project.

1.3 SUBSTITUTIONS

A. Conditions: The Contractor's requests for substitutions will be considered when they are reasonable, timely, fully documented, and when they qualify under one or more of the following circumstances.

1. The proposed substitution is related to an "or approved equal" or similar provision in the contract documents.

2. The required product cannot be supplied in time for compliance with Contract Time requirements.

3. The required product is not acceptable to governing authorities.

4. The required product cannot be properly coordinated with other materials in the work, or cannot be warranted or insured as specified.

5. The proposed substitution will offer a substantial advantage to the Owner after deducting offsetting disadvantages including delays, additional compensation to the Architect/Engineer for redesign, evaluation and other necessary services, and similar considerations.

B. Submittals: Include the following information, as appropriate, in each request for substitution:

1. Provide complete product documentation, including product data and samples, where appropriate.

2. Provide detailed performance comparisons and evaluation, including testing laboratory reports where applicable.

3. Provide coordination information indicating the effect of the substitution on other work and the time schedule.

4. Provide cost information for the proposed change order.

5. Provide the Contractor's general certification of the recommended substitution.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Receive, store and handle products, materials and equipment in a manner which will prevent loss, deterioration and damage.

B. Schedule deliveries so as to minimize long-term storage at the project site.

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

1. GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Provisions of this section apply to the procedural requirements for the actual closeout of the Work, not to administrative matters such as final payment or the change over of insurance.

B. Closeout requirements relate to both substantial and final completion of the Work; they also apply to individual portions of completed work as well as the total Work.

C. Specific requirements contained in other sections have precedence over the general requirements contained in this section.

1.2 PROCEDURES AT SUBSTANTIAL COMPLETION

A. Prerequisites: Comply with General Conditions and complete the following before requesting Architect's/Engineer's inspection of the Work, or a designated portion of the Work, for certification of substantial completion.

1. Submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates and similar required documentation for specific units of work, enabling owner's unrestricted occupancy and use.

2. Submit record documentation, maintenance manuals, tools, spare parts, keys and similar operational items.

3. Complete instruction of Owner's operating personnel, and start-up of systems.

4. Complete final cleaning, and remove temporary facilities and tools.

B. Inspection Procedures:

1. Upon receipt of Contractor's request, Architect/Engineer will either proceed with inspection or advise Contractor of prerequisites not fulfilled.

2. Following initial inspection, Architect/Engineer will either prepare certificate of substantial completion, or advise Contractor of work which must be performed prior to issuance of the certificate of substantial completion.

3. The Architect/Engineer will repeat the inspection when requested and assure that the Work has been substantially completed.

4. Results of the completed inspection will form the initial "punch-list" for final acceptance.

1.3 PROCEDURES AT FINAL ACCEPTANCE

A. Reinspection Procedure:

1. The Architect/Engineer will reinspect the Work upon receipt of the Contractor's notice that, except for those items whose completion has been delayed due to circumstances that are acceptable to the Architect/Engineer, the Work has been completed, including punch-list items from earlier inspections.

2. Upon completion of reinspection, the Architect/Engineer will either recommend final acceptance and final payment, or will advise the Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, this procedure will be repeated.

1.4 RECORD DOCUMENTATION

A. Record Drawings:

1. Maintain a complete set of either blue- or black-line prints of the contract drawings and shop drawing for record mark-up purposes throughout the Contract Time.

2. Mark-up these drawings during the course of the work to show both changes and the actual installation, in sufficient detail to form a complete record for the Owner's purposes. Give particular attention to work which will be concealed and difficult to measure and record at a later date, and work which may require servicing or replacement during the life of the project.

3. Require the entities marking prints to sign and date each mark-up.

4. Bind prints into manageable sets, with durable paper covers, appropriately labeled.

B. Maintenance Manuals:

1. Provide 3-ring vinyl-covered binders containing required maintenance manuals, properly identified and indexed.

2. Include operating and maintenance instructions extended to cover emergencies, spare parts, warranties, inspection procedures, diagrams, safety, security, and similar appropriate data for each system or equipment item.

1.5 GENERAL CLOSEOUT REQUIREMENTS

A. Operator Instructions: Require each Installer of systems requiring continued operation and maintenance by owner's operating personnel, to provide on-location instruction to Owner's personnel, sufficient to ensure safe, secure, efficient, non-failing utilization and operation of systems. Provide instructions for the following categories of work:

1. Mechanical/electrical/electronic systems (not limited to work of Divisions 15 and 16).
2. Live plant materials and lawns.
3. Roofing, flashing, joint sealers.
4. Floor finishes.

B. Final Cleaning: At the time of project close out, clean or reclean the Work to the condition expected from a normal, commercial building cleaning and maintenance program. Complete the following cleaning operations before requesting the Architect/Engineer's inspection for certification of substantial completions.

1. Remove non-permanent protection and labels.
2. Polish glass.
3. Clean exposed finishes.
4. Touch-up minor finish damage.
5. Clean or replace mechanical systems filters.
6. Remove debris.
7. Broom-clean unoccupied spaces.
8. Sanitize plumbing and food service facilities.
9. Clean light fixtures and replace burned-out lamps.
10 Sweep and wash paved areas.
11. Police yards and grounds

END OF SECTION

SECTION 02100 - EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200
B. Contract Drawings

1.03 DESCRIPTION OF WORK:

A. The Contractor shall provide all materials, equipment, and labor necessary for the diversion of surface water from the construction area and provision of temporary and permanent erosion and sedimentation control structures and measures as shown on the plans and set forth in these Specifications, and as designated in the "Erosion and Sediment Control Plan" as shown on the Contract Drawings.

B. The Contractor shall be responsible for maintaining, repairing and all other work necessary to stabilize the site until final completion of the site and completion of the warranty period. This shall be inclusive of repairs due to storm events.

1.04 EROSION AND SEDIMENTATION CONTROL GUIDELINES:

A. Cumberland County Soil & Water Conservation District, Department of Environmental Protection publication dated March, 2003, "Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices".

1.05 CONFORMANCE WITH ENVIRONMENTAL LICENSING REQUIREMENTS:

A. All construction under this project shall be subject to review and/or inspection by local, State, and Federal agencies for the adequacy of erosion and sedimentation control measures. The Contractor shall conform to the conditions of environmental permits or licenses which are applicable to the project.

1.06 SUBMITTALS:

A. Prior to installation, the Contractor shall submit two copies of manufacturer's specifications with application and installation instructions for proprietary materials and items, including silt fencing, erosion control mesh, and others as requested by the Engineer.

PART 2 - MATERIALS

2.01 GENERAL: Seed, fertilizer and lime shall be as specified under Erosion Control Notes provided on Contract Drawings.

2.02 MULCH: Mulch shall meet the requirements of Maine Department of Transportation (MDOT) Standard Specification, Section 619.

2.03 SILTATION FENCE/EROSION CONTROL MIX:

A. Siltation Fence: Fencing shall be "Propex Silt Stop" as manufactured by Amoco Fabrics Company or Engineer approved equal.

B. Support Fence: Siltation fabric shall be attached to metal or wooden posts. Fence with an integral support mesh and posts may be used.

C. Erosion control mix shall be R.C.S., Inc., or Engineer approved equal.

1. Erosion control mix may be used in place of or with siltation fence where shown on plans.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS:

A. Prior to grubbing, stripping, excavation, placement of fill, temporary or permanent placement of excavated materials, or other earthwork within the limits of this Contract, the Contractor shall implement erosion and sedimentation control measures as specified and/or as shown on the drawings. This includes the construction of a construction entrance/exit as indicated on the drawings.

B. Temporary measures for controlling erosion and sedimentation may include, but are not limited to, the following:

1. Siltation fencing around the downslope periphery of areas to be disturbed by construction.

2. Temporary seeding and mulching of soil stockpiles or disturbed areas.

3. Other temporary practices as approved by the Engineer.

C. Permanent measures for controlling erosion and sedimentation shall be provided as shown on the plans or required by these Specifications.

D. Where disturbed areas cannot be permanently stabilized within 14 days of exposure of the soil, the areas shall be temporarily seeded and mulched as specified in the Erosion and Sedimentation Control Plan provided on the Contract Drawing and is approved by the Engineer and necessary to stabilize the site.

E. Permanent soil stabilization measures for all slopes, channels, ditches, or any disturbed land area shall be completed within 7 calendar days after final grading has been completed. Where such permanent erosion control measures are not possible or practical to implement, and upon approval by the Engineer, temporary stabilization practices shall be applied as in 3.01.D above.

F. All temporary and permanent control measures shall be periodically inspected and maintained by the Contractor for the duration of the construction and warranty period of this Contract. Sediment collection devices shall be cleaned periodically as required, and the removed material reused or disposed of at an approved disposal area.

3.02 DIVERTING SURFACE WATER:

A. Build, maintain, and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protection works needed to divert streamflow and other surface water through or around the construction site and away from the construction work while construction is in progress.

B. Outlet diverted stormwater to sedimentation trap or basin or other approved sedimentation control measure.

3.03 SILTATION FENCE/EROSION CONTROL MIX:

A. Construct siltation fences/erosion control mix at the locations and to the dimensions shown on the Drawings, and as required to meet specified criteria.

B. Prior to removal of the silt fence, all retained soil or other material shall be removed and disposed of at an approved disposal area.

3.04 CATCH BASIN PROTECTION:

A. Construct hay bale dikes and install silt sacks at all catch-basins. Monitor, maintain and repair all hay bale dikes and silt sacks.

3.05 REMOVAL OF TEMPORARY WORKS:

A. Upon completion of all work, Contractor shall remove to level and grade to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

END OF SECTION

SECTION 02110 - SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Erosion & Sedimentation Control: Section 02100
B. Contract Drawings

1.03 DESCRIPTION OF WORK:

A. Extent of site clearing is shown on drawings and required to complete site improvements within the limits of construction. The Site Contractor shall be responsible for all other clearing and demolition required to complete the work as shown on the drawings.

B. Site clearing work includes, but is not limited to:

1. Strip topsoil and stockpile on site.

C. Erosion & Sedimentation Control.

1.04 JOB CONDITIONS:

A. Protection of Existing Improvements: Protect existing improvements not indicated to be removed on adjoining properties and on Owner's property. Restore damaged improvements to their original condition, as acceptable to the Engineer.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 SITE CLEARING

A. General: Remove vegetation, improvements and obstructions interfering with new construction within limits designated on drawings. Remove such items elsewhere on site as specifically indicated.

Coordinate work to maintain access and operations of existing building on abutting property. Contractor is responsible for coordination with existing building owner and occupant to ensure operations are not impeded by construction.

B. TOPSOIL

1. Definition: Topsoil is defined as friable loam surface soil found in a depth of not less than 4" from the original ground surface. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 1" in diameter, and without weeds, roots, and other objectionable material.

2. Strip topsoil within limits designated on drawings to whatever depths encountered in a manner to prevent mixing with underlying subsoil or objectionable material. Remove stripped topsoil from the site, screen and reuse for onsite areas to be revegetated. Supplement with new topsoil as necessary.

D. Removal of Improvements: Remove and replace existing improvements as necessary to complete the work, unless otherwise indicated.

END OF SECTION

SECTION 02150 - SHORING AND BRACING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:

A. Earthwork: Section 02200

1.03 SUMMARY OF WORK:

A. Work included:

Shoring and bracing necessary to protect existing buildings, utilities, and other improvements and excavation against caving; and to meet OSHA safety requirements of shoring and bracing. Shoring and bracing to provide cofferdams. Removal of bracing, as required.

B. Shoring and bracing systems include, but are not limited to, the following:

Steel sheet piling
Movable box

C. Steel sheet piling: Provide steel sheet piling, to be removed following completion of Work, where required to complete the work or where directed by the Site Engineer. Payment will be incidental to installation of piping, manholes and site/building construction.

Steel sheet piling may be left in place at the Contractor's option if approved by the Site Engineer. No additional payment will be made for this piling.

No payment will be made for steel sheet piling used for the Contractor's convenience.

D. Movable box: Provide where a shoring system is required but sheet piling is not called for. Cost of movable box system is incidental to other work items.

1.04 QUALITY ASSURANCE:

A. Design: Assign design of shoring and bracing to a registered Professional Professional Engineer.

B. Regulations: Comply with local codes and OSHA requirements.

1.05 SUBMITTALS:

A. Design Documents: Submit design calculations and drawings for shoring and bracing system and other data prepared and sealed by a registered Professional Site Engineer, prior to commencing work on any built in place shoring and bracing system.

1.06 JOB CONDITIONS:

A. Before starting work, check and verify governing dimensions and elevations. Survey condition of adjoining properties with Site Engineer. Take photographs, recording any prior settlement or cracking of structures, pavements and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor, Site Engineer and others conducting the investigation.

B. Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations. Locate datum level used to establish benchmark elevations sufficiently distant so as not to be affected by excavation operations.

C. During excavation, resurvey benchmarks weekly, employing licensed Land Surveyor or registered Professional Site Engineer. Maintain accurate log of surveyed elevations for comparison with original elevations. Notify Site Engineer if changes in elevations occur or if cracks, sags or other damage is evident.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Provide suitable shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.

B. Steel sheet piling and shapes (corners, etc.): Continuous interlocking type; section modules and type of section as required by design.

C. Bracing members: Wood timbers or A36 steel members.

D. Bolts: ASTM A307.

PART 3 - EXECUTION

3.01 GENERAL:

A. Provide system to resist earth and hydrostatic pressures, including surcharges from surface loads.

B. Locate shoring and bracing to clear permanent construction and to permit forming and finishing of concrete.

C. Maintain shoring and bracing while excavation is open.

D. Removal of systems: Remove systems in stages to prevent disturbance of soils and damage to structures and improvements. Fill voids as soon as sheeting is withdrawn.

3.02 STEEL SHEET PILING AND BRACING:

A. Drive sheet piling prior to excavation where possible. Fill and compact voids outside sheeting to hold sides of excavation in place.

B. Brace as required to prevent distortion of piling and other bracing members. If necessary to move a brace, install new bracing prior to removal of original brace.

C. Cut off sheet piling to be left in place at least two feet below finish grade.

END OF SECTION

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK IN OTHER SECTIONS:

A. Site Clearing: Section 02110
B. Shoring and Bracing: Section 02150
C. Erosion and Sedimentation Control: Section 02100
D. Contract Drawings
E. Geotechnical Report – Sebago Technics, Inc.
F. Ash Handling and Disposal Plan – Sebago Technics, Inc.

1.03 SUMMARY OF WORK:

A. Work included: All excavating, saw cutting, traffic control, coordination of work, compaction of materials, rough and finish grading, backfilling, removal of materials, general conditions, all work specified in this section and all other work required to complete the project that is not specified under other related work sections. Contractor is responsible for coordination work in a manner that does not impact access to the existing residential building abutting this project. Contractor shall coordinate with the owner and occupants of the building to insure construction activities do not adversely impact existing access. Work also includes frost protection and building slab preparation per requirements of the Sebago Technics, Inc. Geotechnical Report.

1.04 PROTECTION:

A. Paved surfaces: Do not operate equipment on paved surfaces which will damage these surfaces. If surfaces are damaged contractor shall repair to the engineers/owners satisfaction.

B. Maintain excavations with approved barricades, lights and signs to protect life and property until excavation is filled and graded to a condition acceptable to the Site Engineer.

C. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.05 QUALITY ASSURANCE:

A. Standards:

"Standard Specification for Highways and Bridges" revision of December, 2002, Maine Department of Transportation (abbreviated as MDOT "Standard Specification").

B. Testing and Inspection: Contractor will pay for all aggregate gradation testing and moisture maximum density tests and field compaction tests. Approximately one test per 5000 square feet on paved surface area. Testing shall be completed by an independent laboratory approved by the Engineer.

1.06 SUBMITTALS:

A. Test Reports: Submit the following:

1. Reports on material gradations.
2. Compaction tests.

1.07 JOB CONDITIONS:

A. Site Information: The underground utilities shown were derived from topographical survey and original site drawings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. The site has known ash materials within the subsoils and a Geotechnical Report and an Ash Handlind and Disposal Plan has been prepared by Sebago Technics, Inc. for Shalom House, Inc. and is appended to these specifications. The contractor shall comply with the requirements of the Geotechnical Report and Ash Plan. The contractor shall note that the site design plan details exceed the geotechnical recommendations in some instances (i.e. thickness of gravel subbase and base conditions.) and shall be adhered to by the contractor. The Contractor shall be responsible for any interpretations drawn from the geotechnical report. The Geotechnical report is provided for the contractor's convenience and for general informational purposes. Any conclusions drawn from the report or variations in site conditions from the geotechnical borings and information provided in the report shall be the contractor's responsibility to address during construction. No extra payment will be made to the contractor.

PART 2 - MATERIALS

2.01 MATERIALS:

A. General

1. Suitable materials: As shown on the Drawings or as specified.

2. Unsuitable materials: Material containing excessive plastic clay, vegetation, organic matter, debris, pavement, stones or boulders over 6 inches in greatest dimension, and frozen material. Material which, in the opinion of the Site Engineer, will not provide a suitable foundation or subgrade.

3. On-Site Material: Any suitable material from on-site excavation.

4. Material for embankments and general fills may contain pieces of excavated ledge having a greatest dimension of up to 12 inches if approved by the Site Engineer.

5. Testing: The Engineer may inspect off-site sources of materials and order tests of these materials to verify compliance with these specifications. Provide a gradation analysis on any imported material or material processed on site.

B. Base and Subbase:

1. Aggregate Subbase Material: Shall meet the requirements of Maine Department of Transportation Standard Specifications Section 703.06(b), Type D.

2. Aggregate Base Materials: Shall meet the requirements of MDOT Standard Specifications Section 703.06(a), Type A.

C. Sand: Sieve analysis by weight:

Sieve Size	Max % Passing by Weight
3/8"	100
No. 4	95 – 100
No. 16	50 - 85
No. 100	2 - 10

D. Foundation Backfill: Sieve analysis by weight:

Sieve Size	Max % Passing by Weight
3"	100
No. 40	0 – 70
No. 200	0- 10

E. Building Slab Structural Backfill: Sieve analysis by weight:

Sieve Size	Max % Passing by Weight
3"	100
1/4"	0 - 70
No. 200	0 - 10

F. 3/4" Crushed Stone: Durable, clean angular rock fragments obtained by breaking and crushing rock material. 3/4" crushed stone for underdrain shall be durable, washed angular rock fragments. Sieve analysis by weight.

Sieve Size	Max % Passing by Weight
1"	100
3/4"	95 – 100
1/2"	35 - 70
3/8"	0 - 25

E. Gravel Borrow Material: MDOT Specification 703.20.

F. Common Borrow: Earth suitable for embankment construction free from frozen material, perishable rubble, peat and other unsuitable material.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. General: Remove all materials encountered to the limits shown on the drawings, or designated in the Specifications.

B. Classifications:

1. The following classifications of excavation may be made which will be paid for on a unit cost basis:

   a. Rock and Boulder Excavation
   b. Ash material known to be on-site

2. Excavation below normal grade due to site conditions shall be considered part of the contractors bid. No extra payment will be made.

C. Earth Excavation: Removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be

demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

D. Excavation for Structures:

1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

2. In excavating for footings and foundations, take care not to disturb bottom of excavation. Final excavation to subgrade level in the silty clay shall be made with excavation equipment fitted with smooth edged bucket. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work. Any loose, softened or disturbed material due to construction traffic or replacement of reinforcement shall be removed prior to placement of concrete. Refer to Geotechnical Report for additional requirements.

E. Rock Excavation if Encountered:

1. Removal and disposal of materials that cannot be excavated without drilling and blasting, or requiring use of special equipment, except such materials that are classed as earth excavation.

2. Typical materials classified as rock are solid rock, rock in ledges, and rock-hard cementitious aggregate deposits two cubic yards or more in volume.

3. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

4. Rock excavation does not include:

a. Removal of material which can be removed with a hand pick or power shovel.

b. Loose or previously blasted rock or broken stone in rock fills or elsewhere.

F. Excavation in Paved Areas:

1. Saw cut pavement prior to excavation to provide a clean, uniform edge. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement required to do the work.

2. Use shoring and bracing where sides of excavation will not stand without undermining pavement.

G. Excavation for Trenches:

1. Excavate to widths shown on the Drawings and required to complete the improvements.

2. Produce an evenly graded flat trench bottom at the subgrade elevation required for installation of pipe and bedding material.

3. Load excavated material directly into trucks unless otherwise permitted by the Site Engineer.

4. Place backfill material in lifts directly into trench or excavation. Do not stockpile material to be used as backfill in roadways.

H. Unauthorized Excavation: Removal of materials beyond subgrade elevations or without specific direction of Site Engineer. Unauthorized excavation, as well as remedial work directed by Site Engineer including refilling, is at Contractor's expense.

I. Refilling Unauthorized Excavation:

1. Trenches: Use crushed stone or gravel as directed by Site Engineer.

2. Elsewhere: Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Site Engineer.

J. Excavation of Unsuitable Materials:

1. When excavation has reached required subgrade elevations, notify Site Engineer who will make an inspection of conditions. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper as directed by Site Engineer and replace excavated material with crushed stone and geotextile.

2. Removal of unsuitable material and its replacement as directed will be considered part of the contractors bid. See Ash Handling and Disposal Plan for proper handling of the ash materials.

K. Material Storage:

1. No material storage will be permitted on-site due to space limitations unless expressly approved by the owner.

3.02 BLASTING IF REQUIRED

A. General:

Perform blasting in accordance with the following:

1. "Manual of Accident Prevention in Construction" issued by Associated General Contractors of America, Inc.
2. "Construction Safety Rules and Regulations" as adopted by the State Board of Construction Safety, Augusta, Maine.
3. Section 107.12 of the "Standard Specifications", Maine Department of Transportation.

B. Submit an accurate record on an approved form containing the following information of each blast to the Engineer on a daily basis.

1. General location of blast.
2. Depth and number of drill holes.
3. Type and quantity of explosive used.
4. Time of blast.
5. Seismographic record of each blast taken at nearest structure.

C. Preblast Survey will be done by Site Contractor.

3.03 STABILITY OF EXCAVATIONS

A. General: Slope sides of excavations to comply with OSHA regulations and local codes. Shore and brace where sloping is not possible because of space restrictions or stability to material excavated.

Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

B. Refer to Section 02150 for shoring and bracing requirements.

3.04 DEWATERING:

General: Perform all work in the dry. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Provide and maintain pumps, dewatering system components necessary to convey water away from excavations.

Convey water removed from excavations and rain water to collecting or runoff areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches. Any material removed off site must have erosion control measures compliant with the erosion control plan and BMP's.

3.05 BACKFILL AND FILL:

A. General: Place acceptable soil material in layers to required subgrade elevations.

Fill, backfill and compact to produce minimum subsequent settlement of the material and provide adequate support for the surface treatment or structure to be placed on the material. Place material in approximately horizontal layers of beginning at lowest area to be filled. Do not impair drainage. Refer to Geotechnical Report for additional requirements.

B. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions and deleterious materials from ground surface prior to placement of fills. Scarify surfaces so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

C. Backfill per Geotechnical Report

D. Placement:

1. Place backfill and fill materials in layers not more than 12" in loose depth for material compacted by heavy compaction equipment and not more than 6" in loose depth for material compacted by hand-operated tampers. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Place backfill and fill materials evenly adjacent to structures to required elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.

3. Do not allow heavy machinery within 5 feet of structure during backfilling and compacting.

E. Backfill:

1. Backfill excavations as promptly as work permits, but not until completion of the following:

   a. Acceptance of construction below finish grade including, dampproofing, waterproofing, and perimeter insulation.

   b. Inspection and recording locations of underground utilities.

   c. Removal of concrete formwork.

   d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

   e. Removal of trash and debris.

   f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

   g. Backfill cast-in-place concrete structures when the concrete has developed adequate strength as determined by the Site Engineer.

   h. Use care in backfilling to avoid damage or displacement of underground structures and pipe.

   i. Backfill under all existing utility pipes crossed during construction operations with 3/4" crushed stone. The crushed stone backfill will extend continuously from the bedding of new utility pipes to the utility pipe crossed, including a 6" thick envelope of crushed stone all around the existing utility pipes. Please layer of geotextile at subgrade for all sewer and storm drain trench work.

   j. The 3/4" crushed stone backfill shall stand at its own angle of repose. No "haunching" or "forming" with common fill will be allowed.

F. Backfilling Trenches: See Trench Detail on the drawings.

1. Bed pipe in crushed stone. Limits of bedding and requirements for remaining trench backfill are shown on the Drawings.

G. Replacement of unsuitable materials:

1. Below normal grade: See paragraph 3.01.

2. Above normal grade: Replace unsuitable material approved by the engineer.

3.06 COMPACTION:

A. Methods: Use methods which produce the required degree of compaction throughout the entire depth of material placed without damage to new or existing facilities and which are approved by the Site Engineer. Adjust moisture content of soil as required to achieve specified compaction. Remove and replace material which is too wet to compact to required density. Compact each layer of till and slopes as work progresses.

B. Degree of Compaction: Compact to the following minimum densities:

FILL AND BACKFILL LOCATION	DENSITY
Under structure foundations	95% of max.
Top 2 feet under pavement	95%
Below top 2 feet under pavement	95%
Trenches through unpaved areas	95%
Embankments	95%
Pipe Bedding	95%
Beside structure foundation walls, tank walls, and retaining walls	95%
Under pipes through structural fills	95%

Maximum density: ASTM D1557, modified.

Field density tests: ASTM D1556 (sand cone), ASTM D2167 (rubber balloon), or ASTM D2922 (nuclear methods).

C. Testing:

1. Determine actual in place densities using field tests as directed by the Site Engineer.

D. Minimum Number of Tests:

1. Paved Areas and Building Subgrade: Make at least one field density test of subgrade for every 2000 sq. ft. of paved area or building slab

3.07 GRADING:

A. Grading: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Structure Lines: Grade areas adjacent to structure lines to drain away from structures and to prevent ponding.

C. Finish surfaces free from irregular surface changes, and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below the required subgrade elevations.

2. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than one-half (1/2) inch above or below the required subgrade elevation.

3. Fill Under Slabs: Grade smooth and even, free of voids, compacted as specified and to required elevation. Provide final grades within a tolerance of ½ inch when tested with a 10' straight edge.

D. Compaction: After grading, compact subgrade surfaces to the percentage of maximum density for each area classification.

3.08 MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.09 DISPOSAL OF EXCESS MATERIALS:

A. Removal from Owner's Property:

1. Remove excess excavated material and dispose of it off Owner's property.
2. See Ash Handling and Disposal Plan – Sebago Technics, Inc.

END OF SECTION

SECTION 02459
TIMBER PILES

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. This Section includes timber piles.

B. Related Sections include the following:

1. Division 1 Section "Unit Prices" for a schedule of unit prices.

2. Division 1 Section "Construction Facilities and Temporary Controls."

1.3 UNIT PRICES

A. Basis for Bids: Base bids on number and dimensions of piles indicated from point to cutoff, plus not less than 12" of overlength for cutting piles at required cutoff elevations.

B. Basis for Payment: From data obtained as a result of driving piles, calculate actual total net length of piles used. Contract price per linear foot includes labor, materials, tools, equipment, and incidentals and for performing work for furnishing, driving, cutting off and capping piles. This includes splicing and disposal of cutoffs.

1. Measurements will be based on effective length of piles in place, with lengths measured to nearest 12 inches. Additional payment for lengths in excess of that indicated, and credit for lengths less than that indicated, will be calculated at unit prices stated in the Contract, based on net addition or deduction to total length of piling.

2. Test piles that become part of completed foundation system will be considered as an integral part of the Work.

3. No payment will be made for rejected piles, including piles driven out of place, defective piles, or piles damaged during handling or driving.

1.4 SUBMITTALS

A. General: The Contractor shall submit the information specified herein to the Engineer for review. Unless otherwise specified, submittals shall be made not less than two weeks before the start of the work.

B. Shop Drawings:

1. Shop drawings showing tip and butt diameters and other items pertinent to pile design.

2. A tabular summary of anticipated pile lengths at each column location or other point of support.

C. Manufacturer's literature, including technical and performance literature for pile driving hammer, cushions, and other equipment for piles.

D. Preservative literature, including information for each type of preservative-treated timber product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

E. As-Driven Pile Location Data:

1. Submit pile location within two days after individual pile or group is completed.

2. At the completion of pile driving, submit final as-driven pile location plan, certified by Registered Land Surveyor or Registered Professional Engineer.

1.5 JOB CONDITIONS

A. Site and Subsurface Conditions

1. A geotechnical investigation for the project and site has been prepared by Sebago Technics, Inc. of Westbrook, Maine. Results of the investigation are presented in a report entitled "Report on Subsurface and Foundation Investigation, Proposed Apartments and House, Valley Street, Portland, Maine" dated July 27, 2005, revised November 8, 2005. The report is provided with these specifications for information only and is not part of the Contract Documents.

2. Explorations logs and related information depict subsurface conditions at specific locations and dates indicated. Conditions at other locations at the site may differ from the conditions encountered in the explorations. No claim for extra compensation or extension of time will be allowed on account of actual subsurface conditions inconsistent with the geotechnical information.

3. Contractors bidding the project must read the geotechnical investigation report and must visit the site to observe the current condition of the site prior to submitting a bid. No bids will be accepted from a Contractor unless he affirms, in writing, that he has read the geotechnical report and visited the site.

4. Soil samples recovered from the geotechnical investigation borings may be viewed at the office of Sebago Technics, Inc, One Chabot Street, Westbrook, Maine (tel. 207.856.0277). Appointments to view the soil samples should be made at least two business days in advance.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing piling similar in material, design, and extent to that indicated for this Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver piles at times and in sequence to assure continuity of pile driving.

B. Piles shall be handled, transported, stacked and protected to prevent damage.

1.8 LINES AND GRADES

A The Contractor shall stake the pile locations and establish all elevations required. A baseline and benchmark located on or close to the site will be provided by the Owner. The Contractor shall be responsible for the maintenance and protection of the baseline and benchmark, and all pile location stakes.

B. The Contractor shall employ or engage a licensed Registered Land Surveyor or a Registered Civil Engineer, familiar with pile installation, who shall establish lines and levels. The Contractor shall be responsible for the correct location of piles, as well as keeping up-to-date records of the amount of uplift of individual piles, and establishing actual pile locations. Locations of the centers of as-driven piles shall be shown on a drawing in relation to the design location and submitted to the Engineer within two days after the individual pile or pile group is completed. Drawings shall include the following:

1. Column lines and north arrow.

2. Each pile by a separate number.

3. Elevation of each top of pile prior to cutting, to nearest 0.1 foot.

4. Deviation in inches, to the nearest one-fourth inch, from plan location at cutoff elevation.

C. Within two weeks after completion of all pile driving, the Contractor shall provide the Engineer with a plan, certified by said Surveyor or Engineer, showing the as-driven location of all piles.

PART 2 - PRODUCTS

2.1 TREATED TIMBER PILES

A. Timber piles shall be Southern Yellow Pine of Douglas Fir. Each pile shall be in one piece cut from a sound live tree, free from any defects that will impair its strength and durability. All piles shall be butt-cut above the ground swell, shall have substantially uniform taper from butt to tip end, and shall be free from short kinks. Knots or blemishes shall be trimmed off close to and even with the body of the pile. The axis of the wood piles shall not deviate from the straight line more than one inch for each ten feet of length nor more than six inches for the entire length.

B. The minimum pile tip diameter shall be 8 inches and the maximum allowable diameter three feet below the pile butt shall be 20 inches.

C. No inspection of wood piles will be made by the Owner prior to delivery of piles to the site of the work. At the site, the piles will be inspected by the Owner's representative and any piles which do not comply with the specifications will be rejected and shall be removed from the site by the Contractor. Regardless of this inspection, any pile broken or damaged during driving will be rejected.

D. Length of piles to be ordered shall be determined by the Contractor. Ordering and delivery of piles shall be planned in such a manner that changes in length of piles may be made if driving experience, as work progresses, indicates need for such changes.

E. Splicing of piles will not be permitted.

F. Pile-Length Markings: Mark each pile length with horizontal line at 1-foot intervals.

2.2 TIMBER TREATMENT

A. Pressure-treat timber piles according to AWPA C3 as follows:

1. Service Condition: Foundation.
2. Treatment: Waterborne preservative, creosote or creosote solution, or oil-borne preservative.
3. Species: Southern Yellow Pine or Coastal Douglas Fir.
4. Size Basis: 8-inch tip and natural taper.
5. Treat field cuts, holes, and other penetrations according to AWPA M4.

PART 3 - EXECUTION

3.1 SEQUENCE OF OPERATIONS AND EQUIPMENT REQUIREMENTS

A. The Contractor shall provide at least one fully-equipped pile driving rig in full-time operation at the site during the work, and shall mobilize additional equipment, if necessary, to complete the work on schedule.

B. The Contractor shall coordinate his pile driving operations with other work on the project.

3.2 DRIVING EQUIPMENT

A. Piles shall be installed with approved modern equipment. The proposed pile installation equipment and methods shall be subject to the approval of the Engineer and approval shall be secured before the start of installation.

B. The leads of the pile driving rig shall be fixed at two points; the points shall be at least half the length of the leads apart in order to maintain the pile and hammer in axial alignment at the correct plan location during the entire driving operation. The leads shall extend down to the lowest point at which the hammer must operate.

C. Piles may be driven with a single acting, double acting, or differential acting steam or air hammer delivering a minimum of 8,000 foot-pounds of energy per blow or diesel hammer delivering a minimum of 10,000 foot-pounds per blow. The Contractor shall take care to prevent pile damage during driving.

D. Collars or bands of a design approved by the Owner shall be used where required for protection of pile butts against splitting, brooming or other damage when the piles are driven.

3.3 INSTALLATION

A. Driving

1. As part of preparation for driving, each pile shall be marked at one-foot intervals along the entire pile length. In addition, the footage shall be marked and designated at five-foot intervals, starting from the tip.

2. Prior to production driving, six piles shall be driven as test piles at randomly selected design locations to the required embedment length or penetration resistance.

3. All piles shall be driven at the locations shown on the Drawings. Pile locations shall be checked during driving and appropriate measures taken, as necessary, to maintain the correct pile location.

4. Each pile shall be driven to a minimum tip elevation of El. -20. Pile driving shall be continuous from ground surface to final tip elevation without interruption. Piles may be accepted for less than the minimum tip elevation provided the pile demonstrates an average penetration resistance equal to 6 blows per inch for the final 6 inches of driving. If an abrupt increase in driving resistance is encountered in the naturally deposited soils, the driving may be terminated when the pile penetration is less than ½-inch in six successive blows. The penetration resistance stated above should be in addition to the observed resistance to penetration as the tip enters the naturally deposited soils.

5. Piles in a group shall be driven commencing in the center of the group and working toward the edge. All piles in one group shall be driven before moving to other locations.

6. Immediately after a group is driven, the Contractor shall establish a reference point and its elevation on the pile for purposes of checking uplift of the pile as additional piles are driven.

7. After all piles within the radius of uplift have been driven, the Contractor shall determine the elevation of the reference points on each of the piles in the group. If uplift of 0.5 inch or more has occurred, the pile shall be redriven to its original tip penetration. After redriving each pile, the Contractor shall reestablish the elevation of the reference point. Redriving shall be repeated as often as necessary until measured uplift on any pile is less than 0.5 inch.

8. The radius of uplift is defined as the maximum distance between piles such that pile driving causes uplift of 0.5 inch or more in the affected pile. Survey instruments used to establish the reference elevations shall be carefully checked and adjusted as necessary to insure accurate readings. Uplift measurements shall be submitted to the Engineer.

B. Obstructions

1. Where obstructions make it impossible to install certain piles to the required depth, the Engineer will order additional piles installed to compensate for the obstructed pile. The Contractor will be reimbursed for the obstructed pile and additional piles ordered by the Engineer.

2. Piles abandoned because of obstructions shall be cutoff or pulled out at the discretion of the Engineer and the hole filled with sand.

C. Splicing: Splicing of piles will not be permitted.

1. Firmly seat pile in predrilled hole by driving with reduced energy before starting final driving.

D. Cutting off Piles

1. Pile tops shall be cut off square within one inch of the elevations shown on the Drawings. The pile cut offs shall become the property of the Contractor and shall be removed from the site.

2. After being cut to grade, the top surface of the pile shall be treated as specified under Section 2.2.

3.4 TOLERANCES AND CRITERIA FOR ACCEPTANCE

A. Piles shall be driven as close as possible to the plan location. A maximum lateral deviation from the correct location at cut-off elevation permitted will be two inches for single piles and groups of two piles, and four inches for groups of three or more piles. A maximum deviation from design cut-off elevation equal to one inch will be permitted.

B. The plumbness of a driven pile, as measured on the projection of the pile above ground, shall not deviate by greater than ten percent from the design alignment.

C. Piles that are damaged below cut-off elevation during driving will be rejected. If upon comparing pile performance during driving with that of other driven piles, and based on his knowledge of the subsurface conditions, the Engineer determines that a pile has been unacceptably damaged, he may reject the pile.

D. Piles indicating sudden or peculiar decrease in penetration resistance during driving will be assumed to be broken and will be rejected, unless the Engineer's review of available data indicates that the sudden decrease in driving resistance is due to natural subsurface conditions and continued acceptable driving behavior is observed.

E. Except as specified under "Obstructions". Piles that are rejected because of damage, mislocation or misalignment, or failure to meet the driving criteria. Shall be cut off below the limits of the structure and abandoned, and additional piles shall be driven as directed by the Engineer.

F. When otherwise acceptable, installed piles exceed the specified tolerances, the Contractor shall provide an accurate survey to the Engineer, as specified. The Engineer will than analytically determine the total loads on individual piles, based on this survey. If the load on any pile exceeds 110 percent of the specified load capacity, corrections shall be made by adding piles, or other procedures, in accordance with a design by the Engineer.

G. The installation of replacement piles and other corrective measures shall in all cases be in accordance with designs provided by the Engineer.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Piles will be measured for payment on the basis of length along the axis of the pile in place below the design cut-off elevation. Piles that reach an acceptable penetration resistance above the require tip elevation will be paid for the length to the tip elevation.

4.2 BASIS OF PAYMENT

A. Work included under this contract shall include the total price for installation of the estimated linear feet of timber piles. The work shall include furnishing and driving the piles and all work incidental thereto, and mobilization and demobilization which shall include job set-up, moving equipment including pile driving rigs on and off the site, establishing and dismantling the Contractor's field administration forces and equipment, and all other work incidental thereto.

B. Piles rejected in accordance with the provisions of these Specifications will not be paid for. In such cases, the Contractor will be paid at the contract unit price per foot for one replacement pile installed and accepted, according to the provisions of these Specifications. If more than one replacement pile is required to compensate for a rejected pile, the Contractor will be paid at the contract unit price per foot for only the longer of the replacement piles. Additional piles required to compensate for production piles or replacement piles driven out of design location will be installed at no additional cost to the Owner.

C. Piles rejected, in the judgment of the Engineer, due to causes other than the Contractor's violation of the Specifications or his error, will be measured and included in the aggregate footage of piles for payment.

D. Whenever, in the judgment of the Engineer, misalignment or rejection of a pile or piles caused by the Contractor's violation of the Specifications or his other error necessitates structural redesign, the cost of such redesign shall be deducted from sums otherwise due to the Contractor under the contract. If the redesigned pile cap requires greater quantities of concrete, steel, or timber, as compared with the quantities required for the pile cap as originally designed, the additional cost for pile cap concrete, reinforcing steel, timber, formwork and timber work shall also be deducted from the contract price.

E. No payment will be made for pile cut-offs.

END OF SECTION 02459

SECTION 02510 - BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS:

A. Earthwork: Section 02200
B. Curbing: Section 02525
C. State of Maine, Department of Transportation, Standard Specifications - Highways and Bridges, Revision of December, 2002, hereafter designated as MDOT Specifications.
D. Contract Drawings.

1.03 SUMMARY OF WORK:

A. Furnish all labor, materials, and equipment to construct plant mix bituminous concrete pavement, and pavement marking in conformity with the Contract Drawings and as specified herein.

1.04 QUALITY ASSURANCE:

A. Performance in accordance with State of Maine, Department of Transportation, Standard Specifications - Highways and Bridges, Revision of December, 2002, hereafter designated as MDOT Specifications.

B. Qualifications of Bituminous Concrete Producer: Use only materials which are furnished by a bulk bituminous concrete producer regularly engaged in production of hot-mix, hot-laid bituminous concrete.

C. Qualifications of Testing Agency: Use only recognized commercial testing laboratories with not less than 5 years experience in conducting tests and evaluations of bituminous concrete materials and design. Contractor is responsible for all testing and costs.

1.05 SUBMITTALS:

A. Mix Design: Provide the Site Engineer with a job mix formula for each course used in the work.

B. Test Reports: Provide two copies of each test described below at the frequency determined in paragraph C.

1. Aggregate Material: Submit laboratory test reports that aggregates used in the bituminous mix conform to Section 703 of the MDOT Specifications.

2. Asphalt Cement: Submit laboratory test reports that bituminous material used in the bituminous mix conforms to Section 702 of the MDOT Specifications.

3. In-Place, Compacted Bituminous Concrete Mix: Submit laboratory test reports of samples cut from the in-place, compacted pavement indicating the percentage of theoretical maximum density (TMD), based on laboratory specimens of the mix combined in the proportions of the job mix formula.

C. Frequency of Testing:

1. Aggregate Material: Submit laboratory test reports of the stockpiled aggregates initially used in the mix and additional test reports for each change of course.

2. Asphalt Cement: Submit laboratory test reports for asphalt cement used in the initial mix and additional test reports for each change of source.

3. In-Place, Compacted Bituminous Concrete Mix: Submit laboratory test reports at frequencies not less than one of the following:

a. Every 300 tons placed.
b. Each day's placement.
c. Each course, each day's placement.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Aggregates: Conform to Section 703 of MDOT Specifications.

B. Asphalt Cement: Conform to Section 702 of MDOT Specifications. Grade shall be AC-20.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Plant Mix Hot Bituminous Pavement: Produce and place in conformance with Special Provision Section 401 of MDOT Specifications for Asphalt Pavement.

B. Pavement Overlay:

1. Raise all utility structures to grade.
2. Sweep entire area clean of all sand, dirt and debris.
3. Apply tack coat to entire service prior to applying finish coat.

C. Temporary Trench Pavement Repair:

1. After trenching operations are complete, the Site Engineer may order temporary pavement repair.
2. Material: SHMA hot bituminous concrete.
3. Clean surfaces of existing pavement which will be bonded to the temporary pavement.
4. Place material to a compacted depth of 2 inches.
5. Maintain temporary pavement smooth, free from potholes and to required grade.
6. Periodically inspect temporary pavement areas and repair as necessary, especially during the winter months when the temporary pavement remains in place for an extended period. The Site Engineer shall have the authority to order repair by the Contractor to areas which are, in his opinion, in unsatisfactory condition.

D. Trench Pavement:

1. Saw edges of existing pavement to provide a vertical bonding face.
2. Remove temporary paving and sawn out existing paving.
3. Reset manhole frames and covers.
4. Apply a tack coat to the sawn edges.
5. Apply SHMA bituminous concrete paving, as specified on Contract Drawings.

6. Roller compact both courses, compacting the final wear course to meet existing pavement surfaces exactly.

7. Paving within City R.O.W. shall be per City specifications and requirements. Contractor is required to coordinate with the City Public Works Department and for compliance with the City requirements.

END OF SECTION

SECTION 02520 - BRICK SIDEWALKS & ENTRANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200
B. Curbing: Section 02525
C. Contract Drawings.

1.03 DESCRIPTION OF WORK:

This work shall consist of the construction of brick sidewalks and driveways on bituminous concrete base in accordance with these specifications and in reasonably close conformity with the lines and grades as shown on the plans.

PART 2 - PRODUCTS

Materials shall conform to the requirements of the various subsections of the specifications listed below:

2.01 New Brick: Conform to the various subsections of the specifications listed below.

Brick - Brick shall conform to requirements of ASTM Standard Specifications for Building Brick (made of clay or shale) Designation C62-66 for Grade SW with the following modifications:

(a) The absorption limits shall be from 8 to 12 per cent for the average of 5 bricks.

(b) The compressive strength shall not be less than 8000 pounds per square inch (psi).

(c) The modulus of rupture shall not be less than 1000 pounds per square inch (psi).

(d) The bricks shall be No. 1, wire cut type for paving.

Bricks shall be of standard size (2-1/4" x 3-3/4" x 8") with permissible variations not to exceed 1/16" in depth, 1/8" in width or 1/4" in length.

Bricks shall be as manufactured by the Morin Brick Co. of Danville, Maine or an approved equal. Prior to ordering the brick, samples shall be submitted in whole straps to show color range.

All base courses and joints shall conform to the applicable subsections of Division 700 of the Standard Specifications.

2.02 RELATED MATERIALS:

A. Joint filler at slab perimeters - ¼" thick polyethylene closed cell material to be Sonoflex F. by Sonneborn, or Engineer approved equal.

B. Absorptive Cover: Burlap cloth made from Jute or kenaf, weighing approximately 9 oz. per square yard, complying with AASHTO M182, Class 2.

C. Moisture-Retaining Cover: One of the following, complying with ASTM C171.

1. Waterproof paper.

D. Liquid Membrane Curing Compound:

1. Liquid type membrane-forming curing compound complying with ASTM C 309, Type I, Class A, unless other type acceptable to Engineer. Curing compound shall not impair bonding of any material to be applied directly to the concrete. Demonstrate this non-impairment prior to use.

E. Non-Shrink Grout - "Embeco Pre-Mixed Grout" by Master Builders, "P.I.W. Irontrox Grout" by Toch Brothers, Inc., "Por-Rok" Expanding Grout by Hallemite Manufacturing Company, or equal as approved by the Engineer.

F. Expansion Joint Filler shall be Sonoflex by Sonneborn or Engineer approved equal.

G. Joint Filler at Expansion Joints in Paved Areas: ½" thick polyethylene closed cell material to be Sonoflex F. by Sonneborn, or Engineer approved equal.

H. Backing Rod for Resilient Caulk at Control Joints: 3/8 in. polyethylene backing rod. Use type NP-1 for vertical surfaces and type SL-1 for horizontal surfaces.

I. Seal coat for all exposed concrete surfaces shall consist of two coats of Hydrozo Clear 15 as manufactured by Hydrozo Coatings Company, Lincoln, Nebraska or Engineer approved equal.

PART 3 – CONSTRUCTION METHODS

a. Subgrade: The subgrade for the sidewalks and driveways shall be shaped parallel to the proposed surface of the walks and drives and shall be thoroughly compacted. All depressions occurring shall be filled with a suitable material and again compacted until the surface is smooth and hard.

b. Foundation: After the subgrade has been prepared, a foundation of crushed gravel shall be placed upon it. After being thoroughly compacted, the foundation shall

have a thick-ness as shown on the plans and typical details and shall be parallel to the proposed surface of the work.

c. Bituminous Base: A layer of hot bituminous pavement grading "B" shall be spread upon the properly prepared crushed gravel. After being thoroughly compacted, the bituminous base course shall have a minimum thickness of two (2") inches and shall be parallel to the proposed finish grade.

d. Sand-Cement Base: A layer of sand-cement base course material one (1") inch in thickness shall be spread upon the properly prepared bituminous base course. The course shall be thoroughly compacted and present a hard smooth surface parallel to the proposed finished slope and grade of the walks and drives. The ratio shall be six (6) parts of washed mortar sand to one (1) part Portland Cement.

e. Brick Placement: After the sand base course has been properly prepared, the brick shall be placed in the pattern shown on the plans and typical details. The brick shall be placed as closely together as possible and the sand joints between the brick shall be no wider than that allowed by the natural texture of the brick itself. NO OPEN JOINTS WILL BE ALLOWED. Brick shall be saw cut to fit spaces requiring less than a whole brick. No cut brick shall be less than two (2") inches in length. A journeyman brick mason shall supervise all brick placement.

After the bricks are carefully set upon the properly prepared sand-cement base, a plank or heavy sheet of plywood covering several course of brick shall be placed upon the bricks and carefully rammed with a heavy hammer until the bricks reach a firm, unyielding bed and present a surface of the proper slope and grade. Any divergence from line and grade shall be corrected by taking up and relaying the bricks. After the ramming of the bricks, a sufficient amount of sand-cement shall be spread over the surface and thoroughly swept or raked so as to fill the joints. All surplus sand-cement remaining on the sidewalk and driveway after the joints have been properly filled, shall be carefully removed by sweeping. Care shall be taken to avoid raking out the joints during removal of excess sand-cement. A final application of sand only shall be spread on the sidewalk. The application of sand shall then be removed by sweeping while the aforementioned precautions are being exercised.

A 12" wide bituminous strip shall be placed at the gutter line and at the back edge of the brick driveway as a transition between the brick and adjoining surfaces.

608.13 METHOD OF MEASUREMENT:

Brick Sidewalks and Driveways will be measured by LUMP SUM complete in place.

608.14 BASIS OF PAYMENT:

The accepted quantity of brick sidewalk and brick driveway will be paid for at the contract unit price per LUMP SUM complete in place. This price shall include the cost of excavation including removal of existing sidewalk and driveway, and all labor, materials, and equipment necessary to satisfactorily complete the work. The bituminous strip at back edge of driveway shall be incidental to brick driveway.

Payment will be made under:

Pay Item		Pay Unit
608.15	Brick Sidewalk (Bituminous Base)	Lump Sum
608.16	Brick Driveway Apron with Bituminous Base	Lump Sum

END OF SECTION

SECTION 02525 - CURBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The Plans, General Conditions of the Contract, and Supplementary General Conditions, apply to the work specified in this Section.

1.02 DESCRIPTION OF WORK:

A. Provide all materials, equipment, and labor necessary for the placement of Granite curbing curbing as shown on the Plans and as specified herein.

B. Related Work Specified Elsewhere:

1. Earthwork: Section 02200
2. Brick Sidewalks: Section 02520
3. Bituminous Concrete Paving: Section 02510

1.03 PERFORMANCE SPECIFICATION:

"Standard Specification for Highways and Bridges" revision of December, 2002, Maine Department of Transportation (abbreviated as MDOT "Standard Specification").

PART 2 - MATERIALS

2.01 GRANITE CURBING: Granite curbing shall be as shown on the Drawings.

PART 3 - INSTALLATION

3.01 PLACEMENT OF CURBING:

A. Installation Granite Curb: Install in conformance with MDOT specifications and as shown on contract drawings.

END OF SECTION

SECTION 02630 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Bituminous Concrete Paving: Section 02510

1.03 DESCRIPTION OF WORK:

A. Provide all materials, equipment, and labor necessary for marking of pavement, including parking lots, walks and roadways, as indicated on the drawings.

PART 2 - MATERIALS

2.01 GENERAL: All materials conforming to M.D.O.T. specifications Section 708.03.

2.02 Paint For Pavement Marking: White, yellow and blue as shown on Drawings meeting the requirements of AASHTO M248, Type N.

PART 3 - INSTALLATION

3.01 GENERAL: Comply with requirements of the manual on Uniform Traffic Control.

3.02 PREPARATION OF SURFACE: Immediately prior to applying pavement marking, clean the surface of dirt, grease, oil, water and other foreign matter. Dry the surface if necessary.

3.03 LAYOUT: Layout required markings with chalk prior to applying paint to ensure proper alignment. Use standard stencils for all directional arrows.

3.04 APPLICATION: Apply paint by hand or with striping machine to a minimum wet thickness of 15 mils.

3.05 PROTECTION: Place temporary barriers to keep traffic off paint throughout required drying time.

END OF SECTION

SECTION 02710 - SEWERS, DRAINS and SITE PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Shoring & Bracing: Section 02150
B. Earthwork: Section 02200 (includes excavation, bedding, backfill).
C. Contract Drawings

1.03 DESCRIPTION OF WORK:

A. Provide storm drain system and drainage system as shown on the drawings. This section includes:

1. Storm drain and Sewer pipes
2. Miscellaneous site piping

1.04 SUBMITTALS:

A. Manufacturer's product data and installation instructions.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS:

A. General: Provide fittings of same type and class of materials as pipe. Provide commercially manufactured wyes or tees for service connections. Fitting must have single piece gasket.

B. Foundation or Roof Drain: Buried Piping: PVC meeting ASTM D3034 or ASTM D3033, strength requirement SDR 35, push-on joints ASTM D3212, gaskets ASTM F-477.

C. Storm Drain Pipe: Reinforced concrete pipe Class IV.

D. Sewer Pipe: Buried Piping: PVC meeting ASTM D3034 or ASTM D3033, strength requirement SDR 35, push-on joints ASTM D3212, gaskets ASTM F-477. Sewer force main pipe – Schedule 40 PVC.

E. Electric/Tel-Data Conduit: Schedule 40 PVC pipe.

2.02 MISCELLANEOUS

A. Flexible Adapters:

1. Non-pressure: Neoprene sleeve with stainless steel bands Engineer approved equal to those manufactured by Fernco.

2. Pressure: Engineer approved equal to Rockwell cast couplings.

B. Insulation: Styrofoam SM as manufactured by Dow Chemical.

PART 3 - EXECUTION

3.01 INSTALLATION OF GRAVITY PIPE AND FITTINGS:

A. Methods: Install in accordance with manufacturer's recommendations. Use a laser beam for line and grade unless otherwise permitted by the Engineer. Secure each length of pipe with bedding before placing next length. Plug open ends when work is suspended. Bed pipe as shown on drawings. A 30-inch minimum cover over the top of PVC pipe should be provided before the trench is wheel-loaded.

B. Grade and Line: Lay pipe to line and grade shown on the drawings. If grade is not shown, determine elevations of start and finish points for each run of pipe. Lay pipe to a uniform grade between these points.

Line and grade may be adjusted by the Engineer as required by field conditions.

C. Conditions: Lay pipe in the dry. Do not use installed pipe to remove water from work area.

D. Flush all pipe and remove debris. Flushing method approved by Engineer. Gravity flushing is not acceptable.

E. Connections to manholes and catch basins: Provide short length of pipe so that joints are located within 3 feet of inside surface of manholes and catch basins for other than PVC pipe.

3.02 UTILITIES TO BE ABANDONED

A. Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are not indicated to be removed. Provide sufficiently strong closures acceptable to Engineers to withstand hydrostatic or earth pressure which may result after ends of abandoned utilities have been closed.

3.03 INSULATION:

A. Install as shown on Drawings.

END OF SECTION

SECTION 02720 - - MANHOLES, CATCH BASINS AND PRECAST CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200.
B. Erosion and Sedimentation Control: Section 02100
C. Curbing: Section 02525
D. Sewers, Drains and Site Piping: Section 02710.
E. Contract Drawings

1.03 DESCRIPTION OF WORK

A. Provide drainage manholes and catch basins, and precast concrete items as shown on the drawings. This section includes:

1. Precast drainage manholes
2. Precast catch basins
3. Frames and covers, and grates.
4. Monitoring Manhole

1.04 QUALITY ASSURANCE

A. General: Provide complete manhole, catch basin, and precast concrete structures capable of supporting AASHTO H20 loading.

All precast concrete shall comply with ASTM C913 "Standard Specification for Precast Concrete Water and Wastewater Structures."

B. Precast Manhole and Catch Basin Components: ASTM C478.

1.05 SUBMITTALS

A. Shop Drawings: Submit for approval precast manholes, catch basins and all precast concrete items prior to fabrication. Show components to be used and elevations of top of precast sections, base and pipe inverts, location of pipe penetrations, steps, for each manhole.

B. Product Data: Manufacturers' product data and installation instructions for frames, covers, grates, precast items, manhole sleeves, joint sealants and frost barrier.

PART 2 - PRODUCTS

2.01 CATCH BASINS AND DRAIN MANHOLES

A. Base Sections: Precast.

B. Barrel Sections: Precast.

C. Top Sections: Precast concentric cone, eccentric, or flat cover if required by grade.

D. Joints between precast sections: Watertight, shiplap type, seal with two rings of 1-inch diameter butyl rubber sealant.

E. Monitoring Manhole: Provide and install package metering manhole with flume for measuring flow. Manhole shall be 48" diameter fiberglass barrel with 30" diameter manway, cast iron frame and cover designed for H20 loading. The self contained flow measurement and monitoring flume shall be integral FRP Parshall or Palmer-Boulus flume. Structure to include FRP steps, FRP pipe stubs with flexible watertight neoprene connecting boots. Manufacturer of the structure shall be equal to Plasti-Fab (www.plasti-fab.com/manholes) or equal. Submit shop drawings and manufactures data for engineer/owner approval.

2.02 PRECAST CONCRETE RISERS

A. General: Reinforced precast concrete annular rings, size as shown on drawings. Provide with four 1-inch diameter vertical cast through holes.

2.03 MASONRY MATERIALS

A. Concrete Masonry Units: ASTM C139.

B. Mortar: Type M, ASTM C270. Use Type II portland cement, Type S lime. Proportions for Mortar: 1 part portland cement, 1/4 part hydrated lime. 3 to 3 3/4 parts sand.

2.04 FRAMES, GRATES AND COVERS

A. Cast iron: ASTM A48 Class 30.

B. Manhole frames and covers: Minimum 24" dia. opening, minimum weight 350 pounds.

1. Standard drainage frame and cover: All drainage manholes to be Etheridge Foundry as specified on plans.

C. Catch Basin Frames and Grates: All catch basins manholes to be Etheridge Foundry as specified on plans.

2.05 MISCELLANEOUS

A. Joint Sealants:

1. Butyl Rubber Sealant: One inch diameter strips as manufactured by Kent Seal, or Engineer approved equal.

2. Butyl Rubber Caulking: Conform to AASHTO M-198, Type B.

PART 3 - EXECUTION

3.01 INSTALLATION OF MANHOLES

A. Placement: Place bases on compacted bedding material so manhole structure is plumb and pipe inverts are at proper elevations. Place barrel and top sections in the appropriate height combinations. Plug all lifting holes inside and out with non-shrink grout.

B. Joints: Follow manufacturer's instructions for sealing joints between precast sections. Provide two rings of 1-inch diameter butyl rubber sealant. Point joints inside and out with butyl caulk.

C. Frame and Covers: Set to final grade as shown on the Drawings. Provide adequate temporary covers (conforming with applicable local, State and Federal regulations) to prevent accidental entry until final placement of frame and cover is made.

Use two rings of 1-inch diameter butyl rubber sealant between frame and chimney joints. Provide downward force to frame so as to compress the joint and provide a watertight seal and prevent future settlement. Point compressed joint with butyl rubber caulk sealant.

Set manhole frames and covers to final grade only after pavement base course has been applied, or after final grading of gravel roads.

D. Inverts: See detail on drawings.

E. Steps: Replace steps out of plumb and out of proper horizontal placement.

3.02 INSTALLATION OF CATCH BASINS

A. Placement: Place bases on compacted bedding material so catch basins structure is plumb and pipe inverts are at proper elevations. Place barrel and top sections in the appropriate height combinations. Plug all lifting holes inside and out with non-shrink grout.

B. Joints: Follow manufacturers instructions for sealing joints between precast sections. Provide two rings of 1-inch diameter butyl rubber sealant. Point joints inside and out with butyl caulk.

C. Frame and covers: Set to final grade as shown on the drawings. Use two rings of 1-inch diameter butyl rubber sealant between frame and chimney joints. Provide downward force to frame so as to compress the joint and provide a watertight seal and prevent future settlement. Point compressed joint with butyl rubber caulk sealant.

D. Inverts: See detail on drawings.

3.03 PRECAST CONCRETE RISERS

A. General: For chimneys height 3 to 12 inches as required.

B. Joints: Provide two rings of 1 inch diameter butyl rubber sealant. Compress joints to create permanent seal and prevent future settlement. Point joints with butyl rubber caulk sealant.

C. Install as shown on drawings.

D. Hardware: As specified on drawings.

3.04 REPAIRS

A. Determine causes of all leaks and repair them. Perform earthwork required if manhole has been backfilled.

B. Perform repairs using methods and materials approved by the Engineer. Remove and replace or reconstruct manhole if necessary. Remove and replace defective sections if required by Engineer.

END OF SECTION

SECTION 02800 - LANDSCAPE WORK

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

A. The CONDITIONS OF THE CONTRACT and all Sections of Division 1 are hereby made a part of this Section.

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. Planting installation of trees, shrubs and ground covers; planting of lawns and other work as indicated on Site Drawings.

B. Related Work Specified Elsewhere:

1. Erosion and Sedimentation Control: SECTION 02100
2. Site Earthwork: SECTION 02200

1.03 QUALITY ASSURANCE:

A. General: Comply with requirements of Division 1 sections on Submittals, Procedures, Performances, and Quality Control.

B. Source Quality Control:

1. General: Ship landscape materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to landscape materials.

2. Analysis and Standards: Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable or as further specified.

3. Topsoil: Before delivery of topsoil, furnish written statement giving location of properties from which topsoil is to be obtained.

4. Plant Material:

   a. Plant materials shall mean trees, shrubs, ground covers, and plants of all descriptions, required to be furnished for the project and shall conform to all provisions of the publication, "American Standard for Nursery Stock."

   b. Substitutions: In the event that trees, shrubs, or other plant material specified in the plant list are in the opinion of the Contractor, impossible or unreasonably difficult to obtain, the Contractor shall immediately notify the Owner's Representative to discuss appropriate substitutions. No substitutions of plant material may be made without the prior approval of the Owner's Representative. When authorized, adjustment of contract amount will be made.

5. Inspection: The Owner's Representative reserves the right to inspect any plant materials either at the place of growth or at the site before planting, for compliance with requirements for name, variety, size, quality and health.

1.04 SUBMITTALS:

A. Certification:

1. For information only, submit 2 copies of certificates of inspection as required by governmental authorities, and manufacturer's or vendor's analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.

2. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.

1.05 PRODUCT 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 the site.

B. Plant Materials:

1. In preparing plants for moving, all precautions customary in good trade practice shall be taken. All plants shall be dug immediately before moving unless otherwise specified. Broken, loose, or manufactured balls will be rejected.

2. All plants shall be packed, transported, and handled with utmost care to insure adequate protection against injury and drying. Do not bend or bind-tie trees or shrubs in such manner as to damage bark break branches or destroy natural shape. Provide protective covering during delivery.

3. Deliver plant materials after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set all plants in shade, protect from weather and mechanical damage, and keep roots moist.

4. Label all plant materials of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

1.06 JOB CONDITIONS:

A. Contractor must examine the subgrade, verify the elevations, observe the conditions under which work is to be performed, and notify the Owner's Representative of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

B. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required, to minimize possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.

C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, the Contractor shall notify the Owner's Representative before planting. The Contractor shall be responsible for correcting such conditions.

D. Planting and Seeding Seasons: Unless variance is requested in writing and approved by the Owner's Representative, planting and seeding shall be done within the following dates:

Lawns:	April 1 - September 15
Plant Materials:	
Potted and Container Grown Plants	Spring: April 1 - July 15 Fall: Aug. 15 - Nov. 15
Balled and Burlapped Plants	Spring: April 1 - June 15 Fall: Aug. 15 - Oct. 15

E. Coordination with Lawns: Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to the Owner's Representative. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

PART 2 - PRODUCTS

2.01 TOPSOIL:

A. Loam or approved topsoil removed within the confines of the project area shall be reused in accordance with Section 02200, Earthwork. If quantity of stockpiled topsoil is insufficient, provide new topsoil which 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 than 1 in. in any dimension, and other extraneous or toxic matter harmful to plant growth. Sand, silt, and clay contents comprising existing or new topsoil shall fall within the following ranges:

Sand	50% - 70%
Silt	2% - 40%
Clay	10% - 28%

C. Soil Amendments:

1. Lime: Natural limestone containing not less than 90 percent of total carbonates, ground so that not less than 100 percent passes a 10-mesh sieve, not less than 90 percent passes a 20-mesh sieve, and not less than 50 percent passes a 100-mesh sieve.

2. Peat Humus: Peat humus shall be a natural peat approved by the Owner's Representative consisting or sedge, sphagnum or reed peat of such

physical condition as will pass through a 1 in. screen and will be readily incorporated with the topsoil. The peat humus shall be free from sticks, stones, roots and other objectionable matter.

3. Fertilizer: Refer to Erosion and Sedimentation Control Notes

The Owner's Representative may approve the use of other fertilizers providing they contain an equivalent amount of nutrients in an acceptable form.

2.02 PLANT MATERIALS:

A. Quality:

1. Provide trees, shrubs, and other plants complying with the recommendations and requirements of ANSI Z260.1 "Standard for Nursery Stock" as published by the American Association of Nurserymen. All plants shall be nursery grown unless otherwise stated, and shall have been growing under the same climatic conditions as the location of this project for at least two (2) years prior to award date of this contract.

B. Deciduous Shrubs: Provide balled and burlapped (B&B) deciduous shrubs otherwise noted in plant list. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs as approved by the Owner's Representative.

C. Coniferous and Broad-leafed Evergreens: Provide balled and burlapped (B&B) evergreens. Container grown evergreens will be acceptable as approved by the Owner's Representative.

D. Deciduous Trees:

1. Provide balled and burlapped (B&B) deciduous trees unless otherwise noted in plant list. Container grown deciduous trees will be accepted in lieu of balled and burlapped deciduous trees as approved by the Owner's Representative.

2.03 GRASS MATERIAL:

A. Grass Seed: As specified in the Erosion and Sedimentation Control plan notes.

2.05 GROUND COVER: Provide plants established and well-rooted in removable containers or integral peat pots and with no less than the minimum number and length of runners required by ANSI Z60.1 for the pot size shown or listed.

2.06 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Planting Bed Mulch: Provide shredded bark mulch for planting beds. Do not use material that is decayed or mixed with soil, weeds or other foreign matter. Use material that is large enough in size to prevent it from drifting and blowing in normal wind storms. Submit samples to Owner's Representative for approval prior to delivery of bark mulch to site.

B. Anti-Erosion Mulch: Use "Erosionet" or similar mulch where slopes are too severe to be maintained by planting bed mulch alone.

C. Anti-Desiccant: Emulsion type, film-forming agent or Wilt-Pruf by Nursery Specialty Products, Inc., designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.

D. Wrapping: Wrapping material for tree trunks shall be furnished in strips approximately 4 to 6 inches wide consisting of first quality, 8 oz. per sq. yd. burlap, approved waterproof paper tape or polyethylene film, ASTM D 2103.

E. Stakes and Guys: Provide stakes of sound new hardwood, free of known holes and other defects. Provide wire ties and guys of 2-strand, twisted, pliable galvanized iron wire not lighter than 12 ga. with zinc-coated turnbuckles or an approved equal. Provide new 2-ply garden hose not less than 1/2 in. hose size, cut to required lengths to protect tree trunks from damage by wires or an approved equal.

F. Mulch for Seeded Areas:

1. Straw mulch shall consist of long fibered straw, reasonably free from noxious weeds and other undesirable material. No material shall be used which is too wet, decayed, or compacted as to inhibit even and uniform spreading. No chapped hay, grass clippings or other short fibered material shall be used unless directed by the Owner's Representative.

2. Cellulose fiber mulch shall consist of natural wood, recycled paper or humus cellulose fiber containing no materials which will inhibit seed germination or plant growth. Sufficient non-toxic water soluble green dye shall be added to provide a definite color contrast to the ground surface to aid in even distribution. Cellulose fiber mulch shall be supplied in moisture resistant, sealed bags marked with the manufacturer's name, the air dry weight, and composition of the contents.

G. Mulch Binder: Material for mulch binder may be emulsified asphalt of a type acceptable to the Owner's Representative and may be diluted with water to assure even distribution. Other types of approved mulch binders may be used when authorized by the Owner's Representative.

H. Water: Water used for landscape work shall be free from oil, acids, alkalis, salts, or other substances harmful to plants.

2.07 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. Mix specified soil amendments with topsoil at the rates specified. Unless otherwise specified or indicated on the Drawings, the following planting soil mixture (thoroughly mixed by volume) shall be used for backfill around trees and shrubs: dehydrated processed manure 1 part; topsoil 8 parts; peat moss 3 parts.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Layout: Locations for trees and outlines of planting bed areas shall be staked on the ground by the Contractor and the stakes marked by plant type at least 48 hours before any plant pits or beds are dug. Owner's Representative shall approve all locations of stakes and planting bed outlines prior to installation of plant material.

B. Preparation for Planting Lawns and Disturbed Areas:

1. Spread topsoil on prepared areas to a minimum depth of 6 in. and as required to meet lines, grades and elevations shown, after light rolling and natural settlement. Before placing the topsoil, loosen and scarify subgrade of lawn areas to a minimum depth of 6 in. Remove stones over 1 1/2 in. in any dimension and sticks, roots, rubbish and other extraneous matter.

2. Grade lawn area to smooth, even surface with loose, uniformly fine texture. Roll and rake out all pieces of sod, roots, and grass. Remove

ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

3. 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.

4. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

C. Preparation of Unchanged Grades: Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: till to a depth of not less than 6 in.; apply soil amendments and initial fertilizers as specified; remove high areas and fill in depressions. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter. Incorporate soil amendments, as specified, at appropriate stages.

D. Preparation of Planting Beds:

1. Loosen subgrade of planting bed areas to a minimum depth of 6 in. using a cultimulcher or similar equipment. Remove stones over 1 1/2 in. in any dimension, and sticks, stones, rubbish and other extraneous matter. Spread planting soil mixture to the minimum depth required to meet lines, grades and elevations shown, after light rolling and natural settlement.

E. Excavation for Trees and Shrubs:

1. Excavate pits in accordance with Typical Planting Details with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation. For balled and burlapped (B&B) trees and shrubs, make excavations at least twice as wide as the ball diameter and a minimum of 1 ft. 6 in. wider than root spread.

3.02 PLANTING:

A. Planting Trees and Shrubs:

1. Planting shall be done in accordance with Typical Planting Details. Set balled and burlapped (B&B) stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball at same elevation as adjacent finished landscape grades. When set, carefully remove burlap from sides of balls; retain on bottom only if removal is impossible without damage to root balls. 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 2/3-full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

2. Set container grown stock as specified for balled and burlapped stock, removing containers in such a way as to not damage roots.

3. Dish completed planting pits to form shallow (4") saucer to collect water. Mulch pits, trenches and planted areas with at least 4 in. thickness of shredded bark or equivalent substitute approved by Owner's Representative.

4. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage. If deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving and again 2 weeks after planting.

5. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice. Remove dead, broken, or diseased branches. Prune trees to retain required height and spread. Unless otherwise directed by the Owner's Representative, do not cut tree leaders, and remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character and accomplish their use in the landscape design. Required shrub sizes are the size after pruning. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

6. Wrap tree trunks of 2 in. caliper and larger. Start at ground and cover trunk to height of first branches and securely attach. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures required before wrapping.

7. Immediately after planting, guy and stake trees of 1 1/2 in. caliper or larger or over 6 ft. in height on planting schedule.

B. Seeding New Lawns: As specified in the Erosion and Sedimentation Control Plan notes and as follows.

1. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.

2. The hydraulic spray method shall be used for seeding all areas unless alternative methods are approved by the Owner's Representative.

3. Application Procedure:

a. Hydraulic Spray Method: The hydraulic spray method of sowing seed shall be done with an approved machine operated by a competent crew. Seed and fertilizing materials shall be mixed with water in the tank of the machine and kept thoroughly agitated so the materials are uniformly mixed and suspended in the water at all times during operation. Contractor shall furnish seed and fertilizer labels to Owner's Representative prior to mixing. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates. If the Owner's Representative finds the application uneven or otherwise unsatisfactory, he may require the hydraulic spray method to be abandoned and the balance of the work done as specified under another method.

4. Mulching: As specified in the Erosion and Sedimentation Control Plan notes.

C. Planting Ground Cover: Space plants as shown or scheduled. Excavate subgrade to a depth of 6 inches for contiguous groundcover area 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. Protect from hot sun and wind for several days. Remove protection when plants show evidence of recovery from transplanting shock. Mulch areas between ground cover plants; place not less than 4 in. thick.

3.03 FERTILIZING TREES AND SHRUBS:

A. Water Soluble Fertilizer:

1. The first liquid feeding will be permitted as the first watering only during backfilling of the plant, unless otherwise directed by the Owner's Representative. All seedlings will be liquid fed during planting. The second liquid feeding will be made the following Spring season, no later than June 30th.

2. Liquid fertilizer shall be completely dissolved and mixed in water at the rate of 6 lbs. of the fertilizer concentrate to 100 gallons of water.

3. The resulting solution shall be poured in the plant pit as directed by the Owner's Representative. A second application at the same rate shall be applied as directed by the Owner's Representative. The solution shall be applied at the following rates for each application:

   Plants up to 2 ft. in height shall receive 4 quarts.
   Plants above 2 ft. and up to 6 ft. shall receive 6 quarts.
   Plants above 6 ft. and up to 12 ft. shall receive 12 quarts.
   Plants above 12 ft. shall receive 16 quarts.

B. Slow Release Fertilizer Packets:

1. All woody plants except evergreen seedlings shall be fertilized with slow release fertilizer packets at the time of planting, unless otherwise directed by the Owner's Representative. Fertilizer packets shall be placed equidistantly within the planting pit adjacent to the ball or root mass, but not in direct contact with roots. Placement depth shall be 6 to 8 inches. Packets shall not be cut, ripped or damaged.

2. If it becomes necessary to remove and replace dead or unhealthy plants, damaged or broken packets shall be replaced with new packets.

   The application rates shall be as follows:

Type of Plants	No. of Packets
Evergreen Trees	
Under 18 inches height	1
18 inches to 3 ft. height	2
3 ft. to 6 ft. height	3
Over 6 ft. height	4
Deciduous Trees	
Under 6 ft. height	2

6 ft. to 12 ft. height or under 4 in. caliper	3
Over 4 inches caliper	4
Shrubs	1
Under 2 ft. height or spread	
2 ft. to 3 ft. height or spread	2
Over 3 ft. height or spread	3
Vines and Ground Covers	1

3.04 WATERING: Thoroughly water all plants after delivery to the site and immediately after planting. This shall mean full and thorough saturation of all backfill in the pits and beds during the same day of planting. Apply water only by open end hose at a very low pressure to avoid air pockets and injury to the roots. Continue to water all plants and lawns as required to promote healthy growth during the establishment period.

3.05 GUYING: See Typical Planting Details on Drawings for installation requirements. Keep supports in place during entire guarantee period.

3.06 WRAPPING: Wrap trees by overlapping tree wrap tape to 50 percent. Wind from the lowest main branches to the base of the tree. Tie the wrapping at the top and bottom. Wrap within four days after planting and maintain in place for the entire guarantee period.

3.07 PRUNING: After planting, neatly prune all plants to preserve their natural form and character and in a manner appropriate to their requirements. Limit pruning to the minimum necessary to remove injured twigs and branches and to compensate for the loss of roots during transplanting, but never to exceed 1/3 of the branching structure.

3.08 MULCHING: Within two (2) days after planting, mulch all tree pits and planting beds with 4 in. layers of mulching material.

3.09 MAINTENANCE AND ACCEPTANCE:

A. Lawns:

1. Maintain lawns by watering (on a daily basis during the germination period), fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading and re-planting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

a. Areas will be accepted only upon attainment of a reasonably thick uniform stand of grass of not less than 80 percent coverage of permanent grasses, free from sizable thin or bare spots.

2. The acceptance of any seeded areas will be in writing. After acceptance, the contractor will be relieved of further expense for maintaining the areas, except for damage resulting from his own or his subcontractor's operations.

B. Trees and Shrubs:

1. The acceptability of the plant material furnished and planted under this Contract shall be at the end of a period of establishment, during which the Contractor, as necessary, shall employ all possible means to preserve the plants in a healthy and vigorously growing condition and to insure their successful establishment. The establishment period shall extend for a period of one (1) calendar year from the date of final acceptance of the project. During this period, the Contract shall water, cultivate and prune the plants, repair guy wires and stakes, mouse bait as may be required and do any other work necessary to maintain the plants in a healthy growing condition. This shall include seasonal spraying with approved insecticides or fungicides as may be required. The Contractor shall also be responsible for protecting the plants from mice and other rodents. All dead or rejected plants shall be promptly removed from the project and replaced by live healthy plants meeting the same specifications, if such plants are declared unacceptable during this planting season. Otherwise, they shall be replaced during the next subsequent planting season. No payment shall be made for unsatisfactory work during the establishment period.

2. The period of establishment shall commence as soon as each plant is planted and shall extend until the date of final acceptance. Necessary replacements shall be made so that at the time of final acceptance all plants shall be in a healthy, vigorous growing condition and free from sizable die-back.

3. It shall be the sole responsibility of the Contractor to replace any unsatisfactory plants on the project regardless of whether they are specifically designated by the Owner's Representative. In the case of individual doubtful plants, the Contractor may call upon the Owner's Representative to make a determination as to their acceptability, but it shall not be incumbent on the Owner's Representative to furnish the Contractor with exact lists of replacements.

4. All replacements of plants shall be completed by the end of the planting season prior to the final acceptance date. Any small quantity of plants which fail between the end of the planting season and the final acceptance date shall be canceled from the list of accepted plants and the Contractor will receive no payment for them. If a sizable number fails, the Owner's

Representative may extend the date of final acceptance to the subsequent planting season, in which case, the Contractor will be subject to liquidated damages. All replacement planting shall conform in every way to the requirements of the original planting. The Owner's Representative may require that any replacement plants that are not dormant, or that are planted late in the season, be sprayed, as directed, with an approved anti-desiccant.

3.10 CLEANUP AND PROTECTION: During landscape work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition. 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. Treat, repair, or replace damaged landscape work as directed.

3.11 RESTORATION: All pavements, seeded and planted areas, structures and substructures not specifically provided for in the contract disturbed by the Contractor during the execution of the work shall be restored by the Contractor, in a manner satisfactory to the Owner's Representative, to their original conditions at no additional cost to the Owner.

END OF SECTION

SECTION 02825

ORNAMENTAL METAL FENCE SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

The contractor shall provide all labor, materials and appurtenances necessary for installation of the industrial ornamental aluminum fence system defined herein at Portland, Maine.

1.02 RELATED WORK

Section 02200 - Earthwork
Section 03330 - Concrete

1.03 SYSTEM DESCRIPTION

The manufacturer shall supply a total industrial ornamental aluminum fence system of the Ameristar Echelon II Genesis design. The system shall include all components (i.e., pickets, rails, posts, gates and hardware) required.

1.04 QUALITY ASSURANCE

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
ASTM D523 - Test Method for Specular Gloss.
ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
ASTM D2794 - Test Method for Resistance of Organic Coatings to The Effects of Rapid Deformation (Impact).
ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

1.06 SUBMITTAL

The manufacturer's literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

The industrial ornamental aluminum fence system shall conform to Ameristar Echelon II, Genesis, 3-Rail_style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

PART 2 – MATERIALS

2.01 MANUFACTURER

The industrial ornamental aluminum fence system shall conform to Ameristar Echelon II, Genesis, 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.02 MATERIAL

A. Aluminum material for fence framework (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails (outer channel) shall be Alloy and Temper Designation 6005-T5. The aluminum extrusions for pickets and rail inner slide channels shall be Alloy and Temper Designation 6063-T5.

B. The manufactured framework shall be subjected to the Ameristar® thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be black. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.

C. Material for fence pickets shall be 1" square x 0.065" thick extruded tubing. The cross-sectional shape of the rails shall conform to the manufacturer's ForeRunner design with outside cross-section dimensions of 1.75" square. The top wall of the outer channel of the rail shall be 0.100" thick; the side walls shall be 0.120" thick for superior vertical load strength. The inner slide channel of the rail shall be 0.080" thick. Picket holes in the ForeRunner rail shall be spaced 4.98" o.c. Picket retaining rods shall be 0.125" diameter galvanized steel. Posts shall be a minimum of 2-1/2" square with a perimeter wall thickness of 0.080" and a an interior reinforcing web thickness of 0.080". High quality PVC grommets shall be supplied to seal all picket-to-rail intersections.

D. All fasteners shall be stainless steel. Bracket to rail attachments shall be made using specially designed one-way tamperproof security bolts with inverted "t-nuts". Bracket to post connections shall be made using self-drilling hex-head screws.

E. Aluminum castings shall be used for all rings, post caps, finials, and miscellaneous adornments.

2.03 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. ForeRunner rails shall be pre-punched to accept pickets.

B. The rail inner slide shall be fully inserted into the rail outer channel to form the raceway for the internal retaining rod. Grommets shall be inserted into the pre-punched holes in the rails, and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal raceway of the two-part ForeRunner rails. (Note: This can best be accomplished by using an alignment template). Retaining rods shall be inserted into each ForeRunner rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.

C. Completed panels shall be capable of supporting a 300 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 25% change in grade.

D. Gates shall be fabricated using ForeRunner rail material and gate ends having the same outside cross-section (1.75" Square) as the rail. Gate ends shall be 0.125" thick; gate pickets shall be 0.080" thick. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined either by welding or by the same retaining rod process used for panel assembly.

PART 3 - EXECUTION

3.01 PREPARATION

All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 INSTALLATION

Fence posts shall be set in accordance with the spacings shown in Table 2, plus or minus 1/2", depending on the nominal span specified. Gate posts shall be spaced according to the gate openings specified in the construction plans. The "Earthwork" and "Concrete" sections of this specification shall govern post base material requirements. Echelon II panels shall be attached to posts using mechanically fastened panel brackets supplied by the manufacturer.

3.03 CLEANING

The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

Table 1 - Coating Performance Requirements

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 - Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 3,000 hours (Scribed per D1654; failure mode is 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822, D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 2 - Post Spacing Requirements

Span	6' Nominal (67-3/4" Rail)				8' Nominal (92-5/8" Rail)			
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket	Rigid		Swivel		Rigid		Swivel	
Straight Picket Post Settings ± ½" O.C.	71-1/2"	72"	73"	73-1/2"	96"	96-1/2"	97-1/2"	98"
Curved Picket Post Settings ± ½" O.C.	75"	75-1/2"	76-1/2"	77"	94-1/2"	95"	96"	96-1/2"

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SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements that 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, 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.

1.03 RELATED WORK:

A. Miscellaneous Metal: Section 05500

1. Expansion Anchors - Section 05500

2. Embedded Items - Section 05500

B. Anchor Bolts: Section 05120

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following except where more stringent requirements are shown or specified:

1. ACI 213R-87 "Guide for Structural Lightweight Aggregate Concrete."

2. ACI 211.1-91 "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."

4. ACI 211.2-91 "Standard Practice for Selecting Proportions for Structural Lightweight Concrete."

5. ACI 212.3R-91 "Chemical Admixtures for Concrete."

4. ACI 301-89 "Specifications for Structural Concrete for Buildings."

6. ACI 302.1R-89 "Guide for Concrete Floor and Slab Construction."

7. ACI 304R-89 "Guide for Measuring, Mixing, Transporting and Placing Concrete."

8. ACI 304.2R-91 "Placing Concrete by Pumping Methods."

9. ACI 306 R-88 "Cold Weather Concreting."

10. ACI 308-92 "Standard Practice for Curing Concrete."

11. ACI 309R-87 "Guide for Consolidation of Concrete."

12. ACI 315-80 (86) "ACI Detailing Manual."

13. ACI 318-89 "Building Code Requirements for Reinforced Concrete."

14. ACI 347R-88 "Guide to Formwork for Concrete."

15. ACI 503.2-92 "Specifications for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive."

16. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars," 1992.

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. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement, polypropylene fiber admixtures, patching compounds, non-shrink grout, waterstops, joint systems, curing compounds, bonding agents, sealers and others as requested by Architect.

B. Shop Drawings:

1. Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315, showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

C. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test if trial batch method is used for proportioning concrete mixes.

E. Strength Tests: Provide required records of strength tests if field experience method is used for proportioning concrete mixes.

F. Name and address of proposed testing lab.

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. Fiber Reinforcing: ASTM C1116, Type III virgin polypropylene fibers as manufactured by FIBERMESH or approved alternate.

1. The Fiber size (length) required shall be based on the largest size of the coarse aggregate in the concrete mix and determined by the manufacturer. Manufacturer shall submit written confirmation as to size of fibers that will be used based on concrete mix specified.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Provide welded wire fabric in flat sheets.

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 wire bar type supports complying with CRSI recommendation, unless otherwise specified. Wood, brick and other 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 acceptable to Architect. 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. Calcium Chloride not permitted.

2.04 RELATED MATERIALS:

A. Moisture Barrier: Provide moisture barrier cover over prepared base material as follows:

1. Vaporshield manufactured by Century Floors of Topsham, ME

2. Griffolyn Type-65 manufactured by Reef Industries of Houston, TX

B. Non-Shrink Cement-based Grout: Provide grout consisting of premeasured, 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.

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.

D. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

E. Liquid Membrane-Forming Curing Compound:

1. 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 to be applied directly to the concrete. Demonstrate the non-impairment prior to use.

F. Preformed Expansion Joint Formers:

1. Isostrip manufactured by Century Floors of Topsham, ME

2. Conflex manufactured by Masonite Building and Industrial Products of Chicago, IL

3. Bituminous Fiber Type, ASTM D 1751.

G. Slab Joint Filler:

1. Multi-component polyurethane sealant (self-leveling type).

H. Bonding Agent: Provide epoxy adhesive conforming to ASTM C 881 to bond plastic concrete to hardened concrete. Prepare hardened concrete surface and apply bonding agent in compliance with manufacturer's instructions.

I. Sealer: Sikagard 70, water and chloride-ion repellent penetrating sealer manufactured by Sika orapproved alternate. Apply to all exterior concrete flatwork including stairs, ramps and sidewalks in accordance with manufacturer's instructions.

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 301. 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 at least 14 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

C. Proportion design mixes to provide concrete with the following properties:

1. Interior Slab-On-Grade and Elevated Slabs:
   a. Strength: 4000 psi @28 days, 3/4" aggr.
   b. W/C Ratio: 0.48
   c. Entrained Air: non-air-entrained
   d. Slump: 3"±1"

2. Frost Walls, Retaining Walls and all other exposed Site Concrete:
   a. Strength: 3500 psi @28 days, 3/4" aggr.
   b. W/C Ratio: 0.53
   c. Entrained Air: 6% ± 1%
   d. Slump: 3"±1"

3. Exterior flatwork including slabs, ramps, stairs and sidewalks:
   a. Strength: 4000 psi @28 days, 3/4" aggr.
   b. W/C Ratio: 0.48
   c. Entrained Air: 7% ± 1%
   d. Slump: 3"±1"
   e. DCI -S Corrosion Inhibitor by Grace Construction Products or Rheocrete CNI Corrosion Inhibitor by Master Builders. 3 1/2 gal/cy. added at Batch Plant.

4. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.

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 Architect before using in work.

1. Water may be added at the project only if the specified slump and design mix maximum water/cement ratio is not exceeded.

2.06 CONCRETE MIXING:

A. Job-Site Mixing: Not 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 C 94 may be required by 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, sinkages, 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 snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.

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. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

2. 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.

3. Place reinforcement to obtain specified coverages for concrete protection within tolerances of ACI-318. 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.

4. Fiber Reinforcing shall be introduced directly into the concrete either at the batch plant or job site at the rate of 1.6 pounds (minimum) per cubic yard. If introduced at the batch plant with the aggregate, no extra mixing time is required. If added at the job site, approximately 3 to 5 minutes mixing at agitating speed is required.

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.

1. Provide keyways at least 1-1/2" deep in construction joints in walls, and slabs; accepted bulkheads 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 or permitted, cutting shall be timed properly with the set of the concrete: Cutting shall be started as soon as the concrete has been hardened sufficiently to prevent aggregate being dislodged by the saw, and shall be completed before shrinkage stresses become sufficient to produce cracking.

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.

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.

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, reinforcement and all work shall be subject to review by the Architect. Verify that reinforcing, ducts, anchors, seats, plates and other items to be cast into concrete are placed and securely held. Notify Architect 48 hours prior to scheduled placement and obtain approval or waiver of review prior to placement. Moisten wood forms immediately before placing concrete where form coatings are not used. Be sure that all debris and other foreign matter is removed from forms.

B. 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. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete.

d. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches. 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.

C. 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 supplemented by hand-spading, rodding or tamping. 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.

D. 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 strikeoff. 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.

E. 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 deg.F (4 deg.C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg.F (10 deg.C), and not more than 80 deg.F (27 deg.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 deg.F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 deg.F.

F. 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 deg.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 of 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. 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 unformed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.09 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.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft. when tested with a 10 ft. straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

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.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/4 in. in 10 ft. when tested with a 10-ft. straightedge. Grind smooth any surface defects which would telegraph through applied floor covering system.

D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 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.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

a. Curing shall be continued for at least 7 days in the case of all concrete except high-early-strength concrete for which the period shall be at least 3 days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the specified strength, f'_c. If one of the curing procedures below is used initially, it may be replaced by one of the other procedures any time after the concrete is 1 day old provided the concrete is not permitted to become surface dry during the transition.

3. When the mean daily temperature is less than 40 deg.F, the temperature of the concrete shall be maintained between 50 and 70 deg.F for the required curing period.

a. When necessary, arrangements for heating, covering, insulation, or housing the concrete work shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

b. Keep protections in place and intact at least 24 hours after artificial heat is discontinued. Avoid rapid dry-out of concrete due to overheating and avoid thermal shock due to sudden cooling or heating.

c. Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5 deg.F in any 1 hour or 50 deg.F in any 24 hour period.

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.

1. Provide moisture curing by following methods:

   a. Keep concrete surface continuously wet by covering with water.

   b. Continuous water-fog spray.

   c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-in. lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows:

   a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 in. and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Provide curing compound to slabs as follows:

   a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

   b. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener or with a covering material bonded to concrete such as concrete, waterproofing, damp-proofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

   c. Separating compound may be used as a curing medium if applied in accordance with manufacturer's specifications.

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, 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.

3.11 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 deg.F (10 deg.C)

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 beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and 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.

3.12 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 laitance, 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.

3.13 MISCELLANEOUS CONCRETE ITEMS:

A. Filling In: 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.

3.14 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, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, and other projections on surface and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Proprietary patching compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

5. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

6. Use epoxy-based mortar for structural repairs, where directed by the Architect.

7. Repair methods not specified above may be used, subject to acceptance of the Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. The Contractor 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 employed by an independent testing laboratory acceptable to both the Architect and the Owner.

B. Concrete shall be sampled and tested for quality control during placement of concrete shall include the following, unless otherwise directed by Architect.

C. Sampling Fresh Concrete: ASTM C 172.

1. Slump: ASTM C 143; one test for each concrete load at point of discharge and one test for each set of compressive strength test specimens. A slump test must be run prior to the incorporation of the CFP fibers per recommendations of ACI 544.

2. Air Content: ASTM C 231 "Pressure method for normal weight concrete." One for each set of compressive strength test specimens.

3. Concrete Temperature: Test hourly when air temperature is 40 deg.F (4 deg.C) and below, and when 80 deg.F (27 deg.C) and above; and each time a set of compression test specimens are made.

4. Compression Test Specimen: ASTM C 31; 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. Fiber reinforced concrete test specimens shall be vibrated externally per recommendations ACI 544.

5. Compressive Strength Tests: ASTM C 39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing if required.

   a. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 used.

   b. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived, if in the Architect's judgement, adequate evidence of satisfactory strength is provided.

   c. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

   d. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

   e. Test results will be reported in writing to Architect and Contractor on the day after tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. 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 C 42, 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.

3.16 ENGINEER'S REVIEW

A. The Engineer of Record will conduct periodic reviews of the construction for compliance with the provisions of the Specifications and Drawings during the construction period.

B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

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. This Section includes plant-precast structural concrete units, including the following:

1. Hollow-core slab units.
2. Structural framing beams and columns.

B. Related Sections include the following:

1. Division 7 Section "Through-Penetration Firestop Systems" for joint filler materials for fire-resistance-rated construction.
2. Division 7 Section "Joint Sealants" for elastomeric joint sealants and sealant backings.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the design loads indicated on Drawings within limits and under conditions indicated:

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixes: For each concrete mix.

C. 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.

1. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
2. Indicate locations and details of anchorage devices to be embedded in other construction.
3. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation.

D. Samples of bearing pads.

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 architects and owners, and other information specified.

G. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:

H. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Concrete materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed precast structural concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. 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 jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast structural concrete that are similar to those indicated for this Project in material, design, and extent.
3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group C, Category C3.
4. Has sufficient production capacity to produce required units without delaying the Work.

C. Testing Agency Qualifications: An independent testing agency, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and camber and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products."

F. Product Options: Drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated. Other fabricators' precast concrete units complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel."

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 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.

1.7 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.

PART 2 - PRODUCTS

2.1 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.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 , deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.

C. Galvanized Reinforcing Bars: ASTM A 767, Class II zinc coated, hot-dip galvanized after fabrication and bending, as follows:

1. Steel Reinforcement: ASTM A 615 , Grade 60.

D. Plain-Steel Wire: ASTM A 82, [as drawn] [galvanized].

E. Deformed-Steel Wire: ASTM A 496.

F. Epoxy-Coated-Steel Wire: ASTM A 884, Class A coated, plain.

G. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from galvanized steel wire into flat sheets.

H. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

I. Epoxy-Coated-Steel Welded Wire Fabric: ASTM A 884/A 884M, Class A coated, [plain] [deformed].

J. 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 "Manual of Standard Practice," PCI MNL 116, and as follows:

1. For uncoated reinforcement, use CRSI Class 1 plastic-protected bar supports.
2. For epoxy-coated reinforcement, use all-plastic bar supports.
3. For zinc-coated reinforcement, use all-plastic bar supports.

2.3 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416/A 416M, Grade 250 or 270, uncoated, 7-wire, low-relaxation strand.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source.

B. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 5S.

C. Lightweight Aggregates: ASTM C 330.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

F. Water-Reducing Admixture: ASTM C 494, Type A.

G. Retarding Admixture: ASTM C 494, Type B.

H. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

I. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

J. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.

K. Plasticizing Admixture: ASTM C 1017.

L. Fly Ash Admixture: ASTM C 618, Class C or F.

M. Metakaolin Admixture: ASTM C 618, Class N.

N. Silica Fume Admixture: ASTM C 1240.

2.5 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.

C. Malleable Steel Castings: ASTM A 47.

D. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

E. 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.

F. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

G. 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/A 123M, after fabrication, and ASTM A 153/A 153M, 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.

H. Welding Electrodes: Comply with AWS standards.

I. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast structural concrete units.

2.6 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.

2.7 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, 50 to 70 Shore A durometer, minimum tensile strength 2250 psi per ASTM D 412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore 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. Hardboard: AHA A135.4, Class 1, tempered hardboard strips, smooth on both sides.
6. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.8 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. 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.

C. Epoxy Grout: ASTM C 881, 2-component epoxy resin, of type, grade, and class to suit requirements.

2.9 CONCRETE MIXES

A. Prepare design mixes for each type of concrete required.

1. Limit use of fly ash and silica fume to not exceed, in aggregate, 25 percent of portland cement by weight.

B. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318 .

D. Normal-Weight Concrete: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi
2. Maximum Water-Cementitious Materials Ratio: 0.40.
3. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows, with a tolerance of plus or minus 1-1/2 percent:

a. Air Content: 6 percent for 1-inch nominal maximum aggregate size.
b. Air Content: 6 percent for 3/4-inch nominal maximum aggregate size.
c. Air Content: 7 percent for 1/2 nominal maximum aggregate size.

d. Air Content: 4 percent, minimum.

E. Other Admixtures: Use water-reducing, high-range water-reducing, water-reducing and accelerating, or water-reducing and retarding admixtures according to manufacturer's written instructions.

F. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.10 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 anchorage devices and secure to formwork. Locate anchorages where they do not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in units unless approved by 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 Architect.

D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" 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 or posttensioning methods. 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 on a surface that will not show in finished structure.

L. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by 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. Finish formed surfaces of precast structural 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 color variations, form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.
2. Commercial Finish: Remove fins and large protrusions and fill large holes. Rub or grind ragged edges. Faces are to be true, well-defined surfaces.
3. Grade B Finish: Fill air pockets and holes larger than 1/4 inch in diameter with sand-cement paste matching color of adjacent surfaces. Grind smooth form offsets or fins larger than 1/8 inch.
4. Grade A Finish: Fill air pockets and holes larger than 1/4 inch in diameter with sand-cement paste matching color of precast concrete. Grind smooth form offsets or fins larger than 1/8 inch. Float-apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles.

O. Screed finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections.

P. Smooth steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

1. Apply scratch finish to precast concrete units that will receive concrete topping after installation. After initial strikeoff, transversely scarify surface to provide ridges approximately 1/4 inch deep.

Q. Recess prestressing tendons a minimum of 1/2 inch (13 mm), fill recesses with grout, and apply a sack finish to vertical ends of precast concrete units.

2.11 HOLLOW-CORE SLAB UNITS

A. Type: Precast, prestressed concrete units with open, hollow cores running the full length of the slab units.

B. Furnish units free of voids and honeycombs.

C. Provide standard finish to precast concrete units.

D. Reinforce units to resist transportation and erection stresses.

E. Include cast-in weld plates where required.

F. Coordinate with other trades for installation of cast-in items.

G. Provide solid, monolithic, precast concrete slab units forming an integral part of hollow-core slab unit system. Design and fabricate solid units to dimensions and details indicated for hollow-core slab units.

H. Provide headers of cast-in-place concrete or structural-steel shapes for openings larger than one slab width according to hollow-core slab unit fabricator's written recommendations.

2.12 STRUCTURAL FRAMING UNITS

A. Type: Precast, prestressed structural concrete framing units.

B. Furnish units free of voids and honeycombs.

C. Provide standard finish to precast concrete units.

D. Reinforce units to resist transportation and erection stresses.

E. Include cast-in weld plates where required.

F. Coordinate with other trades for installation of cast-in items.

2.13 SOURCE QUALITY CONTROL

A. Owner will 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 Architect.

2. Cores will be tested, after immersion in water, in a wet condition per ACI 301 if units will be wet under service conditions.
3. Cores will be tested in an air-dry condition per ACI 301 if units will be dry under service conditions.
4. 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.
5. Test results will be made in writing on the same day that tests are performed, with copies to 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 length-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 if 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. Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast 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 shields as required.
2. Repair damaged metal surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces.
3. Repair damaged metal surfaces by cleaning and repriming damaged painted surfaces.

D. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units unless approved by 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."

F. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at keyways, connections, and joints as follows:

1. Provide forms or other approved method to retain grout in place until hard enough to support itself. Pack spaces with stiff 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 surfaces before it hardens.

3.3 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Field welds and connections using high-strength bolts will be subject to tests and inspections.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

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 rinse 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.

END OF SECTION 03410

SECTION 03450

ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes precast concrete units.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast concrete units and connections capable of withstanding design loads within limits and under all existing code criteria.

1.03 SUBMITALS

A. Product Date: For each product indicated.

B. Design Mixes: For each concrete mix.

C. Shop Drawings: Detail Fabrication and installation of precast concrete units including exterior wall panels, column covers, and precast sill members. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish and types of reinforcement, including special reinforcement.

1. Comprehensive engineering analysis stamped and signed by the qualified professional engineer responsible for its preparation. Analysis shall indicate design loads, member spans, member reinforcement, and connection design and detail for attachment to supporting structure.

D. Samples: For each type of finish, in sets of 3, 12 by 12 by 2 inches.

E. Welding certificates.

F. Material certificates.

1.04 QUALITY ASSURANCE:

A. Fabricator Qualifications: A qualified fabricator who assumes responsibility for engineering precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

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ARCHITECTURAL PRECAST CONCRETE

1. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group A, Category A1 – Architectural Cladding and Load Bearing Units.

B. Design Standards: Comply with ACI 318 and the design recommendations in PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete."

C. Quality-Control Standard: Comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

D. Welding: Qualified procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel", and AWS D1.4, "Structural Welding Code-Reinforcing Steel."

E. Sample Panels: Produce a minimum of 3 sets of full-scale sample panels to demonstrate range of finish, color, and texture variations of approved samples.

1.05 DELIVERY, STORAGE, AND HANDLING

A. 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 pints shown on Shop Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Steel Reinforcing:

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 69, deformed.

2. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

3. Plain-Steel Wire: ASTM A 496.

4. Deformed-Steel Wire: ASTM A496.

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5. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

6. Deformed-Steel Welded Wire Fabric: ASTM A 497 flat sheet.

7. Supports: Manufacture's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 117.

8. Prestressing Strand: ASTM A 416/A 416M, Grade 250 or 270, uncoated, 7-wire, low-relaxation strand.

B. Concrete:

1. Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source. Color samples to be submitted to Design /Builder for approval. Color to be MCTC.

2. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with course aggregates complying with Class 5S.

3. Light-Weight Aggregates: ASTM C 330.

4. Coloring Admixture: ASTM C 979 synthetic mineral-oxide pigments or colored water-reducing as mixtures, temperature stable, nonfading, and alkali resistant.

5. Air-Entraning Admixture: ASTM C 260.

6. Fly Ash Admixture: ASTM C 618, Class C or F.

7. Metakaloin Admixture: ASTM C 618, Class N.

8. Silica Fume Admixture: ASTM C 1240.

C. Steel Connections:

1. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

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2. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.

3. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

4. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

5. 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.
6. Finish: For all connection materials, apply zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication and ASTM A 153/A 153M as applicable.

   a. Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.

D. Sand-Cement Grout: Portland cement, ASTM C 150, Type 1, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2 ½ parts sand, by volume, with minimum water required for placement and hydration.

E. Pre-Cast units: To include pre-cast beams at lobby and west stair, pre-cast column covers, and pre-cast sill elements as shown.

2.02 CONCRETE MIXES:

A. Light-Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or filed test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.

2. Maximum Water-Cementitious Materials Ratio: 0.40.

B. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

2.03 FABRICATION:

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A. Anchorage Hardware: Fabricate with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during pre-casting operations.

B. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing pre-cast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in precast concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.

E. Reinforce precast concrete units to resist handling, transportation, and erection stresses.

F. Prestress tendons for precast concrete units by either pre-tensioning or post-tensioning methods. Comply with PCI MNL 117.

G. Mix concrete according to PCI MNL 117 and requirements in the Section. After concrete batching, no additional water may be added.

H. Place face mix to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover.

I. 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 117 for measuring, mixing, transporting and placing concrete.

    1. Place backup concrete to ensure bond with face mix concrete.

J. 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 117.

K. Comply with ACI 306.1 procedures for cold-weather concrete placement.

L. Comply with ACI 305 R recommendations for hot-weather concrete placement.

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M. Identify pickup pints of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

O. Discard precast concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Design/Builder.

P. Fabricate precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finish panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in-items.

2.04 FINISHES:

A. Finish exposed-face surfaces of precast concrete units to match approved design reference sample and as follows:

1. **Face Surface Finish and Color to match Sample WA-4 by Northern Design Precast, 51 International Drive, Loudon, NH 03307, (603) 783 8989.**

References:

a. PCI and APA's "Architectural Precast Concrete – Color and Texture Selection Guide, :" of plate numbers indicated.

b. Smooth-Surface Finish: Free of pockets, sand streaks, and honeycombs, with uniform color and texture.

c. Textured-Surface Finish: Impart by form liners or inserts to produce surfaces free of pockets, streaks, and honeycombs, with uniform color and texture.

d. Bushhammer Finish: Use power or hand tools to remove matrix and fracture coarse aggregates.

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e. Retarded Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.

f. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.

g. Horned Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.

h. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.

B. Finish exposed top and bottom surfaces of precast concrete units to match face-surface finish.

2.05 SOURCE QUALITY CONTROL

A. Design/Builder will employ an independent testing agency to evaluate precast concrete fabricator's quality-control and testing methods.

B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install precast concrete. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

B. Anchor precast concrete units in position by bolting, welding, grouting, or as otherwise indicated.

C. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

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1. Repair damaged steel surfaces by cleaning and applying a coat of galvanized repair paint to galvanized and re-priming damaged painted surfaces.

D. Install pre-cast concrete units level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 117, Appendix 1.

E. Repair exposed exterior surfaces of precast concrete units to match color, texture, and uniformity of surrounding precast concrete if permitted by Design/Builder.

F. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt and stains.

END OF SECTION

SECTION 04200

UNIT MASONRY

1. GENERAL

1.1 DESCRIPTION OF WORK

A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

B. Extent of Unit Masonry is shown on the drawings.

C. In addition to work shown on the drawings and specified elsewhere in this Section, build in steel lintels, anchors, inserts and sleeves.

1.2 QUALITY ASSURANCE

A. Standards: Comply with recommendations of Brick Institute of America (BIA), and National Concrete Masonry Assoc. (NCMA).

1.3 SUBMITTALS

A. Issue submittals in accordance with Section 01300, Submittals.

B. Submit product data and installation recommendations for masonry units, cementitious products for mortar and grout, coloring pigments, throughwall flashing, and masonry accessories.

C. Submit samples of exposed masonry units and mortar, illustrating full range of colors and textures.

PRODUCTS

2.1 FACE BRICK

A. Face brick shall be Red Range Old Port.

B. Face brick shall comply with ASTM C 216, Grade SW, Type FBS. Units shall be standard size, modular for 3/8 in. mortar joints, nominal dimensions 3-5/8 in. thick, 2-1/4 in. high, 7-5/8 in. long, and 8" x 8" x 3-5/8".

2.2 CONCRETE MASONRY UNITS

A. Except as shown on Drawings or specified otherwise, all concrete masonry units shall be as follows:

1. Hollow-type complying with ASTM C 90, Type 1 (moisture-controlled), Grade N, bearing UL Classification Mark D-2 (2 hr.).
2. Compressive strength: 2500 psi net, 1250 psi gross (average of three units). Prism strength fm=2500 psi in Pier A, fm=2000 elsewhere.
3. Normal-weight, with sand and gravel aggregate complying with ASTM C 33, approximate oven-dry unit weight of 135 lbs. per cu. ft.
4. Nominal 8" x 16" face dimensions (modular for 3/8 in. mortar joints), thickness per drawings, smooth face, standard gray color, laid up in running bond.

2.3 MORTAR AND GROUT

A. Mortar shall comply with ASTM C 270, BIA Technical Notes 8 and 8A, and local Building Code.

B. Materials shall conform to applicable ASTM specifications including the following:

1. Portland Cement: ASTM 150, Types I, II, or III (do not use Types IA, IIA, or IIIA).
2. Masonry Cement: ASTM C 91.
3. Hydrated Lime: ASTM C 207, Type S only (do not use Type N).
4. Natural or manufactured sand aggregate: ASTM C 144, gradation conforming to Table 1 in BIA Technical Note 8.
5. Masonry cement shall not contain ground limestone.
6. Water: clean, potable, and free of deleterious amounts of acids, alkalies or organic materials.

C. Mortar Type

1. General:

a. Mortar for exterior brick shall be colored, submit samples to Architect for approval. Color to be 304 Lt. Brown.

b. Use 1800 psi minimum Type S mortar for reinforced masonry and where indicated.

c. Use 750 psi minimum Type N mortar for exterior, above-grade loadbearing and non-loadbearing walls, and for other applications where another type is not indicated.

D. Grout

1. Grout shall conform to ASTM C 476 and to match existing.

2. Fine and coarse aggregate for grout mixes shall be defined in ASTM C 404.

a. Fine grout shall consist of one part portland cement, 0 to 1/10 part lime, 2-1/4 to 3 parts fine sand.

b. Coarse grout shall consist of the fine grout mix described in "a" above plus 1 to 2 parts coarse aggregate.

c. Use coarse grout (pea gravel aggregate) except where minimum horizontal core dimension is under 4 in., in which case use fine grout (sand aggregate). Ordinary concrete (maximum 1 in. aggregate) may be used where minimum core dimension exceeds 6 inches.

E. During cold-weather construction at exterior walls, use Type III (high-early strength) cement and Type S hydrated lime. A non-calcium-chloride-based accelerator such as Dur-o-Wal, Dur-o-Guard, or Euco Accelguard 80 may be used, in quantities recommended by manufacturer for expected ambient temperature. Calcium chloride may not be used. Refer to EXECUTION portion of this Section for general provisions governing cold weather construction.

2.4 METAL REINFORCING, TIES, ANCHORS

A. Acceptable manufacturers: Heckmann Building Products, or approved equal.

B. Brick ties at masonry veneer construction:

1. a. At wood stud backup: 14 Ga # 315-D anchor with 3/16 x 4" #316 triangle ties. Min. 2" into bed joints.
b. At steel stud backup: 14 Ga # 315-D anchor with 3/16 x 4" #316 triangle ties. Min. 2" into bed joints.
c. At concrete wall backup: 24 Ga #100 Standard Dovetail Slot with 3/16 x 4" #316 triangle ties. Min. 2" bed joints.

2. At gypsum sheathing secure anchors through sheathing directly to wood studs with s/s wood screws as recommended by anchorage manufacturer.

3. Maximum spacing: 24 in. o.c. vertically, 16 in. o.c. horizontally or closer spacing as required at expansion joints, corners, floors, etc., or to secure directly to studs.

4. Material: stainless steel.

2.5 THROUGHWALL FLASHING

A. Through-wall flashing: Shall be 7 oz. Asphalt & Copper-Coated Thru-Wall Flashing as manufactured by Sandell Manufacturing Co., Inc., Cambridge, Massachusetts, telephone (617) 491-0540, or approved equal.

B. Through-wall flashing sealant: Shall be Sandell Trowel Mastic, as manufactured by Sandell Manufacturing Co., Inc.

2.6 FELT

A. No. 15, asphalt-saturated, unperforated organic roofing felt, complying with ASTM D 226, Type I, 36 inches wide.

2.7 MASONRY ACCESSORIES

A. Weepholes: medium-density polyethylene, 3/8 in. diameter, full depth of outer wythe.

B. Chemical cleaning agents for newly-installed masonry: ProSoco Sure-Klean liquid masonry cleaners or equal by Diedrich, as recommended by manufacturer for particular condition. Recommended cleaners include Sure-Klean No. 600 Detergent, No. 101 Lime Solvent, and Vana Trol.

3. EXECUTION

3.1 MASONRY WORK IN GENERAL

A. Erect all masonry work in compliance with the line and level tolerances specified herein. Correct, or replace, as directed by the Architect, non-conforming masonry work at no additional cost to the Contract.

B. Lay no face brick or concrete masonry unit having chipped edges or face defects where such unit or piece would be exposed to view. Remove any such unit or piece, if installed, replace with new matching material, and bear all costs therefore.

C. Examine all Drawings as to requirements for the accommodation of work of other trades. Provide all required recesses, chases, slots, cutouts, and set loose lintels. Place anchors, bolts, sleeves and other items occurring in the masonry work. Take every precaution to minimize future cutting and patching. Closely coordinate the location and placement of such items.

D. Protect all masonry from rain prior to, and during the installation thereof. If the temperature is in excess of 80 degrees F. at time of installation, lightly moisten contact surfaces or masonry units by brushing with water.

E. Lay all masonry in full mortar beds, and completely butter all concealed from view vertical edges with mortar. Completely fill cells of masonry units with mortar where vertical reinforcement is to be installed therein and in other locations specified or indicated on the Drawings.

F. Provide complete protection against breakage and weather damage to all masonry work, including substantial wood boxing around door jambs, over the tops of walls and wherever necessary to protect work at all stages of completion. Protect masonry when not roofed over, at all times when masons are not working on the walls. Apply non-staining tarpaulins or waterproof paper, properly weighted, or nailed, to assure their remaining in place to protect masonry from all possible hazards.

G. Fit masonry into bucks and frames so as not to distort alignment of such items, and fill backs of such items with mortar, except where joints are indicated to receive caulking and sealant and have no compressible filler therein, in which case rake joints to a uniform depth of ¾ inch for proper installation of caulking and sealant material.

H. Use only power saw, equipped with carborundum blade, for cutting exposed masonry, as needed to assure straight, evenly-cut edges.

I. Lay out coursing before setting to minimize cutting closures or jumping bond. Do not spread any more mortar than can be covered before surface of mortar has begun to dry. Do not endanger bond or mortar by moving masonry when once laid. If necessary to re-adjust any items, remove entirely, clean-off mortar, and reset with fresh mortar.

J. Except for cleaning down and pointing, finish all new masonry as the walls and partitions are carried up.

K. Point and fill all holes and cracks in mortar joints with additional fresh mortar; do not merely spread adjacent mortar over defect or use dead mortar droppings. Do all pointing while mortar is still soft and plastic. If hardened, chisel defect out and refill solidly with fresh additional mortar, and tool as specified.

3.2 JOB CONDITIONS

A. Store cement, lime and other cementitious materials under cover in a dry place.

B. Keep steel reinforcing, ties and anchors free from oil, dirt, rust, and other materials which would destroy bond.

C. Store masonry above ground on level platforms which allow air circulation under stacked units. Masonry units shall be dry and free from soil and ice before being laid in wall.

D. Keep installed walls dry and clean at all times. Immediately remove grout or mortar from face of masonry to be left exposed or painted. Protect previously installed elements such as louvers, doors, frames, and windows from mortar droppings and construction damage, using masking elements, dropcloths, etc.

E. Cover exposed walls at end of working day with well-secured canvas tarpaulins. Protect base of exterior walls from splashing mud and mortar by spreading sand, straw, and sawdust or plastic sheeting 3 to 4 ft. horizontally and up face of wall. Turn scaffold boards near wall on edge at end of day to prevent splashing mortar or dirt.

F. Securely brace partially completed walls against wind damage. Walls shall have been completed 24 hours minimum before application of distributed loads, 72 hours before concentrated loads.

G. Comply with cold-weather construction specifications in NCMA-TEK 16 and BIA Technical Note 1A:

1. Maintain masonry above 32 degrees F. for 24 hours minimum using insulated blankets or heated enclosures. Construct windbreaks at wind velocities over 15 mph. Maintain mortar on board at 40 degrees F. minimum, heating mixing water and sand as required.

2. Sprinkle units with high rates of absorption with heated water. Refer to mortar paragraph under PRODUCTS in this Section for provisions governing cold-weather additives to mortar. If standard instead of Type III high-early strength cement must be used, maintain installed masonry above freezing for 48 instead of 24 hours.

3. Do no masonry work at temperatures below 38 degrees F and falling or 35 degrees F and rising, until General Contractor has contacted Architect.

3.3 INSTALLATION

A. Verify that substrate is dry and free from frost, dirt, laitance, loose sand and other material which would prevent satisfactory bond. Lay first course in full mortar bed including face shells and webs of concrete masonry units. Keep cells to be grouted free from mortar.

B. Dampen masonry units as required to prevent excess suction of mortar. Lay concrete masonry units to form continuous unobstructed vertical spaces within wall. Provide full mortar coverage on horizontal and vertical face shells. Also bed webs adjacent to reinforced cores to prevent grout leakage, except omit web bedding at fully grouted walls to permit grout to flow laterally. Lay face brick with full vertical and bed joints, except as specified below to provide weepholes. Cut exposed masonry units, where necessary, with a power saw. Avoid the use (by proper layout) of less-than-half-size units.

C. Install masonry units in the bond pattern indicated, or if none is indicated, in running bond.

D. Step back unfinished work -- toothing is not permitted. Do not adjust installed units -- where necessary, completely remove and reinstall using fresh mortar.

E. Maximum variation of installed walls from plumb, level, or plan grid shall not exceed 1/4 in. in 10 ft. Wall thickness shall not vary more than 1/4 in. plus or minus from dimension shown on drawings.

F. Mortar:

1. Measure materials in calibrated containers, or by similar easily-controlled and maintained method. Do not use shovel measurement.

2. Mix materials in a mechanical mixer at least three minutes with minimum amount of water necessary to produce a workable consistency. Retemper stiffened mortar as required to restore evaporated water, but do not place mortar any later than 2-1/2 hours after mixing.

3. Exposed-to-view joints shall be approximately 3/8 in. wide, to meet coursing shown, tooled when thumbprint hard with a round bar to produce a dense, slightly concave surface well-bonded to masonry edges.

4. After tooling, cut off mortar tailings with a trowel and brush off excess. Concealed joints, including those on cavity side of masonry veneer, and joints in masonry to be plastered or stuccoed shall be struck off flush, with no protrusions.

5. Mortar not tight at time of tooling shall be raked out, pointed with fresh mortar, and retooled. Where sealant is shown, rake out joint 3/4 in., ready for backer rod and sealant specified in Division 7 sealants Section.

G. Through-wall flashing:

1. Install flashing to the profiles shown on the drawings.

2. Masonry and concrete surfaces receiving through wall flashings shall be thoroughly dry, free from loose material, and reasonably smooth. There shall be no slopes that will form pockets or prevent free drainage of water to exterior surfaces of wall.

3. Set flashing in sealant. Hold sealant back 1/4 inch from face of lintel. Hold flashing 1/2 inch back from face of lintel.

4. At wall openings, extend flashing 6 in. beyond each side of opening and turn up to form pan. Fold all corners, do not cut.

5. Lap joints between lengths of flashing 6 in. minimum and seal with mastic. Seal penetrations through flashing with mastic or overlapping piece of flashing.

H. Provide weepholes at 24 inches on center maximum spacing through outer face of masonry at all through-wall flashing.

I. At masonry veneer construction over gypsum sheathing, provide rubber washers or bituminous dampproofing compound at all penetrations made in sheathing board or paper as part of work under this Section, including screw heads and veneer-tie anchorage.

J. Provide openings and chases as required for structural members, ductwork, large pipes, etc. Cut exposed masonry with carborundum saw to ensure straight even edges. Neatly block around and patch penetrations. Provide compressible filler around edges of openings to accommodate vibration and structural deflection. Ensure that joint reinforcement remains uncut or is well-lapped.

K. Provide control and expansion joints at locations shown, and keep clean of mortar droppings. Install Joint Sealers in accordance with Section 07900.

L. Build other work into the masonry work as shown, fitting masonry units around other work, and grouting to secure anchorage.

3.4 ALLOWABLE TOLERANCES FOR MASONRY WORK

A. Maximum variation from true surface level for exposed to view walls and partitions:

1. Unit-to-unit tolerance: 1/8 inch.

2. Surface, overall tolerance: ¼ inch in 10 feet in any direction when tested with ten foot long straightedge. Where both faces or wall or partition will be exposed to view, request and obtain decision from the Architect as to which face will be required to conform to the specified surface level tolerance.

B. Maximum variation from true vertical plumb lines:

1. In lines of walls and arises:

a. ¼ inch in 10 feet.
b. 3/8 inch in any story, or up to 20 feet maximum.
c. ½ inch in 40 feet maximum.

2. For external corner lines, control joints, and other conspicuous lines:

a. ¼ inch in any story, or up to 20 feet maximum.

C. Maximum variation from horizontal level or grades for exposed sills, lintel blocks, and other conspicuous lines:

1. ¼ inch in any bay, or up to 20 feet maximum.

2. ½ inch in 40 feet maximum.

D. Maximum variation of linear building line from an established position in plan and related portions of walls and partitions:

1. ½ inch in any bay or up to 20 feet.

2. ¾ inch in 40 feet maximum.

3.5 WALL AND PARTITION CONSTRUCTION

A. General:

1. Build the masonry walls and partitions in the various combinations and thickness as indicated on the Drawings and as herein specified.

2. Build in anchorage items and loose lintels as the work progresses.

3. Lay first course of masonry on a smooth bed or mortar, after supporting concrete has been cleaned. Fill cells of first course concrete masonry units with mortar in all cases. Completely fill cells of concrete masonry units wherever vertical reinforcing rods are installed therein.

4. For exterior masonry cavity walls, install cavity insulation, through wall membrane flashings, weep wicks, and peastone, as specified herein.

5. Fill pressed metal frames occurring in masonry with mortar, as the masonry is erected.

3.6 GROUT

A. Lay masonry units with core cells vertically aligned and cavities clear of mortar and unobstructed.

B. Permit mortar to cure three (3) days before placing grout.

C. ACI Bulding Code requirements for Masonry Structures and ACI Specifications for Masonry Structures are made part of this specification as are all pertinent sections of the ACI Building Code.

3.6 CLEANING MASONRY

A. Masonry cleaning procedures shall follow recommendations of NCMA-TEK 45 and BIA Technical Note 20 (revised).

B. Dry brush masonry work at end of each day's work.

C. After new mortar has cured 14 days minimum, remove large mortar particles with non-metallic scrapers, chisels, or wooden paddles. Wash off dirt and other foreign materials with clean water and light concentration of soap or detergent.

D. For mortar smears, construction dirt, stains, efflorescence, etc., not removable by above methods, use proprietary cleaners specified under PRODUCTS. Muriatic acid may not be used. Adhere strictly to manufacturer's recommendations.

E. Apply and scrub cleaning solutions with non-metallic fibrous brushes. Thoroughly rinse cleaned area before cleaning solution can dry, using water hosed under moderate pressure.

END OF SECTION

SECTION 05400

LIGHTGAGE METAL FRAMING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and 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 THE WORK

A. Work specified within this Section includes, but is not necessarily limited to, the following:

1. Provide and install lightgage framing for interior walls, as shown on the Drawings.

2. Provide and install lateral strap bracing, anchors and bridging as required.

3. Provide and install miscellaneous fasteners, hat channels, stiffeners, expansion joints, and accessories necessary to complete the work.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Interior Partition Walls: Section 09250 - Gypsum Wallboard Systems

1.04 QUALITY ASSURANCE

A. Materials and installation shall conform to recommendations of the following publications:

1. American Iron and Steel Institute Cold-Formed Steel Design Manual, Parts I & II "Specification for the Design of Cold-Formed Steel Structural Members".
2. AWS D1.1-90 "Structural Welding Code" - Steel.
3. AWS D1.3-89 "Structural Welding Code" - Sheet Steel.
4. ASTM C 954, "Specification for Steel Drill Screws for the Application of Gypsumboard or Metal Plaster Bases to Steel Studs from 0.033 in. to 0.112 in. Thickness."

5. ASTM C 955, "Specification for Load-Bearing (Transverse and Axial)Steel Studs, Runners (Tracks), and Bracing or Bridging, for Screw Application of Gypsum Board and Metal Plaster Bases.
6. ASTM C 1007 "Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories."
7. ASCE 7-98 "Minimum Design Loads for Building and Other Structures," (formerly ANSI A58.1).

B. Slip Track Tolerances: Where non-bearing light gage framing abuts the structure, provide a slip joint capable of accommodating the vertical movement of the structure. Slip joint gaps shall allow for 1" Live Load deflection of the supporting member

1.04 SUBMITTALS

A. The Engineer shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have reviewed and approved all submittals prior to review by the Engineer. All review of submittals by the Contractor, Architect and Engineer shall be completed prior to fabrication and installation of any material or product.

The Engineer's review of shop drawings will consist of a review of the design criteria and loads used for calculations and a review of the type and position of elements and connections to the Primary Structural System. Any errors in calculations, shop drawings and verification of field dimensions shall be the responsibility of the General Contractor.

B. Product Data: Submit Manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications.

1. Steel Studs, tracks, cold rolled channels and hat channels.
2. Anchors and anchor bolts
3. Self drilling screws

C. Shop Drawings:

1. General: Submit shop drawings showing the following:

a. Member type, gauge and spacing.
b. Sizes, gages and fastenings for all built-up members including but not limited to roof trusses, headers and jambs.
c. Shop Coatings
d. Type, size, quantity, locations and spacing of all anchorages and self drilling screws.
e. Details of attachment to structure and adjacent work.
f. Supplemental strapping, bracing, splices, bridging, hat channels and other accessories required for proper installation.
g. Critical installation procedures.

D. Submit (2) blue line prints and (1) reproducible transparency (Sepia) of each shop drawing. Submit (2) copies of design calculations.

PART 2 - PRODUCTS

2.01 FRAMING MEMBERS

A. Steel Studs:

1. Acceptable manufacturers:
   Dale/Incor
   Marino
   Dietrich
   Superior
   Ware
2. Provide channel-shaped studs, channel-shaped joists, runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, stiffeners, fasteners, and other accessories recommended by manufacturer for complete framing system.
3. Steel framing materials (all gauges) shall comply with ASTM A 653. Fabricate all components from structural quality sheet steel with the following minimum yield points:

   A. Studs and truss components, 40,000 psi
   B. Bracing, bridging and blocking, 33,000 psi

4. Manufacture of studs, runners (track), and other framing members shall comply with ASTM C 955.
5. Framing components shall be galvanized per ASTM A 525, minimum G-60 coating.

B. Screws and other attachment devices:
1. Provide a protective coating equivalent to cadmium or zinc plating and comply with ASTM A 165 type NS.
2. Self-drilling screws shall comply with the Industrial Fastener Institute Standard for steel self-drilling and tapping screws (IFI-113).
3. Penetration through jointed materials shall not be less than three (3) exposed threads.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Product Storage: Store studs, trusses, joists, track etc. on a flat plane. Material damaged (i.e. rusted, dented, bent or twisted) shall be discarded. Protect adhesives and sealants from freezing.

B. Construction Methods: Wall construction may be either piece-by-piece (stick-built), or by fabrication into panels either on or off site.

C. Material Fit up: All framing components shall be cut squarely or at an angle to fit squarely against abutting members. Members shall be held firmly in position until properly fastened. Prefabricated panels, if used, shall be square and braced against racking.

D. Attachment: Components shall be joined by self-drilling screws, so that connection meets or exceeds required design loads. Wire tying of framing components will not be permitted. Field welding will be permitted only where shown on the drawings or approved by the engineer.

E. Anchorage to Structure: Securely anchor studs and track to floor construction and overhead structure. Provide slip joints where non-bearing vertical studs meet floor or roof structural steel, or as indicated on the drawings.

F. Welding: Shop and field welds shall conform to applicable AWS and AISI standards, and may be fillet, plug, butt or seam type. Touch-up damage to galvanizing caused by welding with zinc-rich paint.

G. Openings: Frame openings larger than 2 ft. square with double studs. Provide suitable reinforcements (double studs, headers, jack studs, cripples, bracing, etc.) at control joint intersections, corners, and other special conditions.

H. Tolerances: Finished installation shall be level and plumb within a tolerance of 1/8 inch 10 feet horizontally and vertically. Maximum deviation from plan or section dimension shall not exceed 1/8 inch. Spacing of studs shall not be more than 1/8 inch from design spacing, providing that cumulative error does not exceed requirements of finishing materials.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

1. GENERAL

1.1 REFERENCES

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specifications, apply to work in this section.

B. Rough Carpentry: Section 06100

C. Finish Carpentry: Section 06200

D. Roofing and Flashing: Section 07300

E. Painting: Section 09900

F. American Society of Testing Materials (ASTM)

G. Steel Structures Painting Council (SSPC)

H. National Association of Architectural Metal Manufacturers (NAAMM)

1.2 DESCRIPTION OF WORK

A. Extent of Metal Fabrications is shown on the drawings and includes deck railings and metal grills.

B. Elevator pit metal ladder.

1.3 QUALITY ASSURANCE

A. Refer to Section 01631, Products and Substitutions, for general provisions covering product selection, substitutions, material storage, and installation.

B. Refer to Section 01400, Quality Control Services, for provisions for testing and inspection.

1.4 SUBMITTALS

A. Issue submittals in accordance with Section 01300, Submittals.

B. Submittals under this section include:

1. Shop drawings showing details of fabrication, assembly, and installation showing all connections to other work.
2. Samples of materials and finished products as may be requested by the Architect.

2. PRODUCTS

2.1 MATERIALS

1. Railing assembly shall withstand a minimum concentrated load of 200 lbs. applied in any direction at any point on top rail. Intermediate rails, balusters, and panel fillers shall be designed for uniform load of not less than 25 lbs./sq. ft. over gross area of guard. Assembly shall comply with all provisions of the applicable Building Codes.

2. Accurately miter and cope intersections, and weld all around. Form rail-to-end post connections and changes in rail direction with mitered corners or radius bends, as detailed. Form elbow bends and wall returns to uniform radius, free from buckles and twists.

3. EXECUTION

3.1 FABRICATION

A. GENERAL

1. Use materials of size and thickness shown, or if not shown, of required size, grade, and thickness to produce strength and durability in finished product.

2. Provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes on exposed surfaces.

3. Form metalwork to required shapes and sizes, with true lines, curves and angles. Provide necessary rebates, lugs and brackets for assembly and installation. Use concealed fasteners wherever possible. Mill joints to tight hairline fit; cope or miter corners.

4. Welding:
   a. Weld corners and seams continuously; grind exposed welds smooth and flush.
   b. Welding Electrodes and Filler Metal: Type and alloy to match metal to be welded.

5. Anchors and Inserts: Furnish as required for installation in other work. Use copper, cadmium or galvanized anchors and inserts for exterior work.

6. Fasteners
   a. Type and alloy to match metal to be fastened; use Phillips flat-head screws for exposed fasteners if not otherwise indicated.
   b. Provide bolts, nuts, lag bolts, machine screws, wood screws, toggle bolts, masonry anchorage devices, lock washers as required for application indicated and complying with applicable Federal standards. Hot-dip galvanize fasteners for exterior applications to comply with ASTM A 153.

7. Shop Finishing

   a. Comply with NAAMM "Metal Finishes Manual".
   b. Apply shop primer to surface of metal fabrications except those embedded in concrete or galvanized; comply with SSPC-PA1.

c. Surface Preparation: Comply with SSPC-SP6 "Commercial Blast Cleaning" for exterior work, and with SSPC-SP3 "Power Tool Cleaning" for interior work.
d. Shop Primer: Fabricator's standard, fast-curing, lead-free, "universal" primer complying with performance requirements of FS TT-P-645.
e. Stripe paint edges, corners, crevices, bolts, welds and sharp edges.
f. Protect finished metal items.

3.2 INSTALLATION

A. Perform cutting, drilling and fitting required for installation; set work accurately in location, alignment and elevation, measured form established lines and levels.

B. Provide anchorage devices and fasteners where necessary for installation to other work.

C. Repair or replace damaged items as directed by the Architect.

D. Touch-up shop paint after installation. Clean field welds, bolted connections and abraded areas, and apply same type paint as used in shop.

E. Restore damaged protective coverings after installation. Maintain until other work in same areas is completed. Remove protective coverings and clean exposed surfaces prior to final inspection.

END OF SECTION

SECTION 05517

ALTERNATING TREAD STEEL STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Provide all material, labor, equipment and services and perform all operations necessary or required for the work of this section, in accordance with the Drawings and Specifications, and including fabrication and installation of Alternating Tread Steel Stairs.

B. Related work specified elsewhere includes but is not limited to:
1.Metal Fabrications in another Division 5 section
2.Painting in Division 9

1.3 PERFORMANCE REQUIREMENTS:

A. Stair Treads: be capable of withstanding a concentrated 1000 pound load without deformation

B. Handrail: be capable of withstanding a load of 200 pounds applied in any direction at any point on the rail.

1.4 CONSTRUCTION REQUIREMENTS:

A. Landings, Treads, and Mounting Base: shall be stamped and formed from single piece material. Stock shapes, hand forming, or welded remnants shall not be permitted. All stamped parts shall have integrally formed rigidizing bends and shall be spot welded to stringers of like material.

B. Welds: shall be a minimum of 8 welds per tread, and 12 welds each on the landing and mounting base. Each weld shall be quality controlled and be capable of withstanding a minimum of 2800 lbs. in shear.

C. Pedestrian Surfaces: shall be punched through with upset non-skid openings.

D. Riser Spacing: shall be equally spaced to within 3/16" for adjacent risers and to within 3/8" for any two non-adjacent risers on a stair.

E. Handrails: shall be contoured for body guidance and underarm suppor and shall be attached to the outside stringers and landings by bolting.

F. Landing Reinforcement: shall be with 1/4" steel angle notched and punched and factory welded to the landing at the points of a handrail attachment.

G. Rubber Foot Divider: shall be affixed to the central portion of the landing. A rubber bumper strip shall be attached or will be provided for field attaching to the central stringer.

1.5 DIMENSIONS:

A. Stair Angle: 68 degrees from horizontal as specified in the drawings.

B. Vertical Drop: the change in elevation, as shown in the drawings, between the upper finished floor surface where the top landing will be attached and the lower finished floor surface where the base of the stair will be secured.

1.6 SUBMITTALS:

Dimensional Prints: shall be submitted for approval prior to fabrication.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURER:

A. Lapeyre Stair, Inc.
220 Laitram Lane
Harahan, LA. 70123;
1-(800)-535-7631 or
1-(504)-733-6009.

2.2 MATERIALS:

A. Carbon Steel:
1. Treads: 13 Gauge 1010/15 HRPO per ASTM A569
2. Landing & Foot Stampings: 11 Gauge 1010/15 per ASTM A569
3. Stringers: 3" x 1 3/4" x 11 Gauge 1010/15 for 56 degree stairs over 10 vertical feet and for 68 degree stairs over 12 vertical feet.
4. Handrails: 1 1/2" OD x 0.083" 1010/15 CS per ASTM A569 cold drawn, fully annealed tube per ASTM 513.

B. Miscellaneous Material:
1. Rubber Spine: Hollow neoprene
2. Rubber Foot Divider: Solid neoprene

2.3 FINISHES:

A. Carbon Steel:
1. Gray Primer: Powder Coat Baked Enamel

2.4 FABRICATION:

General: Fabricate alternating tread steel stairs to conform with performance and construction requirements, and in accordance with approved shop drawings or dimensional prints. Fabricate and shop assemble to greatest extent possible.

A. Carbon Steel: gas metal arc welded with treads spot welded to stringers and bolt-on handrails with included bolts using the specified materials.

PART 3- EXECUTION:

3.1 PREPARATIONS:

A. Coordination: Coordinate start and installation of steel alternating treads with all other related and adjacent work. Installation shall not start until the construction has progressed to the point that weather conditions and remaining construction operations will not damage stair installation.

B. Verification: Verify that dimensions and angle are correct and that substrate is in proper condition for stair installation. Do not proceed to install until all necessary corrections have been made.

3.2 INSTALLATION:

A. If bumper has not been installed at the factory, install the bumper in accordance with the manufacturer's instructions using glue supplied with the stair.

B. Prepare mounting holes.

C. Position stair with top tread at same elevation as upper finished floor or roof surface.

D. Secure stair with not less than 2 bolts or studs at top and with not less than 2 at bottom of stair.

E. Touch up with matching paint any chipped or abraded damage to factory finish.

3.3 CLEAN:

Leave work area clean and free of debris.

SECTION 06100
ROUGH CARPENTRY

PART I - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: The drawings and the general provisions of the contract, including General and Supplementary Conditions and 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 covered by this Section includes the furnishing of all labor, material, equipment and accessories, and the performing of all operations in connection with the wood framing, other carpentry as indicated on the Drawings and/or specified within this Section.

B. The work covered by this Section includes, but is not necessarily limited to, the following:

1. Furnishing and installing all rough carpentry, including rafter and beam framing, blocking, plates, shoes, shims, and furring, framing anchors, and fasteners.

2. Furnishing and installing plywood wall back up panels and backer boards for telephone and electrical equipment.

3. Drilling masonry and drilling and tapping of metal work as required for installation of rough carpentry.

4. Any other items of carpentry necessary to complete work properly.

1.04 QUALITY ASSURANCE

A. Codes and Standards:

1. International Building Code - 2003

2. AITC Timber Construction Manual - 1994

3. NFPA National Design Specification For Wood Construction - 1991

PART 2 - PRODUCTS

2.01 LUMBER

A. Lumber shall conform to American Softwood Lumber Standard Voluntary Product Standard PS20-70. Lumber shall bear the grade and trademark of the Association under whose rules it is produced and a mark of mill identification.

B. Protect all lumber and keep dry, both in transit and at the job site.

C. All lumber shall be well seasoned and contain not more than 15% moisture content (marked "S-Dry").

D. All two inch nominal framing lumber shall have the following minimum base values, unless otherwise noted:

1. Extreme Fiber Stress in Bending, F_b = 750 psi.

2. Horizontal Shear, F_v = 70 psi.

3. Compression Perpendicular to Grain, F_{cA} = 335 psi.

4. Compression Parallel to Grain, F_c = 975 psi.

5. Tension Parallel to Grain, F_t = 325 psi.

6. Modulus of Elasticity, E = 1,100,000 psi.

E. Engineered Wood Products: Provide engineered wood products manufactured by TrusJoist/MacMillan, Boise Cascade, or approved alternate.

2.2 PLYWOOD

A. General:

1. Each panel shall be identified with appropriate American Plywood Association grade-trademark, showing panel type, span rating, thickness, veneer grade, species group member, edge detail (where applicable), and exposure grade.

2. Each panel shall meet requirements of U.S. Product Standard PS 1 for Construction and Industrial Plywood, or APA Performance Standards where applicable.

3. Panels shall be square-edged except as noted below for flooring panels.

B. Exposure Classification: All panels shall be APA "Exposure 1" panels, unless noted otherwise on the Drawing Set, or qualified below:

1. In areas of high humidity, or in locations permanently exposed to weather, panels shall be APA "Exterior".

2. "Exposure 2" panels may be used if only moderate construction delays are anticipated.

3. "Interior" grade panels may be used only if the panels will be fully protected from weather, both during and after construction.

C. Finish:

1. Plywood with one face exposed-to-view shall be APA A-D Veneer Grade or better.

2. Plywood which is not exposed to view shall be APA C-D Plugged Grade or better.

2.03 PRESERVATIVE TREATED LUMBER

A. The following wood members shall be Southern Yellow Pine Treated with in accordance with AWPA C-18. Wood shall be air dried or kiln-dried to reduce maximum moisture content to 15 percent. Each piece shall bear the AWPA stamp, indicating the plant number, preservative symbol, symbol of standard, date of treatment and moisture content after treatment:

1. Wood sills plates, rough bucks and frames in exterior masonry wall openings.

2. Wall plates and furring in contact with exterior masonry or concrete.

3. Nailers that are set into, or are in contact with, concrete or masonry.

4. Blocking and nailers for roof deck, sub-fascia members, roof cants and saddles.

5. Lumber in contact with the ground, embedded in or in contact with concrete or masonry and all exterior trim.

6. Preservative treated lumber shall meet manufacturer's requirements for installation location.

B. Cut Surfaces: Cut surfaces of preservative-treated materials shall be brush coated with at least two coats of the same preservative used in the pressure treatment.

C. Odors and Compatibility: Treated wood exposed in the final structure shall be free from objectionable odors and shall not be harmful or corrosive to adjacent materials or anchorages.

D. Plywood Backer Panels:

1. Plywood telephone and electrical backer panels, roof framing, and any other wood designated as fire-retardant treated on drawings, shall be pressure-treated with fire-retardant 2 chemicals to achieve a UL FR-S rating, designating a surface-burning characteristics rating of 25 or less for flame-spread, fuel contributed, and smoke developed, per ASTM E 84, in compliance with AWPA C 20 (lumber) and AWPA C 27 (plywood). Each piece shall be dried to a15-to-19 percent moisture content after treatment.

2. Acceptable products include: Koppers Dricon, Osmose Flame-Proof, and Hoover Pro-Tex.

3. Strength reduction factors used in the design of fire retardant treated wood shall be in accordance with the NFPA "National Design Specification

PART 3 - EXECUTION

3.01 INSTALLATION

A. Wood Framing:

1. General Requirements:

a. Wood construction practices shall conform to recommendations of the NFPA "National Design Specification" and the AITC "Timber Construction Manual".

b. All members are to be installed as shown on the drawings.

c. When individual members have built-in camber, the members shall be placed with camber up.

d. No cutting of holes or notches in trusses for pipe, conduit or other reasons will be allowed.

e. All bearing surfaces shall be horizontal and even over the entire width of support.

f. Accurately and properly fit and brace all work. Secure in proper position and orientation. Framing, studding and blocking shall be as indicated on the Design Drawings, or as required by the work.

g. Cooperate with all other trades as required.

2. Concrete or Masonry Contact: All wood material in contact with concrete or masonry shall be given two coats of green Cuprinol wood preservative. Note: Wood sills shall be pressure treated, not paintable treated.

3. Cutting and Patching: Do all cutting, patching, heading and blocking required for work of all trades.

4. Blocking and Supports:

a. Install 2" nominal blocking in stud partitions for anchoring all cabinets, mirrors, towel bars, grab bars, handrail brackets and other items applied to or in the walls.

b. Set all blocking required to erect all exterior and interior woodwork, cabinets, plumbing, electrical and mechanical equipment, rough bucks and blocking for roofing work.

c. Backing Boards: Install 3/4" plywood backer boards for electrical and mechanical trades as required.

d. Provide pressure-treated blocking at exterior window openings in steel stud walls.

B. Plywood:

1. Plywood sheathing shall be installed with face-grain perpendicular to supports and be continuous over a minimum of two spans.

2. End joints of sheets shall be staggered so that joints are not continuous along a support.

3. When framing members (including walls and roofs) are 24" or more on center, support edges of plywood sheathing perpendicular to and at midpoints between framing with metal "H" clips or solid blocking.

C. Fastening:

1. Fastening shall be as indicated on the Design Drawings, or in accordance with Table 2304.9.1, of the International National Building Code.

2. Framing supported by concrete or masonry shall be anchored with built-in threaded bolts or lags, as indicated on the design drawings

3. Fasteners shall be non-corrosive on exposed and exterior locations.

4. No aluminum flashing or common nails with pressure treated lumber.

3.02 CLEAN-UP

A. Keep the premises and working surfaces in a neat, safe, and orderly condition at all times during execution of this portion of the work.

1. At the end of each day, or more often if necessary, remove accumulation of sawdust, cut-ends, and other debris to proper storage areas for disposal.

B. Upon completion of this portion of the work, thoroughly clean up the area.

3.03 ENGINEER'S REVIEW

A. The Engineer of Record will conduct periodic reviews of the construction for compliance with the provisions of the Specifications and Drawings during the construction period.

B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

SECTION 06190
METAL-PLATE-CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements that 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.

1.2 DESCRIPTION OF WORK:

A. Definition: Metal-Plate-Connected Wood Trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the job site.

B. Types of fabricated wood trusses are indicated on the drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 06100 - Rough Carpentry

1.4 QUALITY ASSURANCE:

A. TPI Standards: Comply with all requirements and recommendations of the following Truss Plate Institute (TPI) publications:

1. ANSI/TPI 1 1995, "National Design Standard for Metal-Plate-Connected Wood Truss Construction" including Commentary and Appendices

2. TPI DSB-1989, "Recommended Design specification for Temporary Bracing of Metal-Plate-Connected Wood Trusses."

3. TOI HIB-1991, "Commentary and Recommendations for Handling, Installing & Bracing Metal-Plate-Connected Wood Trusses."

4. TPI DSB-89, "Temporary Bracing of Metal-Plate-Connected Wood Trusses."

B. Wood Structural Design Standard: Comply with all requirements and recommendations of the National Forest Products Association's NDS-1991, "National Design Specification for Wood Construction."

C. Lumber Standard: Comply with PS20-70 and with applicable rules of the respective grading inspecting agencies for species and grade of lumber indicated.

D. Connector Plate Manufacturer's Qualifications: Provide truss connector plates manufactured by a Truss Plate Institute member firm

E. Fabricator's Qualifications: Provide trusses by a firm which has a record of successfully fabricating trusses similar to type indicated and participates in the TPI "Quality Control Inspection Program" as a licensee authorized to apply TPI marks to trusses.

F. Uniformity of Manufacture for Connector Plates: Provide metal connector plates from a single manufacturer.

1.5 SUBMITTALS:

A. The Engineer shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have received and approved all submittals prior to review by the Engineer. All review by the Architect, Engineer and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.

B. Product Data: Submit fabricator's technical data covering lumber, metal plates, hardware, fabrication process and treatment (if any).

1. Submit certificate, signed by an officer of fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.

C. Shop Drawings:

1. General: Submit shop drawings, prepared under the supervision of a professional engineer, showing species, sizes and stress grade of lumber to be used; pitch, span, camber, configuration and spacing for each type of truss required; type, size, material, finish, design value and location of metal connector plates; and bearing and anchorage details.

2. Design: To the extent engineering design considerations are indicated as the Fabricator's responsibility, submit design analysis and test reports indicating loading, section modulus, assembled allowable stress, stress diagrams and calculations and similar information needed for analysis and to ensure that trusses comply with requirements.

3. Engineer Stamp: Provide shop drawings that have been signed and stamped by a structural engineer licensed to practice in the State of Maine.

4. TPI Approval: All drawing submittals must bear a TPI stamp.

1.6 DELIVERY, STORAGE, HANDLING

A. Handle and store trusses with care, and in accordance with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.

B. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 LUMBER

A. General: Factory mark each plate of lumber with type, grade, mill and grading agency.

B. Sizes: Nominal sizes are indicated except as shown by detail dimensions. Provide actual sizes as required by PS20-70 for dressed lumber, S4S, unless otherwise indicated.

C. Moisture Content: Provide seasoned lumber with a maximum moisture content of 19% at time of dressing.

D. Lumber Grade: Lumber members will be graded in accordance with the following grading agency requirements:

1. Eastern Woods: NELMA or NHPMA

2. Western Woods: WWPA

3. Southern Pine: SPIB

2.2 METAL CONNECTOR PLATES, FASTENERS AND ANCHORAGES

A. Connector Plate Material: Use metal not less than "0.036" thick, coated thickness, (Contractor's option if more than one metal indicated).

1. Galvanized Sheet Steel: ASTM A 446, Grade A, Coating G60.

2. Electrolytic Zinc Coated Steel Sheet: ASTM A 591, Coating Class C, with minimum structural quality equivalent to ASTM A 446, Grade A.

2.3 FABRICATION:

A. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with wood-to-wood bearing in assembled units.

B. Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicated.

C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber indicated.

D. Connect truss members by means of metal connector accurately located and securely fastened to wood members by means indicated or approved.

PART 3 - EXECUTION

3.1 GENERAL

A: Erect and brace trusses to comply with the recommendations of the Manufacturer and the TPI publications referenced above.

B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.

C. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.

E. Anchor trusses securely at all bearing points to comply with methods and details indicated.

F. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.

G. Do not cut or remove truss members.

3.2 ENGINEER'S REVIEW

A. The Engineer of Record will conduct periodic reviews of the construction for compliance with the provisions of the Specifications and Drawings during the construction period.

B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

1. GENERAL

1.1 GENERAL PROVISIONS: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK:

A. The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

1. All finished carpentry work and millwork as required by Drawings and as specified under this section.
2. Installation of metal and other items furnished by other trades, if specifically noted in these Specifications.

2. PRODUCTS:

2.1 BOARD LUMBER shall comply with the American Lumber Standards Simplified Practice Recommendation No. 16. Grade of board lumber shall be suitable for its intended use. Finish lumber is to be painted and shall be dressed free of tool marks and other objectionable defects. All exposed lumber to be architectural quality grade: Custom.

2.2 INTERIOR TRIM: Door and Window Apron - Brosco style 8627, Back Relieved. Base - Brosco style 8385. All interior trim unless noted otherwise on Drawings or in Specifications to be equal to No. 1 Pine or Poplar. Finger joints shall be allowed only where trim is to be painted.

2.3 STAIR RISERS AND TREADS: 3/4" APA plywood.

2.4 STAIR RAILINGS: Brosco, #75 Fir (1-1/2" x 1-3/4" round).

2.5 STAIR SKIRTBOARDS: #1 Pine (Poplar where painted).

2.6 STAIR HANDRAIL BRACKETS: Stanley SP7081, Satin brass finish. Secure with #8 or #10 Brass screws of adequate length for wall condition, minimum 1-1/4" into blocking.

2.7 NAILS: 6d for 1/2" finish stock and 4d finish for thinner wood. Use 8d generally for nailing 3/4" wood trim to framing.

2.8 SCREWS, BOLTS & OTHER FASTENERS: as shown on Drawings with penetration into framing or blocking adequate to support loads shown. Where not shown, consult Architect.

2.9 COUNTERTOPS: Rounded-edge preformed plastic laminate countertops, color choice of Architect. See Section 11450-Residential Equipment & Kitchens.

2.10 PLASTIC LAMINATE: See Section 11450

2.11 CLOSET SHELVING: Premanufactured plastic coated wire shelving with integral clothes hanger. Closet Maid or equal.

2.12 UNIT NUMBERS: 2" rigid plastic adhesive backed letters, style and color to be selected by Architect for interior apartment entry, and to match existing.

3. EXECUTION:

3.1 ALL ITEMS OF MILLWORK shall be carefully erected, leveled and plumbed with tight-fitting joints and square corners, carefully cut and secured. Exposed nails shall be set adequately for putty. Moulds and faces shall be free from hammer or other tool marks, clean-cut and true pattern. All work shall be thoroughly cleaned and sanded to receive the finish. Sharp corners of small members of finished woodwork shall be slightly rounded. All trim baseboards, etc. fastened to walls shall be secured to wall framing members and nails set. Care shall be taken to avoid splitting ends of trim boards.

3.2 INTERIOR TRIM: Install trim with finishing nails and glue where required to assure permanent, tight joints, according to Drawing details.

3.3 STAIRS: Skirtboards and handrails installed as shown on Drawings (handrails supported every 4'-0" o.c. minimum) secured into solid blocking (1-1/4" minimum screw depth for handrails). Risers and treads to be glued and screwed together.

END OF SECTION

SECTION 07200

INSULATION AND VAPOR BARRIERS

1. GENERAL:

1.1 GENERAL PROVISIONS: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of the Specifications. The work covered by this section of Specifications consists of the following:

1. Installation of rigid insulation, fiberglass batts and sound insulation in exterior walls, interior walls, ceilings and floors where shown on Drawings.
2. Vapor barriers to be installed as shown.

2. PRODUCTS:

2.1 BATT INSULATION TYPE: Fiberglass by Owens-Corning- Fiberglass, or approved equal.

2.2 RIGID INSULATION: R-19 in walls Styrofoam or equal by Dow.

2.3 ROOF INSULATION: See Section 07500

2.4 MOISTURE PROTECTION: 6 mil. clear polyethylene film in exterior walls.

2.5 SHEATHING PAPER AT BRICK CAVITY WALL: 15# asphalt felt. NOTE: No equals will be allowed.

2.6 WATER RESISTANT BARRIER UNDER SIDING: Tyvek by Dupont or equal.

3. EXECUTION:

3.1 FIBERGLASS INSULATION

A. Fiberglass batts in exterior walls between floors shall be fluffed to full nominal depth and shall be stuffed in around window unit frame to fill gap between frame and rough opening studs. Secure wall batts at top of cavity with wire or nails into side of studs. Provide foam insulation in ¾" or less gaps between frame and R.O. Insure that insulation is tight and full

3.2 MOISTURE PROTECTION: A continuous 6-mil. vapor barrier shall be installed on all exterior walls stapled to hold fiberglass batts in place, as part of the work of this section.

Vapor barrier on walls shall be 8' wide to minimize horizontal joints. All joints in vapor barrier shall be taped, and all vapor barrier free edges shall be taped to substrate. Minimum lap at joints to be 8" including lap at wall/ceiling (cap 8" each surface).

END OF SECTION

SECTION 07215
SPRAYED THERMAL INSULATION

PART 1 – GENERAL

1.01 SUMMARY: This specification applies to spray insulation applied to ceiling of garage, to meet R-Factor of R-30.

1.1 RELATED WORKS AND SECTIONS
a) Section 07200 – Insulation & Vapor Barriers

1.2 WORK INCLUDED: Provide all labor, materials and equipment necessary to provide a complete installed application of sprayed thermal insulation applied to areas indicated on the drawings and described herein.

1.3 QUALIFICATIONS OF APPLICATORS: All firms of applicators performing the Work of this Section must be approved by the manufacturers of the sprayed thermal material and shall also have been in business for a minimum period of three (3) years.

1.4 SAMPLES: If requested, provide samples, minimum 12" x 12" of sprayed insulation bonded to a piece of rigid board.

1.5 MANUFACTURER'S LITERATURE: Copies of the manufacturer's literature, clearly indicating conditions of acceptance and methods of applications shall be available on site before, and during, period of application of Work of this Section.

1.6 DELIVERY: Materials to be delivered to the site in original, labeled and unopened packages.

1.7 STORAGE: Materials to be stored on site in a warm, dry place and either on a concrete floor or a wood platform.

1.8 ENVIRONMENTAL CONDITIONS
a) Work on this Section shall only be performed under the conditions stated in the manufacturer's printed application instructions.
b) Arrange for natural ventilation to properly dry the insulation material during and subsequent to its application.

1.9 PATCHING: All patching and repairing of sprayed thermal insulation due to cutting by other trades shall be performed under this Section and paid for by the trade performing the cutting.

1.10 PROTECTION
a) Provide adequate protection to adjacent surfaces from being sprayed by means of drop cloths, polyethylene sheets, with necessary taping.
b) Close off and seal any duct work in areas where sprayed insulation is being applied.

1.11 MANUFACTURER'S REPRESENTATIVE: Allow the manufacturer's representative full access to the site.

PART 2 - PRODUCTS

2.0 MATERIALS

a) Spray-applied materials shall be MONOGLASS Spray-On White Fiber conforming to CAN 4-S114-78 using MONOGLASS Liquid Bonding Adhesive manufactured by Monoglass Incorporated.

b) MONOGLASS Spray-On shall not contain asbestos, free crystalline silica or combustible fibers, and shall exhibit the following properties:

PROPERTY	TEST METHOD RESULTS
Fire Hazard Classification	ASTM E84-79: Flame Spread - 0, Smoke Developed - 0
Non-Combustibility	ASTM E-136
Smolder Resistance	CGSB 51-GP-36P
Dry Density	ASTM D-1622-83: 2.8 pounds/cubic foot
Thermal Conductivity	ASTM C518: K-Factor .25, R-Value 4.00/inch
Noise Reduction Coefficient	ASTM C-423-77: NRC .85 (1.4 inches on solid backing)
Fire Gas Toxicity	University of Pittsburgh Protocol
Fungus & Bacterial Resistance	ASTM G-21-90

c) MONOGLASS Bonding Adhesive shall be mixed with fresh, clean water to the exact proportions recommended by the manufacturer.

PART 3 - EXECUTION

3.0 EXAMINATION

a) Examine all surfaces and conditions to which the Work of this Section is to be applied. Ensure they are adequate to provide a satisfactory application of the specified materials. Report any deficiencies to the design authority.

3.1 PREPARATION

a) Clean off any dust, loose dirt, foreign material, etc. on surfaces to which the Work is to be applied, which could otherwise create a false bond.

b) Verify bond requirements and compatibility of all surfaces to receive thermal insulation materials.

c) Ensure that all ducts, piping, equipment, or other items which would interfere with application of thermal insulation are not positioned until thermal insulation work is completed.

3.2 APPLICATIONS

a) Mix and apply thermal insulation in strict accordance with manufacturer's recommendations.

b) Apply insulation in sufficient thickness to achieve the required thermal value.

c) Spray apply insulation to the underside of the substrate as shown on the drawings. Apply insulation to substrate in sufficient thickness to achieve an R-24 thermal rating in ceiling of first floor parking level. Mechanically secure insulation values greater than R-20 on horizontal surfaces and R-28 on vertical surfaces. Board tamp and over-spray with adhesive.

3.3 CLEAN-UP

a) Remove sprayed thermal insulation from material and surfaces not specifically required to be insulated.

b) Broom clean work areas affected by the Work of this Section.

END OF SECTION

SECTION 07460

SIDING

1. GENERAL

A. Work under this section is subject to the provisions of the contract documents which in any way affect the work specified herein.

1.1 Scope

A. Furnish and install Hardiplank Lap Siding and Harditrim fascia and moulding and accessories where shown on drawings or as specified herein.

B. Coordinate this section with interfacing and adjoining work for proper sequence of installation.

1.2 Quality Assurance

A. Submittals: within sixty (60) days of owner's notice

1. Submit three 6 inch x 6 inch pieces of Hardiplank / Harditrim claddings in texture and widths shown and specified herein.

2. Submit three copies of specifications, installation data and other pertinent manufacturer's literature.

1.3 Product Handling

A. Stack Hardiplank / Harditrim claddings on edge or lay flat on a smooth, level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

1.4 Job Conditions

A. Nominal 2 inch x 6 inch wood framing selected for minimal shrinkage and complying with local building codes, including the use of weather-resistive barriers and/or vapor barriers where required. Minimum 1½ inch face and straight, true, of uniform dimensions and properly aligned.

B. Install weather-resistive barriers and claddings to dry surfaces.

C. Repair any punctures or tears in the weather-resistive barrier prior to the installation of the siding.

D. Protect siding from other trades.

1.5 Warranty

A. James Hardie's limited product warranty against manufacturing defects in Hardiplank lap siding for 50 years and HardiTrim for 10 years. Workmanship: application limited warranty for 1 years.

2. PRODUCTS

2.1 Hardiplank / Harditrim Fascia and Moulding

A. Non-asbestos fiber-cement siding to comply with ASTM Standard Specification C1186 Grade II, Type A.

B. Siding to meet the following building code compliance National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI); City of Los Angeles, Research Report No. 24862; Metro Dade County, Florida Acceptance No. 94-1234.04; US Department of Housing and Urban Development Materials Release 1263a; California DSA PS-019; and City of New York MEA 223-93-M.Non-asbestos fiber-cement siding to be non-combustible when tested in accordance with ASTM test method E136.

C. Type: Smooth 8 /4" wide with 7" exposure.

D. Trim Type: XLD Trim Smooth 5/4 "

James Hardie Building Products, 1-800-9-HARDIE

2.2 Fasteners

A. Wood framing: 1 5/8" stainless steel 11 Ga. roofing nails.

3. EXECUTION

3.1 Surface Conditions

A. Correct conditions detrimental to timely and proper completion of work.

3.2 Installation - Harditrim Fascia and Moulding

A. Install flashing around all wall openings.

B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum ¾ inch or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.

C. Place fasteners no closer than ¾ inch and no further than 2 inch from side edge of trim board and no closer than 1 inch from end. Fasten maximum 16 inch on center.

D. Maintain clearance between trim and adjacent finished grade.

E. Trim inside corner with single board.

F. Install single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten Harditrim board to Harditrim board.

G. Allow 1/8 inch gap between trim and siding.

H. Seal gap with high quality, paint-able caulk.

I. Shim frieze board as required to align with corner trim.

J. Install Harditrim fascia over structural subfascia.

3.3 Installation - Hardiplank Siding

A. Starting: Install a minimum ¼ inch thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1¼ inch wide laps at the top. The bottom edge of the first plank overlaps the starter strip.

B. Allow minimum 1 inch vertical clearance between roofing and bottom edge of siding.

C. Align vertical joints of the planks over framing members.

D. Maintain clearance between siding and adjacent finished grade.

E. Locate splices at least one stud cavity away from window and door openings.

F. Use off-stud metal joiner when vertical joints occur between framing members. Position metal joiner so that the bottom lip is resting on the solid course of planks. Fasten plank to the framing. Position and fasten abutting plank into place insuring that the lower edges of the two planks align. Locate metal joiner centrally behind the joint. Locate off-stud splices a minimum of two stud cavities from wall corners and stagger all subsequent course splices at minimum 24 inch intervals when located in the same wall cavity.

G. Wind Resistance: Where a specified level of wind resistance is required Hardiplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

3.4 Finishing

A. Finish all material, finished "Color Plus". Install per manufactures recommendations.

SECTION 07500

ROOFING AND FLASHING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Fully adhered fire retardant EPDM sheet roofing, tapered and flat roof insulation, elastomeric flashing, wood nailers, aluminum edge strips and fascia, tapered edge strips, roof drains, roof hatch and walkway pads.

1.02 CODES, REGULATIONS AND STANDARDS

A. Contractor Responsibility: The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State and local codes, regulations and standards pertaining to work practices, hauling, disposal, protection of workers and visitors to the site, and persons occupying areas adjacent to the site. This includes modification of procedures to comply with changes to codes, regulations and standards which occur during the work of this contract. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State and local regulations. The Contractor shall hold the Owner and Owner's Representatives harmless for failure to comply with any applicable work, hauling, disposal, safety, health or other regulations on the part of himself, his employees or his subcontractors.

B. Roof assembly to have a UL Class "B" rating.

1.03 QUALITY ASSURANCE

A. Roofing contractor to be approved in writing by the membrane manufacturer. Contractor shall be able to substantiate that he has been trained by the membrane manufacturer.

B. Roofing and flashing workmanship to comply with industry standards. The National Roofing Contractors Association's (NRCA) ***ROOFING AND WATERPROOFING MANUAL*** along with ***ARCHITECTURAL SHEET METAL MANUAL*** as published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) will be used to establish industry standards.

1.04 SUBMITTALS

A. Sample ten (15) year watertight warranty for the EPDM membrane.

B. Sample twenty (20) year material warranty for the EPDM membrane.

C. Current EPDM membrane manufacturer's application specifications.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in their original, unopened containers, clearly labeled with manufacturer's name. All material to be stored in waterproof trailers or sheds, up on raised platforms and under lock and key until use. Do not use materials damaged in handling or storage. Replace damaged material with new material. Store adhesives between 60 and 80 degrees F. Should they be exposed to lower temperatures, restore to room temperature for three to five days prior to use.

1.06 WARRANTY

A. A ten (15) year watertight warranty and twenty (20) year material warranty shall be issued by the EPDM membrane manufacturer.

B. The roofing contractor shall furnish the Owner with his personal two (2) year watertight warranty.

PART 2 PRODUCTS

2.01 ROOF INSULATION

A. Tapered roof insulation to be polyisocyanurate closed-cell foam core with manufacturer's standard facing laminated to both sides, complying with FS HH-I-1972/2, Class 1. The roof drain sumps and crickets between the drains to be formed using 1/2" per foot tapered isocyanurate.

B. Roof insulation to be polyisocyanurate closed-cell foam core with manufacturer's standard facing laminated to both sides, complying with FS HH-I-1972/2, Class 1. Roof insulation to be three layers of 2" ISO 95+ by Firestone, H-Shield by Hunter Panels or approved equal having a total R-value of approximately 36.0.

C. Over all foam insulation, install one layer of 1/2" high density fiberboard roof insulation. The high density fiberboard roof insulation to be Structodek by Wood Fiber Industries, High Density Fiberboard by the Celotex Corp. or approved equal.

2.02 MEMBRANE ROOF SYSTEM

A. Membrane roofing to be fully adhered fire retardant .060" EPDM sheet roofing furnished in twenty five foot (25') wide (or wider) rolls by Firestone, Carlisle or Versico. Roof membrane to be fully adhered to the 1/2" high density fiberboard roof insulation. Roofing assembly must have a UL Class "B" fire rating.

B. Use the roof membrane for flashing of curbs and walls per the manufacturer's standard details. Use reinforced EPDM anchor strips to avoid splice joints at walls and edges.

C. Adhesives, sealants, thinner, cleaner and accessories to be furnished by the membrane manufacturer.

D. **Six inch (6") wide seam tape will be required for all field seams**.

2.03 ROOF DRAINS

A. Roof drains shall be 4" diameter Zurn ZC-100-DP furnished with cast iron domes and "Top-Set" deck plates.

2.04 METAL FLASHING

A. Edge strip, fascia wrap and cornice wrap to be formed using .050" mill finish aluminum.

2.05 FASTENERS

A. Use fasteners recommended by the membrane manufacturer to secure anchor bars and termination bars.

B. Fasteners used to secure roof insulation to the wood deck to be #14-10 Heavy Duty Roofing Fasteners with CR-10 coating, a minimum shank diameter of 0.170" and a thread diameter of 0.125". Pressure plates to be 3" diameter Galvalume plates. Screws and plates to be manufactured by Olympic Fasteners or approved equal. Length, size and accessories to be as required by the EPDM membrane manufacturer selected.

C. Aluminum flashing to be secured with annular-ring aluminum nails as shown on attached drawings.

2.06 WALKWAY PADS

A. Walkway pads to be 30" x 30" x .30" thick Firestone Rubbergard Walkway pads or approved equal.

2.07 ROOF HATCH

A. New roof hatch to be model No. 6-202 (2'-6" x 4'-6") fabricated with hot dipped galvanized steel by Babcock-Davis or equal by Bilco.

PART 3 EXECUTION

3.01 PREPARATION OF SURFACES

A. Surfaces on which the roofing system is to be applied shall be clean, smooth, dry, free of fins, rot, sharp edges, loose and foreign materials, oil and grease.

3.02 ROOF INSULATION

A. Insulation shall be tightly butted with joints not more than 1/8" in width. Stagger joints with those in layer below. Fiberboard to be installed with a 1/16"-1/8" gap at all joints when board size is greater than 2' x 4'.

B. Fasten insulation to the roof deck with the appropriate screws and plates. Fastener quantity and layout must meet all requirements that may be imposed by the EPDM manufacturer to obtain their warranty.

C. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses leaving no gaps, allowing a complete thermal envelope to be formed.

D. Provide tapered units to suit drainage pattern indicated.

E. Do not install more insulation in a day than can be covered with membrane before end of day or before start of inclement weather.

3.03 ROOF MEMBRANE

A. Adhere the .060" EPDM membrane to the 1/2" high density fiberboard in strict accordance with the manufacturer's specifications.

B. **Six inch (6") wide seam tape will be required for all field seams**.

3.04 FLASHING - - WALLS, PARAPETS, CURBS AND VENTS

A. Remove all existing flashing.

B. Use the longest pieces of material which are practical. All flashing and terminations shall be done in accordance with the applicable manufacturer's details.

C. Care must be taken to set the elastomeric flashing so it does not bridge where there is a change of direction (i.e. where a parapet meets the roof deck). This can be accomplished by creasing the membrane into the angle change prior to adhering up the wall. Excess bridging will be cause for rejection and will be re-done at the contractor's expense.

D. Install termination bars at the top of all base flashing, fastening a minimum of 6" on center.

3.05 FASCIA AND EDGE STRIPS

A. Install fascia wrap using #10 x 1-1/4" screws through slotted holes. Install under-cover plates at all end joints per SMACNA's details.

B. Bottom edge of aluminum copper edge strips to be secured with continuous cleats. Nail top flange with annular-ring nails, three inches (3") on center. Strip top flange with 6" pressure sensitive flashing.

C. Fabricate scupper per SMACNA's details.

3.06 ROOF DRAINS

A. Install new roof drains in accordance with the manufacturer's instructions. Review installation procedure with job-site inspector prior to installing drains.

B. Avoid target patches at the roof drains by installing new wood blocking, drains and tapered sumps prior to adhering the EPDM roof membrane.

3.07 ROOF HATCH

A. Install wood nailers to match roof insulation height. Set and flash hatch in accordance with the manufacturer's instructions.

3.08 WALKWAY PADS

A. Adhere walkway pads to roof membrane in accordance with the manufacturer's instructions.

3.09 TEMPORARY WATER CUT-OFF

A. Temporary water cut-offs are to be constructed at the end of each working day to protect the insulation, roofing, building and building interior from damage due to wind, snow and rain.

B. Temporary water cut-offs are to be detailed by the contractor and approved by the manufacturer and Owner.

3.10 CLEAN UP

A. Site clean-up shall be complete and to the satisfaction of the Owner.

B. All roofs, building, landscape and parking areas shall be cleaned of all trash, debris and dirt caused by or associated with this work.

C. Any areas stained, dirtied, discolored or otherwise damaged due to this work shall be cleaned, restored and replaced as required.

D. All debris shall be removed from the premises promptly and the construction area left clean daily.

3.11 INSPECTION AND TESTING

THE OWNER RESERVES THE RIGHT TO INSPECT AND TEST ALL CONSTRUCTION OPERATIONS AND MATERIALS.

A. Any defect or noncompliance discovered by inspection shall be reported to the contractor who shall promptly remove any defective material from the site.

B. The Owner reserves the right to inspect the work or parts of it as he chooses. His failure to inspect the work in progress shall not relieve the contractor of the responsibility for properly executing the contracted work, nor shall it impair the Owner's right to reject deficiencies he may subsequently discover.

PART 4 JOB CONDITIONS

A. Roofing to be applied in dry weather.

B. Completed roof areas shall not be trafficked. The work shall be coordinated to prevent this situation by working toward the roof edges.

C. This project is subject to compliance with all requirements of the Occupational Safety and Health Administration (OSHA). All work on this project must meet the requirements of all applicable state and local codes, laws and ordinances.

END OF SECTION

SECTION 07720

ROOF SCUTTLE

I. PART ONE - GENERAL

1.01 SUMMARY

A. Work included: Furnishing and installing factory fabricated roof scuttle

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM), 100 Bar Harbor Drive, West Conshocken, PA 19428-2959; (610) 832-9585, fax (610) 832-9555
   1. ASTM A 36-93a: Standard Specification for Structural Steel

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's product data for all materials in this specification.
B. Shop Drawings: Show profiles, accessories, location, and dimensions.
C. Samples: Manufacturer to provide upon request; sized to represent material adequately.
D. Contract Closeout: Roof scuttle manufacturer shall provide the manufacturer's Warranty prior to the contract closeout.

1.04 PRODUCT HANDLING

A. All materials shall be delivered in manufacturer's original packaging.
B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.
C. Remove protective wrapping immediately after installation .

1.05 SUBSTITUTIONS

A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before bid due date. Contractor guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.06 JOB CONDITIONS

A. Verify that other trades with related work are complete before installing roof scuttle(s).
B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
D. Coordinate installation with roof membrane and roof insulation manufacturer's instructions before starting.
E. Observe all appropriate OSHA safety guidelines for this work.

1.07 WARRANTY/GUARANTEE

A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.

II. PART TWO - PRODUCTS

2.01 MANUFACTURER

A. The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 1-203-934-6363, Fax: 1-203-933-8478, Web: www.bilco.com

2.02 ROOF SCUTTLE

A. Furnish and install where indicated on plans metal roof scuttle Type F, size width: 4'0" (1219mm) x length: 4'0" (1219mm). Length denotes hinge side. The roof scuttle shall be single leaf. The roof scuttle shall be pre-assembled from the manufacturer.

B. Performance characteristics:
   1. Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m2) with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
   2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
   3. Operation of the cover shall not be affected by temperature.
   4. Entire scuttle shall be weathertight with fully welded corner joints on cover and curb.

C. Cover: Shall be 11 gauge aluminum with a 3" (76mm) beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

D. Cover insulation: Shall be fiberglass of 1" (25.4mm) thickness, fully covered and protected by an 18 gauge aluminum liner.

E. Curb: Shall be 12" (305mm) in height and of14 gauge paint bond. The curb shall be formed with a 3-1/2" (89mm) flange with 7/16" (11.1mm) holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Posi-Flash® flashing system, including stamped tabs, 6" (153mm) on center, to be bent inward to hold single ply roofing membrane securely in place.

F. Curb insulation: Shall be rigid, high-density fiberboard of 1" (25.4mm) thickness on outside of Curb.

G. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe.

H. Hardware
   1. Heavy pintle hinges shall be provided
   2. Cover shall be equipped with a spring latch with interior and exterior turn handles
   3. Roof scuttle shall be equipped with interior and exterior padlock hasps.
   4. The latch strike shall be a stamped component bolted to the curb assembly.
   5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" (25.4mm) diameter red vinyl grip handle to permit easy release for closing.
   6. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed. Springs shall have an electrocoated acrylic finish for corrosion resistance.
   7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

I. Finishes: Factory finish shall be alkyd based red oxide primed steel.

III. PART THREE - EXECUTION

3.01 INSPECTION

A. Verify that roof scuttle installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.02 INSTALLATION

A. Submit product design drawings for review and approval to the architect or specifier before fabrication.

B. The installer shall check as-built conditions and verify the manufacturer's roof scuttle details for accuracy to fit the application prior to fabrication. The installer shall comply with the roof scuttle Manufacturer's installation instructions.

C. The installer shall furnish mechanical fasteners consistent with the roof requirements.

END OF SECTION 07720

FIRESTOPPING & SMOKE SEALS

SECTION 07860

1 General

1.1 SECTION INCLUDES

.1 Comply with Division 1, General Requirements and Documents referred to therein.

.2 It is the intent of this section of the specifications to establish a single, competent source to be responsible for providing all labour, materials, products, equipment and services, to supply and install the firestopping and smoke seal work for the entire project, at the following locations:

Openings in fire rated walls, floors and roofs both empty and those containing penetrations such as cables, conduits, cable pipes, ducts and similar penetrating items.

Gaps between fire rated walls and exterior walls.

Openings at each floor level in fire rated shafts or stairwells.

Gaps between the tops of fire rated walls and underside of fire rated floor or roof assemblies.

Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Openings through Floors and Walls:

Fire Rated: Metal sleeves for fire rated openings through floors and walls shall be provided under applicable mechanical and electrical specification sections.

Non-Rated: Non-rated openings through floors and walls shall be sealed under applicable mechanical and electrical specification sections.

.2 Firestopping and smoke seals <u>within</u> mechanical (i.e. inside ducts, dampers) and electrical assemblies (i.e. inside bus ducts) shall be sealed under applicable mechanical and electrical specifications sections. Firestopping and smoke seals around outside of such mechanical and electrical assemblies, where they penetrate fire rated separations, are the responsibility of this section.

1.3 RELATED SECTIONS

.1 Division 15 - Mechanical: Mechanical work requiring firestopping.

.2 Division 16 - Electrical: Electrical work requiring firestopping.

1.4 REFERENCE STANDARDS

.1 ANSI/UL 1479 - Fire Tests Of Through-Penetration Firestops

1.5 SYSTEM DESCRIPTION

.1 Firestopping Materials: Provide firestopping system(s) of sufficient thickness, width and density to provide and maintain a fire resistance rating, as indicated on drawings and in accordance with UL or FM design numbers.

.2 Provide a seal completely filling all annular spaces to prevent the passage of flame, smoke and gases through the opening in the fire separation in which it is installed.

.3 Material Compatibility: Provide materials which are compatible with all materials used in the system including materials used in or on penetrants as well as all construction materials used in conjunction or contiguous with the system.

.4 Accessories: Provide components for each firestopping system that are needed to install fill materials. 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:

Permanent forming/damming/backing materials.
Temporary forming materials.
Substrate primers.
Collars.
Steel sleeves.

1.6 SUBMITTALS

.1 Manufacturer's Data: Submit manufacturer's specifications, installation instructions and product data for each material required, in accordance with Section 01300. Include manufacturer's certification, if requested and UL, WH, ULC, cUL or FM test reports to show compliance with the Contract Documents.

.2 Shop Drawings: Submit shop drawings showing typical installation details including reinforcement, anchorage, fastenings and method of installation for each type of firestopping condition.

.3 Samples: If requested, submit samples of each type of firestopping systems, smoke seals and accessories. Indicate location where material/system shall be utilized.

1.7 QUALITY ASSURANCE

.1 Manufacturer: Company specializing in manufacturing products of this Section with minimum three (3) years documented experience.

.2 Applicator: Company having a minimum of three (3) years experience in the installation of materials specified herein on projects comparable to this Project. The firm shall have the written approval of the firestopping material manufacturer(s).

1.8 REGULATORY REQUIREMENTS

.1 Conform to applicable local Building Codes for fire resistance ratings.

.2 Provide materials, accessories and application procedures which have been listed by UL, FM or tested by a nationally recognized independent testing agency according the ANSI/UL 1479 or ASTM E814 to achieve the required fire protection rating.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Do not proceed with the installation of firestopping materials when temperatures or weather conditions exceed the manufacturer's recommended limitations for installation.

.2 Ventilate solvent based firestopping per firestopping manufacturer's instructions by natural means or, where this is inadequate, forced air circulation.

1.10 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to Site in manufacturer's sealed and labelled containers intact. Handle and store materials in accordance with manufacturer's instructions.

1.11 PROJECT/SITE CONDITIONS

.1 Comply with manufacturer's recommended requirements for temperature, relative humidity and substrate moisture content during application and curing of materials.

1.12 SEQUENCING AND SCHEDULING

.1 Do not install firestopping system(s) until Work within opening has been completed. Coordinate with other applicable Sections. Schedule work of other trades so that firestopping applications can be inspected prior to being covered by subsequent construction.

2 Products

2.1 ACCEPTABLE MANUFACTURERS

.1 Provide firestopping silicone sealants, water-based sealants, mortars, or firestop devices from the following manufacturer:

A/D Fire Protection Systems Inc.

2.2 MATERIALS

.1 Provide a complete system of asbestos-free firestopping and through-penetrations firestopping. Firestop systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ANSI/UL 1479 or ASTM E814 and listed by UL or FM and in addition are approved by jurisdictional authorities and the Consultant.

.2 A/D FIREBARRIER Silicone Sealants: For use in openings 304.8 mm dia. or greater but not to exceed opening sizes for which they are intended, penetrations subject to movement, in control joints, in curtain wall joints, as a sealant for smoke barrier construction, fire and smoke dampers, head of wall details and fire doors in masonry or gypsum wall partitions.

.3 A/D FIRBARRIER Mortar: For use in large openings, in static, non-moving, penetrations such as cable trays, electrical and communication bundles, conduit and non-combustible sleeves and rated insulated pipes.

.4 Firestopping for Combustible Penetrating Items: For use in openings where either plastic pipe, non-rated insulated pipes or insulated cables are installed.

.5 Firestop system ratings: Comply with Building Code (BOCA) requirements for locations and hourly ratings of F, FT, FH and FTH designations.

2.3 ACCESSORIES

.1 Damming and backup materials, supports and anchoring devices: Non-combustible, to manufacturer's recommendations and in accordance with the tested system being installed as acceptable to jurisdictional authorities.

.2 Retainers: Galvanized clips approved by manufacturer to hold A/D FIREBARRIER Mineral Wool insulation in place.

.3 Primers: As required by firestopping manufacturer and compatible with selected system and contiguous materials.

.4 Water: Potable.

.5 Sealants for vertical joints: Non-sagging.

.6 Sealants and fluid seals at floor openings: Self-levelling.

.7 Sealants and putty for vertical and overhead joints: Non-sagging.

.8 Tape: Pressure sensitive masking tape as recommended by the firestopping manufacturer.

3 Execution

3.1 EXAMINATION

.1 Examine substrates, openings, voids, adjoining construction and conditions under which the Work is to be installed. Confirm compatibility of surfaces scheduled to receive firestopping.

.2 Verify that penetrating elements are securely fixed and properly located with the proper space allowance between penetrations and surfaces of openings.

.3 Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Surfaces to receive firestopping shall be free of dirt, dust, grease, oil, rust, loose materials, form release agents, frost, moisture or any other matter which would impair the bond of firestopping material to the substrate of penetrating item(s).

.2 Prime substrates in accordance with manufacturer's written instructions or recommendations. Confine primers to areas of bond; do not allow spillage or migration onto exposed surfaces.

.3 Do not apply firestopping and smoke seals to surfaces previously painted or treated with sealers, curing compounds, water repellent or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure that anchoring devices, back-up materials, clips, sleeves, supports and other related materials used in the actual fire tests are provided.

.5 Mask where necessary to prevent firestopping materials from contacting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

.6 Installation is not to proceed until submittals have been completed.

3.3 INSTALLATION

.1 Manufacturer's Instructions: Comply with UL or FM Listings and manufacturer's instructions for the type of material and condition of opening in each case. Consult with the manufacturer's technical representative to determine

proper procedure for conditions not fully covered by printed instructions. Record in writing any oral instructions received, with copy to manufacturer.

.2 Install firestopping with sufficient pressure to properly fill and seal openings to ensure an effective smoke seal. Tool or trowel exposed surfaces. Remove excess firestopping material promptly as the Work progresses and upon completion.

.3 Damming: Provide leak-proof dams as required to seal openings and contain liquid sealants, putty or mortar until cured. Install damming in accordance with manufacturer's instructions.

.4 Damming Boards: Install forming/damming materials and other accessories of type required to support fill materials during their application and in the position needed to produce the shapes and depths required to achieve fire ratings of through-penetration firestop systems.

Combustible Type: For temporary dams only. Remove after firestopping material has cured.

Non-Combustible Type: For temporary or permanent dams. Provide non-combustible type wherever damming material cannot be removed after applying firestopping materials.

.5 Void Filler: Use materials recommended by the firestopping manufacturer to seal gaps created by non-combustible type damming boards and to seal around cables, conduits, pipes and where void filler material becomes part of the fire rated assembly.

.6 Sealant: Install damming material or mineral wool as required. Apply sealant so air voids are not present and sealant is in full contact with penetrating items. Tool sealant to ensure substrate contact. Remove excess sealant in accordance with manufacturer's recommendations.

.7 Mortar: Install damming material as required. Mix mortar in strict accordance with manufacturers instructions. Pump, trowel or hand pack mortar through openings to minimum thickness as recommended by manufacturer and as listed by UL or FM, to achieve required fire rating.

.8 Firestopping Mineral Wool: Install firestopping by compressing material to the minimum required by UL or FM listing. Apply firestopping in sufficient thickness, depth and density so as to achieve the required fire resistance rating. Use impaling clips to support and secure firestopping where required by tested system.

3.4 FIELD QUALITY CONTROL

.1 Notify Consultant when completed installations are ready for inspection prior to concealing or enclosing an area containing firestopping materials.

.2 Arrange for inspections by the Owners independent inspection and testing company, appointed and paid for by Owner.

.3 Following field inspections, provide all repair as required to ensure compliance with the Contract Documents.

3.5 CLEANING AND PROTECTION

.1 Upon completion of this work, remove all materials, equipment and debris from the site.

.2 Leave work area and adjacent surfaces in a condition acceptable to the Consultant.

.3 Leave installed work with sufficient protection to enable it to remain untouched until project turnover.

End of Section

SECTION 07900

JOINT SEALERS

1. GENERAL:

1.1 REFERENCES:
   A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.
   B. Section 01045 Cutting and Patching, SPECIFICALLY Section 2.1B Fire stopping & section 07860 fire stopping & smoke seals.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet requirements of these Specifications.

2. PRODUCTS:

2.1 CAULKING MATERIAL

   A. Tremco Dymonic; one part polyurethane on exterior walls for caulking joints at all junctions as necessary to obtain complete watertight construction.

   B. Tremco Latex 834 for general interior caulking.

   C. All caulking for "Hardy Building Products" to be approved by Manufacturer of siding.

3. EXECUTION:

3.1 ALL POTENTIAL INFILTRATION cracks & joints to be caulked. Caulking shall be done only by workmen who are thoroughly experienced in this work. Exterior caulking shall be applied around windows, doors, vents, utilities, and any other infiltration "crack".

3.2 INTERIOR CAULKING shall be applied to seal all penetrations through top plates of interior walls, (due to electrical or plumbing), and at tubs, showers, counter tops, bottom of party walls GWB, and other as shown on Drawings.

3.3 IN GENERAL, caulking to be done prior to (in conjunction with) siding installation. See Drawings for any additional applications. Joints and spaces to be caulked shall be dry and free from dust. Finished caulking "bead" shall be neat and smooth, free of gaps and sags and run continuously. Complete all caulking work and allow to stand for the manufacturer's recommended time period before painting. Prime if required before finish coat of paint is applied.

END OF SECTION

STEEL DOORS AND FRAMES

SECTION 08100

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

A. The CONDITIONS OF THE CONTRACT and all Sections of Division 1 are hereby made a part of this section.

1.02 DESCRIPTION OF WORK:

A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this section. Extent of steel doors and frames required is indicated on drawings and in schedules.

1. Furnish and Install:
   a. Steel frames for hollow metal doors
   b. Steel frames for wood doors
   c. Steel sidelite, borrowed lite, and transom frames
   d. Hollow metal doors
2. Install Only: Finish hardware for hollow metal doors as specified in Section 08710 Finish Hardware.

B. Related work specified elsewhere:

1. SECTION 08210: WOOD and MOLDED DOORS
2. SECTION 08710: FINISH HARDWARE
3. SECTION 09900: PAINTING

1.03 QUALITY ASSURANCE; SUBMITTALS:

A. General: Comply with requirements of SECTION 01300 - SUBMITTALS, MEETINGS & RECORD DOCUMENTS and SECTION 01400 - QUALITY CONTROL SERVICES.

B. Manufacturer: Provide steel doors and frames complying with these specifications from one of the following:

1. CECO
2. Curries
3. Steelcraft

C. Supplier: A recognized hollow metal supplier, with in-house fabrication facilities, who has been furnishing doors and frames in the project's vicinity for a period of not less than five years.

D. Product Data: Submit four copies of manufacturers technical product data for each item. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and maintenance.

E. Door Schedule: Submit final door schedule in manufacturer's standard format and as outlined below. Coordinate doors, frames and related work to ensure proper size, thickness, hand, function, and fasteners.

1. **NOTE: Contractor shall make all submittals for finish hardware, doors, frames and related items simultaneously, only after proper review and coordination by own staff beforehand.**
2. Final Door Schedule Content: Based on doors and frames in drawings, organize door schedule to indicate complete designations of every item required for each door or opening. Include the following information:
   a. Type, style, hand, size and construction of each item.
   b. Anchors and fastenings to related work.
   c. Corner construction of welded and/or knocked down frames.
   d. Location of door and frame cross-referenced to indications on drawings both on floor plans and in hardware schedule.
   e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
   f. Mounting locations for hardware.
   g. Door construction and materials.
   h. Gage and finish of all materials.
3. Shop Drawings: Submit separate detail drawings, referenced to door schedule, showing size, hand, construction, fasteners, anchors and all other details pertinent to the fabrication of doors and frames for this project.

1.04 APPROVAL OF SUBSTITUTIONS:

A. Manufacturers and model numbers specified herein are to establish a standard of quality. If products other than those specifically identified herein are to be considered for this Project, they must be submitted for approval of the Architect not less than ten (10) calendar days prior to receipt of General Bids.

B. Requests for approval of substitutions shall be in writing, accompanied by catalog cuts, technical information and physical samples.

C. Approval of substitutions shall only be valid when issued by Architect to all bidders in the form of Addendum.

1.05 REFERENCES:

A. ANSI A115 Series: Standards for Steel Doors And Frames.

B. NFPA 80, NFPA 101.

C. Other applicable building and life safety codes.

D. Door and Hardware Institute: "Recommended Locations for Builder's Hardware.

E. ANSI A117.1: American National Standard Providing Accessibility and Usability for Physically Handicapped People.

F. Other applicable industry standards.

1.06 PRODUCT PACKAGING AND HANDLING:

A. Tag each item or package separately, with identification related to final door schedule.

B. All doors shall be packaged in full cartons and securely banded.

C. Doors and frames shall be received by the contractor at the jobsite and handled in a manner so as not to be damaged. They shall be stored upright in a protected area on wood runners or skids and shall be covered with vented tarpaulins or plastic.

1.07 WARRANTY: Doors and frames specified for this Project shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of Substantial Completion of Project.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Doors shall be manufactured from commercial quality cold-rolled steel sheets. Exterior doors shall be A60 hot-dipped galvanized.

B. Frames shall be manufactured from commercial quality cold-rolled steel sheets. Exterior frames shall be A60 hot-dipped galvanized.

C. Steel shall conform to ASTM standards A366 or A620 and A568 (uncoated), ASTM A526 or A642 and A525 (galvanized).

D. All doors and frames shall be chemically treated for paint adhesion and prime painted to meet performance requirements of ANSI A224.1.

2.02 DOOR FABRICATION:

A. Interior doors shall be 1-3/4" thick, manufactured from two 18 gage steel sheets. A one piece resin-impregnated honeycomb core with sanded edges shall be securely

bonded to both face sheets. Doors shall have mechanically interlocked vertical edges, flush face sheets, and hairline seam edges. The top and bottom of the door shall be closed flush by 16 gage steel channels (where concealed door bottoms are specified, bottom channel shall be reversed to allow insertion of door bottom into door web). At contractor option, in lieu of honeycomb cores, doors may be provided with a rigid polystyrene foam core, continuously bonded to the face sheets, and completely filling the door.

B. Exterior doors shall be 1-3/4" thick, manufactured from two 16 gage galvanized steel sheets. The interior of the doors shall be completely filled with a foamed-inplace polyurethane core, chemically bonded to all interior surfaces. Doors shall have mechanically interlocked vertical edges, flush face sheets, and hairline seam edges. The top and bottom of the door shall be closed flush by 16 gage steel channels (where concealed door bottoms are specified, bottom channel shall be reversed to allow insertion of door bottom into door web).

C. All doors shall be handed type with factory preparation for all concealed or mortised Finish Hardware scheduled. Door closer reinforcements shall be provided for all doors whether scheduled to received closer or not. Reinforce doors for all surface applied hardware.

D. Non-handed doors, and/or filler plates for cutouts not required for scheduled hardware preparation shall NOT be acceptable.

2.03 FRAME FABRICATION:

A. General: Frames shall be knocked down and field assembled or welded type at contractor option.

B. Standard knockdown or welded frames shall be manufactured form 16 gage steel sheets with 2" face and 5/8" integral stop. Jamb depth to be determined by wall thickness in accordance with the drawings. Supply appropriate anchors for wall construction.

C. Drywall frames shall be manufactured form 16 gage steel sheets with 2" face and 5/8" integral stop and double back bend to grip the partition firmly without marring the wall surface. Jamb depth to be determined by wall thickness in accordance with the drawings. Provide adjustable plumb anchors to insure square and plumb installation. Supply standard floor anchors for bottom of each jamb.

D. Prepare frames for all concealed or mortised hardware and reinforce for all surface applied hardware.

E. Provide plaster guards for all hardware cutouts.

F. Prepare frames to receive pneumatic type silencers: two for each pair frame, three for each single frame.

2.04 FIRE RATED ASSEMBLIES

A. All labeled fire doors and frames shall be of a type tested in accordance with ANSI/UL-10b, ASTM E-152, NFPA-252, or UL-305, and shall provide the degree of fire protection, heat transmission, panic-loading capabilities, and/or smoke control as indicated on the label and required by the drawings.

B. Labeled doors and frames shall bear the label of Underwriters Laboratories, Warnock Hersey, or Factory Mutual and shall meet all requirements of the labeling agencies current procedures and policies.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Doors and frames shall be assembled, installed, and erected plumb and in true alignment and in conformance with manufacturer's recommendations and final approved shop drawings. Preparation for surface applied hardware shall be performed on the jobsite. Frames shall be rigid and securely anchored in place. Doors shall be installed in a manner to achieve functional operation and appearance.

B. Install hardware in compliance with 08710 FINISH HARDWARE.

END OF SECTION

SECTION – 08150

Elevator Smoke Door

1.0 GENERAL

1.1 Roll down smoke door is to be provided at elevator shaft openings on first floor only. Door shall be by Cookson Company (Door Services Inc 797-5696) and meet UL1784 for air leakage.

END OF SECTION

SECTION 08210

WOOD & MOLDED DOORS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

A. The CONDITIONS OF THE CONTRACT and all Sections of Division 1 are hereby made a part of this section.

1.02 DESCRIPTION OF WORK:

A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this section. Extent of wood doors required is indicated on drawings and in schedules.

1. Furnish and Install:
   a. Flush wood doors for steel frames
   b. Four panel molded swinging doors in wood frames.
   c. Four panel molded sliding doors.

Related work specified elsewhere:

1. SECTION 08100: STEEL DOORS AND FRAMES
2. SECTION 08710: FINISH HARDWARE
3. SECTION 09900: PAINTING

1.03 QUALITY ASSURANCE; SUBMITTALS:

A. General: Comply with requirements of SECTION 01300 - SUBMITTALS, MEETINGS & RECORD DOCUMENTS; SECTION 01400 - QUALITY CONTROL SERVICES.

B. Manufacturer: Provide wood doors complying with these specifications from one of the following:

1. Weyerhaeuser
2. Brosco
3. Mohawk
4. Jeld Wen

C. Supplier: A recognized wood or molded door supplier, with in-house fabrication and warehousing facilities, who has been furnishing doors and frames in the project's vicinity for a period of not less than five years.

D. Product Data: Submit four copies of manufacturers technical product data for each item. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and maintenance.

E. Door Schedule: Submit final door schedule in manufacturer's standard format. Coordinate doors, frames and related work to ensure proper size, thickness, hand, function, and fasteners.

1. **NOTE: Contractor shall make all submittals for finish hardware, doors, frames and related items simultaneously, only after proper review and coordination by own staff beforehand.**

2. Shop Drawings: Submit separate detail drawings, referenced to door schedule, showing size, hand, construction, fasteners, elevation and all other details pertinent to the fabrication of doors and frames for this project.

1.04 APPROVAL OF SUBSTITUTIONS:

A. Manufacturers and model numbers specified herein are to establish a standard of quality. If products other than those specifically identified herein are to be considered for this Project, they must be submitted for approval of the Architect not less than ten (10) calendar days prior to receipt of General Bids.

B. Requests for approval of substitutions shall be in writing, accompanied by catalog cuts, technical information and physical samples.

C. Approval of substitutions shall only be valid when issued by Architect to all bidders in the form of Addendum.

1.05 REFERENCES:

A. Applicable AWI standards.

B. NFPA 80, NFPA 101.

C. Other applicable building and life safety codes.

D. Door and Hardware Institute: "Recommended Locations for Builder's Hardware.

E. ANSI A117.1: American National Standard Providing Accessibility and Usability for Physically Handicapped People.

F. Other applicable industry standards.

1.06 PRODUCT PACKAGING AND HANDLING:

A. Tag each item or package separately, with identification related to final door schedule.

B. All doors shall be packaged in full cartons and securely banded.

C. Doors and frames shall be received by the contractor at the jobsite and handled in a manner so as not to be damaged. They shall be stored upright in a protected area on wood runners or skids and shall be covered with vented tarpaulins or plastic.

1.07 WARRANTY: Doors and frames specified for this Project shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of Substantial Completion of Project.

PART 2 - PRODUCTS

2.01 FLUSH WOOD DOORS:

A. Doors shall be 1-3/4" thick with particle board cores bonded to stiles and rails.

B. Provide standard 3-ply face veneer of plain slice oak.

C. Where glass lites are required, provide manufacturer's standard wood molding to match face veneer on non-fire rated doors, and standard steel molding on fire rated doors.

D. Factory prepare doors to receive concealed or mortise hardware as specified in 08710 FINISH HARDWARE.

2.02 FOUR PANEL MOLDED DOORS:

A. Doors shall be 1-3/8" thick with solid particleboard core – combination wood/mdf frame with 1 5/32" mdf top and bottom rails, 1 5/32" wood stiles, 28# per cubic foot minimum density particleboard core and 1/8" HDF facings.

B. Factory prepare doors to receive hardware as specified in 08710 FINISH HARDWARE.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Doors and frames shall be assembled, installed, and erected plumb and in true alignment and in conformance with manufacturer's recommendations and final approved shop drawings. Preparation for surface applied hardware shall be performed on the jobsite. Frames shall be rigid and securely anchored in place. Doors shall be installed in a manner to achieve functional operation and appearance.

B. Install hardware in compliance with 08710 FINISH HARDWARE.

END OF SECTION

SECTION 08331

OVERHEAD COILING DOORS

Type FCM - Motor (Gearhead - Horizontal) Operated Service Door ColorCote Finish - Full Weatherstrip - Face of Wall Mounted – Featheredge

1.0 GENERAL

1.1 Summary

A. All Rolling Service Doors shall be as manufactured by The Cookson Company, Phoenix, Arizona. Furnished materials shall include all curtains, bottom bars, guides, brackets, hoods, operating mechanisms and any special features.

B. Work not to be included by The Cookson Company includes design of, material for, and preparation of door openings but not limited to structural or miscellaneous iron work, access panels, finish painting, electrical wiring, conduit and disconnect switches.

1.2 Quality Assurance

A. Exterior rolling service doors shall be designed to withstand at least a twenty (20) pounds per square foot windload. Windlocks shall be installed on doors over 14'1" wide.

B. All rolling service doors shall have extra high cycle springs and be designed to a standard maximum of 25 cycles per day and an overall maximum of 100,000 operating cycles for the life of the door.

C. The ColorCote finish shall be such that there is no corrosion when the material is subjected to salt spray resistance test ASTM B-117 for 1000 hours.

2.0 PRODUCTS

2.1 Materials

A. The door curtain shall be constructed of interconnected strip steel slats conforming to ASTM A-653. The proper gauge of steel shall be chosen as follows:

1. 20 gauge with a No. 5 flat slat as designated by The Cookson Company.

B. The finish on the door curtain shall be Cookson ColorCote consisting of the following:

1. Hot dipped galvanized G-90 coating consistent with ASTM A-653
2. Bonderized coating for prime coat adhesion
3. Factory applied Thermosetting Powder Coating applied with a minimum thickness of 2 mils. The color shall be selected by the architect and shall be chosen from standard color chart.

C. The bottom bar shall consist of two 1/8" steel angles mechanically joined together and shall include the Cookson Featheredge safety edge system. The finish on the bottom bar shall be the same Cookson ColorCote finish as indicated in the curtain section.

D. The guides shall consist of 3 steel angles bolted together with 3/8" fasteners to form a channel for the curtain to travel and shall include an extruded vinyl snap-on weatherstripping continuously along the exterior leg of the guide. The wall angle portion shall be continuous and fastened to the surrounding structure with either minimum 1/2" fasteners or welds, both on 36" centers. The finish on the guide angles shall be the same Cookson ColorCote finish as indicated in the curtain section.

E. The brackets shall be constructed of steel not less than 1/4" thick and shall be bolted to the wall angle with minimum 1/2" fasteners. The finish on the brackets shall be the same Cookson ColorCote finish as indicated in the curtain section.

F. The barrel shall be steel tubing of not less than 4" in diameter. Oil tempered torsion springs shall be capable of correctly counter balancing the weight of the curtain. The barrel shall be designed to limit the maximum deflection to .03" per foot of opening width. The springs shall be adjusted by means of an exterior wheel. The finish on the barrel shall be one (1) coat of bronze rust-inhibiting prime paint.

G. The hood shall be fabricated from 24 gauge galvanized steel and shall be formed to fit the curvature of the brackets. The hood shall contain a waterproof baffle to control air infiltration. The finish on the hood shall be the Cookson ColorCote finish as indicated in the curtain section.

2.2 Operation

A. The door shall be operated at a speed of 2/3 foot per second by an open drip-proof electric motor with gear reducer in oil bath. The motor operator shall include a geared limit switch, and an electrically interlocked emergency chain operator. The motor starter shall be housed in a NEMA 1 housing and include a magnetic reversing starter size 0, a 24 volt control transformer, and complete terminal strip to facilitate field wiring. The motor operator shall be activated by a 3 button push-button station in a NEMA 1 enclosure and by remote control. The motor shall be ½ HP. three phase. The motor operator shall be mounted to the door bracket as shown on drawings. All motor operators shall be U.L. listed.

B. The service door shall include the Featheredge rolling door safety edge system as manufactured by The Cookson Company and shall include the following features:

1. The Featheredge shall be installed on the bottom bar of the door and shall automatically reverse the door if the device detects an obstruction in the downward travel of the door.
2. The Featheredge shall consist of a rubber boot attached below the bottom bar with an electrical switch secured to the back of the bottom bar. The Featheredge shall operate with air wave technology and shall not rely on pneumatic pressure or electrical strip contacts to operate properly. The Featheredge shall create an air wave that shall be detected and reverse the direction of the rolling door.
3. The operation of the Featheredge shall not be subject to interferences by temperature, barometric pressure, water infiltration, or cuts in the rubber boot.
4. The Featheredge shall be connected to the motor operator with a coil cord.

C. Provide Radio Control Receiver with 28 transmitters.

3.0 EXECUTION

3.1 Installation

A. All Cookson Rolling Service Doors shall be installed by an authorized Cookson Distributor.

3.2 Warranty

A. All Cookson Rolling Service Doors shall be warranted for a period of 2 years from the time of shipment against defects in workmanship and materials.

END OF SECTION

SECTION 08600
POLYVINYL CHLORIDE (PVC) WINDOWS
DOUBLE HUNG

PART 1 – GENERAL

1.1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in text by basic designation only.

1.1.1 Federal Specifications (Fed. Spec.):

L-S-125B	Screening, Non-metallic, Insect
DD-G-45-1D	Glass, Float or Plate, Sheet

1.1.2 American Architectural Manufacturers Association (AAMA);

AAMA/NWWDA 101/I.S.2-97	Specifications for PolyVinyl Chloride (PVC) Windows
	Test method for rate of Air Leakage through Exterior windows, Curtain walls and doors
	Test method for Structural Performance of Exterior Windows, Curtain walls and doors
	Test method for Water Penetration of Exterior windows, Curtain walls and doors by Uniform Static Air Pressure Difference
	Specifications for Sealed Insulating Glass Units
AAMA 1503-98	Voluntary test method for Condensation Resistance of Windows, Doors, and Glazed wall sections
AAMA 1503-98	Voluntary test method of Thermal Transmittance of Windows, Doors, and Glazed wall sections

1.1.3 American Architectural Manufacturers Association (AAMA) Certification Program for Vinyl Windows

1.2 SUBMITTALS: Submit to Contracting Officer for Approval.

1.2.1 Certified Test Reports: Submit for air infiltration, water resistance, and uniform loading in accordance with the above referenced specification.

1.2.2 Catalog Data: Shall describe each type of window, hardware, fastener, accessory, operator, screen, and finish. Submit color chart of factory finished color.

1.2.3 Certification of Compliance: Submit certificates that identical windows have been successfully tested and meet the requirements specified herein for air infiltration and water penetration.

1.2.4 DELIVERY AND STORAGE: Deliver windows to project site in an undamaged condition. Use care in handling and hoisting during transportation and at the job site. Store windows and components out of contact with the ground, under a watertight covering, so as to prevent damage to the windows. Damaged windows shall be repaired to an "as new" condition as approved. If windows cannot be repaired, a new unit shall be provided.

1.2.5 PROTECTION: Finished surfaces shall be protected during shipping and handling using manufacturers standard method.

1.2.6 CERTIFICATION: Window units shall be tested and certified for performance with the above referenced test methods. All window units shall bear sticker certifying conformance with AAMA/NWWDA 101/I.S.2-97 , AAMA 1503-98 and Energy Star.

1.3 CERTIFIED FABRICATOR: Windows shall be fabricated by an AAMA Certified Fabricator.

1.7 WARRANTIES:

1.7.1 Windows shall be fully warranted against any defects in material or workmanship under normal use and service for a period of 20 years from date of acceptance on commercial projects and lifetime warranty to original homeowner on residential projects. 5 years factory labor included.

1.7.2 PVC finish shall be warranted against chipping, peeling, cracking, or blistering for a period of 20 years from date of acceptance.

1.7.3 Insulated Glass Units shall be fully warranted against visual obstruction resulting from film formation or moisture collection between the interior glass surface, excluding breakage, for a period of 20 years from date of acceptance on commercial projects and lifetime warranty to original homeowner on residential projects. 5 years factory labor included.

1.7.4 Contractor shall provide a written service warranty that clearly spells out how requests for service shall be handled, by whom, under whose responsibility and shall include the time frame for handling these service requests. A labor warranty providing service on the windows shall cover a period of not less than 10 years, and shall be provided in writing. A copy of the product and labor warranty must accompany other applicable warranties and be presented with bid.

1.8 PERFORMANCE REQUIREMENTS: Thermopane double Glazed Low E^2 insulating glass standard on new construction series, Argon filled.

1.8.1 Test for air infiltration shall be in accordance with AAMA/NWWDA 101/I.S.2-97. On a test, the air rate shall not be greater than 0.1 cfm per square foot of sash.

1.8.2 Test for water penetration shall be in accordance with AAMA/NWWDA 101/I.S.2-97 under a static pressure difference of 5.25 psf

1.8.3 Test for Thermal Performance shall be in accordance with AAMA 1503-98 the thermal transmittance due to conduction shall not exceed 0.33 BTU/HR/FT2/F

1.8.4 Test for Condensation Resistance Factor (CRF) shall be in accordance with AAMA 1502.7 the CRF shall not exceed 65.

1.8.5 Uniform Load Structural Test, with the window closed and locked, shall be in accordance with AAMA/NWWDA 101/I.S.2-97 On a test at a static pressure difference of 90 psf* with first the exterior (positive) pressure applied and then the interior (negative) pressure applied.

1.8.6 Solar Heat Gain Coefficient: 0.31

1.8.7 U-Factor: 0.30.

PART 2 – PRODUCTS

2.1 MATERIALS: Prime windows shall conform to the requirements of specifications listed above. Provide windows of combinations, types and sizes indicated or specified. Each window shall consist of a unit including sub-frame, frame, sash, hardware, mullions, trim, casing, insect screen, and fasteners complete. Window units shall be prime windows of the type specified. Dimensions shown are minimum.

2.1.1 Double-Hung Windows Extruded PVC units, produced from commercial quality virgin powder dry blend UPVC (unpalsticised polyvinyl chloride), conforms to Grade H-R 35** of ASTM D – 4099 from sections in one piece, straight, true and smooth. Provide multi-chambered PVC extruded frames and sash in accordance with the manufacturers standard practice. Make fusion welded frame joints strong enough to develop full strength of members, with a wall thickness of .070 ". Head and jamb members shall have integral screen stops. Make interior horizontal top surfaces of both meeting rails flat and in the same plane. Meeting rails have an integral interlock with two lines of pile weatherstrip provided. Upper and lower sash shall have the same glass size. Sash shall have fusion welded mitered corners with a wall thickness of .070". **Double Hung window standard is Paradigm Standard Double Hung Window manufactured by Paradigm Window Solutions, Portland, ME 04103.**

* As tested in 36x60 window unit, 75 psf as tested in 44x60 window unit.

* As tested in both 36x60 and 44x60 window units.

2.1.1.1 Balance Mechanism (DH): Provide two stainless steel, 1/2" thickness constant force coil spring balances for each sash. Enclose balance springs in rustproof cases, with jamb liner covers, from the top of the bottom sash to the head of the window unit. Balance covers shall be finished to match window frame finish and easily removable for field service. Balances shall also have an interlocking Pivot Bar, for integral frame alignment with sash for keeping window frames straight and true during installation.

2.1.1.2 Locking Device (DH): Provide each window over 32 inches in width with two cam-action sweep sash locks, and windows under 30 inches in width with one lock. The lower sash shall have one continuous, integral lift rail at the bottom of the sash. The upper sash shall have a continuous, integral pull-down member on the sash top rail. Provide two tilt latches in the top of each sash for tilting in sash for cleaning. The tilt latches shall be integrally mortised into the sash top rails for a clean appearance.

2.1.2 Glass and Glazing: Glass shall conform to DD-G-451 and not less than "B" quality. Sash shall be in factory glazed ¾" insulating glass conforming to ASTM-E-774 with TruSeal Swiggle seal spacer, manufactured by TruSeal Industries Inc., Cleveland, OH 44122. Glazing shall be integral glazing type system with architectural back bedded glazing tape and designed to maintain a watertight seal between glass and sash frame. Glass shall have a LowE2 coating on number three side of insulating glass unit with a U-Value of 0.30, Argon filled.

2.1.3 Caulking and Sealing: As specified or recommended by window manufacturer.

2.1.4 Weather-stripping: All sash units shall be triple weather-stripped where the sash meet the jamb using silicone treated pile with a mylar center fin bonded to backing.

2.1.5 Insect Screening: Fed. Spec. L-S-125, Type II, Class 2 (plastic coated or impregnated fibrous glass yarn) of standard color as approved, mesh 18 X 16

2.1.6 Color – selected by Architect from manufacturer's standard colors.

2.2 FABRICATION

2.2.1 Weathering Surfaces: All frame members shall be multi-chambered PVC extrusions utilizing double wall design without the need for reinforcement. Frame corners shall be fusion welded. Sash members shall be multi-chambered PVC extrusions utilizing double wall design at all glazing locations. Horizontal sash members shall be mitered and fusion welded to vertical sash members.

2.2.2 Drips and Weep Holes: Provided as required to return water to the outside.

2.2.3 Glazing Thickness: Design glazed windows and rabbets suitable for glass thickness specified above.

2.2.4 Fasteners: All fasteners are to be stainless steel type, corrosion resistance. Use flathead, cross-recessed type, exposed head screws with standard threads on windows, trim, and accessories. Screw heads shall finish flush with adjoining surfaces. Self-tapping sheetmetal screws are not acceptable for material more than 1/16 inch in thickness. All sheetmetal screw fasteners shall penetrate into a screw boss consisting of at least three layers of PVC profile for secure fastening and reduce pull out.

2.2.5 Provisions for Glazing: Design sash for outside double-glazing and for securing glass with manufacturer's standard glazing systems. Provide glazing channels of adequate size and depth to receive and properly support the glass and glazing accessories.

2.2.6 Accessories: Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation.

2.2.7 Weather-stripping: Provide for ventilating sections of all windows to insure a weathertight seal meeting the infiltration tests specified herein. Use easily replaceable factory applied weather-stripping of manufacturer's stock type, as specified above. Use EPDM covered open cell foam weatherstrip for compression contact between the sill and the sash. For sliding surfaces, use silicone treated pile, with a mylar center fin bonded to a plastic-backing strip. Do not use neoprene or polyvinylchloride weather-stripping where they will be exposed to direct sunlight.

2.2.8 Finishes: Exposed surfaces shall be factory finished. All windows for each building shall have same finish.

2.2.9 Screens: Provide one insect screen for each operable ventilating unit. Design screens to fit closely around entire perimeter of each ventilator or opening, to be rewirable, easily removable from inside building, and interchangeable for same size ventilators of similar type windows, with no exposed fasteners and latches. Provide all guides, stops, clips, bolts and screws as necessary, for a secure and insect tight attachment to window. Provide continuous extruded aluminum screen frame for screen strength, and a center tie bar on taller units to prevent frame compression.

2.2.9.1 Screen Frames: Provide same quality and color finish as the window units. Frames shall have extruded sections not less than .4375" by 1.25" by 0.050 inch thick and shall have removable vinyl splines. hardware, attachment devices, and accessories shall be manufacturer's standard and of same quality, material and finish as hardware of window unit.

2.2.9.2 Screening: Install screening with weave parallel to frame and stretch sufficiently to present a smooth appearance. Conceal edges of screening in the spline channel.

PART 3 – EXECUTION

3.1 INSTALLATION

3.1.1 Method of Installation: Install in strict accordance with the window manufacturer's printed instructions and details, except as specified otherwise herein. Install windows without forcing into prepared window openings. Insulate perimeter of window frame with acceptable approved insulation material, as recommended by window manufacturer. Set windows at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment. Protect ventilators and operating parts against accumulation of dirt, and building materials by keeping ventilators tightly closed and locked to frame. Bed screws in sill members, joints at mullions, contacts of windows with sills, built in fins, and sub-frames in approved sealant. Install windows in a manner that will prevent entrance of water. Provide sill angle flashed in sealant at windowsills.

3.1.2 Anchors and Fasteners: Make ample provision for securing units to each other, and to adjoining construction. Contractor to prepare window for jamb screen installation.

3.1.3 Adjustments after Installation: After installation of windows adjust all ventilators and hardware to operate smoothly and to provide weathertight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary.

3.1.4 Protection: Where surfaces are in contact with, or fastened to wood, or dissimilar materials, the surface shall be protected from dissimilar materials as recommended by the manufacturer. Surfaces in contact with sealant after installation shall not be coated with any type of protective material.

3.2 CLEANING: Clean interior and exterior of window units of mortar, plaster, paint spattering spots, sealants, and other foreign matter to present a neat clean appearance and to prevent fouling of weather-stripping surfaces and weather-stripping, and to prevent interference with the operation of hardware. Replace with new windows all stained, discolored, or abraded windows that can not be restored to their original condition.

END OF SECTION

SECTION 08610

SLIDING DOOR & TRANSOM

1. GENERAL;

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specification. The work covered by this section of specifications consists of the following:

A. Furnishing and installing all sliding doors shown on Drawings, complete with transom and all hardware, operators and other accessories, including corner flashing pieces. (Door 405 is the sole sliding door in the Project.)
B. Furnishing screens.
C. Adjusting the door for smooth and faultless operation.

2. PRODUCTS:

2.1 SLIDING DOOR shall be "Pella Proline" or equal wood/aluminum with insulated glazing; window color to be selected by Architect from manufacturer's standard colors. Door to have screens. Screens to be packaged independently of doors. Insulating glass contains ¾" contoured aluminum grills, installed between the two panes of glass. See Drawings for types. Interior to be factory primed.

2.2 ALL DIMENSIONS shall be as shown on Drawings or from manufacturer's information. See details on Drawings for finish installation details.

2.3 Minimum glass U Value of 0.35.

1. Glass must be National Fenestration Rating Council (NFRC) rated AND have:
   a. U value of less than .35
   b. Solar Heat Gain Coefficient (SHGC) of .45 or higher
   c. Air Leakage Rate (AL) of .30 or less

3. EXECUTION:

3.1 DOOR shall be installed by workmen experienced in this kind of work. Set frames plumb, level and square, within clearance limits of the respective openings. Fasten frames securely to the wall framing. Frames and other installation materials shall be handled carefully at all times and shall be protected from all possible sources of damage such as dampness, dirt, mortar, etc. Units shall be stacked standing on edge on wood strips to prevent contact with ground. Installation of windows shall strictly follow the manufacturer's recommendations.

3.2 CAULK door as required in other sections and on drawings. Install corner flange closures and caulk as door is installed.

3.3 AFTER the door is installed, it shall be checked for smooth operation and adjusted as necessary. Install screens. Leave installed door and screens clean, tight and weatherproof.

END OF SECTION

FINISH HARDWARE
SECTION 08710

PART 1- GENERAL

1.01 Work Included

Furnish, install finish hardware necessary for doors as enumerated in the sets and as indicated or required by actual conditions at the building. The hardware shall include all screws, bolts, expansion shields and all other devices needed for the proper application of the finish hardware. General and Supplementary Conditions as described in Division 1 apply.

1.02 Drawings

Consult drawings note all conditions that may affect the work and the care for same in executing the Contract.

1.03 Related Sections

A.	Finish Carpentry	Section 06200
B.	Steel doors and frames	Section 08100
C.	Wood and Molded Doors	Section 08210
D.	Painting	Section 09900
E.	Electrical	Section 16000

1.04 References

A.	NFPA-80	Fire Doors & Windows	(1992 Edition)
B.	NFPA-101	Life Safety Code	(2003 Edition)
C.	DHI	Installation Guide	(1986 Edition)
D.	DHI	Keying Terminology	(1989 Edition)
E.	ANSI/BHMA	Standards	----------
F.	MAINE BUILDING CODE		Current Edition
G.	MAINE ACCESS BOARD		Current Edition

1.05 Submittals

A. Make all submittals in accordance with Section 01340.

B. Submit six (6) copies of a typed hardware schedule including catalog cuts in the scheduling format recommended by DHI. The Architect's approval will not relieve the contractor of the responsibility of providing all required hardware needed to complete the project.

C. Upon request from the Architect, submit one (1) sample of each proposed hardware item to be used in this project. All samples remain the property of the

supplier and will be returned after completion of the project.

D. Furnish all templates needed by door and frame manufacturer to enable proper machining for the required template hardware.

E. Supply a complete keying schedule for approval by Architect. This should be done after keying meeting has been held with owner's representative. Submit this keying schedule using the reference manual from DHI.

F. Submit wiring and riser diagrams needed for all electrical/electronic hardware.

G. At the completion of the project, supply the owner with two (2) copies of an Owner's Operation and Maintenance Manual. This manual shall consist of a hard cover (3) ring binder with the project name listed on the front. Included will be:

1. A final copy of the approved and as built hardware schedule.
2. A final copy of the approved keying schedule.
3. Catalog cuts for each item used in the project.
4. Parts list and numbers for each item used.
5. Maintenance instructions for all items .
6. Name, address and phone number of local representative for each item used.

1.06 Quality Assurance

A. Manufacturer's model numbers listed in sets are to establish the standard of quality. Similar items listed by one of the other listed manufacturer's that conforms to the quality standard, may be accepted upon prior approval by Architect provided required the data and physical samples are submitted in accordance with Section 01630.

B. Hardware supplier must be engaged in regularly contracting work and be staffed to expedite the work. The firm shall have been furnishing finish hardware on similar projects in the vicinity of this project for no less than five (5) years. The firm shall also employ a Certified Architectural Hardware Consultant (AHC) or a person with proper documented qualifications acceptable and approved by the Architect, to inspect periodically and direct detailing, setting, applying of architectural grade finish hardware.

1.07 Delivery, Storage and Handling

A. Hardware shall be delivered to the job site in the manufacturer's original packages, marked to correspond with the approved hardware schedule door numbers.

B. Provide a clean, dry, locked and lighted room with shelves exclusively used to store hardware.

C. A delivery document shall be signed by both the distributor representative

and an authorized representative of the contractor after verification of the quantities delivered.

1.08 Warrantee

A. Supply written warranties from all manufacturers. Supply from the door closer manufacturer a warranty document for no less than 10 years from the date of substantial completion of the project.

1.09 Maintenance

A. Furnish one (1) dozen extra screws or fasteners of each type size and of the same finish used in this project.

PART 2- PRODUCTS

2.01 Acceptable Manufacturer's (**Bolded** companies and their products are listed in Sets)

A.	Hinges	**Hager Companies**	**St Louis, MO**
		McKinney	Scranton, PA
		Bommer Industries	Landrum , SC
B.	Flush Bolts	**Hager Companies**	**St Louis, MO**
		Ives	New Haven, CT
		DCI	Dexter, MI
C.	Electric Strikes	**Folger Adam**	**Lemont, IL**
		HES	Phoenix, AZ
		Locknetics	Forestville, CT
D.	Locks	**Schlage**	**Colorado Springs CO**
E.	Exit Devices	**Yale Security**	**Charlotte, NC**
		Corbin/Russwin	Berlin, CT
		Von Duprin	Indianapolis, IN
F.	Door Closer	**Norton Door Controls**	**Charlotte, NC**
		Corbin/Russwin	Berlin, CT
		LCN	Princeton, IL
G.	Wall Magnets	**Rixson**	**Charlotte, NC**
		Sargent	New Haven, CT
		ABH	Elk Grove, IL
H.	Protection Plates	**Hager Companies**	**St Louis, MO**
		Rockwood	Rockwod, IL
		Ives	New Haven, CT

I.	Thresholds & Gasketing	**Hager Companies**	**St Louis, MO**
		National Guard	Memphis, TN
		Pemko	Memphis, TN
J.	Silencers	**Hager Companies**	**St Louis, MO**
		Glynn Johnson	Indianpolis, IN
		Ives	New Haven, CT
K.	Miscellaneous	**Hager Companies**	**St Louis, MO**
		Johnson	
		Lawrence Brothers	
L.	Door Knocker/ Nameplate	**Ives**	
M.	Door Stops	**Ives**	

2.02 Materials

A. Hinges: Unless otherwise noted, hinges when listed in sets shall be the five (5)knuckle type and they shall meet or exceed ANSI/BHMA 156.1. All hinges shall have a lifetime warranty. Width of hinges shall be sufficient to clear all trims.

1. **Hager, BB1279, BB1168 or BB1191, BB1199 as listed in sets.**
2. McKinney, TA2714, T4A3786, TA2314, T4A3386
3. Bommer, BB5000, BB5004, BB5001, BB5005 series

B. Flush Bolts: Unless otherwise noted provide flush bolts, dust proof strikes, coordinators from the listed manufacturer that conforms with ANSI/BHMA A115.4 Unless otherwise listed noted in sets, provide the following:

1. **Hager, 282D, with 280X dst prf strk or as listed in sets.**
2. Ives, 458B, with 487/489 dst prf strk.
3. DCI, 780 F, with 80 dst prf strk.

C. Electric Strike: Provide heavy-duty electric strike that will release and capture the deadbolt of a mortise lock. Provide them 24 VDC with NFS option at entry door. Power supplies are provided in Division 16 as well as the connections to security.

1. **Folger Adam, 672 series 24VDC**
2. HES, 1003 series
3. Locknetics, 9030 series

D. Locks/Latches: Provide heavy-duty mortise locks/latches from the manufacturer that conforms to ANSI/BHMA standard A156.13 series 1000 Operational Grade 1 and to this article. Provide KNURLING on levers when required by code. At electrified locks, provide proper power supplies, listed or not in the sets.

1. **Schlage L Series**

Cylindrical latches: Provide cylindrical latches from the same manufacturer as the mortise locks and latches inside the patient room doors as listed in sets. These shall conform to ANSI/BHMA A156.2 1996 Grade 2 Series 4000 for cylindrical latches. Lever design shall match PHASE I and II.

1. **Schlage A Series**

E. Exit Devices: Provide heavy duty, security, fire rated and non fire rated exit devices from the same listed manufacturer that conforms with ANSI/BHMA A156.3 Standard Grade 1 and shall have the proper UL listings and labels. Provide keyed cylinder dogging at non-fire rated devices as listed in sets. Electrify devices as listed in sets. Device bodies shall be smooth steel extruded aluminum bodies are not acceptable. Provide KNURLING as required by code.

1 Yale, 7100 series or as listed.
2. Corbin/Russwin, ED5000 series
3. Von Duprin, 98 series

Unless otherwise noted, trims are Heavy Duty and shall match the design used in PHASE II. Provide KNURLING as required by code.

1. Yale, HD Trim 600 series or as listed.
2. Corbin/Russwin, HD Trim, 900 series as listed.
3. Von Duprin, HD 994L trim

F. Door Closer: Provide a surface mounted door closer from one of the listed manufacturers that comply with ANSI/BHMA A156.4 grade 1 standard C02011or C02021, and will have a minimum ten (10) year written warranty. Provide all mounting brackets as required for proper installation. Provide BF, DA ST, UNITROL options or metal plated covers as listed in sets. Install closing devices away from public view when possible.

1. Norton, 7500, series or as listed in sets.
2. Corbin/Russwin, DC2000 Series
3. LCN, 4000 Series **.

** When the UNITROL arm is listed in the sets, LCN would only be acceptable if supplied with an additional separate "spring "cushioning overhead stop.

G. Protective Plates: Provide all kick and mop plates from one of the listed manufacturers that conforms with ANSI 156.6 standard J102 or J103. Thickness shall be .050 and have 3 beveled edges. Height of protection plates shall be as listed in sets. The width of the kick plates shall be less -2" inches for single doors and less - 1" inch for pairs of doors. Mop plates shall be less -1" inch for singles and less - 1/2" inch for pairs. Provide countersunk screws (CSK) at all protection plates.

1. Hager, 193 S series as listed in sets.
2. Rockwood, .050 thick material
3. Ives, 8400 series

H. Thresholds and Gasketing; Provide perimeter gasketing, door sweeps, thresholds, astragals, etc, from one of the listed manufacturers that conforms with ANSI/BHMA A156.22 standard. Provide as follows or as listed in sets.

1. **Hager, 802 S B gasketing and astragal, as listed.**
2. National Guard, B606 series
3. Pemko, 18061 series

1. **Hager, 801 S B door sweeps as listed in sets.**
2. National Guard, D608 series
3. Pemko, 18125 series

1. **Hager, 412 S thresholds or as listed in sets.**
2. National Guard, 425E series
3. Pemko, 171 series

1. **Hager, 726 S smoke/sound gasketing as listed in sets.**
2. National Guard, 5050 series
3. Pemko, S88 series

I. Silencers; At openings that do not have weather-stripping, use rubber silencers. Comply with ASNI/BHMA A156.16 standard L03011. Supply 3 silencers for a single opening and 2 for pairs.

1. **Hager, 307 D or 308D as listed.**
2. Glynn Johnson, GJ64 series
3. Ives, 20 series

J. Miscellaneous: Provide heavy-duty by-fold track or by parting hardware sets that conforms to ANSI A156.14.

1. **Hager, 9871 series by-fold track and hardware set.**
2. Johnson, 100FD series
3. Lawrence 570 series

1. **Hager, 9602 series by-parting track and hardware set.**
2. Johnson, 134F-138F series
3. Lawrence, 581 series

K. Door Stops: Provide wall or floor stop as appropriate for all swing doors.

1. Wall - Ives 60 (3-3/4") or #62 (4-1/2").
2. Floor - Ives #430

L. Door Knocker/Nameplate:

1. Ives Knocker with peephole (door viewer) and nameplate. Style to be approved by Architect.

2.03 Finishes

A. Conform to ANSI/BHMA A156.18 Standard for architectural finishes

B. Finishes are as follows: Exterior US32D (BHMA 630), Interior US26D (BHMA 626/652) unless otherwise noted in sets.

2.04 Keying

A. Provide a construction Master key system (CMK) for the project.

B. Provide the following quantities of keys:

1.	Change keys	3 per lock.
2.	Grand Master	6
3.	Master Keys	6
4.	Const Master keys	6

2.05 Key control

A. Provide a complete lockable "Key Control System" cabinet as manufactured by one of the listed manufacturers. Include all components for expansion of 50 % of building capacity.

1. MMF Industries
2. TELKEE
3. LUND

2.06 Schedule

A. Heading #1 – Wood Door & Wood Frame, Single Door

3	Hanging Device	EXTERIOR HINGE HEAVY DUTY NRP
1	Securing Device	MORTISE LOCK GRADE 1
1	Closing Device	DOOR CLOSER
1	Protective Plate	KICKPLATE
1	Protective Plate	LATCH PROTECTOR
1	Accessory	DOOR BOTTOM SWEEP
1	Accessory	DOOR SILENCER
1	Accessory	ELECTRIC STRIKE
1	Accessory	PERIMETER WEATHERSTRIP
1	Accessory	THRESHOLD

B. Heading #2 - Wood Door & Wood Frame, Single Door

3	Hanging Device	EXTERIOR HINGE HEAVY DUTY NRP
1	Operating Trim	10" CENTER LINE PULL & PUSH PLATE
1	Closing Device	DOOR CLOSER
1	Protective Plate	KICKPLATE
1	Accessory	DOOR BOTTOM SWEEP
1	Accessory	DOOR SILENCER
1	Accessory	ELECTRIC STRIKE
1	Accessory	PERIMETER WEATHERSTRIP
1	Accessory	THRESHOLD

C. Heading #3 - HM Door & HM Frame, Single Door

3	Hanging Device	INTERIOR STANDARD HINGE
1	Securing Device	CYLINDRICAL GRADE 1 LEVER
1	Closing Device	DOOR CLOSER
1	Protective Plate	KICKPLATE

1	Stop/Holder	DOOR STOP
1	Accessory	DOOR BOTTOM SWEEP
1	Accessory	DOOR SILENCER
1	Accessory	PERIMETER WEATHERSTRIP
1	Accessory	THRESHOLD

D. Heading #4 - Wood Door & HM Frame, Single Door

3	Hanging Device	INTERIOR STANDARD HINGE
1	Securing Device	CYLINDRICAL GRADE 1 LEVER
1	Closing Device	DOOR CLOSER
1	Protective Plate	KICKPLATE
1	Stop/Holder	DOOR STOP
1	Accessory	DOOR SILENCER

E. Heading #5- Wood Door & HM Frame, Single Door

3	Hanging Device	INTERIOR STANDARD HINGE
1	Securing Device	MORTISE LOCK GRADE 1
1	Closing Device	DOOR CLOSER
1	Protective Plate	KICKPLATE
1	Stop/Holder	DOOR STOP
1	Accessory	DOOR SILENCER
1	Miscellaneous	INTERIOR DOOR KNOCKER W/VIEWER
1	Miscellaneous	PERIMETER SMOKE GASKET
1	Miscellaneous	ADDITIONAL VIEWER AT HC UNITS

F. Heading #6- Molded Door & Wood Frame, Single Door

3	Hanging Device	RESIDENTIAL 3.5 INTERIOR HINGE
1	Securing Device	CYLINDRICAL GRADE 2 LEVER
1	Stop/Holder	DOOR STOP

G. Heading #7- Molded Double Bypass Closet (Cased Opening)

1	Hanging Device	BYPASS DOOR TRACK RESIDENTIAL
2	Accessory	4" WIRE PULL

PART - 3 EXECUTION

3.01 Examination

A. Installer shall examine doors, frames and conditions under which the work is to be performed and notify the Architect in writing of any detrimental conditions to the proper completion of the installation. DO NOT proceed until unsatisfactory conditions have been corrected. Starting of the work means the installer has accepted all substrates and conditions and the responsibility.

3.02 Installation

A. Comply with the manufacturer's instructions on the installation of the finish hardware. Install door-closing devices away from public view when possible.

B. Mount the finish hardware at the recommended location listed in DHI' s document on installation, except where required by law.

C. Install surface closers and exit devices with trough bolts and/or grommets only at HM Doors. Wood doors shall not have any visible fasteners.

D. Provide for the mechanical hardware installer shall be present when electrical connections are made to electrical hardware to make final adjustments to the mechanical hardware.

3.03 Adjusting and cleaning

A. At completion of installation, hardware shall be left clean and free from disfigurement. Make final adjustments to all closing devices after HVAC system has been activated and balanced. Where hardware is found defective repair or replace as instructed by the Architect.

3.04 Protection

A. Provide proper protection of the hardware items until the Architect accepts the project as complete.

3.05 Field Quality Control

A. After final installation and adjustments are made, provide for the manufacturers representative of each major group of hardware to determine if their products were installed according to their recommended guidelines and the approved hardware schedules. This task shall be supervised by a certified AHC chosen by the Architect. This Individual shall provide a written report confirming that all hardware has been installed properly and that it is operating as intended.

3.06 Hardware Sets

A. The following hardware sets are intended to represent the finish hardware required for typical openings in this project. However it shall not be construed as a complete listing of the proper hardware needed for completion of this project. Bidders shall verify the plans and shall be responsible for the quantities, and the adequacy of the hardware needed to comply with all Federal, State and Local Laws and regulations.

END OF SECTION

SECTION 09250

GYPSUM BOARD

1. GENERAL

1.1 REFERENCES:

A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

B. NOTE: Selection of Finish colors and patterns in overall color scheme to be made by Architect. Contractor to notify Architect prior to commencing Gypsum Board work, to allow adequate time for color selections, Owner's approval and material ordering lead time.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

A. Drywall installation as required by Drawings and noted in these Specifications.
B. Taping and finishing all walls and ceilings, except where other kind of finish is specified.

2. PRODUCTS

2.1 NOTE: GWB types are shown as U.S.G. brand names "Sheetrock", "Firecode", "Firecode C", "M.R. Board" and "Shaftwall". Substitutions must have equal U.L. and STC ratings. See Drawings for Specific assembly.

2.2 EXTERIOR & INTERIOR WALLS & CEILINGS: See rated & non rated assemblies and wall types on the drawings.

2.3 NOTE: Type M.R. in baths as shown on Finish Schedule.

2.4 METAL FURRING CHANNEL- Unimast DWC – 25; suspend from truss with Simpson CSC support clip and FSS furring stabilizer straps.

2.5 RESILIANT CHANNEL: USG-RC-1

3. EXECUTION

3.1 THE DRYWALL CONTRACTOR shall inspect all areas affected by his work to ascertain that all work is complete and has been accepted. Defective installations shall be corrected before finished surfaces are painted or sprayed with acoustical material.

3.2 DRYWALL INSTALLATION. Install drywall as shown on plans, noted in the UL Specifications, and as set forth in U.S.G. Handbook. Installation of non-UL rated drywall assemblies on steel studs shall comply with the following minimum requirements:

A. Spacing for attachment members shall not exceed 24" o.c. for walls and 16" o.c. for ceilings. All drywall shall be screwed with approved drywall screws made specifically for the purpose and of length adequate for wall types. On walls, screws shall not be placed more than 16" apart for 16" o.c. framing or 12" apart for 24" o.c. framing. Screw all edges 12" o.c. maximum.

B. The drywall contractor may use a few drywall nails to temporarily secure a sheet of drywall before securing with drywall screws. In this event, the drywall nails must be countersunk prior to taping. Corner beads shall be used on all corners and casing beads used whenever Gypsum Board abuts dissimilar material. Caulking to also be applied at these junctions. At all party and unit/corridor walls, Gypsum Board to be set in caulking (for sound).

C. Drywall shall be laid vertically or horizontally. No tapered joints at floor base.

3.3 ON SURFACES TO BE PAINTED: tape and cement all joints and screw locations with three coats of compound, then sand to smooth finish, acceptable to paint.

3.4 DURING WORK PROGRESS, remove all excess materials and debris resulting from operations, which may disrupt the work of other trades, and after completion leave the premises broom clean.

END OF SECTION

SECTION 09510

ACOUSTICAL CEILINGS

1. GENERAL

1.1 REFERENCES

A. Drawings and general provisions of Contract, including General Conditions and Division 1 Specifications, apply to work in this section.

B. Gypsum Drywall: Section 09250

C. Mechanical and Electrical: Division 15 and 16

D. Underwriters Laboratories (UL)

E. American Society for Testing and Materials (ASTM)

1.2 DESCRIPTION OF WORK

A. Extent of Acoustical Ceilings is shown on the drawings.

1.3 SUBMITTALS

A. Submittals under this Section shall include:
   1. Manufacturers' data and installation instructions on all specified products;
   2. Color range;
   3. Samples of acoustical units;
   4. Shop drawings indicating materials, pattern number, tile number, and manufacturer.

B. Provide, as maintenance material, 1 percent of each acoustical unit used on job, in clean, marked cartons.

2. PRODUCTS

2.1 SUSPENSION SYSTEMS

A. Suspension System, unless noted otherwise, shall be "Prelude" series, Low Glass Baked Enamel Finish as manufactured by Armstrong, or approved equal.

B. Suspension system shall comply with ASTM C 635. Detailed design of system is manufacturer's responsibility, including materials, metal thickness, dimensions of necessary component sectionconfigurations, hanger and assembly devices, and provision of necessary accessory items.

C. System shall support design load with a maximum deflection of 1/360 between supports. Component materials that oxidize or corrode in normal environments shall have protective treatment or coatings, such as hot dipped galvanizing or anodizing.

D. Structural classification (per Table 1, ASTM C 635): intermediate-duty.

E. Minimum runner support: 14 gauge wire at 4'-0" intervals, staggered.

F. For circular penetrations at ceiling, provide edge moldings fabricated to fit penetration exactly. Fry Column Collar edge molding or approved equal.

2.2 MINERAL-FIBER ACOUSTICAL UNITS

A. Tile shall be manufactured by Armstrong as follows:
1. Fine Fissured 9/16" beveled 24" x 24" x 5/8" with Suprafine 9/16" grid.

3. EXECUTION

3.1 INSTALLATION

A. Before beginning installation, examine areas to receive ceiling system for dampness, structural weakness, and other conditions which would affect quality of finished work. Coordinate layout with work in Divisions 15 and 16, for alignment of equipment with ceiling suspension system.

B. Installation of suspension system shall comply with ASTM C 636. Finished installation shall be level to within 1/4 in. in 10 ft.

1. Space hangers not over 48 in. o.c. in direction of main runner channels, and within 6 in. of ends of main runner runs and of boundary walls, structural steel, partitions, and similar interruptions of ceiling continuity. Install additional hangers at ends of each suspension member and at ceiling equipment not separately suspended, 6 in. from vertical surfaces. Do not splay wires more than 5 in. in a 4 ft. vertical drop. Wrap wire a minimum of three times horizontally, turning ends upward.

2. Attach hangers directly to ceiling structure, or to supplementary framing members supplied and installed under this Section. Hangers may not be suspended from mechanical or electrical equipment such as ductwork, conduit or piping.

3. Install main and cross runners level and perpendicular to walls, at right angles to one another.

4. Install wall molding at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Attach to vertical surfaces with mechanical fasteners.

C. Install lay-in panels to bear fully on suspension system. Neatly cut acoustical units as required for sprinkler heads and HVAC equipment.

D. At completion of job, clean soiled or discolored unit surfaces after installation. Touch up scratches, abrasions, voids, and other defects in painted surfaces. Remove and replace damaged or improperly installed units.

END OF SECTION

SECTION 09650

RESILIENT FLOORING AND VINYL BASE

1. GENERAL:

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK

A. SCOPE: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

B. Extent of Vinyl Composition Tile Flooring and Vinyl Base as shown on the drawings.

1.3 SUBMITTALS

A. Submittals under this Section shall include:

1. Manufacturers' data and installation instructions on all specified products;
2. Color range;
3. Samples of vinyl composition tile flooring and vinyl base
4. Shop drawings indicating materials, pattern number, tile number, and manufacturer.

2. PRODUCTS:

2.1 SHEET VINYL: Shall be " Mannington Ceramica"` 1/8" gauge.

2.2 SUBSTITUTIONS: The contractor may substitute resilient flooring specified by manufacturer's name with a product manufactured by a different company only with approval of Architect. The substituted product shall be of equal quality and price range.

2.3 VINYL BASE MOLDING – shall be Johnsonite Cover Base 4", 1/8 gauge. Submit color for Architect's approval. See Architectural Drawings for locations.

2.4 ADHESIVES: shall be as recommended by the manufacturer.

3. EXECUTION:

3.1 INSTALLATION shall be done by skilled craftsmen using the adhesives recommended by the manufacturer and in accordance with the manufacturer's instructions. The flooring contractor shall examine the subfloors and report all defects which have to be corrected before the application of flooring starts. Concrete floors shall be smooth, free of any grooves and depressions, and brushed clean of any foreign matter. Install all resilient flooring with joints tight, floor true, level and even with no bubbles, pops or other visible defects. Cut to and around all permanent fixtures keeping vinyl tight to fixtures. Vinyl also shall be installed under fixtures such as baseboard heating, and glued tight. Wrap vinyl base around exterior corners.

3.2 DURING WORK PROGRESS, remove all excess materials, extraneous mastic, and debris resulting from operations, which may disrupt the work of other trades. The Contractor shall be responsible for keeping the floors clean, unstained and undamaged until the final completion of the building.

END OF SECTION

SECTION 09680

CARPET

1. GENERAL

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK:

A. Installation of "Roberts Strips" for carpeting.

B. Installation of Carpeting as shown on plans or noted in these Specifications.

1.3 QUALITY ASSURANCE

A. Finished installation shall comply with fire test specified in applicable Building Code.

B. Architect/Engineer shall review first finished space for workmanship. Accepted space shall serve as project standard.

C. All carpets and pads will meet UM44D

1.4 SUBMITTALS

A. Submittals under this Section shall include:

1. Manufacturer's specifications and installation instructions on all specified products.
2. Samples: one piece, 18" x 18", of each color and type of carpet provided.

B. Deliver to Owner, neatly packaged and labeled, all usable carpet scraps over 2 sq. ft. or 8 in. in least dimensions: 1 percent of each type and color of carpet provided, in 12 ft. wide rolls; and 1 percent of each type of edge strip provided, in standard lengths.

C. Provide written maintenance program.

2. PRODUCTS

2.1 CARPET shall be as follows:

A. Units: Queen/Henry 20

B. Corridors: Henry 26

C. Stairs: Henry 26 oz. direct glue.

2.2 CARPET must carry stamp confirming conformance to above and submitted to Architect for approval.

3. EXECUTION:

3.1 JOB CONDITIONS:

A. Examine Subfloor for dampness, loose material, excessive irregularity, oily or waxy areas impeding adhesion, or other conditions which would prevent proper installation. Verify that no incompatible curing compound has been used on newly-poured concrete. Commencement of work constitutes acceptance of subfloor.

B. Allow newly-poured concrete to cure as long as possible before installation of carpet, a minimum of 7 days, 28 days preferable. Perform bond and moisture tests in accordance with carpet manufacturer's instructions, to verify that concrete is sufficiently cured, dried and then sealed.

C. Broom-clean or vacuum surfaces to receive carpet, before beginning installation. Apply primer-sealer to plywood or concrete sub-floor, if recommended by carpet or adhesive manufacturer.

D. Before proceeding with complete installation of carpet, install a representative sample area of each type of carpet provided over each type of substrate, to test for compatibility of adhesive to substrate at glue-down installation, and verify general appearance of finished installation. If sample is securely bonded after 72 hours, final installation may proceed.

3.2 INSTALLATION

A. Install carpet by direct glue-down in handicap units and corridors, all other units install over pad. Install Entry carpet in accordance with the manufacturer's recommendations.

B. Field measure each space to receive carpet. Do not scale drawings. Before beginning installation, verify that floor telephone and electrical outlets have been installed.

C. At glue-down installations, apply manufacturer's recommended adhesive in accordance with manufacturer's instructions, observing proper safety precautions. Apply adhesive in a uniform film with a steel trowel and proper size notches for correct coverage. Avoid applying excess quantities so that adhesive bleeds through joints. Apply adhesive only in area which dries or films over. Avoid soiling adjacent walls and floors with adhesive. Promptly remove any spillage. Broom or roll carpet to remove air bubbles and insure bond.

D. Install carpet wall to wall unless noted otherwise. Fit carpet neatly into breaks, recesses, closets and alcoves, against bases, around pipes and penetrations, under saddles and thresholds, and around permanent cabinets and equipment. Install Schluter metal strip wherever carpet edge does not abut vertical surface, of appropriate configuration to provide smooth transition to adjacent material. Allowable variation from level for finished installation: 1/4 in. from level in any direction when tested with 10 ft. straight-edge.

E. Seams shall be flat, free from puckering, without twists, free from frayed edges. Coat edges with seam adhesive at glue-down installation, hot-melt tape at cushion, and as recommended by manufacturer. Patterns at seams shall match exactly. Cut raw edges on a slight angle with surface yarns extending outward over backing material so that surface yarns mingle neatly at seams.

F. Seams shall be in accordance with approved seaming shop drawings and samples. No seams will be accepted perpendicular to openings such as doors, stairs, and entries. Seams at doors shall be centered directly under doors. Seam at corridor change of direction shall follow inner wall line across corridor.

G. Provide removable cut-out pieces over flush equipment requiring access such as telephone and power outlets. Cut-outs shall be neatly edged and securely held in place with double-edged tape all around.

H. Remove adhesive spots from carpet immediately with solvent. Trim loose pieces of face yarn with sharp scissors. Upon completion of installation, remove rubbish, selvages, wrapping paper, small scraps, etc., and vacuum with commercial-type vacuum cleaner. Remove soiling, by shampoo if necessary. Cover finished work with kraft paper or polyethylene until Substantial Completion.

I. At completion of job, remove protective paper, vacuum or shampoo again if required.

END OF SECTION

SECTION 09900

PAINTING

1. GENERAL

1.1 DESCRIPTION OF WORK

A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

B. The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

1. Painting or staining all interior and exterior surfaces as called for in the Finish Schedule on Drawings or in these Specifications.

2. Painting interior walls, door trim, window trim, etc.

3. Staining and varnishing rails as called for on Drawings.

4. Painting all exterior doors as specified.

5. Painting and finishing any other work requiring finishing left unfinished by others.

6. Walls painted accent as called for on Drawings.

NOTE: All colors to be selected by Architect. The Contractor shall submit to the Architect, for approval, color samples of stain finishes, See general Note Section 09250.

1.2 SUBMITTALS

A. Issue submittals in accordance with Section 01300, Submittals.

B. Submit as follows:

1. Manufacturer's data, application instructions, and color chips on all specified products.

2. Paint schedule covering all surfaces to be painted.

3. Contractor to provide 4' x 8' test panels in finished spaces for up to 3 trials for each required color selection. Test panel colors to be selected by Architect. Final color to be approved by Architect from test panels.

4. Provide as maintenance material, a minimum of one gallon of each type and color of paint used on job, in labeled and well-sealed containers, for future touch-up. Also provide typed list of each type and color of paint used on job, including name of distributor from whom paint may be obtained.

2. PRODUCTS

2.1 General

A. Paint: Acceptable manufacturers, unless specific manufacturer is noted: California Products Corporation, Benjamin Moors, Pratt & Lambert, Sherwin-Williams, Tnemec.

B. All products used shall be manufacturer's top quality product for each type of finish specified.

2.2 MATERIALS

A. Where primer is called for, use primer recommended by manufacturer for particular combination of substrate and finish coat. Where painting over shop-applied primers, verify that finish paint proposed for field application is compatible with shop primers actually used.

B. Exterior Doors: Steel-Clad: Benjamin Moore Ironclad Retardo

C. All Gypsum Walls and Ceilings to be painted: Primer - Benjamin Moore Vinyl Latex Primer Sealer.

D. Finish-Walls - Benjamin Moore Moorcraft Latex Eggshell.

E. Finish Ceiling – Flat Ceiling White

F. Interior exposed softwood woodwork as noted on Drawings: One (1) coat Primer; two (2) finish coats Semigloss Latex. All Hardwood: three (3) coats urethane.

G. Wood Door Frames & Trim, & Miscellaneous interior wood trim: Benjamin Moore Wood Primer and two (2) coats Latex Semigloss.

H. Exterior Cement Board Clapboards & Trim – (2) coats latex exterior grade paint within 180 days of installation. Note: seal all cut edges.

I. Interior garage gypsum board walls - alkyd primer and alkyd eggshell enamel.

J. Exterior steel railings, balconies Sherwin Williams Alkyd Systems

3. EXECUTION

3.1 JOB CONDITIONS

A. Store materials in sealed containers. Provide a fire extinguisher in storage room. Remove flammable rags and waste from building at end of day.

B. Do not perform exterior work in rain or when precipitation is forecast imminently; or in hot, dry, or windy weather which would cause finish to cure too rapidly, or be marred by windstorm dust; or at temperatures below 40 degrees F.

C. Maintain temperature at interior locations between 50 and 75 degrees F, maximum 80 percent relative humidity, while paint is being applied. Provide adequate ventilation, by mechanical means if necessary, for drying of paint and prevention of condensation and mildew. Do not apply finish in areas in which dust is being generated.

D. Protect finished surfaces and equipment not being painted with masking tape, canvas dropcloths, polyethylene sheets, etc. Items such as lighting switch covers, fixture canopies, and door handles shall be temporarily removed, carefully stored, and replaced after painting, or carefully covered during painting operations.

3.2 PREPARATION

A. Preparation of newly-installed materials to receive finish painting is specified under those Sections installing materials. This includes, but is not necessarily limited to: touch-up of damaged shop coats; taping, sealing and sanding of drywall; patching masonry; sanding finish wood; and cleaning off grease, oil, dirt, mildew, factory-applied protective coatings, and other foreign materials.

B. At wood surfaces to be painted, scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

C. Before beginning work under this Section, verify that preparation of substrates under other Sections has been done as specified. Thoroughly remove water, dirt, and dust with clean cloths, brooms, or brushes. Allow masonry motar joints to cure as long as possible before beginning paint application, 7 days minimum, 28 days preferably.

3.3 APPLICATION

A. Apply all materials in accordance with the manufacturer's recommendations.

B. Apply materials with suitable brushes, rollers, and spraying equipment. Keep application equipment clean, dry, and free from contaminants. Thoroughly stir materials before applying, and periodically during application.

C. Rate and method of application and drying time between coats shall be strictly in accordance with manufacturer's recommendations.

D. Prepare field test panels in accordance with paragraph 1.4-B.3 of this Section for each type and color of finish specified. Request review of first completed room, color scheme, special items, etc., which shall serve as project standard after approval.

E. Touch-up shop applied primers before field painting.

F. Do not apply first coat until surface is dry to touch. Moisture content of surface shall be within limitations recommended by paint manufacturer.

G. Leave all parts of moldings and ornaments clean and true to detail, without excessive paint in corners and depressions. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping. Paint surfaces visible through grilles one coat flat black.

H. Finish coats shall be smooth, free of brush marks, streaks, laps or pile-up of paint, and skipped or missed areas. Refinish whole wall if unacceptable finish is extensive or of such a nature that it cannot be repaired by normal touch-up.

I. After completion of painting work, remove spilled or spattered paint. Touch-up and repair finishes damaged in any way by work under this Section. Protect finished surfaces.

3.4 Exterior

A. Exterior and interior - Steel-Clad door: Two (2) coats exterior enamel over factory primer. Doors shall be laid flat if sprayed. Doors may be rolled or brushed in place, however with no visible brush marks, drips or imperfections.

B. All exterior metal work (steel) to include railings, brackets, grids and deck.

a. Alkyd Systems
Gloss Finish

1st Coat: S-W All surface Enamel Primer, A11w210
2nd Coat: S-W All Surface Enamel, A11 Series
3rd Coat: S-W All Surface Enamel, A11 Series
(4 mils wet, 1.6 mils dry per coat)

3.5 Interior

A. Interior Painting: Paint shall be applied in the following number of coats, primer and finish. Tint all primers to match finish color.

1. One (1) fully applied finish coat of even coverage. NOTE: Contractor to adequately cover M.R. (Blueboard) or other colored drywall by primer or finish coat as necessary to eliminate any visible "bleed through".

2. Drywall: All interior walls to receive paint: one (1) coat latex base primer-sealer, two (2) finish coats latex eggshell. Ceiling: One (1) coat primer and two (2) coats latex flat.

B. Interior Window Sill, Door Frames & Trim, and Miscellaneous Interior Wood Trim- one (1) coat primer and two (2) coats finish for all soft wood.

C. All hardwood to receive three (3) coats urethane.

D. Interior garage – One (1) coat alkyd primer and sealer. One (1) coat alkyd eggshell enamel.

E. Exterior siding & trim – Two (2) coats latex exterior grade paint within 180 days of installation.

F. NOTE: Painting Contractor to verify that interior apartment doors are prefinished.

END OF SECTION

SECTION 10550

POSTAL SPECIALTIES (MAILBOXES)

1. GENERAL

1.1 DESCRIPTION OF WORK

A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

B. The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the items listed as indicated on Drawings.

2. PRODUCTS:

2.1 Mailboxes shall be manufactured by Auth – Florence, item AF-H2600FA-55, black, front loading, installed to Postal Regulations. Provide for twenty-five (25) mailboxes. Refer to Drawings for configurations per building.

2.2 The lock on each compartment door shall be keyed to the resident's door. It shall be a pin tumbler type with spring bolt. Provide Locking Device 2090. Provide a "Key Keeper" by entry door for mailman.

3. EXECUTION:

3.1 Mailboxes shall be framed into wall as shown on drawings. Care shall be taken to insure tight fit and that Vertical Placement (Ht. to boxes) meets Postal Regulations. Properly secure, block and align unit as shown in manufacturer's installation guidelines. All work shall be done in first-class manner insuring high-grade finish.

3.2 NOTE: The Contractor shall submit drawings on every item specified in this section. There shall be no substitutions without a written explanation from the subcontractor that the specific item is equal with the item specified by the Architect. All substitutions shall be approved by the Architect and the Owner.

END OF SECTION

SECTION 10670

STORAGE SHELVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vinyl-coated ventilated shelving.

1. Five (5) tier linen shelving as shown at Door 7 in unit plans.
2. One (1) Super Slide shelf with hang bar at all closets as shown in unit plans.

1.2 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's catalog data, detail sheets, and specifications.

C. Shop Drawings: Prepared specifically for this project; show dimensions of shelving and interface with other products.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: ClosetMaid (Clairson International), P.O. Box 4400; Ocala, FL 34478-4400; ASD. Tel: (800) 874-0008.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

C. Provide all storage shelving from a single manufacturer.

2.2 MATERIALS

A. Steel Wire: Basic cold drawn, Grade C-1006; average tensile strength over 100,000 psi (690 MPa); coated.

B. Wire Coating: Proprietary heavy-duty polyvinyl chloride (PVC) formula resin, plasticizers, stabilizers, pigments, and other additives.
1. Thickness: 9 to 11 mils (0.229 to 0.279 mm).
2. Classification: No ingredients listed as hazardous per OSHA 29CFR1910.0017.

2.3 MANUFACTURED UNITS

A. Wire Shelving: Coated steel wire, 1/2 to 1 inch (13 to 25 mm) incremental cross-deck spacings.

B. Accessories:
   1. Wall Clips.
   2. End Brackets.
   3. Support Brackets.
   4. Poles.
   5. Standards.
   6. Shelf Brackets.
   7. Pole Clips.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Prepared spaces are sized and located in accordance with shop drawings.
   2. Framing, reinforcement, and anchoring devices are correct type and are located in accordance with shop drawings.

B. Installer's Examination:
   1. Examine conditions under which installation is to be performed; submit written notification if such conditions are unacceptable.
   2. Installation activities before unacceptable conditions have been corrected is prohibited.
   3. Installation indicates installer's acceptance of conditions.

3.2 INSTALLATION

A. Cut shelves 1/2 inch to 1-3/8 inches (12.7 to 35 mm) shorter than actual wall measurements; cap all exposed ends.

B. Install shelving plumb and level at heights indicated in accordance with shop drawings and manufacturer's printed installation instructions.

C. Place wall clips No. 910, 911 every 10 to 12 inches (250 to 300 mm) on level line.

D. Install end brackets No. 972, 973, 974 on same level line as wall clips, centered on the front rods of shelves. Support shelves 36 inches (915 mm) maximum with end brackets, support brackets, or poles.

E. Drill holes where required using sharp bit; do not punch.

F. Drywall: Drill 1/4 inch (6 mm) hole, insert No. 910 or 911 wall clip. Use No. 8 pin to expand anchor.

G. Wood: Drill 1/4 inch (6 mm) hole into wood, secure wall clip with No. 8 x 1 inch (25 mm) screw or secure pole clip No. 978 directly to wood with No. 8 x 1-1/4 inch (31 mm) screws.

H. Standards and Brackets:
   1. Install standards vertically every 16 inches (400 mm) on studs.
   2. Install horizontal tracks level, secured with screws or mollies in studs or drywall; use hanging adapters to connect wall standards for hanging.

3. Attach shelf brackets with SuperSlide, Heavy Duty, Linen Shelf and Rod and Close Mesh 12-inch (300 mm) or 16-inch decking.

I. Use lightning pole clip No. 978 for linen shelving, clip No. 977 for shelf and rod shelving.

J. Shelf Supports:
1. Place shelf support brackets No. 1164 or 1166 vertically to the shelf, attach with No. 954 or 975 wall anchors.
2. Install down clips No. 983/977 or cable clips No. 312 with 1/4 inch (6 mm) anchor on the back rod behind every support bracket.
3. 36 inches (900 mm) o.c. maximum.
4. 24 inches (600 mm) o.c. maximum.

K. Attach No. 977 or 978 pole clips at same elevations as wall clips for a given shelf; use with No. 117 or 118 poles.

L. Use No. 120 corner support brackets on all corner "butt" joints.

M. For wall to wall installation, use lightning end bracket No. 972 or 973; drill 1/4 inch (6 mm) holes, and secure with No. 8 pins.

N. SuperSlide Component Installation:
1. Place hang bar supports No. 5647 every 24 to 36 inches (600 to 900 mm); place express support brackets (No. 164) adjacent to supports.
2. Use SuperSlide end bracket No. 979 or 980 at side wall where pole is used.
3. Use 12 inch (300 mm) express support brackets (No. 1164) for 12 inch or 16 inch (300 or 400 mm) deep shelves.
4. Place pole caps No. 2083 on cut ends of poles.
5. Use pole connector No. 2085 to connect 3/4 inch (19 mm) poles; rest joints in brackets.
6. For wall installation, use end bracket No. 979 or 980.
7. For open end installations, use down clips No. 978, 983, or 312 (312 stud installation preferred).

3.3 CLEANING

A. As work proceeds, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris related to this work.

B. Upon completion of installation, clean all surfaces that have become soiled during installation.

END OF SECTION

SECTION 10800

TOILET AND BATH ACCESSORIES

1. GENERAL

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the items listed as indicated on Drawings.

2. PRODUCTS:

2.1 TOWEL BARS AND TOILET PAPER HOLDERS: shall be Nutone Hallmack "Coronado" series, size as shown on Drawings.

2.2 SOAP DISH: shall be equal to NuTone HM-621, or be integral with sink.

2.3 DOUBLE HOOK FOR BATHROOM DOOR: shall be equal to NuTone HM-682.

2.4 SHOWER CURTAIN ROD: bath shall be equal to NuTone HM-382. Curtains are not included.

2.5 GRAB BARS: Stainless steel, 1 ¼ " diameter, concealed mounting with snap flange, satin finish; Bobrick B-5806 Series, lengths as shown on drawings.

2.6 ALL APARTMENT UNITS: Surface Mounted Medicine Cabinet: Vienna 155130, 30 x 26 x 5½, with lights by NuTone, #SB23129.

2.7 **NOTE**: Blocking for all accessories and grab bars must be provided. See Section 06100 - Rough Carpentry.

2.8 **NOTE**: The contractor shall submit shop drawings on every item specified in this section. There shall be no substitutions without a written explanation from the subcontractor that the specified item is equal with the item specified by the architect. All substitutions shall be approved by the Architect and the Owner.

3. EXECUTION:

3.1 All work shall be done by experienced craftsmen in first-class manner and high-grade finish.

3.2 All installations shall be in accordance with layout shown on plans and in strict conformity with the manufacturer's recommendations and secured into blocking or other framing with screws of adequate length and size to properly support accessories. Grab bars must be able to sustain a 300# direct load pulling down or out on it.

END OF SECTION

SECTION 11450

RESIDENTIAL EQUIPMENT AND KITCHENS

1. GENERAL:

1.1 REFERENCES

A. Drawings and general provisions on Contract, including General Conditions and Division 1 specifications, apply to work in this section.

B. Rough Carpentry: Section 06100

C. Finish Carpentry: Section 06200

D. Gypsum Drywall: Section 09250

1.2 DESCRIPTION OF WORK

A. The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the following items as indicated on Drawings.

B. Kitchen Cabinets - wall hung and base and countertops according to layout on drawings.

C. Bathroom Vanities and Countertops

D. Refrigerator

E. Kitchen Ranges and Range Hoods

F. Plastic Laminate on wall adjacent to range

1.3 SUBMITTALS

A. Submit manufacturer's product data and installation recommendations for all specified products.

B. Architect reserves the right to require samples of all products to be submitted. Acceptable samples will be returned and may be used in the work.

C. Submittals for countertops shall be in accordance with Section 06200, Finish Carpentry.

2. PRODUCTS

2.1 Kitchen Cabinets:

A. Shall be of wood construction, with wood finished reverse beveled doors, self closing hinges, adjustable shelves, dual tracks for drawers with nylon guides.

B. Cabinets to be Extreem Series by Armstrong. Countertops to be postform plastic laminate. Cabinet front panels to be Cornet Series by Armstrong.

2.2 Bathroom Vanities: shall be equal to "Oasis Marble Tops" with built in bowl available through FW Webb Co. (207) 784-4575. Coordinate with plumber for drilling holes to receive faucet. Kitchen counter tops to be rounded edge preformed plastic laminate color by Architect.

2.3 Unit Refrigerator shall be Kenmore "Energy Star" Model #46-60752, frostless, refrigerator-freezer, 17 cu. ft.

2.4 Unit Kitchen Range to be; Kenmore, Model 22-96012, self clean, radiant. Handicap units Kitchen Range to be Fridgidaire Model FES300DS, slide in, up front controls, white, self clean, coil.

2.5 Unit Kitchen Range Hoods: to be ventless 30" Kenmore Model #22-53345, white.

3. EXECUTION:

3.1 INSTALLATION

A. All installation shall be done in a quality first-class manner according to Drawings and layouts shown, and shall be according to manufacturer's recommendations.

B. Kitchen cabinets and vanities: shall be installed by experienced cabinet installers in a craftsmanlike manner, as though this were really "cabinets". Securely screw cabinets to blocking in the walls. Blocking shall be in place at top and bottom of wall and base cabinets (see Rough Carpentry Sec. 06100), and screws shall be long enough to penetrate blocking 1-1/4" minimum. Cabinets shall be level and plumb. If leveling cabinets puts them visually out of line with other elements (wall line, window sill, door casing, etc.) Architect shall be notified. Countertops shall be tight to the wall and joints caulked. Cabinets shall be tight to each other and in line. All doors and drawers to open freely. Work shall be left clean and right.

C. Refrigerators and ranges: Shall be set in place properly hooked up and leveled.

D. Range hoods shall be new secured in place by means of screws hidden from view.

SECTION 12500

WINDOW TREATMENT

1. GENERAL:

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION: The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the following items:

A. Shades for each window in residential units as described.

1.3 SUBMITTALS: Contractor to submit product data on shades and blinds

2. PRODUCTS:

2.1 Window shades: Black-Out Shade

A. 12 oz. 4-ply opaque darkening shade available from Reo Window Shade Company, Portland, Maine (207) 773-7992.

1. Construction – 4- Ply fiberglass (1 ply fiberglass, 3 ply vinyl)

REQUIREMENTS	521-E FEDERAL SPECS	BUTLER 4-Ply Opaque
Finished weight – oz/sq		12.0
Breaking strength – lbs. in.	Warp 130 Fill 120	meets/ or exceed meets/ or exceed

2. Flame Resistance (U.S. Government Specification CCC-C 521E and NFPA 701 Small Scale)

After Flame Seconds	Warp 2.0 Fill 2.0	meets/ or exceed meets/ or exceed
Char Length Inches	Warp 4.0 Fill 4.0	meets/ or exceed meets/ or exceed
		No evidence of holes, breaking or cracking
Adhesion		Vinyl Films Inseparable

Meets Federal Spec. CCC-C521E

2.2 Spring wood rollers to be pine 1″ for up to 46″ wide 1 ¼″ for over 46″ wide.

3. EXECUTION:

3.1 All work to be done by experienced craftsman in first-class manner and high-grade finish. All installations shall be in accordance with layout shown on plans and in strict conformity with the manufacturer's recommendations.

3.2 Window Shade holding hardware shall be installed to provide level and secure system for attaching window shade and rods. Work shall be free of dents, dings and other damage to finish (paint, etc.) and clean.

3.3 Solid backing is required for all window treatment hardware. Hardware attached otherwise will not be acceptable.

3.4 The Contractor shall furnish all wood blocking within wall, filler pieces, angles, mouldings and other finish items necessary for complete installation of the equipment.

3.5 The Contractor shall check and make necessary adjustments to insure that all installed items operate faultlessly.

END OF SECTION

SECTION 13900

AUTOMATIC WET PIPE SPRINKLER SYSTEM

PART 1: GENERAL

1.01 WORK TO BE PREFORMED

A. The work described in this Specification consists of providing all labor, materials, equipment permits, transportation, inspections, incidentals and services necessary and required to design, determine adequacy of utilities to serve this system, fabricate, install, test, and secure required approvals of an automatic wet pipe sprinkler system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation in accordance with pertinent requirements of the Fire Rating Bureau and governmental agencies having jurisdiction. Any material not specifically mentioned in this specification or not shown on drawings but required for proper performance and operation shall be furnished and installed. The directives and guidance provided by the Applicable Publications listed below will be considered MINIMUM standards. Where a greater level of performance or protection is required by the drawings or specifications, then the greater level will be taken to be the minimum standard required by these contract documents. In no case shall any indicator or directive within the Drawings or Specification be taken to be a request or directive below minimum code requirements. Should there be a conflict between minimum code requirements and Contract Document requirements, apply to the Architect/Engineer for resolution.

B. Work includes, but is not limited to:

1. New wet pipe sprinkler system at Valley Street Apartments, Gilman Street, Portland, Maine, to accomplish the following:

a. Provide new hydraulically designed system beginning at a flanged outlet in a plumb and level position above the floor in Mechanical Room 101, to cover all areas, including combustible concealed areas.

b. Provide quick-response heads throughout building.

c. Design system for light hazard occupancy in apartment unit and office areas; and ordinary hazard occupancy (group 2) in mechanical/utility/storage areas.

d. Provide spare sprinkler head cabinet with not less than the number of heads required by NFPA 13, and with proper wrenches. Locate next to sprinkler riser.

e. Provide tamper switches as required.

f. Provide proper signage as required.

g. Provide drawings of the system approved by the authorities having jurisdiction.

h. Provide test data verifying adequacy of water supply pressure and flow.

2. Provide, design, fabricate, and install a complete fire protection automatic wet sprinkler system for total building coverage in accordance with the standards of these specifications. The system is to be designed for light hazard in all areas, except storage and mechanical areas. The entire roof, all rooms, shafts, spaces above ceilings (except where NFPA 13 provides an exception) and hallways shall be protected.

3. Drawings of the system shall be reviewed by and acceptable to Fire Rating Bureau of the State of Maine, the State Fire Marshal having jurisdiction and the City of Portland Fire Department.

4. Work generally begins at mechanical coupling elbow where shown on the drawings, with a backflow preventor, as required.

5. Provide Dry Pipe Sprinkler System for ground floor parking area and in areas subject to freezing, see Section 13935.

6. Provide quick-response heads throughout building.

7. Provide test data verifying adequacy of water supply pressure and flow for the system.

The Contractor shall satisfy himself of an adequate water supply in designing the system and shall confirm this through the City of Portland Water Department. Submit both static and dynamic data for records, as well as backflow preventer approved by City of Portland Water Department.

1.02 RELATED WORK

A. Section 01045 – Cutting and Patching

B. Division 15 – Mechanical

C. Division 16 - Electrical

D. Fire Alarm Systems (Coordinate with Owner's fire alarm contractor)

1.03 QUALITY ASSURANCE

A. Qualification of Installers: The entire fire protection standpipe system shall be fabricated, installed and tested by a Maine licensed Contractor qualified to install fire protection systems. He shall submit evidence of his qualifications upon request.

B. Codes and Standards Publications (current edition being enforced by authority having jurisdiction):

1. NFPA 13: Installation of Sprinkler Systems.

2. NFPA 14: Installation of Standpipe, Private Hydrant, and Hose Systems

3. NFPA 70: National Electric Code

4. NFPA 70A to E: Protective Signaling Systems

5. NFPA 101: Life Safety Code

6. B.O.C.A.: Building Code

7. Factory Manual (FM) Approval Guide

8. Underwriters Laboratories, Inc. (UL)

9. State Fire Marshall's Office – Publications and Directories.

1.04 SUBMITTALS

A. Shop Drawings:

1. Prior to the submittal for Architect/Engineer's review, secure the approval and stamp of review of the Fire Rating Bureau having jurisdiction.

2. Before any sprinkler system materials are fabricated, submit complete layout and shop drawings to, and obtain approval from, the Architect/Engineer in accordance with the requirements of the General Conditions and Supplementary Conditions of these specifications.

3. Upon request, the Architect/Engineer will furnish without charge to the Contractor one set of reproducible transparencies or a CAD

file of those drawings included in the Contract Documents, which may be suitable for use in preparation of layout drawings.

4. Shop drawings shall include:

   a. Layout drawing of the complete sprinkler system. These drawings shall indicate accurate locations of all piping and other apparatus associated with this system indicating relationship to architectural conditions, structural conditions, lighting layouts, speaker layouts, detector layouts, ducts and diffuser layouts, plumbing, mechanical and electrical layouts.

   b. All items and data required to be shown by the Fire Rating Bureau having jurisdiction.

   c. Complete details and sections as required to clearly define and clarify the design, including a materials list with catalog cuts describing all proposed materials by manufacturer's name and catalog number.

5. Drawings shall be to the same scale, same sheet size, and shall bear a title block, all in accordance with the contract drawings. Architectural backgrounds shall be in accordance with the latest architectural drawings. If, upon preliminary submittal of drawings, there are corrections to be made (such as head location, pipe location, drain locations, etc.,), corrections shall be made and the corrected drawings, along with revised calculations, shall be resubmitted at no increase in contract price. These drawings shall be corrected and approved before starting work. The decision of the Architect/Engineer shall be final on all items. Calculations shall be done on standard 8-1/2" x 11" sheets, all in accordance with NFPA Standard No. 14. Calculations shall be bound and indexed in a loose-leaf binder same as for operating and maintenance instructions.

B. As-Built Drawings: During progress of the work, maintain an accurate record of all changes made in the sprinkler system installation from the layout and materials shown on the approved shop drawings.

C. Manual: Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect/Engineer for the Owner two (2) copies of a manual describing the system operation and maintenance detail. Prepare manuals in durable plastic binders approximately 8-1/2" x 11" in size with at least the following:

   1. Identification on, or readable through, the front cover stating general nature of manual.

2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the installation.

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. Copy of the as-built drawings.

7. 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.

D. Operating Instructions Training

1. Schedule an organized training session, prior to the completion of the work, giving detailed instructions to the responsible personnel designated by the Owner, in the operation and maintenance of all work installed under this Section. A letter with two (2) copies containing the name of the person or persons to whom the instructions were given and the dates of the instruction period (s) shall be submitted to the Owner. The Owner may wish to videotape the instructional training session.

1.05 PRODUCT HANDLING

A. Protection: Use all means necessary to protect fire sprinkler system materials before, during, and after installation and to protect the installed work of all other trades.

1. All materials shall be transported, stored, protected and handled in accordance with the manufacturer's instructions.

2. The Fire Protection Contractor shall be responsible for the care and protection of all work included under this Section until it has been tested and accepted.

3. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal (the same) material or equipment at no cost to the Owner.

4. Protect all equipment, outlets and openings with temporary plugs, caps, and covers. Protect work and materials of other trades from damage that might be caused by work or workmen and make good damage thus caused.

5. The Fire Protection Contractor shall be responsible for all consequent damage caused by his work or workmen to the materials and/or others.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

1.06 GUARANTEE

A. This contractor shall guarantee all materials and workmanship furnished by him or his Subcontractors to be free of defects for a period of one year from the date of final acceptance of the completed systems and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner.

B. The warranty shall include parts, labor, prompt (24 hour) field service, pickup and delivery. Upon receipt of notice from the Owner of failure of any component during the guarantee period, the system shall be repaired/replaced (as appropriate) promptly with new parts including all damage to areas, material and other systems resulting from such failures. Any equipment requiring excessive service shall be considered defective and shall be replaced.

PART 2: PRODUCTS

2.01 DESIGN

A. General:

1. All materials furnished under this Section shall be U.L. listed and/or F.M. approved and shall meet the requirements of all agencies having jurisdiction.

2. The design shall be complete in all regards and shall include, but not necessarily be limited to:

a. Connection to sprinkler riser at entrance and modification to meet current need as applicable, including all required valves, fittings and other items for coverage.

3. Sprinkler work shall be laid out to adequately cover the areas of the building in accordance with the requirements of all authorities having jurisdiction over its installation and to afford adequate clearance with the work of the Heating, Ventilating, Plumbing and Electrical Contractors. Piping shall generally be run parallel to walls and girders. Before installing any piping, the Sprinkler Contractor shall consult with the Contractors for the other trades to avoid interfering with their work, and he shall be responsible for any expense involved due to negligence in not so doing.

4. All piping in areas having ceilings shall be concealed including supply mains through finished areas.

2.02 MATERIALS

A. The quality of materials required for this installation shall be that required by the agencies having jurisdiction.

1. SPRINKLER HEADS:

a. All sprinkler heads shall be quick response U.L. listed sprinklers and shall be ordinary type tested in accordance with UL-199. Sprinkler heads shall be of the required temperature rating for space usage.

b. Finished areas: Commercial Quick Response, Recessed, Pendent & Sidewall, Automatic Sprinkler Heads - with recessed escutcheon, support cup and head to be painted white by manufacturer.

c. Unfinished Areas (closets, etc.): Commercial Quick Response, Pendent, Upright & Sidewall (completely heated areas), with brass finish.

d. Unfinished & Mechanical Areas: Upright or Pendent, Automatic Sprinkler with brass finish.

e. In addition to the heads actually required for system, Contractor shall furnish three (3) extra sprinkler heads of each type, finish and temperature rating used and two suitable wrenches, all contained in a metal cabinet. The cabinet shall be installed in the same room as the sprinkler entrance valve.

f. Sprinkler Guards: Provide and install sprinkler guards in all areas where sprinklers might be subject to mechanical damage. Units to be compatible with sprinkler heads.

2. PIPE:

   a. Sprinkler piping shall be all metal and in accordance with NFPA Standard No. 13.

3. VALVES:

   a. All valves shall be the product of one approved manufacturer and shall be designed for pressures suitable for the duties to be imposed upon them in the system. They must be in accordance with the requirements of authorities having jurisdiction over the work.

   b. All shut-off valves on system shall have supervisory switches furnished and installed.

4. FITTINGS:

   a. All fittings shall be the products of an approved manufacturer's standard weight and shall be designed for pressure suitable for the duties to be imposed upon them in the system.

   b. Screwed fittings shall have clean cut tapered threads.

   c. Fittings shall conform to the requirements of NFPA No. 2, Chapter 3.

5. PIPE HANGERS:

   a. All horizontal piping shall be supported at intervals required by NFPA Standard No. 13.

   b. All vertical piping shall be securely anchored and provided with alignment guides where necessary.

   c. Pipe hangers shall be of the type approved and listed in NFPA Standard No. 13.

   d. Pipe shall not be supported from piping of other trades.

6. SLEEVES AND ESCUTCHEONS:

   a. Contractor shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than the pipe. Piping passing through walls other than masonry shall be provided with

No. 24 gauge galvanized steel tubes with wired or hemmed edges.

b. Sleeves set in concrete floors shall finish flush with the underside but extend a minimum of one inch above the finish floor. Sleeves set in partitions shall finish flush with each side.

c. Where piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel-plated steel floor and ceiling plates. Head escutcheons in finished areas shall be painted white by the manufacturer.

d. Space between sleeves and pipes shall be caulked with high temperature rope to make smoke and water tight.

e. Points of penetration of piping through fire rated or smoke retardant walls, floors and ceilings shall be through iron pipe sleeves. Sleeves shall be of the next clearance size.

1. Fill space between sleeve and pipe with fire barrier caulking to prevent smoke or fire passage. Sealant shall be "FIBERFRAX" fire putty ceramic fiber by Carborundum Company or approved equal and installed in accordance with the manufacturer's instructions.

7. FLOW SWITCHES: Furnish and install a water flow detector to indicate system water flow. Flow switches have 0 to 60 second retard devices set at a minimum of 30 seconds.

8. ELECTRICAL ALARMS:

a. Electrical contacts, supervisory switches on all valves shall be supplied and installed.

b. Connection to the alarm and supervisory contacts and all wiring shall be provided under this section.

2.03 EXPANSION AND CONTRACTION

A. Long runs of pipe shall be provided with suitable means to permit free movement resulting from expansion and contraction of the pipe.

2.04 INSPECTORS TEST AND DRAIN

A. Provide and install an Inspectors Test connection as required by NFPA Standard No. 13. Also provide the necessary main drains and auxiliary drains at all points in the system.

2.05 BACKFLOW PREVENTER

A. Provide testable double check valve type, Watts model 709, or approved equal.

2.06 VALVE TAGS, IDENTIFYING SIGNS, ETC. SPRINKLERS

A. Provide and install at every valve an engraved brass or plastic valve tag (minimum 2" diameter) attached to the valve stem with a brass chain or plastic fastener, bearing the legend "FP #" (# shall be a series of discrete sequential numbers assigned to individual valves for identification). Acceptable Manufacturer: Seton Name Plate, Corp., or approved equal.

B. Valve identification numbers shall be indicated on the "As Built" plans and on a separate valve chart provided in the maintenance manual and adjacent to the spare sprinkler head cabinet in an aluminum frame, under shatter resistant glass.

C. In addition, identify the function of each valve and element by signage specifically manufactured for this purpose consisting of a pre-painted legend on aluminum sheet attached using aluminum wire as a fastener. Acceptable Manufacturer: Pasco Specialty & Mfg., Inc., or approved equal.

2.07 PIPE IDENTIFICATION SPRINKLERS

A. Identify piping as specified herein. Identification markers for piping ¾ inch up to and including 5 inch shall be Setmark Type SNA. Piping 5 inch and above shall be identified with Setmark Type STR laminated plastic marker.

B. Exposed piping and piping above removable ceiling shall be identified at intervals of 20'-0" and at each change of direction together with an arrow showing the direction of flow.

C. Fire Protection shall be red, with all lettering and arrows colored black. Legend shall read "FP".

2.08 METERS AND GAGES

A. General: Provide meters and gages in accordance with the following listing:

1. Pressure gages, 0-250 psi range.

2.09 FIRE DEPARTMENT CONNECTIONS

A. Wall Type Siamese Fire Department Connections: Provide wall type cast brass siamese connections and escutcheon plate assembly, with 2, 2-1/2" fire department inlets with female hose connections, fire hose connection screw thread complying with City of Portland Fire Department, equipped with individual drop clapper valves, equipped with plugs and chains, construction features as indicated, and constructed with the following additional construction features:

1. Finish: Polished brass

2. Inlet Pipe: 6" pipe (pipe size)

3. Outlet: Screw thread connections shall comply with the city of Portland Fire Department standards.

4. Escutcheon: 7" x 14" rectangular with cast lettering.

5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering siamese connections which may be incorporated in the work include, but are not limited to, the following:

a. Allen (W.D.) Mfg. Div., J.W. Moon, Inc.

b. Croker-Standard Div.; Fire-End & Croker Corp.

c. Elkhart Brass Mfg. Co., Inc.

PART 3: EXECUTION

3.01 SCOPE - SPRINKLER

A. It is the intent of these specifications that the Contractor design and install the fire protection systems to meet the specifications contained herein, including the various design and performance criteria delineated, and to be responsible for the actual performance of the system according to these criteria.

B. SPRINKLER DESIGN CRITERIA:

1. The automatic sprinkler system shall conform to the requirements of NFPA and BOCA.

2. Penetrations of rated assemblies shall be fire stopped.

3. Installation of the sprinkler system shall not be started until complete plans and specifications (including water supply information) have been approved.

4. At various stages and upon completion, the system must be tested in the presence of the enforcing agency.

5. In general, the system shall be a fully automatic wet pipe system with water flow switches for main entrance. This system shall provide full coverage in all rooms, corridors, chases, shafts, blind spaces, etc., for the entire building.

6. Occupancy Classification for submission (Note: All data marked with an asterisk (*) shall be filled in and approved by regulating agency).

   a. (*) Hazard, Groups (*) maximum area of (*) square foot area of application.

   b. Minimum discharge density of (*) gpm/sq. ft. over the most hydraulically remote (*) square foot area of application.

   c. Maximum average discharge density of (*) gym/sq. ft. over any (*) square foot area of application.

   d. The hydraulic data used in the hydraulic calculations. Data based on existing building service.

7. The actual layout is the responsibility of the Contractor.

8. The Contractor shall prepare system hydraulic calculations and submit them with the construction shop drawings. The calculations shall be prepared as indicated in NFPA Standard No. 13. Calculations shall be prepared for as many areas of application as necessary to demonstrate to the satisfaction of the Architect/ Engineer that the design meets the criteria as outlined herein.

9. No construction work shall be done without hydraulic calculations and working plans approved by the Architect/Engineer. No materials without the Architect/Engineer's approved submittals shall be installed.

3.02 SURFACE CONDITIONS

A. Inspection:

1. Prior to commencement of each stage of the fire sprinkler system installation, carefully inspect installed work of all other trades and verify that all such work is complete to the point where installation may properly commence.

2. Verify that fire sprinkler system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect/Engineer.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been completely resolved.

3.03 CUTTING AND PATCHING

A. All cutting and patching incidental to the installation of the apparatus and work shall be executed by this Contractor, who shall furnish the Owner with all locations and details as required.

3.04 INSTALLATION

A. Install the complete fire sprinkler system in strict accordance with all pertinent codes and regulations and the requirements of the Fire Rating Bureau having Jurisdiction.

B. No construction work shall be done without hydraulic calculations and working plans approved by the Architect/Engineer. No materials without the Architect/Engineer's approval submittals shall be installed.

C. Sprinkler Systems:

1. All piping shall be cut accurately to measurements obtained at the site of the system and shall be installed without springing, forcing, bending or crimping. All piping shall be protected against mechanical injury in a manner that is satisfactory to the authorities having jurisdiction.

2. All exposed and concealed horizontal lines of pipe shall be carried on specified hangers properly spaced and set to allow the pipe to adjust for expansion and contraction. Trapeze hangers shall be used for supporting groups of pipes. Piping in parallel shall be evenly spaced and supported.

3. All piping shall be concealed in ceilings, furred walls and partitions, and pipe spaces, except where specifically noted otherwise. All piping runs shall be checked before hand and with all other trades to ensure clearance. Provide maximum headroom and run piping to maintain proper clearance for maintenance and to clear openings in exposed areas. Piping shall be run in strict coordination with mechanical ducts and equipment, structural, and architectural conditions. When other work prevents installation of the piping, the Contractor shall reroute piping as directed by the Architect/Engineer at no increase in contract price. The Contractor shall verify all inverts and pitched lines of other trades before starting work.

4. Piping shall be installed parallel to or at right angles with the building's walls and shall be tight to walls or columns wherever possible, except where otherwise shown on the drawings. Piping exposed on walls or columns shall be secured with Super Strut, Unistrut, or approved equal.

5. No valve and no piece of equipment or trim shall support the weight of any pipe. All valves and other trim shall be installed in accessible locations.

6. Coordination and Clearances: The installation shall fit into the spaces provided. It is the essence of this contract that all work be completely coordinated with other trades and that all lines, grades, slopes, and vertical and horizontal locations of pipes be exactly determined in the field and cleared with all other trades before installation of these items is begun. Install all piping and equipment allowing for work by other trades.

7. Identification: All valves and devices in sprinkler system shall have permanent tags indicating their purpose.

3.05 FLUSHING

A. Fire Protection Systems: After completions of all work in each section of the water-piping systems and prior to testing, thoroughly flush all piping to remove all foreign materials and to thoroughly clean the piping.

3.06 ADJUSTING AND CLEANING

A. Cleaning and Inspecting: Clean and inspect sprinkler system in accordance with requirements of the Owner.

****END OF SECTION****

SECTION 13935

DRY PIPE SPRINKLER SYSTEM – PARKING GARAGE

PART 1: GENERAL

1.01 WORK TO BE PERFORMED

A. The work described in this Performance Specification consists of providing all labor, materials, equipment permits, transportation, inspections, incidentals and services necessary and required to design, determine adequacy of the existing utilities to serve this system, fabricate, install, test, and secure required approvals of a complete automatic fire extinguishing system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation in accordance with pertinent requirements of the Fire Rating Bureau and governmental agencies having jurisdiction. Any material not specifically mentioned in this specification or not shown on drawings but required for proper performance and operation shall be furnished and installed. The directives and guidance provided by the Applicable Publications listed below will be considered MINIMUM standards. Where a greater level of performance or protection is required by the drawings or specifications, then the greater level will be taken to be the minimum standard required by these contract documents. In no case shall any indicator or directive within the Drawings or Specification be taken to be a request or directive below minimum code requirements. Should there be a conflict between minimum code requirements and Contract Document requirements, apply to the Architect/Engineer for resolution.

B. Work includes, but is not limited to:

1. Fabricate and install automatic dry pipe fire protection sprinkler system for the ground floor parking garage building areas, as shown on the architectural drawings, and in accordance with the standards of these specifications. The system is to be designed generally for ordinary Hazard Group 1.

2. Drawings of the system shall be reviewed by and acceptable to the State Fire Marshall's Office of the State of Maine and the City of Portland, Maine, Fire Department.

3. Work begins from a flanged outlet in a plumb and level position above the floor in Mechanical Room 101.

4. The contractor shall confirm existing pressure prior to designing the sprinkler system. The contractor shall satisfy himself of an adequate water supply prior to designing the system and shall confirm this through testing, etc.

1.02 RELATED WORK

A. Section 01045 – Cutting and Patching.

B. Section 13915 – Automatic Wet Pipe and Sprinkler System.

C. Division 15 - Mechanical.

D. Division 16 – Electrical.

E. Section 16721 – Fire Alarm Systems.

1.03 QUALITY ASSURANCE.

A. Qualifications of Installers: The entire fire protection automatic sprinkler system shall be fabricated, installed and tested by a contractor well qualified to install sprinkler systems. He shall submit evidence of his qualifications to Architect/Engineer upon request.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with:

1. Requirements of all pertinent National Fire Codes - National Fire Protection Association.

2. All pertinent requirements of the Fire Rating Bureau having jurisdiction and the State Fire Marshal office publications and directives.

3. Building Codes.

4. Factory Mutual (FYD Approved Guide).

5. Underwriters Laboratories Inc. (UL).

1.04 SUBMITTALS

A. Shop Drawings:

1. Before any fire sprinkler system materials are fabricated submit complete layout and shop drawings to and obtain approval from the Architect/ Engineer in accordance with the requirements of the General Conditions and Supplementary Conditions of these specifications.

2. Prior to submittal for Architect/Engineer's review, secure the approval and stamp of review of the Fire Rating Bureau having jurisdiction.

3. Upon request, the Architect/Engineer will furnish without charge to the contractor one set of reproducible transparencies of those drawings included in the Contract Documents which may be suitable for use in preparation of layout drawings.

4. Shop drawings shall include:

   a. Layout drawing of the complete overhead sprinkler system indicating relationship of all other overhead items including ducts, ceiling air diffusers, lighting fixtures, beams, piping and all other items.

   b. All items and data required to be shown by the Fire Rating Bureau having jurisdiction.

   c. Complete details and sections as required to clearly define and clarify the design, including a materials list with catalog cuts describing all proposed materials by manufacturer's name and catalog number.

   d. Automatic Dry Pipe Sprinkler System: Complete piping and sprinkler-head layout for the sprinkled areas. These drawings shall indicate accurate locations of all piping, sprinkler heads, drain locations and other apparatus associated with these systems in respect to architectural conditions, structural conditions, lighting layouts, speaker layouts, detector layouts, duct and diffuser layouts, plumbing, mechanical and electrical layouts. Approval of the same drawings and calculations must first be obtained from the Architect/Engineer.

      Drawings shall be to the same scale, same sheet size, and shall bear a title block, all in accordance with the contract drawings. Architectural backgrounds shall be in accordance with the latest architectural drawings. If, upon preliminary submittal of drawings, there are corrections to be made (such as head location, pipe location, drain locations, etc.), corrections shall be made and the corrected drawings, along with revised calculations, shall be resubmitted at no increase in contract price. These drawings shall be corrected and approved before starting work. The decision of the Architect/Engineer shall be final on all items.

   e. Sprinkler system shall be sized for the hazard as required, according to the prescriptive sizing methods outlined in NFPA No. 13.

B. As-Built Drawings: During progress of the work, maintain an accurate record of

all changes made in the fire sprinkler system installation from the layout and materials shown on the approved shop drawings.

C. Manual: Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect/Engineer for the Owner two (2) copies of a manual describing the system. Prepare manuals in durable plastic binders approximately 8-1/2" x 11" in size with at least the following:

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 emergency data regarding the installation.

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. Copy of the as-built drawings.

7. Where contents of manuals include manufacturers' 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.

1.05 PRODUCT HANDLING

A. Protection: Use all means necessary to protect fire sprinkler system materials before, during and after installation and to protect the installed work of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

1.06 GUARANTEE

A. This contractor shall guarantee all materials and workmanship furnished by him or his subcontractors to be free from all defects for a period of one year from date of final acceptance of completed systems and shall make good, repair or replace any defective work which may develop within that time at his own expense and

without expense to the Owner.

PART 2: PRODUCTS

2.01 DESIGN

A. General:

1. The design shall be complete in all regards and shall include, but not necessarily be limited to:

a. Connection to mains as applicable, including all required valves, fittings and other items.

2. All piping in areas having ceilings shall be concealed, piping in garage area will be exposed but must run protected against beams, etc

3. Sprinkler work shall be laid out to adequately cover the areas of the building in accordance with the requirements of all authorities having jurisdiction over its installation and to afford adequate clearance with the work of the heating, ventilating, plumbing and electrical contractors. Piping shall generally be run parallel to walls and girders. Before installing any piping, sprinkler contractor shall consult with the contractors for the other trades to avoid interfering with their work and he shall be responsible for any expense involved due to negligence in not so doing.

2.02 MATERIALS

A. The quality of materials required for this installation shall be that required by the agencies having jurisdiction.

1. Sprinkler Heads:

a. All sprinkler heads in areas with finished ceilings shall be chrome plated dry pendant spray type with chrome plated escutcheons; heads in areas of exposed piping may be bronze dry pendant or upright. Temperature ratings of the heads installed shall be proper for the particular area involved.

b. All sprinklers subject to mechanical damage shall be covered with approved head guards. This includes all heads within 7 feet of any floor or walk surface.

c. In addition to the heads actually required, contractor shall furnish extra sprinkler heads of each finish, including three (3) heads of each type and temperature rating used and two (2) suitable

wrenches contained in a metal cabinet. The cabinet shall be installed in sprinkler service room.

2. Pipe: Sprinkler piping shall be all ferrous pipe in accordance with NFPA No. 13.

3. Valves: All valves shall be the product of an approved manufacturer and shall be designed for pressures suitable for the duties to be imposed upon them in the system. They must be in accordance with the requirements of authorities having jurisdiction over the work.

4. Fittings:

   a. All fittings shall be the products of an approved manufacturer standard weight and shall be designed for pressure suitable for the duties to be imposed upon them in the system.

   b. Screwed fittings shall have clean cut tapered threads.

   c. Fittings shall conform to the requirements of NFPA 2 - Chapter 3.

5. Pipe Hangers:

   a. All horizontal piping shall be supported at intervals of not more than 12'-0". Where pipe sizes require, spacing shall be such as to prevent sag in the lines.

   b. All vertical piping shall be securely anchored and provided with alignment guides where necessary.

   c. Pipe hangers shall be of the type approved and listed in NFPA No. 13.

   d. Pipe shall not be supported from piping of other trades.

6. Sleeves and Escutcheons:

   a. Contractor shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than the pipe. Piping passing through walls other than masonry shall be provided with No. 24 gauge galvanized steel tubes with wired or hemmed edges.

   b. Sleeves set in concrete floors shall finish flush with the underside but extend a minimum of one inch above the finish floor. Sleeves set in partitions shall finish flush with each side.

c. Where piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel plated steel floor and ceiling plates.

d. Space between sleeves and pipes shall be caulked with high temperature rope to make smoke and water tight.

7. Automatic Supervisory Air Supply:

a. Grinnell model G16AC812 or approved equal automatic reciprocating oil-less air compressor with 1/6 hp, 115 volt motor, pump, pressure switch, inlet air filter, sensoring line, check valve, and relief valve. NEMA Type 1 enclosure for all electrical components.

b. If needed, provide a low pressure supervisory alarm switch to signal system pressure loss, Grinnell model PS-10-1A, or approved equal.

2.03 EXPANSION AND CONTRACTION

A. Long runs of pipe shall be provided with suitable means of permit free movement resulting from expansion and contraction of the pipe.

PART 3: EXECUTION

3.01 SCOPE

A. It is the intent of these specifications that the contractor design and install the various fire protection systems to meet the specifications contained herein, including the various design and performance criteria delineated and to be responsible for the actual performance of the system according to these criteria.

B. Sprinkler Design Criteria:

1. The automatic sprinkler system for the parking areas shall conform to the requirements of N.F.P.A. and B.O.C.A.

2. Penetrations of rated assemblies shall be fire stopped.

3. Installation of the sprinkler system shall not be started until complete plans and specifications (including water supply information) have been approved.

4. At various stages and upon completion, the system must be tested in the presence of the enforcing agency.

5. The actual layout is the responsibility of the Contractor.

9. No construction work shall be done without working plans approved by the Architect/Engineer. No materials without Architect/Engineer approved submittals shall be installed.

3.02 SURFACE CONDITIONS

A. Inspection:

1. Prior to commencement of each stage of the fire sprinkler system installation, 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 fire sprinkler system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect/Engineer.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been completely resolved.

3.03 CUTTING AND PATCHING

A. All cutting and patching incidental to the installation of the apparatus and the work shall be executed by the general contractor under the direction of this contractor, who shall furnish the general contractor with all locations and details as required. Failure on his part to furnish the proper locations or details shall make this contractor responsible for this work.

3.04 INSTALLATION

A. Install the complete fire sprinkler system in strict accordance with all pertinent codes and regulations and the requirements of the Fire Rating Bureau having jurisdiction.

B. Sprinkler Systems:

1. All exposed and concealed horizontal lines of pipe shall be carried on specified hangers properly spaced and set to allow the pipe to adjust for expansion and contraction. Trapeze hangers shall be used for supporting groups of pipes. Piping in parallel shall be evenly spaced and supported.

2. All piping shall be concealed in ceilings, furred walls and partitions and pipe spaces, except where specifically noted otherwise. All piping runs

shall be checked before hand and with all other trades to insure clearance. Provide maximum head room and run piping to maintain proper clearance for maintenance and to clear openings in exposed areas. Piping shall be run in strict coordination with mechanical ducts and equipment, structural, and architectural conditions. When other work prevents installation of the piping, the contractor, shall reroute piping as directed by the Architect/ Engineer at no increase in contract price. The contractor shall verify all inverts and pitched lines of other trades before starting work.

3. Where exposed pipe is permitted (mechanical equipment room, storage etc.), such piping shall be installed parallel to or at right angles with the building walls and shall be tight to walls or columns wherever possible, except where otherwise shown on the drawings. Piping exposed on walls or columns shall be secured with Super Strut, Unistrut, or approved equal.

4. No valve and no piece of equipment or trim shall support the weight of any pipe. All valves and other trim shall be installed in accessible locations.

5. Coordination and Clearances: The installation shall fit into the spaces provided. It is the essence of this contract that all work be completely coordinated with all other trades and that all lines, grades, slopes, and vertical and horizontal locations of pipes be exactly determined in the field and cleared with all other trades before installation of these items is begun. Install all piping and equipment allowing for work by other trades.

3.05 FLUSHING

A. Fire Protections Systems: After completions of all work in each section of the water-piping systems and prior to testing, thoroughly flush all piping to remove all foreign materials and to thoroughly clean the piping.

3.06 TESTING

A. Upon completion of the fire sprinkler system installation, furnish all personnel and equipment required and test and retest the complete system, making all adjustments necessary to secure the approval of the Fire Rating Bureau and Fire Marshal having jurisdiction. Report testing on the forms provided for above ground piping.

3.07 ACCEPTANCE

A. After the fire sprinkler system has been completely approved, secure a letter of final acceptance from the Fire Rating Bureau having jurisdiction and deliver three (3) copies of the letter to the Architect/Engineer.

END OF SECTION

SECTION 14240

HYDRAULIC ELEVATOR

1. GENERAL:

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

A. 110 volt branch circuit to the terminals of the elevator controller for car light supply and 110 volt light and outlet in the elevator pit, complete with switch adjacent to the pit ladder as shown on Elevator Drawings.

B. Any cutting, patching or painting of walls and grouting under thresh-holds and hoistway frames.

C. Adequate supports for guide rail brackets.

D. Sill support angles.

E. Electrical current during erection and testing of equipment.

F. Necessary recesses to accommodate doors, sills, (min. 2-1/2" deep) and signal equipment such as indicators, push buttons, hall lanterns, etc.

G. Pit access ladder.

H. General Contractor to receive, handle and store in the building approximately ten (10) tons of elevator materials.

I. Smoke sensors in each elevator lobby and elevator machine room complete with necessary wiring to elevator controller. A shunt trip circuit breaker with heat detectors will also be provided as required.

1.3 REGULATORY AGENCIES: Perform all work in accordance with the National Electrical Code, American Standard Safety Code and such state and local codes as may be applicable.

1.4 SUBMITTALS: Shop Drawings-

A. Submit six (6) blue print copies of elevator layout drawings to the Architect for approval.

B. Upon completion submit to Owner, warrantee operating manual and maintenance information.

1.5 GUARANTEE:

A. Elevator Contractor shall guarantee that materials and workmanship of apparatus installed by him under these Specifications shall be first class in every respect; and that he will make good any defects not due to ordinary wear and tear or improper use which may develop within one (1) year from date of completion and installation.

B. In addition to the other requirements, inspection, tests and remedies herein provided upon completion of elevator installation and before final approval and final payment, Elevator Contractor shall make, in speed test with full maximum load on elevator to determine whether elevator equipment as installed meets the speed, capacity and all other requirements of the Specifications.

C. In event equipment does not meet all requirements of Specifications, Elevator Contractor shall promptly remove from the premises all work condemned by Architect as failing to conform to the contract and shall bear all expense of making good all work of other Contractors destroyed or damaged by such removal or replacement. If Elevator Contractor does not remedy such condemned work within a reasonable time, fixed by written notice from Architect, General Contractor may correct such condemned work at expense of Elevator Contractor and withhold such cost from final payment under contract price. In the event the remainder due under Contract price is insufficient to cover such a cost, Elevator Contractor shall, immediately upon request, reimburse General Contractor in full.

1.6 PERMITS, TAXES AND LICENSES: All permits, inspection fees and licenses necessary for the execution of the work shall be secured and paid for by the Elevator Contractor.

1.7 TEMPORARY USE: The General Contractor, Sub-contractors, Owner or others will not be permitted use of the elevators during construction except under a written agreement as stipulated by the Elevator Contractor.

2. PRODUCTS:

2.1 ACCEPTABLE MANUFACTURES:

A. Except as otherwise specified herein, or specifically approved by Architect, the Elevator Contractor shall be regularly engaged in installation of elevators of type specified herein, and shall be able to demonstrate at least three (3) installations of this type made by him within the State of Maine which have provided satisfactory operation for a period of one (1) year prior to the date of receipt of General Bids, for this project.

B. Demonstrate that he has provided satisfactory maintenance service for elevators of type specified and that he has maintained a complete maintenance organization comprised of regularly employed inspectors and mechanics within the State of Maine for a period of at least one (1) year prior to the date of receipt of General Bids.

C. Provide 1 year maintenance warrantee for insuring problem free operation of elevator, and make available complete ongoing maintenance service package.

D. Elevator shall be equal to Canton Elevator Company, or approved equal. Elevator shall meet latest ANSI handicapped requirements and Maine State Elevator Code.

E. Delivery of elevator systems shall be guaranteed by Manufacturer to be on site sixteen (16) weeks after receipt of approved Shop Drawings. Shop Drawings shall be submitted to the General Contractor for review by the Architect within ten (10) days of Sub-Contractors award.

2.2 MATERIALS AND FABRICATIONS:

A. Description of equipment -

Capacity:	2500 lbs.
Speed:	125 fpm
Operation:	Selective Collective
Inside Cab Dim	6'-8" x 4'-3" inside dim.
Travel:	Approximately (30'-9 ½ ") as shown on Drawings
Power supply:	208V, 3 phase, 60 cycle.
Machine Location:	As shown on Drawings
Stops & Openings:	Five (5) stops, Five (5) openings – front & rear.
Car Enclosure:	High pressure laminate interior panels, overhead fluorescent lighting above egg crate suspended ceiling, stainless steel front return, and stainless steel car door. Handrail on side walls. Carpeted floor by others. One (1) set Protection pads and hooks. Include: ADA compliant telephone Fan

	Fan Emergency Lighting Proximity detectors, door protection
Hoistway Door Frames:	Hollow metal U.L. "B: labeled door, square frame
Door Size & Type:	Single slide side open 3'-6" W x 7'-0"H (clear opening) finish to be baked enamel; color to be selected from standard selection charts
Door Operation:	D.C. Power Operation
Signals:	Illuminated halo buttons, (Braille) alarm bell, in car location. Hall position indicator at main floor level. In – Car Direction Lantern
Special Features:	Special handicap provisions Door Hold Key Service Independent Operation Key Switch
Motor HP:	40 hp, 3 Phase Power
Starter	Solid state soft start

B. Jack unit:

1. The jack unit shall be designed and constructed in accordance with the applicable requirements of the American Standard Safety Code for Elevators A-17. It shall be of sufficient size to lift the gross load the height specified. It shall be factory tested to insure adequate strength and freedom for leakage. No brittle material, such as gray cast iron, shall be used in the jack construction.

2. The jack unit shall consist of the following parts: a plunger of heavy polished steel tubing accurately turned; a stop ring shall be electrically welded to the plunger to positively prevent plunger leaking its casing made of steel tubing and provided with a pipe connection and air bleeder; Brackets shall be welded to jack casing and supporting the elevator on pit channels.

3. A sealed PVC cylinder protection system shall be installed. The system shall provide a means to monitor the space between the PVC sleeve and cylinder wall and evacuate unwanted fluids, so as to prevent such fluids from remaining in contact with the cylinder.

4. A standard wellhole with steel pipe casing to retain the hole shall be provided. All drilling spoils are to be removed by the general contractor. Water for drilling, if required, will be provided by others also. Should obstructions such as rock, boulders, debris, water, quicksand or any other condition other than normal soil or clay be encountered, additional time to drill the hole will be treated as a change order. Work cease until a change order is issued.

C. Car:

1. Platform and Sling: The platform and sling have a fabricated frame of formed and structural steel shapes, gusseted and rigidly welded. Flooring shall be wood top floor laid over wood sub-floor. Finished flooring shall be provided, by others, on top of the car platform.

2. The sling shall consist of heavy steel channel stiles properly affixed to a steel cross head and bolster, with adequate bracing members, to remove all strain from the car enclosure.

3. Steel bumper plates shall be affixed to bottom of bolster channels; and a platen plate with clamps and car screws shall be furnished for fastening sling to plunger.

D. Car doors: The car entrance shall be provided with horizontal sliding doors. Panel rigidity to be obtained by suitable steel reinforcements. Doors shall be hung on sheave hangers with polyurethane tires and sheaves not less than 2-1/2" diameter running on a polished steel track, and guided at the bottom by non-metallic shoes sliding in a smooth threshold groove.

E. Alarm bell: An emergency alarm bell shall be located in conformance with ANSI A-17 Code requirements, and connected to a plainly marked push button in the car. Alarm bell shall be connected to the emergency lighting power pack.

F. Guide and Guide Shoes: Guides for the elevator car shall be planed steel elevator guide rails, properly fastened to the building structure with steel brackets. The car stile shall be fitted at top and bottom with sliding guide shoes.

G. Power Unit:

1. (Oil pumping and control mechanism) shall be compactly and neatly designed with all of the components listed below combined in a self-contained unit; structural steel outer base with tank supports; floating inner base for mounting motor pump assembly; over head oil reservoir with tank cover and controller compartment with cover; metal drip pan; oil-hydraulic pump; electric motor; and oil control unit with the following components built into a single housing: a high pressure relief valve, a check valve, an automatic unloading up start valve, a lowering and leveling valve, and a magnetic controller.

2. The pump shall be especially designed and manufactured for oil-hydraulic elevator service. It shall be of positive displacement screw type, inherently designed for steady discharge with minimum pulsations to give smooth and quiet operation. Output of pump shall not vary more than ten percent (10%) between no load and full load on elevator car.

3. Motor shall be especially designed for oil-hydraulic elevator service, of standard manufacturer and of duty rating to comply with herein specified speeds and loads.

4. Oil control unit shall consist of the following components, all built into a single housing. Welded manifolds with separate valves to accomplish each function will not be acceptable under this Specification. All adjustments shall be accessible and shall be made without removing the assembly from the oil lines:

   a. Relief valve shall be externally adjustable and shall be capable of bypassing the total oil flow without increasing back pressure more than ten percent (10%) above that required to barely open the valve.

   b. Up start and stop valve shall be externally adjustable, and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, insuring smooth up starts and up stops.

   c. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.

   d. Lowering valve and leveling valve shall be externally adjustable for drop-away speed, lowering speed, leveling speed and stopping speed to insure smooth "Down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling when slow down is initiated.

   e. Sound insulation panels manufactured of reinforced 16-gauge steel with a 1" thick 1-1/2" core of fiberglass affixed to interior shall be mounted on all four open sides of the power unit frame.

5. Electric controller shall be of the full magnetic type or solid-state integrated circuitry. Silver to silver contacts shall be utilized on all relays and contractors. Thermal overload relays to be provided to protect the motor. All component switches to be mounted in a steel panel designed for wall to floor mounting.

H. Mainline Strainer: A mainline strainer of the self-cleaning type, equipped with a 40-mesh element shall be furnished and installed in the oil line.

I. Failure Protection: The electrical control circuit shall be designed so that if a malfunction should occur, due to motor starter failure, oil becoming low in the system, or the car failing to reach a landing in the up direction within a predetermined time, the elevator car will automatically descend to the lowest terminal landing. If power operated doors are used, the doors will automatically open when the car reaches the landing to allow passengers to depart. The doors will then automatically close and all control buttons, except the "door open" button in the car station, shall be made inoperative.

J. Sound Isolating Coupling: Install a minimum of two in the oil line in the machine room between pump and jack.

K. Oil-Hydraulic Silencer (muffler device): Install in oil line near power unit. It shall contain pulsation-absorbing material inserted in a blowout-proof housing arranged for inspecting interior parts without removing unit from oil line. Rubber hose without blowout-proof features will not be acceptable.

L. Vibration Pads: Mount under the power unit assembly to isolate the unit from the building structure.

M. Automatic Terminal Limits: Place electric limit switches in the hatchway near the terminal landing; designed to cut off the electric current and stop the car should it run beyond either terminal landing.

N. Automatic Self-leveling: Provide elevator with a self-leveling feature that will automatically bring the car to the floor landings. This self-leveling shall, within its zone, be entirely automatic and independent of the operating device, and shall correct for over travel or under travel. The car shall also be maintained approximately level with the landing regardless of the load.

O. Buffers: Furnish and install substantial buffers under the car in the elevator pit. They shall be mounted on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor and substantial extensions will be provided, if required. Buffers shall comply with ANSI A-17.1 Code requirements.

P. Car Top Inspection Station: A car top inspection station with an "emergency stop" switch and with constant pressure "up-down" direction buttons shall make the normal operating devices inoperative and give the inspector complete control of the elevator.

Q. Door Operation: Furnish and install a direct current motor driven heavy-duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and door-operating mechanism shall be arranged for manual operation in event of power failure. The leading edge of the car door shall be provided with a retractable reversal edge arranged to automatically return car and hoistway doors to the open position in the event the doors are obstructed during closing cycle. Doors will then resume closing cycle.

Doors shall automatically open as the car arrives at the landing and shall automatically close after an adjustable time interval or when the car is dispatched to another landing. Direct drive geared operators, A.C. controlled units with oil checks, or other deviations for the above are not acceptable.

R. Interlock: Equip each hoistway entrance with an approved type interlock tested as required by Code. The interlock shall be designed to prevent operation of the car away from the landing until the doors are locked in the closed position as defined by Code and shall prevent opening the doors at any landing from the corridor side unless the car is at rest at the landing or is in the leveling zone and stopping at the landing. Interlocks shall bear Underwriter's Laboratories "B" label of approval.

S. Hoistway Door Unlocking Device: Provide hoistway door unlocking devices as specified by the ANSI A-17.1 Code to permit authorized persons to gain access to hoistway when elevator car is away from the landing.

T. Door Hangers and Tracks: For each hoistway sliding door, furnish and install sheave type two point suspension hangers and tracks complete. Sheaves shall be 2-1/2" in diameter and have polyurethane tires with ball bearings properly sealed to retain grease. Hangers shall be provided with an adjustable slide to take the up-thrust of the doors. Tracks are to be drawn steel shapes, smooth surface and shaped to conform to the hanger sleeves.

U. Hoistway Entrances: Hoistway entrances of the hollow metal, horizontal sliding type shall be furnished and installed complete at each of the hoistway openings. Note that entrances must be at least minimum legal width for wheelchair use, meeting ANSI A-17.1.

1. Entrances shall be manufacturer's standard design and shall bear Underwriter's Laboratories "B" labels. They shall consist of frames, sills, doors, hangers, hanger supports, hanger covers, fascia plates, and all necessary hardware. Finish to be baked on prime enamel for finish painting in the field by others.

2. The entire front wall of the hoistway is to be left open or a rough opening provided which is 12" greater in width and 6" greater in height than the finished opening, until after entrances are installed. After guide rails are set and lined, the entrance frames shall be installed in perfect alignment with the guide rails. Finish walls will then be completed by others.

V. ADA telephone shall be furnished with wiring from elevator cab to the machine room and telephone box. Wiring to be coordinated with Electrical Contractor and tied into outside phone system.

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1: GENERAL

1.01 WORK INCLUDED

A. The work of this section consists of furnishing all labor, equipment and materials, and performing all operations necessary to complete heating and ventilation work in accordance with these specifications.

B. Work includes, but is not limited to:

1. Fin Tube Radiation, cabinet unit heaters and unit heaters.

2 Gas fired heating hot water boilers heating.

3. Hot water heating supply and return piping, materials, and heating specialties.

4. General exhaust, toilets, parking garage ventilation and dryer exhaust ventilation system.

5. Sheetmetal work and materials.

6. Ventilation roof top gas fired units.

7. Insulation: Hot water heating supply and return piping, domestic hot and cold water piping, storm drain piping and sanitary piping where indicated.

8. Controls.

9. Natural Gas Piping and Accessories

10. Domestic Water Service and Sprinkler Service entrance to 10'-0" outside building wall where indicated on the drawings.

11. Sanitary and Storm building drain to 8'-0" outside building wall or where indicated on the drawings.

12. Domestic hot water and cold water piping and plumbing specialties within building.

13. Soil, waste, plumbing vent lines, and drainage specialties.

14. Plumbing fixtures.

15. Indirect fired domestic water heaters.

16. Oil-intercepting Elevator Sump Pump

17. Testing.

18. All other items indicated on the drawings, specified herein, or needed for complete and proper systems installation.

1.02 GENERAL CONDITIONS

A. Related Documents: The General Conditions and other documents of the contract apply to the work specified in this section.

B. Guarantee: All work executed under this section shall be guaranteed for one (1) year as stated in the General Conditions.

C. Permits and Laws:

1. Obtain and pay for all required permits, inspections, licenses, etc.

2. Execute all work to conform to the requirements of all local, state and federal laws, regulations, etc., applicable to the work.

D. Drawings:

1. The general location of the apparatus and the details of the work are shown on the drawings, which form a part of this specification. Exact locations are to be determined at the building as the work progresses, and shall be subject to the Architect/Engineer's approval.

2. Anything shown on the drawings and not mentioned in the specifications, or vice versa, shall be furnished as if it were both shown and specified.

3. It is not intended that the drawings shall show every pipe, fitting, or appliance, but it shall be a requirement to furnish, without additional expense, all material and labor necessary to complete the system in accordance with the best practices of the trade.

E. Electrical Work:

1. Provide and erect all motors, starters, pilot lights, controllers, limit switches, etc., as herein specified.

2. All motors furnished shall meet NEMA requirements and shall have an operating temperature of not to exceed 40 degrees C. above ambient temperature and be so marked. Except as noted, all motors shall be of the open drip-proof type. Motors may be furnished of fully enclosed type if it is the standard equipment.

   a. Each motor shall be provided with a manual or magnetic starter with overload elements sized for proper protection of the motor in accordance with manufacturer's recommendations. Provide overload protection for each phase conductor. All magnetic starters shall have coil and wiring designed for 120 volt operation.

   b. Starters shall be as manufactured by Allen-Bradley Company, or approved equal, with NEMA-1 enclosures and be of similar manufacture for all the motors furnished under this section.

3. Controls: Wiring for controls shall be under this division.

4. Except as noted, all required line switches, fused switches, etc., and all necessary wiring to properly connect all equipment to motors and switches will be furnished and installed under Division 16 - Electrical Section of these specifications.

F. Equipment Requirements:

1. Installation Directions: Obtain manufacturer's printed installation directions to aid in properly executing work on all major pieces of equipment.

2. Objectionable Noise and Vibrations:

   a. Mechanical and electrical equipment shall operate without objectionable noise or vibration, as determined by the Engineer.

   b. If such objectionable noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, piping, ducts, or by other part of mechanical and electrical work, make necessary changes and additions, as approved, without extra cost to the Owner.

3. Equipment Design and Installation:

   a. Uniformity: Unless otherwise specified, equipment or material of same type of classification, used for same purpose shall be the product of same manufacturer.

   b. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with ASHRAE, ASME, IEEE, AWWA, ANSI, ASTM, ASSE, PDI or other applicable technical standards, suitable for maximum working pressure and shall have neat and finished appearance.

   c. Installation: Erect equipment in neat and workmanlike manner; align, level and adjust for satisfactory operation; install so that connecting and disconnecting of piping and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, and maintenance and repair. Minor deviation for indicated arrangements may be made as approved.

   d. Welding: Before any welder performs any welding, submit a copy of the welder's certification as a certified welding mechanic. All welding shall be executed using the best practices of the trade.

4. Site Visit: The Contractor estimating and submitting a bid for the work covered by this section of the specifications shall visit the site, and view conditions as they exist prior to submission of a bid. The submission of a bid shall be taken as evidence that the bidder has examined the existing conditions and has satisfied himself as to the various requirements, obstacles and advantages of performing the work. No subsequent allowances will be made in this respect due to failure of the Contractor to meet the full requirements of these specifications.

5. Protection of Equipment and Materials: Responsibility for care and protection of all materials and mechanical work rests with the Contractor at all times until the entire project has been completed, tested, and the project is accepted.

6. Foundations:

   a. Ceiling Mounting: Where ceiling mounting is indicated or specified, use suspended platform or strap hangers, bracket or shelf, whichever is most suitable for equipment and its

location. Construct of structural steel members, steel plates, rods, as required, brace and fasten to building structure or to ensure as approved.

b. Structural steel required to support equipment shall be furnished.

7. Shop Drawings: The Contractor shall, after the award of Contract, and before installation, submit for approval shop drawings and Owner's manuals and operating instructions of equipment to be furnished under this Contract. After shop drawings have been given final approval, three (3) copies of shop drawings shall be retained by the Architect/Engineer. The following items of equipment shall be submitted for approval:

   a. New fin tube radiation cabinet unit heaters, unit heaters, and accessories.

   b. Gas fired boiler.

   c. Hot water specialties including valves, etc.

   d. Exhaust fans.

   e. Gas fired rooftop ventilation units.

   f. Insulation.

   g. Controls.

   h. Plumbing fixtures and trim.

   i. Plumbing equipment and specialties.

   j. Gas Piping and Accessories

   i. Other equipment as the Engineer may require.

8. Substitutions:

   a. The bid shall be based on the materials or products as specified. Whenever in the specifications a particular article is specified by proprietary name, names, or "approved equal", the bidder shall base his bid on one of the above.

   b. Any materials or products not herein specified, but worthy of consideration shall be so noted in a separate letter attached to his Proposal Form, stating supplier, manufacturer or name

and the amount to be added to or deducted from base bid and his reasons for the suggested substitution. He shall also assume the costs necessary for revision in other trades due to this substitution.

PART 2: PRODUCTS

2.01 RADIATION

A. General: Furnish and install radiation of sizes, type and service in locations indicated on the drawings and as scheduled by Sterling, or approved equal.

B. Main Components and Features: Provide enclosure as indicated on the drawings complete with cover, brackets, fin pipe, sliding hangers, fittings, end caps, etc.

1. Covers: Finished in manufacturer's baked enamel, color as selected by Architect/Engineer.

2. Backs: Partial wall back plate with gasket of 20-gauge bonderized steel.

3. Hangers: Nylon cradle guides shall glide fin pipe for quiet operation or approved equal system. Maximum spacing between brackets shall be 3'.

4. Fin Pipe shall be of aluminum elements and copper tube.

2.02 CABINET UNIT HEATERS AND UNIT HEATERS

A. General: Furnish and install, where indicated, cabinet unit heaters of sizes and capacities as scheduled on the drawings and as manufactured by Sterling, American Air Filter Co., Trane, or McQuay.

B. Main Components and Features:

1. Unit shall be complete including the following:

a. 18 gauge furniture grade steel cabinet.

b. Units shall be arranged for recessed ceiling as scheduled.

c. Locations of inlet, discharge, cabinet type and style shall be as scheduled on drawings. Provide supply and return grilles in locations scheduled.

d. Copper coils with aluminum fins.

e. Fans, multiblade, forward curved, centrifugal type, direct drive.

f. Permanent split capacitor multispeed type motor with two-speed controller for operation on 120 volt, 1 phase, 60 cycle current.

g. Unit mounted disconnect switch with thermal overload protection.

h. 1" throwaway filters and two spare sets.

i. Furnish in baked enamel color as selected by the Architect/Engineer.

C. Other Requirements: The control of temperatures will be as hereinafter specified.

2.03 IN-LINE CENTRIFUGAL PUMPS (HEATING)

A. General: Furnish and install an in-line single stage centrifugal pump specifically designed for service as indicated on the drawings. Pumps shall be equal to Grundfos or approved equal.

B. Main Components and Features: Pump shall be constructed for 145 psi working pressure with 125 psi flanges and shall include the following:

1. Seals: Pumps shall be high temperature bellows seals specifically designed for indicated service with Tungsten carbide/carbon seal faces mounted in stainless steel.

2. Tappings for pressure gauges on suction and discharge flanges.

3. Material: Stainless steel fitting with stainless steel impeller, hydraulically and dynamically balanced.

4. Motor: Open drip-proof motor of size and with voltage characteristics as scheduled on the drawings, shall not exceed 1,750 rpm.

5. Operating Characteristics: Pumps shall be non-overloading throughout entire operating range.

C. Other Requirements:

1. Supports: Provide additional supports for pumps as required to

insure correct installation.

2. Submittals: Provide pump curves for each pump with the shop drawings.
3. Disconnects: Furnish for each pump.

4. Frequency Drive and Speed Control: Coordinate control and furnished with Section 15950 Controls.

2.04 IN-LINE CENTRIFUGAL PUMPS (PLUMBING)

A. General: Furnish and install an in-line centrifugal pump specifically designed for domestic hot water service as indicated on the drawings and specifications. Pumps shall be equal to Bell and Gossett, Taco or Thrush.

B. Main components and Features: Pump shall be constructed for 175 psi working pressure with 125 flanges and shall include the following:

1. Seals: Pumps shall be mechanical seals specifically designed for indicated service, rated 220 degrees F at 125 psig continuous operation.

2. Tappings for pressure gauges on suction and discharge flanges.

3. Material: Bronze throughout with bronze impeller, hydraulically and dynamically balanced.

4. Motor: Open drip-proof motor of size and with voltage characteristics as scheduled, shall not exceed 1,750 rpm, with built-in overhead protection.

5. Operating Characteristics: Pumps shall be non-overloading through entire operating range, with characteristics as scheduled on the drawings.

C. Other Requirements:

1. Supports: Provide additional supports for pumps as required to insure correct installation.

2. Submittals: Provide pump curves for each pump with the shop drawings.

3. Provide a seven day time clock the equal of Paragon 47000 series four pole, 20 amp, T-rated ASTRO and Skip-A-Day feature. Mount clock on wall behind recirculation pump.

4. The Electrical Contractor shall completely wire all pump controls and time clock.

D. Provide five (5) year warranty for commercial use.

2.05 PACKAGE BOILER UNITS (HOT WATER - NATURAL GAS)

A. General: Provide integral boiler -burner units of high silicon cast iron wet base, double wall, sectional type, 3-pass design, as manufactured by Dedietrich of GT300A series as scheduled on the drawings or approved equal by Buderus Model G515 Series.

1. Boiler-burner units shall be rated for not less than as scheduled on drawings, minimum 88% combustion efficiency scheduled on the drawings burning natural gas.

2. Unit shall be constructed for minimum of 50 psig.

3. Units shall be forced draft with breeching and chimney sized as recommended by the boiler manufacturer. Provide flue damper to prevent excess draft in boiler if required by boiler furnished.

B. Boiler Unit: The boiler unit shall be complete with the following standards equipment and/or accessories:

1. Combustion chamber of the water backed design; burner mounting plate with insulation block.

2. Boiler and burner base on concrete pad with 5" minimum height.

3. Insulated metal jacket of not less than 3" thickness glass fiber insulation. Jacket and all exposed parts shall be neatly painted.

4. Return fitting and 3/4" (minimum) drain fitting with 3/4" drain valve and piped to drain.

5. Gas tight gaskets for doors and positive gas tight seal between burner, burner mounting plate and boiler, boiler and flue, etc., to positively guarantee no combustion gases to enter Boiler Room.

6. Observation ports to combustion chamber for visual sighting of flame pattern. Combustion chamber relief door.

7. ASME stamped safety relief valves set at 50 psi.

8. Water pressure gauge with brass stopcock. A temperature gauge shall be mounted on the boiler with a separate well connection.

9. Hydrolevel model 550 probe type low water cutoff.

C. Oil Burner: Power Flame Model Series J burner or approved equal by Riello shall have intermittent pilot gas electric ignition; a full lo-hi-lo firing for natural gas with air and gas control; and automatic damper closed when not running.

1. Full gas train including gas regulator, vent relief, solenoids, gas cocks complete, pipe vents to outside.

2. Factory-fabricated control panel incorporating the following:

a. Electronic programming control with lo-hi-lo control to coordinate with burner and code for firing rate.

b. Forced draft proving switch.

c. Power switch.

d. Flame failure warning light with contacts for future tie-in to central D.D.C. control.

e. Flame safeguard with UV and intermittent pilot for natural gas.

3. Operating Controls: Provide Honeywell controls as follows, each with separate brass well individually connected to tappings on boiler.

a. One operating and high fire dual control unit.

b. One safety high limit control (set at 205 degrees F), Honeywell L4006A1058.

c. Manual reset high limit aquastat equal to Honeywell L400GE1109.

D. Other Requirements:

1. A complete set of flue brushes, handles, etc., for serving the boiler.

2. All electrical equipment wired in conformance with the Underwriters Laboratories requirement.

2.06 MANUFACTURED VENTS

A. General: Furnish and install exhaust gas removal system for the natural gas fired packaged boilers. Stacks shall be as manufactured by Metalbestos, Metal-Fab, or approved equal.

B. Main Components and Features:

1. Stack shall be U.L. approved for gas fired boilers, equal to Positive Pressure, Type "IPS-2".

2. Units shall have internal lining of 316L stainless steel corrosive resistant material.

3. Units shall have 2" high temperature insulation on exhaust from natural gas fired boilers.

4. Provide all accessories for complete installation (roof thimble, floor thimble, roof cap, support tee tie-in, cleanouts, etc.).

5. Units shall be sealed pressure tight.

6. SEE SCHEDULE.

PRE-FABRICATED VENT STACK SCHEDULE

SYMBOL	SERVES	BOILER NET MBH OUTPUT	NAT GAS INPUT MBH	MINIMUM INSIDE SIZE	MFG-SELKIRK METAL BESTOS	OPTIONS
VS-1	B-1	433	599	7"Ø	IPS-2"	STACK CAP, ROOF VENTILATED SLEEVE, GUIDES, WALL SUPPORT, DRAIN AT BOTTOM OF STACK, ETC.

** U.L. LISTED CLEARANCES TO COMBUSTIBLES MINIMUM 1".

2.07 CEILING EXHAUST FANS

A. General: Furnish and install where indicated Panasonic fan/light combination unit where ceiling indicated in each bathroom.

B. Main Components and Features: Fans shall be complete, including the following:

1. Acoustically insulated housing.

2. Chatterproof integral backdraft damper.

3. Resilient mounted motor.

4. Vibration isolators.

5. Cabinet access panels.

6. Fans shall be located, sized and with capacities as scheduled on drawings.

7. Each fan shall have combination air grille and light louver with 2x13 watt fluorescent lamps (FQ13E354) and 4 watt night light..

8. Fan motor shall have thermal overload protection. Provide (disconnects) starters where required. Unit shall be rated and listed by U.L. for tub/shower area.

C. Other Requirements: Disconnect furnished with fan.

2.08 ROOF TOP HV UNIT (GAS FIRED HEATING)

A. Factory assembled and tested: designed for and consisting of fan, heating section, and temperature controls, filters and dampers. Units shall be Trane, McQuay or Carrier.

B. Casing: Construction with corrosion-protection coating and exterior finish, removable panels or access doors with neoprene gaskets for inspection and access to internal parts, minimum 1½ inch thick thermal insulation, sleeves for electrical and piping connections, and lifting lugs.

C. Supply Fans: Forward curved, centrifugal, belt drive with adjustable sheaves and with permanently lubricated motor bearings.

D. Heat Exchangers: Manufacturer's standard construction for gas-fired heat exchangers and burners with the following controls:

1. Redundant, dual gas valves (2 stage heating) or modulating per drawing schedule.

2. Electronic-spark ignition system.

3. High-limit cutout.

4. Forced-draft proving switch.

E. 100% Outside Air Unit Control: Outside-air dampers, outside-air filter, fully modulating electronic-control system with adjustable mixed-air thermostat.

F. Smoke Detectors: Photoelectric detector located in supply, to de-energize unit. Detector shall be furnished and installed and tied into fire alarm system. See Division 16.

G. Operating Controls: Factory-installed microprocessor controls and monitors unit and communicates and is controlled by Control Section of this Division for D.D.C.

1. Control Outputs: stage heating per drawing schedule and automatic or continuous fan operation.

2. Control Sensors: Supply-air-temperature sensor, fan airflow-proving switch, dirty-filter switch.

H. Roof Curbs:

1. Unit with Vertical connections for Supply Factory fabricated 16" high or lined with 2 layers of 3/4"Armaflex listed for duct lining use. Duct openings shall be located as shown on the drawings and arranged for flexible type duct connections. Conform with other requirements indicated.

I. Motors: Refer to Division 15 Section "motors" for general requirements for factory-installed motors.

1. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.

2. Enclosure Type: Open, drip proof.

2.09 ROOF MOUNTED EXHAUST FANS - UPBLAST

A. General: Furnish and install roof fan with capacities and sized as scheduled on the drawings as manufactured by Cook or approved equal.

B. Main Components and Features: Fan shall be complete, including the following:

1. Aluminum housing.

2. Adjustable V-belt drive.

3. Non-overloading backwardly inclined, centrifugal fan wheel.

4. Motor mountings with rubber-in-shear isolators.

5. Sealed ball bearings.

6. Motors, of required size, with thermal overload protection on each phase. Provide magnetic starter where required and remote pushbutton control with pilot light where indicated. Provide "on-off-auto" switch if connected to temperature control cycle located next to control panel.

7. Housing mounted disconnect switch.

8. Fan shall be AMCA rated.

9. 14" high, all welded, aluminum, insulated roof curb for flashing into roof equal to Cook Model "RCA."

10. Screen guard.

11. Fans shall have a hinged subbase for easy access of fan.

12. Backdraft damper furnished with the fan where scheduled.

2.10 WALL MOUNTED EXHAUST FANS

A. General: Furnish and install wall mounted propeller exhaust fan with capacities and sized as scheduled on the drawings as manufactured by Loren Cook Company or approved equal.

B. Main Components and Features: Fan shall be complete, including the following:

1. Aluminum housing with primer coat to receive paint to blend into background.

2. Adjustable V-belt drive as scheduled.

3. High efficiency fabricated steel propeller with blades securely fastened to a minimum 7 gauge hub.

4. Motor mountings with rubber-in-shear isolators. Motor to be mounted out of the airstream and shall have breather tube for cooling.

5. Sealed ball bearings.

6. Wall mounting fastening frame.

7. Motors, or required size, with thermal overload protection on each phase. Provide magnetic starter where required and remote pushbutton control with pilot light where indicated. Provide "on-off-auto" switch if connected to temperature control cycle located next to control panel. On fume exhaust, motor shall be explosion-proof.
8. Housing mounted disconnect switch.
9. Fan shall have AMCA certified rating seal, U.L. 762 LABEL.
10. Screen guard.
11. Backdraft damper furnished with the fan as scheduled.

2.11 MECHANICAL DRYER VENT SYSTEM

A. Furnish and install a packaged mechanical dryer venting system and related equipment as shown on the drawings as manufactured by Exhausto or approved equal.

B. Main Components and Features: System shall be complete, including the following:

1. Packaged ventilator/control combination, listed to UL 705, Standard for Power Ventilators as a complete system and approved for removal of lint-laden air.
2. Electrical connections.
3. Duct connection.

C. Other Requirements:

1. Submittals: Provide certification of listing by recognized testing laboratory.
2. Operating and Maintenance Manual: Provide complete Operating and Maintenance Manual with product literature on the ventilator and controls, dimensional and wiring diagrams.

2.12 PLUMBING FIXTURES

A. General: This Contractor shall furnish and install all plumbing fixtures shown on the drawings and as hereinafter scheduled, except where noted in such schedule. Fixtures and fittings hereinafter listed are generally based on American Standard Products. An approved equal type and quality of

fixture as manufactured by Kohler Manufacturing Co., or another approved equal are acceptable. Approved equal types and quality of fittings as manufactured by the fixture manufacturer are acceptable.

B. All piping drops to fixtures shall be anchored solidly.

C. All fixtures shall be white.

D. Fixture Schedule:

1. P-1 Water Closet - Regular Height:

   a. American Standard "Cadet" No. 2333.100, 1.6 GPF, pressure assisted, elongated bowl, siphon jet, vitreous china, tank type with Sloan "Flushmate III", floor mounted, 14" high rim.

   b. McGuire No. 166 angle supply with wheel handle stop, wall flange, all chrome plated.

   c. Church No. 380TC white, elongated, closed front seat with cover.

2. P-1B Water Closet - Barrier Free:

   a. American Standard "Cadet " No. 2377.100, 1.6 GPF, pressure assisted, elongated, siphon jet, vitreous china, tank type with Sloan "Flushmate III", floor mounted, 16-1/2" high rim. A.D.A. compliant.

   b. McGuire No. 166 angle supply with wheel handle stop, wall flange, all chrome plated.

   c. Church No. 380TC white, elongated, closed front seat with cover.

3. P-2 Lavatory - Regular

   a. Integral countertop lavatory provided by another division of the contract. The plumbing contractor shall be responsible for drilling faucet holes, providing fittings specified below and complete piping.

   b. Faucet: Symmons "Symmetrix" No. S-240-2 centerset, metal lever handles, metal pop-up drain, washerless valve cartridges, all chrome plated.

   c. McGuire No. 167 angle wall supplies with wall flange,

wheel handle stop and 12" flexible copper risers, all chrome plated.

d. McGuire No. 8090 adjustable swivel P-traps, 1-1/4" x 1-1/2", cleanout plug, No. 2127 brass nipple to wall with cast escutcheon, all chrome plated.

4. P2B Lavatory - Barrier Free:

a. American Standard "Declyn" No. 0321.075, 19" x 17", vitreous china, faucet holes on 4" centers, concealed arm support. A.D.A. compliant at 34" rim height.

b. Faucet: Symmons "Symmetrix" No. S-240 centerset, metal lever handles, metal pop-up drain, washerless valve cartridges, all chrome plated. A.D.A. compliant.

c. McGuire angle wall supplies with wall flange, wheel handle stop and 12" flexible copper risers, all chrome plated.

d. McGuire No. 8090 adjustable swivel P-traps, 1-1/4" x 1-1/2", cleanout plug, No. 2127 brass nipple to wall with cast escutcheon, all chrome plated.

e. Provide Truebro, Inc. lavatory pipe insulation kit on supplies, trap and waste.

f. J.R. Smith, Josam, Zurn, or Wade concealed arm carrier to meet building conditions.

5. P-3 Kitchen Sink - Regular:

a. Elkay "Pacemaker" model PSR-2522-75-4, 25" x 22", 20 gauge type 302 stainless steel, seamlessly drawn, self-rimming, sound deadened on underside, single 21" x 15-3/4"x 7-1/2" deep compartment, four (4) faucet holes.

b. Faucet: Symmons "Symmetrix" No. S-248-2, 8" center deck mount, conventional swing faucet, hose and spray, metal lever handles, washerless valve cartridges, all chrome plated.

c. McGuire No. 151 crumb cup strainer and tailpiece.

d. McGuire No. 2165 ½" angle supplies with wheel handle stops, all chrome plated.

e. McGuire No. 8089 adjustable swivel P-trap with cleanout and brass nipple to wall with cast escutcheon, all chrome plated.

6. P-3B Kitchen Sink - Barrier Free:

a. Elkay "Lustertone" model LRAD-2522-60-4, 25" x 22", 18 gauge type 302 stainless steel, seamlessly drawn, self-rimming, sound deadened underside, single 21" x 15-3/4" x 6" deep compartment, four (4) faucet holes. A.D.A. compliant.

b. Faucet: Symmons "Symmetrix" No. S-248-2, 8" center deck mount, conventional swing faucet, hose and spray, metal wrist blade handles, washerless valve cartridges, all chrome plated. A.D.A. compliant.

c. McGuire No. 151 crumb cup strainer and tailpiece.

d. McGuire No. 2165 ½" angle supplies with wheel handle stops, all chrome plated.

e. McGuire 8089 adjustable swivel P-trap with cleanout and brass nipple to wall with cast escutcheon, all chrome plated.

f. Provide Truebro, Inc. insulation kit on supplies, trap and waste.

7. P-3 Bathtub - Regular:

a. Universal-Rundle "Atlas 34" model G6032.70 R/L, or approved equal, one-piece tub/shower unit with integral surround, 60" x 33-5/8" x 73-1/4" height overall, fiberglass-reinforced polyester resin, integral soap dish, toiletry ledge and grab bar, slip-resistant floor, meets requirements of ANSI Z124.1, ASTM F462 (for slip resistance), HUD UM73A (for fire safety), and ASTM F466 (grab bar).

b. Bath Drain: McGuire No. 1221 TL concealed trip-lever bath waste with brass overflow and strainer drain, polished chrome finish.

c. Trim: Symmons "Temptrol" model S-96-2-B-X tub/shower unit with pressure balancing mixing valve with brass escutcheon, combination integral diverter and volume control, adjustable stop screw to limit handle turn, tub spout, "Clear-Flo" shower head, arm, flange and integral 2.5

GPM flow control.

8. P-3B Bathtub - Barrier Free:

   a. Lasco model 2603-SM, or approved equal, white, gelcoat finish, fiberglass reinforced polyester, ADA compliant and NAHB listed, inside dimensions of 55-3/4" x 32" x 76" and outside dimensions of 60" x 33-1/4" x 77-1/4", soap tray molded in the back corners, removable seat, four (4) grab bars (two on back wall and one each on end walls), 24" x 1-1/2" diameter with 1-1/2" safety statute clearance secured from the rear with a 3" x 3" x 11" gauge metal mounting plate, three wall brackets installed at 42" and 72" above floor on valve wall for handheld shower, and 22" above floor at center of back wall for hand held shower, 1" diameter 18 gauge stainless steel curtain rod, ribbed floor for slip resistance, and commercial grade white weighted, antibacterial shower curtain with hooks.

   b. Bath Drain: McGuire No.1221TL concealed trip-lever bath waste with brass overflow and strainer drain, polished chrome finish.

   c. Trim: Symmons "Temptrol" model 96-600-B30-L-V-B-X barrier free tub/shower unit, pressure balancing mixing valve with single blade lever handle and adjustable stop screw to limit handle turn, brass valve escutcheon, tub spout; No. 4-458 lever handle diverter with integral volume control, "Clear-Flo" shower head with arm and flange, wall/hand shower spray with 60" flexible metal hose, in-line vacuum breaker, wall connection and flange, 30" slide bar for hand shower mounting, and one (1) wall hook for alternate hand shower mounting.

9. P-5 Roll-In Shower- Barrier Free:

   a. Universal-Rundle "Summit 60 SM" model 6210 H one-piece stall, 60" x 37-3/4" x 78-1/4" high including 1-1/4" mounting flange, 1-1/2" diameter wrap-around grab bar, slip resistant floor. Complies with ANSI 117.1 and A.D.A. Meets requirements of ANSI Z124.2, ASTM F462 (for slip resistance), HUD UM73A (for fire safety), and ASTM F466 (grab bar).

   b. Drain: Chrome-plated 2" grid drain with tailpiece.

   c. Trim: Symmons "Temptrol" model 96-500-B30-L-V-B-X

barrier free shower unit, pressure balancing mixing valve with single blade lever handle and adjustable stop screw to limit handle turn, brass valve escutcheon, No. 4-458 lever handle diverter with integral volume control, "Clear-Flo" shower head with arm and flange, wall/hand shower spray with 60" flexible metal hose, in-line vacuum breaker, wall connection and flange, and 30" slide bar for hand shower mounting.

d. Accessories: 60" nominal, 1" diameter, 20 gauge type 304 stainless steel curtain rod and commercial grade vinyl shower curtain.

10. P-6 Clothes Washer Hookup: Symmons "Laundry-Mate" model W-602-X supply and drain fixture, or approved equal, ½" sweat inlet connections, single level shut-off valve with ¾" hose ends, brass overflow tray with 2" waste connection, stud mounting brackets, screwdriver operated service stops.

11. P-7 Wall Hydrant:

a. Woodford Model B65C, or approved equal, automatic draining, freezeless box type wall hydrant with antisiphon vacuum breaker hose end spout, lock shield key-operated stem, under nozzle drain, wall clamp, loose key, 3/4" cooper inlet. ASSE Standard 1019 approved. Install as detailed on the drawings.

2.13 INDIRECT FIRED DOMESTIC WATER HEATERS

A. General: Furnish and install domestic water heater, Superstor "Ultra" model SSU with size as scheduled.

B. Main Components and Features:

1. U.L. Seal of Certification with a hydrostatic work pressure of 150 PSIG (Meet U.L. 174.)

2. Vacuum Breaker.

3. Type 316L stainless steel water reservoir shell.

4. 2" thick, CFC-free, water blown polyurethane foam insulation.

5. Plastic outer jacket.

6. 90/10 cupronickel coil heat exchanger, 15 square feet surface area.

7. Quick-action adjustable immersion-type aquastat and indicator light.

C. Shall meet energy efficiency performance criteria set forth by HUD, ASRAE 90A, BOCA, DOE and all local codes.

2.14 MASTER THERMOSTATIC MIXING VALVE:

A. Furnish and install Symmons "Temp Control" series, as scheduled on the drawings, or approved equal, thermostatic controller with the following features:

1. Removable cartridge with strainer, stainless steel piston and liquid filled thermal motor and bellows mounted out of water.
2. Integral check stops.
3. N.P.T. female inlets.
4. N.P.T. female outlet.
5. Fail safe to greatly reduce flow on hot water and cold water supply failure.
6. Standard brass valve finish with rough chrome finish on operating handle and service stops.

2.15 PIPING, FITTINGS, VALVES & MISCELLANEOUS PLUMBING

A. Piping:

1. Hubless cast iron pipe and fittings conforming to FS WW-P-401; hub and spigot cast iron pipe conforming to ASTM A74.
2. Copper tubing shall be Type "L" rigid copper, ASTM standard specification B88.
3. Schedule 40 rigid PVC plastic pipe and fittings with solvent cement joints conforming ASTM D-2665.

B. Soil, Waste, and Vent Piping:

1. Underground pipe and fittings shall be service weight, coated cast iron with both lead and oakum or neoprene compression gaskets or PVC as listed below for non-buried pipe.
2. Piping not buried shall be Schedule 40 rigid PVC plastic pipe and fittings made up with solvent cement meeting ASTM D-2665, all vertical rise piping shall be no-hub cast iron pipe to meet code for high rise or furnish system that will meet code.

C. Domestic Water Piping:

1. All hot and cold water piping above finish floor (not buried) shall be hard-drawn type "L" copper tube with cast or wrought fittings and made up with non-lead bearing solder such as "Silver-Brite" or equivalent.
2. All buried hot and cold water piping shall be type "K" soft copper tubing and installed with silver solder joints.

    a. All hot and cold water piping installed below floor slab shall be insulated with 1/2" thick flexible unicellular insulation as manufactured by Armstrong or an approved equal. All flexible unicellular insulation shall be vapor sealed. Where underslab water piping penetrates above slab, or through foundation walls, flexible unicellular insulation shall extend at least 4" above or beyond concrete.

D. Fittings:

1. Copper Type "L" Pipe:

    a. Cast bronze solder joint pressure fittings (ANSI B 16.18).

    b. Wrought copper and bronze solder joint pressure fittings (ANSI B 16.22).

E. Valves shall be as manufactured by Nibco, Milwaukee, Watts, or approved equal.

F. Sleeves and Plates:

1. Pipes passing through masonry or concrete walls and floors shall be provided with sleeves of steel pipe.

2. Provide steel pipe sleeves or extra heavy cast iron soil pipe sleeves for piping passing through foundations, etc.

3. Pipes passing thorough partitions and ceiling other than the above shall be provided with minimum 24 gauge galvanized iron tubes with wired or hemmed edges.

4. Sleeves shall be of ample size to provide for renewal of piping and be securely fastened in floors, walls, etc.

5. Where exposed piping passes through walls, floors, partitions, cabinet work and ceilings, provide and set chrome-plated brass

floor and ceiling plates of approved design with depth to cover sleeve-projection through floor or wall. Ceiling plates are not required on insulated piping.

G. Hangers and Supports:

1. Piping suspended from overhead shall be supported by approved wrought or malleable iron hangers with adjustable solid mold steel rods except as noted.

2. Piping smaller than 6" size shall be supported by approved clevis type hangers.

3. Piping run on side walls or partitions shall be supported by malleable iron brackets, adjustable swivel rings and rod hangers.

4. Hangers and supports shall be as manufactured by Grinnell Co., Inc. or approved equal.

5. Pipe supports on copper tubing shall be all copper plated.

2.16 DRAINAGE SPECIALTIES

A. Traps: Traps of material and design as approved by the State of Maine Plumbing Code shall be furnished and installed at all fixtures and appliances. Trap each fixture separately, and vent each trap. Make off-sets in vent piping with 45 degree angle fittings when possible, pitch horizontal vents toward waste lines, group vents and take through roof as shown. All traps located in finished areas shall be chrome plated.

B. Cleanouts: Provide cleanouts for soil and waste piping where shown on the drawings and as required by code.

1. Floor Cleanouts:

a. All floor cleanouts in concrete or tile, in finished areas, shall be flush with finish floor, round adjustable tops, bronze plug and lead seal, nickel bronze top, flashing flange with flange device, inside caulk. Units shall be Smith Figure 4026 - F-C or equal by Josam, Zurn, Wade or MIFAB.

b. Floor cleanouts in mechanical areas and the parking garage shall be Smith Figures 4220 and 4231 respectively with heavy-duty cast iron tops.

2. Wall Cleanouts: All wall cleanouts shall be "tee" fittings with bronze slotted plug with lead seal, stainless steel cover; Smith

Figure 4531 or 4551 or equal by Josam, Zurn, Wade or MIFAB.

2.17 WATER SPECIALTIES

A. General: Furnish and install all hot water specialties as indicated and required for a complete installation. Specialties shall be as manufactured by Bell and Gossett, Sarco, Armstrong, Taco, or Dole.

B. Main Components and Features:

1. Drain Valves at all low points complete with hose end and caps.
2. Manual Vents with air chambers at other high points shall be Dole No. 10, or approved equal, with 1/8" IPS connection, key-operated. Furnish ten keys.

3. Shut-Off Valves and Balancing Fittings shall be provided at each unit heater. Shut-off valves shall be Watts ball valve, or approved equal. Balancing fitting shall be Sarco Type IBC or approved equal combination balancing fitting and tight shut-off valve. NOTE: Valves and balancers shall be located for easy access. Valves and fittings as manufactured by Sarco, Watts, Dunham-Bush, or Taco.

4. Shock Arresters: All domestic water piping shall be protected from water hammer or shock by P.D.I. approved shock-absorbing devices. Install where required according to P.D.I. Standard WH-201.

5. Expansion Compensators: Furnish and install where necessary to absorb expansion and contraction in copper lines, Flexonics model HB expansion compensators having two-ply phosphor bronze bellows, brass shrouds and end fittings.

6. Air Separators: Furnish and install air separators for the hot water system equal to Taco or Bell and Gossett of size as indicated on the drawings.

7. Hot Water Expansion: Provide and install on domestic water heaters supply side expansion tanks equal to Amtrol Therm-X-Trol Model "ST" Series with ASME certification. Sized according to manufacturer's recommendations.

8. Pressure Gauges: Trerice No. 890 Series 3-1/2" stainless steel case dial range 0-100 psi with 1 psi minor graduations gauge. Cocks Trerice Series No. 865 or No. 880.

9. Thermometers: Trerice industrial thermometer 9" adjustable angle brass stem A405 with socket and union hub. Temperature range 30 degrees F to 240 ° F.

10. Furnish and install in the Boiler Room where shown, a continuous pressure type backflow preventor the equal of Watts 9D.

2.18 SUMP PUMPS

A. Sump Pumps, General: Factory-assembled and -tested, single-stage, centrifugal, end-suction sump pump units complying with UL 778. Include motor, operating controls, and construction for permanent installation.

1. Discharge Pipe End Connections NPS 2 (DN50) and Smaller: Threaded. Pumps available only with flanged-end discharge pipe may be furnished with threaded companion flanges.

2. Motors: Single speed, with grease-lubricated ball bearings, and non-overloading through full range of pump performance curves.

3. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.

4. Manufacturer's Preparation for Shipping: Clean exposed, machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect pipe openings and nozzles with screwed-in plugs.

B. Submersible Sump Pumps: Submersible, direct-connected sump pump complying with HI 1.1-1.5 for submersible sump pumps.

1. Pump Arrangement: Simplex.

2. Casing: Type 304 stainless steel with stainless steel inlet strainer, legs that elevate pump to permit flow into impeller, and discharge suitable for threaded-end pipe connection arranged for vertical discharge.

3. Impeller: ASTM A 48, Class No. 25 A or higher, stainless steel or composite; statically and dynamically balanced, closed or semi open design, overhung, single suction, keyed to shaft, and secured by locking cap screw.

4. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.

5. Seals: Double mechanical seals.

6. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection; and three-conductor waterproof power cable

of length required, with grounding plug and cable-sealing assembly for connection at pump.

7. Pump Discharge Piping: Factory or field fabricated, ASTM A 53, Schedule 40, galvanized-steel pipe, bronze pipe, or copper tube.

8. Controls: NEMA 250, 120 VAC, mechanical float or micropressure switch integral with pump casing.

9. High Water Alarm: Discharge piping-mounted, NEMA 250, Type 6 enclosure with micropressure-switch alarm; matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell.

C. Elevator Sump System

1. General: Provide pump and control systems capable of pumping water while containing oil. The system shall function automatically and shall provide for an alarm in the event of (a) the presence of oil in the sump (b) high liquid in the sump or (c) high amps or a locked rotor condition. An alarm that sounds only in the event of a high liquid condition shall not be acceptable.

2. Pump: The pump system shall be Stancor "Oil-Minder" model No. SE-40 ELV submersible type, capable of pumping 30 GPM at 15' TDH . The pump shall be approved to UL 778 standards and shall include thermal and overload protection. The motor shall be rated 0.4 H.P., 1 phase, 115V and capable of operating continuously or intermittently. The motor housing shall be constructed of No. 304 stainless steel and mechanical seals shall be housed in a separate oil-filled compartment.

3. Control: The control shall be approved to UL 508 standards and housed in a gasketed Nema 4X enclosure with stainless steel hinged hardware and 8-pin twist-lock electrical receptacle. The control shall include dual "Oil-Minder Relays" with variable sensitivity settings, magnetic contactor with separate over-current relay, self-cleaning stainless steel sensor prove, high decibel warning horn with illuminated red light and alarm silencing switch, dual contact, a Nema 4X box with 8-pin twist-lock electrical receptacle and adequate length of mating cable shall be provided. All cables between the pump and junction box shall be 16' long and the cable and plug from the control unit shall be 8' long. The control unit, pump, floats and sensor probe shall be factory assembled as a complete, ready to use system and shall be tested and approved by a nationally recognized laboratory such as ENTELA.

4. Install as detailed on the drawings and per manufacturer's instructions and recommendations.

2.19 NATURAL GAS PIPING AND ACCESSORIES

A. General: Provide all piping and accessories for a complete system.

B. Main Components and Features: Piping to handle natural gas shall be complete, including the following:

1. Above Ground and Underground Piping shall be Type K, annealed, seamless copper tube complying with ASTM B88. Underground piping may be plastic rated for natural gas service and in accordance with Northern Utilities requirements. Aboveground piping may be schedule 40 carbon steel conforming to ASTM A106 with fittings of malleable iron type.

2. Fittings shall be copper, brass, or bronze with minimum 80 percent copper content where exposed to soil.

3. Valves 1/2" through 2" shall be conventional part, bronze or brass ball, screwed ends, bronze or brass body, teflon seat, lever handle, 400 lb. wog. ball valves.

2.20 PIPING, FITTINGS, VALVES & MISCELLANEOUS - HEATING

A. Piping:

1. Seamless scheduled 40 standard weight black steel, ASTM A-106 National Tube Co. or equal from Bethlehem, U.S. Steel Corp.

2. Copper tubing shall be Type "L" rigid copper, ASTM standard specification B88.

B. Fittings:

1. Schedule 40 Pipe:

a. Screwed: 125 lb. best grade cast iron screw pattern with clean-out threads. (150 lb. malleable iron, ASTM B-16.3.)

b. Flanged: 150 lb. forged steel, slip-on or welding neck, raised or flat face as applicable.

c. Welded: Butt-welded, wrought carbon steel, schedule not less than adjacent pipe.

d. Unions: Screwed through 2", 250 lb. S.W.P. malleable iron,

bronze to bronze (with brass to brass) seat, "Dart" or equal.

2. Copper Type "L" Pipe:

   a. Cast bronze solder joint pressure fittings (ANSI B 16.18).

   b. Wrought copper and bronze solder joint pressure fittings (ANSI B 16.22).

C. Valves shall be as manufactured by Nibco, Jenkins, Crane, Walworth, Fairbanks, or approved equal.

D. Sleeves and Plates:

1. Pipes passing through masonry or concrete walls and floors shall be provided with sleeves of steel pipe.

2. Provide steel pipe sleeves or extra heavy cast iron soil pipe sleeves for piping passing through foundations, etc.

3. Pipes passing thorough partitions and ceiling other than the above shall be provided with minimum 24 gauge galvanized iron tubes with wired or hemmed edges.

4. Sleeves shall be of ample size to provide for renewal of piping and be securely fastened in floors, walls, etc.

5. Where exposed piping passes through walls, floors, partitions, cabinet work and ceilings, provide and set chrome-plated brass floor and ceiling plates of approved design with depth to cover sleeve-projection through floor or wall. Ceiling plates are not required on insulated piping.

E. Hangers and Supports:

1. Piping suspended from overhead shall be supported by approved wrought or malleable iron hangers with adjustable solid mold steel rods except as noted.

2. Piping smaller than 6" size shall be supported by approved clevis type hangers.

3. Piping run on side walls or partitions shall be supported by malleable iron brackets, adjustable swivel rings and rod hangers.

4. Hangers and supports shall be as manufactured by Grinnell Co., Inc. or approved equal.

5. Pipe supports on copper tubing shall be all copper plated.

2.21 WATER SPECIALTIES - HEATING

A. General: Furnish and install all hot water specialties as indicated and required for a complete installation. Specialties shall be as manufactured by Bell and Gossett, Sarco, Armstrong, Taco, or Dole.

B. Main Components and Features:

1. Drain Valves at all low points complete with hose end and caps.

2. Manual Vents with air chambers at other high points shall be Dole No. 10, or approved equal, with 1/8" IPS connection, key-operated. Furnish ten keys.

3. Shut-Off Valves and Balancing Fittings shall be provided at each unit heater. Shut-off valves shall be Sarco series 37, or approved equal. Valves shall be lock-shield construction. Balancing fitting shall be Sarco Type IBC or approved equal combination balancing fitting and tight shut-off valve. NOTE: Valves and balancers shall be located for easy access. Valves and fittings as manufactured by Sarco, Dunham-Bush, or Taco.

4. Shock Arresters: All domestic water piping shall be protected from water hammer or shock by P.D.I. approved shock-absorbing devices. Install where required according to P.D.I. standard WH-201.

5. Expansion Compenstors: Furnish and install where necessary to absorb expansion and contraction in copper lines, Flexonics model HB expansion compensators having two-ply phosphor bronze bellows, brass shrouds and end fittings.

6. Air Separators: Furnish and install air separators for the hot water system equal to Taco or Bell and Gossett of size as indicated on the drawings.

PART 3: EXECUTION

3.01 PIPING - GENERAL

A. Provide and erect in a workmanlike manner, all piping shown and required to complete the installation intended. Erect piping to allow sufficient clearance for expansion, application of insulation and finish painting with offsets as required to avoid other work.

B. Sizes and general arrangement, as well as methods of connecting all piping, valves, equipment, etc., shall be as indicated, or so as to meet the requirements of the Architect/Engineer.

C. All pipe used is to be new material, and all threads on piping must be full length and clean-cut with inside edges reamed smooth to full inside bore.

D. In the erection of mains, special care must be used in the support, working into place without springing or forcing.

E. Make such offsets are shown and required to place the pipes and risers in proper position to avoid other work.

F. Pipes shall be anchored, guided, etc., where necessary, to prevent vibration or to control expansion.

G. Install a sufficient number of flanged fittings or unions to facilitate making possible future alterations or repairs. Unions shall be installed at all equipment, traps, fixtures and risers.

H. Piping shall be erected so as to provide for the easy passage and noiseless circulations of water, steam and condensation under all working conditions.

I. Provide 1/2" minimum size valved draw-offs with hose connection at all low points of the piping systems, apparatus, etc. Copper piping and fittings shall be installed with soldered joints using the following alloy - per ASTM standard B32.

1. 95-5 tin-antimony solder (200 degrees F at 200 psi).

2. All domestic water piping non-lead bearing solder equivalent to "Silver-Brite".

3.02 PIPING - INSTALLATION FOR WATER SYSTEM

A. General: Unless otherwise noted, grade supply mains, up in direction of flow, at a minimum uniform slope of 1" in 40', and return mains down in direction of flow, at a minimum uniform slope of 1" in 40'. Take branch lines off bottom of main, either vertically or at a 45 degree angle as space permits.

B. Piping: Copper piping shall be used for hot water heating system and domestic water system.

C. Air Vents: Furnish and install at all high points in piping systems and where indicated and required, manual air vent valves.

1. Manual air vents shall be key operated.

2. Install 6" high air chamber for each vent.

D. Valving: Furnish and install the following:

1. Drain valves at all low points complete with hose and caps.

2. Provide and install manual shut-off valve in supply and tight closing balancing valve in return of each finned pipe circuit and radiation element. Provide and install manual shut-off valves in new main branch lines where indicated.

3.03 PIPING - MISCELLANEOUS MATERIALS

A. Sleeves and Plates: All sleeves through all floors and through all masonry and all fire walls shall be caulked air tight with high temperature rope and sealed with lead rope (1/2" depth).

B. Hangers and Supports:

1. All hangers shall be supported from steel beams or steel angles installed between top chord or two bar joists. Provide steel angles are required. No attachments shall be made to the floor construction or the roof deck.

2. All anchors and guides from joist construction shall be supported from steel beams or angle iron and other steelwork provided and installed between three adjoining joists.

3. Support all horizontal piping of steel wrought iron and brass as per following schedule:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4" (Incl.)	3/8"	8'0"
1-1/2" and 2"	3/8"	10'0"
2-1/2" and 3"	1/2"	10'0"

4. Provide and set all required hangers, clamps, plates, beams, brackets, anchors, guides, expansion bolts, and ironwork required to support all piping and equipment.

3.04 PIPING AND DUCT - INSULATION

A. General:

1. Provide and install insulation for all surfaces of piping, equipment,

and specialties, as indicated and specified.

2. Systems shall be tested and proven tight, and surfaces painted where required before application of insulation.

3. Insulation on all piping systems shall include all valves, fittings, flanges and appurtenances to match the piping insulation jacket, vapor barrier, and finish. Prefabricated "Zeston" or equal fittings will be acceptable.

4. All insulation shall have noncombustible vapor barrier jacket applied in accordance with manufacturer's instructions. Seams shall be concealed where possible. Provide 6" high 20 gauge aluminum protector sleeves on all insulation passing through floor on exposed piping.

5. Labels and trademarks shall be removed.

6. Insulation shall be neatly finished at pipe hangers, pipe anchors, and pipe covering protection saddles as specified for fittings and valves.

7. Materials shall be as manufactured by Johns-Manville, Carey, Armstrong, Owens-Corning or Gustin-Bacon.

B. Piping Systems:

1. The entire new hot water heating piping portion including all supply and return shall be completely insulated.

2. All domestic hot water, cold water piping and recirculating hot water shall be completely insulated. Vapor seal all insulation on cold water piping.

3. All piping shall be insulated as follows:

a. Generally, piping shall have calcium silicate with ASJ jacket or 7 lb. minimum density glass fiber. Fiberglass 25 with ASJ jacket

b. All insulation shall have a flame-spread rating of 25 or less and a smoke developed rating of 50 or less as tested by the ASTM E84 method.

c. Minimum pipe insulation size:

Domestic Pipe	Heating Supply and Return	Hot	Cold

1" and less	1"	1"	1"
1-1/4" to 2"	1-1/2"	1"	1"
2-1/2" to 4	1-1/2"	1-1/2"	1"

4. Insulation shall not be applied to the following:

   a. Screwed unions.
   b. Valve hand wheels.

   c. Vents to atmosphere, discharges from safety and relief valves.

   d. Plumbing fixture supplies (accept as noted in fixture specifications).

C. Duct System: All supply heated air ductwork shall be insulated with 1-1/2" duct wrap fiberglass with appropriate jacket equal to ASJ.

3.05 SHEET METALWORK AND MATERIALS

A. General: Furnish and install all required sheet metalwork, including: manual dampers, turning vanes, manual operators, collars, sleeves, baffles, access doors, flexible connections, supports, etc., for the complete installation in accordance with the intent of the drawings and specifications.

1. Furnish and install all ductwork connected to units, wall caps, and other equipment furnished under these specifications.

2. Toilet venting shall conform to Maine Plumbing Code.

3. Exhaust and supply air ductwork.

B. Installation: Fabricate and install in accordance with applicable requirements of the ASHRAE Guide and SMACNA Manual. Ductwork shall conform to 2" SMACNA Pressure Class except where SMACNA requirements are exceeded by these specifications. Ductwork shall be neat, accurate, rigidly constructed and mechanically tight, as well as substantially airtight and shall provide quiet system of air transportation. Offsets of exposed ductwork shall be made on sides opposite to walls and ceilings, unless otherwise shown on the drawings or specified. Sizes, as marked on the drawings, shall be adhered to as closely as possible. The right is reserved to vary the size of ducts and flues to accommodate structural conditions during the progress of the work, without additional cost to the Owner.

C. Materials: Ductwork shall be of galvanized sheet metal or aluminum where

indicated. Galvanized sheet metal shall be new copper bearing (or prime grade) galvanized steel sheets of lock-forming quality. Zinc coating that will flake or peel under any forming operation, or laminated sheets will not be allowed.

1. Thickness of metal for rectangular ducts, including elbows and other details, shall be as follows:

Longest Rectangular Dimension of Duct Inches	Thickness of Galvanized Steel USS Gauge	Thickness of Aluminum Alloy Inches
Up thru 12	26	.032
13 thru 36	24	.040

2. Thickness of metal for round ducts, including elbows and other details, shall be as follows:

Duct Diameter Inches	Galvanized Steel USS Gauge	Aluminum Inches
Up thru 10	26	.040

D. Construction: Seams, joints, bracing angles and stiffeners.

1. Longitudinal Seams: Longitudinal joints in ducts not exceeding 60" in either dimension, and ducts exceeding 60" in the larger dimension but not exceed 18" in the smaller dimension, shall be either Pittsburgh lockseams or grooved seams.

2. Round Ducts: The downstream end of each section of round duct shall be crimped and beaded. Assembly shall be made by inserting the crimped end into the upstream end of the adjoining section. The joints shall be fastened in place by three or more sheet metal screws spaced not over eight inches apart.

3. Transverse Joints and Bracing Angles of Rectangular Duct shall be as follows:

Duct Size Long Side Inches	Minimum Rigidity	Transverse Class Joints	Bracing Angles Size - Inches	Flat Bar
18 or less	A	Plain, "S" or Drive Slip	None	----

19 thru 36	B	Standing Drive	3/4 x 3/4 x 1/8	1-1/2 x 1/8	
		Slip Reinforced Drive			
		Slip Reinforced			
		Hemmed "S" Slip			

Alternative joint/reinforcement methods may be used, subject to approval by the Engineer, provided that the rigidity classification is met.

Lock type as described in SMACNA Low Velocity Duct Manual.

a. Transverse Joints: Drive slips shall be used on short sides of transverse duct joints if side is less than 18". Metal and thickness of S slips and drive slips shall be same as duct. Ends of drive slips shall be bent over at least 1/2" at corners. Bar slips shall be fastened with sheet metal screws on 12" centers. Corners of all bar slip joints shall be folded over and riveted. Where intermediate type reinforcements are used as supplements for joints, they shall be attached to duct wall within 3" of the joint.

b. Stiffeners: All ducts over 18" wide shall be provided with stiffeners which may be either transverse joints or angle bracing, as indicated above. The center-to-center spacing of stiffeners shall not be over four feet for ducts not exceeding 60" (long side) and shall not be over two feet for ducts not exceeding eight feet in any case. Flat area of uninsulated ducts over 18" wide shall be stiffened by cross-breaking. Uninsulated exposed ducts shall have flat bar reinforcement and flush seams in lieu of bracing angles and projecting seams.

c. Bracing Angles shall be of the same metal as the duct. Angles shall be riveted to the ducts on 6" centers, and shall be applied on all four sides. On vertical ducts, set of bracing angles shall be located with heel down at the floor line wherever duct passes through floor. End of two opposite angles shall extend as required to catch floor construction.

E. Duct Turns: Long radius elbows shall be provided, except as indicated hereinafter:

1. Long Radius Elbows shall be constructed with a throat radius equal to not less than the dimension to the duct width in the plane of the

duct turn. Where space does not permit the use of a long radius elbow, vaned mitered elbows shall be provided.

2. Mitered Elbows: All mitered elbows shall be constructed with factory-fabricated, turning vanes equal to Barber-Colman "Ducturns".

F. Flexible Connections: Furnish and install flexible connections between all fans and ducts or casings where required to prevent excessive movement of long ducts and wherever ducts cross building expansion joints. Material shall be fabricated with sewed seams. Connections shall be approximately 4" long and installed with sufficient slack to prevent transmission of vibration.

G. Duct Hangers:

1. Ducts up to and including 36" in width shall be hung by 1" x 1/8" flat straps bent under bottom of duct a minimum of 2" and securely fastened to duct.

2. Ducts larger than 36" in width shall be hung using 3/8" steel rods and 2" x 2" x 1/4" angle trapeze hanger. Rods shall be supported by 2-1/2" x 2-1/2" x 1/4" minimum steel angles secured to two or more joists.

H. Joint Sealants:

1. Low Pressure Ductwork: Seal joints in accordance with SMACNA Low Pressure Duct Construction Standards, Seal Class B.

a. Sealant: Resistant to gasoline, oil and water. Thermal range from minus 25 ° F to plus 200 degrees F, flame spread rating of not more than 25 and smoke developed rating of not more than 50, withstand duct air pressure 25 percent in excess of leakage test pressure. Supplier of sealant shall certify that sealant has been successfully marketed and used for a period of three (3) years without change in formula.

b. Tape: In conformance with Fed. Std. 147, polyethylene coated cloth backing with rubber resin adhesive, four inches wide, not less than 0.0125 inches thick, withstand minimum temperature of 180 degrees F, tensile strength not less than 35 pounds per inch width and water vapor transmission rate not over 1.2 grains per 100 square inches per 24 hours.

3.06 AUTOMATIC PARKING GARAGE EXHAUST FAN CONTROL SYSTEM

A. Description: The Carbon Monoxide Detection and Exhaust Fan Control

System shall use carbon monoxide (CO) to voltage transducers that measure the level of CO and transmit this information to the exhaust fan control panel.

B. Main Components and Features: System shall be complete, including the following:

1. CO Sensors: Provide CO transducers equal to Macurco Model SS102HC-1.

2. Control Panel: Provide automatic fan control panel equal to Macurco Model SS103. Panel shall provide three levels of fan and alarm control relays.

3.07 CONTROLS

A. DESCRIPTION

1. General: The control system shall be direct digital control (D.D.C.) with equipment furnished, installed and guaranteed by Honeywell, Maine Controls, or approved equal. Based on Lon Works Technologies open system building automation and BAC NET standard Network.

2. The Temperature Control Contractor shall provide and install a complete system of micro processor based direct digital automatic temperature control as herein specified, including all required micro processors, controllers, monitoring, I/O devices, software, sensors, transducers, wiring, thermostats, valves, relays, switches, etc. as indicated and required.
   a. Work includes, but is not limited to, the following:

   b. Thermostats and Sensors

   c. Control Valves

   d. Digital Control Cabinets (DDC)

3. Wiring of Control Devices

   a. Control Devices

   b. Sequence of Operation

B. QUALITY ASSURANCE

1. SPECIFICATION COMPLIANCE REVIEW

a. The temperature control system/BAS contractor shall supply, at the time of bid opening, a paragraph by paragraph specification compliance report. The report shall indicate for each numbered paragraph, how the contractor meets the criteria of the paragraph. The following format must be utilized in completing the compliance report:

Comply - without exception.

Qualify - meet the functional intent. For each paragraph, the contractor shall identify all differences in specific functions stated in the given paragraph and provide a description of what is excluded or how the qualifying system will meet the function specified.

Does not comply – cannot meet specified function

b. The control systems shall be installed under the direct supervision of the control manufacturer. The manufacturer shall provide instruction and direct work in progress and shall assume complete responsibility for the final installation. The control manufacturer shall perform all tests and make the necessary adjustments, and provide free service of the installation for one year from the date of acceptance by the Owner.

C. SUBMITTALS

1. Manufacturer's Literature and Data:
   a. All control items, I/O devices, D.C.C., P.C.I., valves, dampers, transformers, etc., associated with the systems.

   b. Complete control drawings showing all wiring, controls and written sequence of operation.

   c. General application and specific application programs.

2. Manuals: All maintenance and operating equipment associated with controls.

D. DIGITAL CONTROLLERS (D.C.C.)

1. Main Components and Features:

   a. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system. The FMCS requires the incorporation of LonWorks

Technologies using Free Topology Transceivers (FTT-10), and specific conformance to the LONMARK Interoperability Association's v3.0 Physical and logical Layer guidelines in all unitary, terminal unit and other devices.

b. LonTalk communications protocol will be used on the communication network between FMCS controllers and other LonWorks devices to assure interoperability between all devices within the network.

c. The FMCS shall support the direct integration of standard and non-standard communicating systems. At a minimum, the FMCS shall deliver connectivity at the Lon, IP, and HMI levels through standard offerings. The FMCS shall offer as a standard available solution, a minimum of 300 individual communicating interfaces to 3rd party products.

d. The FMCS shall provide a standard available test kit for development of additional interfaces by others, in addition to the FMCS manufacturer.

e. The FMCS shall provide compliance with the ASHRAE standard 135-P for BACnet interoperability with all devices within the FMCS.

E. DDC Sensor (for all DDC controllers)

1. The DDC Sensor shall connect directly to the DDC Controller and shall not utilize any of the I/O points of the controller. The DDC Sensor shall provide a two-wire connection to the controller that is polarity and wire type insensitive. The DDC Sensor shall provide a communications jack for connection to the LON communication trunk to which the DDC controller is connected. The DDC Sensor, the connected controller, and all other devices on the LON bus shall be accessible by the Graphical Programming tool.

a. The DDC Sensor shall be supplied in the following variations; Type 1) Tamper-resistant (no display); Type 4) Full user functions (LCD display and network-variable access and tenant override)

2. The DDC Sensor shall be provided in a modular configuration that allows for the rough in of all wiring without the presence of the electronics or aesthetic covering. The DDC Sensor shall allow for the customization of the color on the aesthetic covering as a standard offering. User interface with the DDC Sensor shall be

provided as a configurable function by the FMCS, and shall offer password protection for access to network variable editing. Multiple network variables shall be accessible and editable by the DDC Sensor. Icons shall be utilized to represent sensor and controller function status, affording independence from a single language for use interface.

F. HOST COMPUTER HARDWARE (PERSONAL COMPUTER INTERFACE)

1. The personal computer interface (PCI) shall be provided to the Owner capable of handling functions and expansion in the future.

2. The Control installer shall provide all software functions and hardware for complete network system. Provide all software including windows based package with mouse driven for all data logging board for customizing. Provide interactive graphic screens for Owner interface and control settings.

G. NETWORK LINK AND MODEM

1. Networking: provide networking hardware and software to tie P.C.I. into owner's network.

H. AUTOMATIC CONTROL VALVES

1. Automatic control valves shall be furnished as follows:

a. Valves shall have removable composition discs and with monel stem. Bodies 2" or smaller shall be bronze with screwed ends. Bodies 2-1/2" and larger shall be cast iron with flanged ends. If mechanical contractor chooses grooved piping system, grooved valve ends will be acceptable. Valve bodies, trim and stuffing boxes shall be designed for not less than 125 psi working pressure. Valve packing shall be non-lubricated teflon packing.

b. Shall be two position as herein before described under operators.

c. Water valves shall be sized for approximately 2 psi drop.

I. ROOM ELEMENTS

1. Sensors shall be securely attached to a suitable base mounted on the wall or other building surface. Each sensor shall be located where shown or, if not shown, where it will respond to the average

temperature in the room. Sensors generally shall be mounted 5 feet above floor and shall not be mounted on outside walls or partitions between offices if other locations are possible. If located on outside wall, it shall have an insulated base.

2. Apartment units shall be Type 4, in public areas Type 1, with Type 4 in maintenance office and mechanical room.

J. A.C. DRIVE CONTROLLERS: Furnish and install adjustable frequency A.C. motor controllers for all pumps that are scheduled equal to Toshiba, Square "D", Danfoss Graham, or approved equal.

1. All motors of 3/4 HP or above are, 208 volt, three phase. Coordinate with unit manufacturer to correctly match with furnished motor.

2. Provide NEMA 1 encloser. Provide on all units speed meters in percentage.

3. Units shall interface with network direct through network card and software.

K. WIRING

1. Under this section provide and install all wiring associated with the temperature control system. Equipment and wiring not provided under electric sections shall be furnished and mounted under this section.

   a. Low voltage control wiring (24V) shall be Type THHN stranded No. 16 or multiconductor No. 18 or better.
   b. Communication wiring shall be Lon compliant Category 4 or 5 twisted unshielded pair or per control manufacturer requirement.

   c. Line voltage wiring (120V or higher) shall be No. 12 minimum.

   d. All wiring shall be in accordance to Division 16 - Electrical.

   e. Exposed wire in mechanical rooms shall be in conduit. Concealed wire shall be plenum grade, run together and supported every 4 feet. All wiring shall be run at right angles to the building.

L. DESCRIPTION OF OPERATION

1. Hot Water Pump VFD: Variable Speed Pump

a. The hot water heating system consists of water distribution pumps. The system will be DDC controlled.

b. Water Pump Control: When the system is on set at 75° O.A. adjustable through DDC System.

c. Pump Control: Provide alarm on failure of any pumps.

2. Radiation (Fin Tube Radiation): Apartment units shall have "ACV" with room wall mounted control.

a. "ACV" Radiation: The radiation is controlled by an application specific DDC controller utilizing electric actuation. The space served by the radiation is controlled in Occupied and Unoccupied modes as follows:

1) Occupied: The controller monitors the room temperature sensor and modulates the heating valve to maintain the space temperature at set point.

2) Unoccupied: When heating is required, the control valve is controlled using the Unoccupied space temperature set point. The controller may reset to the Occupied mode for a predetermined time period upon a signal from the control system or manually at the room sensor.

3. ROOF TOP UNITS CONSTANT VOLUME WITH GAS HEAT

a. The air handling unit consists of 100% outdoor air, air damper, filter, gas heating section, and supply fan. The unit is DDC controlled using electric actuation.

b. The air-handling unit is scheduled for automatic operation on a time of day basis for Occupied and off during Unoccupied modes.

The air handling unit operates on a discharge air controller during occupied for outside air and below 65° outside for Heating and Safety modes as follows (All suggested set points and settings are adjustable.):

1) Occupied: The fans start and the unit is controlled as follows:

When the outside air dry bulb temperature is below

65°, the heating section, modulates the gas heating section to maintain the supply air temperature set point with a low limit of 65° F at the mixed air sensor.

The heating section control varies based upon outdoor air temperature. Below an outside air temperature of 45 degrees F, the heating modulates to maintain the supply air temperature set point of 70°. Above an outside air temperature of 45 degrees F (7 degrees C), the heating section modulates to maintain the supply air temperature at 65° set point.

2) Unoccupied (Normal Off): The supply fan is off, damper closes to the outdoor air.

3) Safety: Smoke detector in the supply air streams de-energize the supply fan upon activation. A low temperature detector in the mixed air stream de-energizes the supply fan when temperatures below 38 degrees F (3 degrees C) are sensed. All dampers and valves position to their normal position after the fan is de-energized.

Current switches to be installed in supply fan starter. The DDC system uses the switches to confirm the fans are in the desired state (i.e. on or off) and generates an alarm if status deviates from DDC start/stop control and the system goes to Normal Off mode.

4. Garage Ventilation: The CO sensors and control system for parking garage exhaust fan control to be furnished under temperature control section of mechanical. Fan to start on rise of CO and off when area CO drops below set point.

5. Basic and Optimizing Functions: Provide all software on Owner's computer and field programming needed to operate with the following features:

a. Control of pumps and temperature (time and temperature to be coordinated with Owner). Provide statics of all pumps operation.

b. Individual room adjusting of temperature with low and high limits along with alarm and recording.

c. Design of software to provide Owner specific functions including:

1) Provide graphic interactive system for system input and operating perimeters with adjustable set points.

M. Guarantee: The entire system shall be complete in every respect and guaranteed by the Contractor against original defects in workmanship or materials for a period of one year from date of final certificate, to control all valves so as to maintain temperature within one degree above or below any desired point. The Contractor shall maintain the equipment in perfect working order for the guarantee period without additional charge.

N. Instruction and Adjustment: On completion of the job, the Contractor shall completely adjust, ready for use, all sensors, valves, and relays provided under his contract. The Contractor shall provide a complete instruction manual covering the function and operation of all control components on the job and a schematic control diagram. This manual shall be furnished to the Owner's operating personnel, and a competent technician shall be provided for instruction purposes for two (2) days minimum.

O. Testing: A minimum of two technicians for at least two (2) days minimum for testing procedures. Prior to the final inspection, perform required tests and submit the reports and records along with final readings with technicians signed certification of compliance. The following shall be done as a minimum:

1. Verify every point in the system and record findings with one technician at a D.C.C. panel to operate a point command and the other to observe the point and insure function has been carried out.

2. Confirm and record all temperatures being correctly read within acceptable tolerance.

3.08 INSTALLATION OF GAS SYSTEM

A. General: Install gas systems complete according to these specifications and drawings.

B. Piping and Equipment:

1. General:

a. Install all piping promptly, capping or plugging all open ends and making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.

b. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions. Promptly remove all defective material from the job site.

c. All risers and offsets shall be substantially supported.

d. The entire installation should conform to applicable NFPA requirements and local and state codes.

e. All gas copper piping both above and underground shall be enclosed in PVC tubing.

f. Connect natural gas system to downstream side of gas meter furnished by the gas utility.

2. Joints and Connections:

a. Smoothly ream all cut pipe.

b. Pipe joints shall either be made with approved gas tubing fittings or be brazed with a material having a melting point in excess of 1000 degrees F. Brazing alloys shall not contain phosphorus.

c. All valve connections for steel piping systems shall be of the treaded type.

C. Closing in Uninspected Work:

1. General: Do not cover up or enclose work until it has been properly and completely inspected and approved.

2. Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completed inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

3. Underground Piping: Buried piping shall be marked with warning tape in the trench during back filling.

D. Pressure Testing and Inspection:

1. General:

a. Prior to acceptance and initial operation, all piping

installations shall be inspected and tested to determine that the materials, design, fabrication and installation practices comply with code requirements.

b. Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly or pressure tests as appropriate.

c. In the event repairs or additions are made following the pressure test, the affected piping shall be retested, except that in the case of minor repairs or additions retest may be omitted, when precautionary measures are taken to assure sound construction.

d. Because it is sometimes necessary to divide a piping system into test sections and install test heads and other necessary appurtenances for testing, it is not required that the tie-in sections of pipe be pressure tested. Tie-in connections, however, shall be tested with soap solution after gas has been introduced and the pressure has been increased sufficiently to give some indications should leaks exist.

e. The test procedure used shall be capable of disclosing all leaks in the section being tested and shall be selected after giving due consideration to the volumetric content of the section and to its location.

f. A piping system may be tested as a complete unit or in sections as the construction progresses. Under no circumstances shall a valve in a line be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, unless two valves are installed in series with a valved "telltale" located between these valves. A valve shall not be subject to the test pressure unless it can be determined that the valve, including the valve closing mechanism, is designed to safely withstand the test pressure.

g. Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed may be tested with inert gas at the time of fabrication.

h. The piping system, after isolation, shall hold the test pressure, of not less than 1-1/2 times the proposed maximum working pressure, but not less than 3 psig, for at least eight hours between times of first and last reading of pressure and temperature.

2. Test Medium: The test medium shall be air or inert gas (e.g., nitrogen, carbon dioxide). OXYGEN SHALL NEVER BE USED.

3. Test Preparation:

   a. Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test.

   b. Equipment which is not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test need not be tested.

   c. When the piping system is connected to equipment or components designed for operating pressures of less than the test pressure, such equipment shall be isolated from the piping system by disconnecting them and capping the outlet(s).

   d. When the piping system is connected to equipment or components designed for operating pressures equal to or greater than the test pressures, such equipment shall be isolated from the piping system by closing their individual manual shutoff valve(s).

   e. All testing of piping systems shall be done with due regard or the safety of employees and the public during the test. Bulkheads, anchorage and bracing suitably designed to resist test pressures shall be installed if necessary. Prior to testing, the interior of the pipe shall be cleared of all foreign material.

4. Test Pressure Measurement:

   a. Pressure shall be measured with a manometer or an equivalent device so calibrated as to read in increments of not greater than one-tenth pound. The source of pressure shall be isolated before the pressure tests are made.

5. Detection of Leaks and Defects:

   a. The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction of test pressures as indicated by pressure

gages shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

b. The leakage shall be located by means of an approved combustible gas detector, soap and water, or an equivalent nonflammable solution, as applicable. Matches, candles, open flames, or other methods which could provide a source of ignition shall not be used. Caution: Since some leak test solutions, including soap and water, may cause corrosion or stress cracking, the piping shall be rinsed with water after testing, unless it has been determined the leak test solution is noncorrosive. When leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

6. Test Records: Records shall be made of inspection and all tests performed. These records shall indicate which portions of the piping system conform to this code or were pressure tested.

7. Leakage Check After Gas Turn On:

a. Before Turning Gas On: Before gas is turned into a system of new gas piping, or back into an existing system after being shut off, the entire system shall be checked to determine that there are no open fittings or ends and that all valves at outlets and equipment are closed.

b. Check for Leakage: Immediately after turning on the gas, the piping system shall be checked to ascertain that no gas is escaping. If leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

c. Placing Equipment in Operation: Gas utilization equipment may be placed in operation after the piping system has been tested and determined to be free of leakage and lines purged.

8. System Purging: After system has been pressure tested and before system operation, purge line in accordance with ANSI B31.2.

E. Cleaning: Prior to acceptance of the buildings, thoroughly clean all exposed portions of the installation removing all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the item being careful to avoid all damage to finished surfaces.

3.09 BOILER INSTALLATION

A. Wiring shall be under this section from existing panel breaker to all motors and controls.

1. Wiring shall be type THW copper insulated conductors in EMT, except wiring close to and over boiler and flue shall have high temperature insulated wire, spaced a minimum of 2" from boiler. Minimum size wire shall be No. 12.

2. All wiring shall be in accordance with requirements of Division 16 - Electrical and National Electric Code.

3. Wiring shall include master emergency switch wired to stop boilers.

B. Piping: Provide all required connections, valves, etc. See other sections of this division and the drawings.

1. Pipe safety relief valve discharge to drain.

C. Boilers shall set on 4" concrete pads with vented roles, per manufacturer requirements.

D. Start-Up: The burner shall be started up and adjusted by the manufacturer's representative at the time of supplying temporary heat and at the completion of the work.

E. Instruction: The manufacturer's representative shall provide the instructions to the Owner's representative as to the proper care and operation.

F. Guarantee: Contractor shall guarantee the entire installation for a period of one year from the date of final certificate of payment and maintain apparatus in satisfactory operating condition for the period of guarantee without additional cost to the Owner.

3.10 INSTALLATION OF MANUFACTURED STACKS

A. General: Install stack complete, including all accessories per Code and manufacturer's recommendations for a complete installation.

B. Main Components and Features: Provide breeching and stacks with cleanouts for the following equipment:

1. Natural Gas Fired Hot Water Boilers.

3.11 INSTALLATION OF COMBUSTION AIR INTAKE AND EXHAUST FOR GAS BOILERS

A. General: Install vents complete, including all accessories per Code and manufacturer's recommendations for a complete installation.

3.12 GAS SYSTEM INSTALLATION FOR BOILER AND ROOF TOP H.V. UNITS

A. General: Install gas piping for boiler and air handlers complete according to the specifications and the drawings.

B. Piping: Completely install all necessary piping to burner, etc. Piping shall be Schedule 40, standard weight black steel wrought pipe with malleable fittings and joints made with approved joint compound.

1. Provide all vents to outside on all reliefs, regulators, etc.

3.13 HVAC Unit:

A. Install units level and plumb, maintaining manufacturer's recommended clearances.

B. Curb Support: Install roof curb on roof structure, level, according to NRCA's written installation instructions. Install and secure rooftop units on curbs and coordinate roof penetrations and flashing with roof construction. Locate curb for proper discharge of exhaust fans.

C. Unit Support: Install unit on structural curbs and level. Coordinate wall penetrations and flashing with wall construction.

D. Install piping to allow service and maintenance.

E. Gas Piping: Conform to applicable requirements of Division 15 Section "Natural Gas Piping." Connect gas piping to burner, full size of gas train inlet, and provide union with sufficient clearance for burner removal and service.

F. Install ducts to termination in roof mounting frames. Where indicated, terminate supply-air duct through roof structure and insulate space between roof and bottom of unit.

G. Electrical: conform to applicable requirements in Division 16 Sections.

H. Ground Equipment: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.14 JOB CLOSING

A. Operating and Performance Tests:

1. Prior to the final inspection perform required tests and submit the test reports and records.

B. Testing and Adjusting:

1. Testing Piping Systems: All piping shall be tested periodically during the progress of the work. The Contractor shall provide necessary labor, test pump, gauges, meters, other instruments and materials. All tests shall be made in the presence of the Engineer. No joint or section of piping shall be left untested.

a. Before testing piping systems, remove or otherwise protect from damage, control devices, air vents, other parts which are not designed to stand test pressures.

b. Hydrostatic Pressure: Test hydrostatically, piping to one and one-half times the maximum working pressure, but in no case to less than 75 psig for at least four (4) consecutive hours, during which time pressure shall remain constant without pumping. Subject welded joints to hammer test while under hydrostatic pressure.

c. Domestic water piping shall be tested in accordance with the State of Maine Internal Plumbing Rules, Chapter 11, Article H.

d. Sanitary piping shall be tested in accordance with State of Maine Internal Plumbing Rules, Chapter 4, Article P.

e. Do not paint, cover or conceal piping, including swing joints and the like, before testing and obtaining approval.

C. Sterilization of Pipes

1. General:

a. After preliminary purging of the system, chlorinate the entire new potable water system in accordance with the current recommendations of the American Water Works Association and in accordance with all pertinent codes and regulations.

b. Chlorinate only when the building is unoccupied.

2. Flushing:

a. Upon completion of the sterilization, thoroughly flush the entire potable water system.

b. When sterilization and flushing are complete, a sample shall be collected from the end of the longest main, or at any other location selected by the Architect/Engineer, and a water analysis test provided. The test must prove the water acceptable or additional disinfecting of system performed. A copy of the test report shall be submitted to the Architect/Engineer.

D. Air System:

1. All controls should be checked out by the Control Contractor and be operating correctly prior to start-up of the system. Final set points and adjustments may be made during or after the balancing. All lubrication, electrical connections, air filters, etc., necessary for proper operation of the system shall be completed prior to start-up of the system.

2. Upon start-up of a system, check fan for the following and record readings as indicated.
   a. Check fan drives for rotation and slippage and record fan rpm.

   b. Measure and record voltage and actual amperage draw on each phase leg. Determine that motor is not overloaded.

   c. Take all necessary airflow or pressure measurements to determine air quantities in ducts and outlets. Make all adjustments necessary to proportion the airflow correctly. Make final adjustments to fan drives to establish correct total airflow.
   d. Take final readings and record the following data:

      1) Fan rpm, voltage, amperage draw on each phase leg, and calculated BHP all fans, outlets, etc.

   e. Submit for approval all initial and final readings as specified. Compare measured readings to design quantities and note deviation.

E. Hot Water Heating System:

1. Balancing: Upon start-up of a system, check pump rotation and measure and record rpm, voltage and amperage on each phase leg and verify motor is not overloaded. Make all adjustments to balancing valves necessary to obtain correct system water flow rate.

Take final readings and record the following:

a. Pump rpm, amperage draw on each phase leg, voltage and suction and discharge pressures.

b. Pressure at high point in each system.

c. Submit for approval all initial and final readings as specified. Compare measured readings to design quantities and note deviation.

d. Record and submit installed heater sizes, rate heater ampacities, and motor service factors for all motors.

F. Cleaning:

1. After satisfactory completion of pressure tests, before permanently connecting equipment, strainers, and the like, clean equipment thoroughly, blow and flush piping for a sufficient length of time as directed, so that interiors will be free of foreign matter.

2. Fill, vent and circulate the system with approved solution in accordance with boiler manufacturer's recommendations, allowing it to reach design or operating temperatures. After circulating a few hours, the system should be drained completely.

3. The entire system installations including apparatus, motors, etc., shall be left in first-class condition including cleaning, oiling and packing.

G. Instruction and Charts: After completion of the installation work called for in this specification, the Contractor and his Subcontractors shall furnish necessary mechanics or engineers for the adjustment and operation of the systems, to the end that the systems may be perfectly adjusted and turned over to the Owner in perfect working order. The Contractor shall further instruct the Owner's authorized representative in the care and operation of the installation, providing all required framed instruction charts, directions, etc.

H. Painting:

1. All exposed ironwork, including steel supports, hangers, etc., shall be painted two (2) coats of machine gray or equal.

2. Painting specifically noted on equipment.

J. Nameplates: Furnish and install DYMO, or approved equal, embossed

vinyl-plastic nameplates, with white letters on black background to identify equipment, controls, etc., furnished under this section of the specifications.

END OF SECTION

SECTION 16000

BASIC ELECTRICAL REQUIREMENTS

PART 1: GENERAL

1.01 WORK INCLUDED

A. In general, the work consists of connecting new equipment associated with the construction of new apartments including power, lighting, and heating system, all as indicated on the drawings and specifications, including the following:

1. Furnish and install wiring and connections for new lighting fixtures, receptacles, panelboards, signaling, etc.

2. Provide a new sub-service panel to each apartment unit and main service entrance.

3. Furnish all labor, materials, equipment, suppliers and perform all operations necessary to complete the secondary grounding work in accordance with drawings and these specifications.

4. Furnish and install addressable fire alarm system for complete coverage of all areas including interface with city, detection and signal devices for individual apartment units. Installation shall comply with NFPA 72 and 72E. "See Section 16721 -- Fire Alarm Systems"

5. Furnish and install a complete and operable communication and signaling system for each apartment unit as shown on the drawings.

B. Unless specifically noted otherwise, all items noted to be furnished, provided, or installed shall be both provided and installed.

1.02 QUALITY ASSURANCE

A. All wiring shall be in accordance with the latest issue of the National Electrical Code.

B. The service equipment shall be the grounding point for the conduit, boxes, fittings and metal enclosed equipment used in the building wiring system. Any grounding methods allowed under Article 250 of the National Electrical Code may be used, provided the ground resistance is less than 25 ohms. This resistance shall be tested.

C. The contractor shall show evidence of having successfully completed at least five similar projects. Installation of each system shall be under the supervision of a factory-authorized organization.

D. The Contractor shall show evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The Contractor must have a service contract program for the maintenance of the system after the guarantee period.

E. All electrical equipment shall be approved by the Underwriters' Laboratories, Inc. Each system shall be products of a single manufacturer of established reputation and experience. The Contractor shall be have supplied similar apparatus to comparable installations rendering satisfactory service for at least three years.

F. The Contractor shall guarantee all equipment and wiring free from inherent mechanical or electrical defects for one year from date of acceptance.

G. For each system the manufacturer shall furnish "gratis" to the Owner, a one year contract effective from the date of installation, for maintenance and inspection services of the manufacturer's equipment with a minimum of two inspections during the contract year.

H. Furnish the services of a competent instructor for not less than one four hour period for instructing personnel in the operation and maintenance of the communication and signaling systems, on the dates requested by the Owner.

1.03 SYSTEM DESCRIPTION

A. The utility providing service is C.M.P. 208 volt 3 phase four wire.

B. Provide a 120/208-volt, 1 phase, 3 wire sub-panel to each apartment.

1.04 SUBMITTALS

A. Submit six (6) copies of manufacturer's literature.

B. Certification: Prior to final inspection, deliver to the Owner's representative four (4) copies of the certification that the material is in accordance with the drawings and specifications and has been properly installed.

C. In accordance with Section 01340 – Shop Drawings, Product Data and Samples furnish the following:

1. Submit shop drawings which include engineering drawings of the system with specification sheets covering all component parts of the system and interconnection diagrams.

2. Manuals: Submit six (6) complete sets of operating instructions, including operating and maintenance manuals, circuit diagrams, and other information of system components.

D. Certification: Submit certification of system operating test.

1.05 PROJECT CONDITIONS

A. Regulatory Requirements: Secure and pay for all permits and certificates as required by local and state laws.

1.06 WARRANTY

A. The Contractor shall guarantee all equipment and wiring free from inherent mechanical or electrical defects for one year from date of acceptance.

1.07 RELATED WORK

A. Division 15 – Mechanical

B. Division 13 – Sprinkler Systems

PART 2: PRODUCTS

2.01 MATERIALS

A. Toggle Switches: 20A, 277V, 1 pole, brown specification grade, mount 4' 0" above finished floor at door entrance.

B. Receptacles shall be 20 amp duplex units, ivory.

C. Plates shall be same color as receptacles, nylon.

D. Boxes shall be steel, minimum 2 ½ " deep.

E. Light Fixtures: The light fixtures shall be as described on the drawings or other approved equal are also acceptable.

F. Disconnect Switches: Disconnect switches shall be horsepower rated, heavy-duty type.

G. Wiring Materials:

1. Wiring shall be enclosed in electrical rigid galvanized steel, aluminum or intermediate metal conduit sized in accordance with code requirements for the conductors. Electrical metallic tubing may be used where concealed in walls or ceilings.

a. Terminations for all conduit shall have insulated bushings or insulated throat connectors in accordance with code requirements.

b. All conduits shall be substantially supported with approved clips or hangers spaced not to exceed ten (10) feet on centers. Minimum conduit size shall be ½".

2. Flexible Metal Conduit shall be used for all connections to motors and vibrating equipment, and shall comply with Federal Spec. WW-C-566.

3. All wiring shall be type THW, XHHW, or THWN, UL labeled, copper conductors with 600 volt insulation, except as otherwise noted. Minimum size wire shall be No. 12 AWG.

4. Type MC Cable shall have minimum No. 12 AWG type THWN or XHHW insulated copper conductors with an internal bare or insulated copper ground wire.

5. Fire Alarm Wiring: Wiring shall be in accordance with NEC Article 760, as shown on drawings, and as recommended by the manufacturer of the fire alarm system. All wires shall be color coded and installed in metal conduit. Conduit fill shall not exceed 40 percent of interior cross sectional area. Number and size of conductors shall be as recommended by the fire alarm system manufacturer. Conduit shall be ½" minimum.

H. Panel Boards

1. Provide standard manufacturer products. All components of panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards shall be of the same manufacturer.

2. All panels shall be dead front safety type.

3. All panelboards shall be completely factory assembled with molded case circuit breakers.

4. Panels shall have main breaker or main lugs, bus size, voltage, phase, top or bottom feed, and flush or surface mounting all as scheduled on the drawings.

5. Panel boards shall have the following features:

a. Nonreduced size copper or aluminum bus bars and connection straps bolted together and rigidly supported on molded insulators. Bus bar taps shall be arranged for sequence phasing of branch circuit devices.

b. Full size neutral bar mounted on insulated supports.

c. Ground bar with sufficient terminals for all grounding wires. The ground bar shall be insulated and isolated where called for on the drawings.

d. Buses braced for available short circuit current, but not less than 22,000 ampere symmetrical. If the panelboard is within 25 feet of the service entrance, and never less than 10,000 amperes symmetrical.

e. All breakers arranged so that it will be possible to substitute a two-pole breaker for two single pole breakers or a three-pole breaker for three single pole breakers when frame size is 100 amperes or less.

f. Design interior so that protective devices can be replaced without removing adjacent units, main bus connectors and without drilling or tapping.

g. Where designated on panel schedule as "space", include all necessary bussing, device supports and connections. Provide blank cover for each space.

h. Provide galvanized steel cabinets to house panelboards. Cabinets for panelboards may be factory primed and suitably treated with a corrosion-resisting paint finish meeting UL standard for outdoor applications.

i. Back and sides shall be of one piece formed steel. Cabinets for panelboards may be of formed sheet steel with end and side panels welded, riveted or bolted as required.

j. Provide minimum of four interior mounted studs and necessary hardware for in and out adjustment of panel interior.

k. Fabricate trim of sheet steel consisting of frame with door attached by concealed hinges. Provide flush or surface trim as shown on the drawings.

l. Surface trim shall have the same width and height as the box.

m. Provide doors with flush type latch and manufacturer's standard lock.

n. In making switching devices accessible, doors shall not uncover any live parts.

o. Provide concealed butt hinges welded to the doors and trims.

p. Provide keyed alike system for all panelboards.

q. Provide a directory card, metal holder, and transparent cover. Permanently mount holders on inside of doors.

r. Circuit breakers in panelboards shall be bolt on type on phase bus bar or branch circuit bar. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips.

I. Service Entrance Main Distribution:

1. Switchboard:

a. General: Furnish a 208/120 volt, three-phase, four-wire service and distribution switchboard as herein specified and shown on the associated electrical drawings. The switchboard shall meet Underwriters' Laboratories enclosure requirements and be furnished with an Underwriters' Laboratories label.

b. Equipment:

1) Enclosure Construction: The switchboard shall be wall mounted NEMA 1 dead-front with front and left side accessibility required. The switchboard framework shall consist of steel channel bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting. The framework is to be formed of Code gauge steel, rigidly welded together to support all cover plates, bussing and component devices. Each switchboard section shall have an individual removable top plate for installation and termination of conduit. Top and bottom conduit areas are to be clearly shown and dimensioned on the shop drawings. Front covers shall be hinged to permit easy access to the terminals. The paint finish shall be the manufacturer's standard finish.

2) Bussing: The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise. Through bus shall be plated copper or plated extruded aluminum. The through bus shall have an ampacity of 1200 amperes and shall be braced to have a short circuit current rating of 100,000 RMS symmetrical amperes. The through bus shall have provisions for the addition of future sections.

The through bus supports, connections and joints are to be bolted with hex head bolts and Belleville washers to minimize maintenance requirements.

3) Short Circuit Current Rating: Each switchboard, as a complete unit, shall have a minimum short circuit rating of 100,000 RMS symmetrical amperes. Such rating shall be established by actual tests by the manufacturer, in accordance with UL specifications, on equipment constructed similarly to the subject switchboard.

4) Bolted Pressure Contact Switches: The main switches shall be of the fusible bolted pressure contact type with ratings as shown on the associated drawings. Pressure contacts are to be made by firmly bolting blades to both top and bottom stationary contacts. The switches shall have quick-break mechanisms, interphase barriers and arcing equipment. Switches shall be manually operated and have an electric trip mechanism which is piloted by the output of ground-fault and phase failure or reversal sensing circuitry. Power for the electric trip circuit shall be obtained from a control transformer connected from phase to phase on the line side of the switch. The electric trip coil shall be designed to operate at 55% of rated voltage. In accordance with UL Standard 977, switches shall have an interrupting rating of 12 times the continuous rating. The operating mechanism shall permit closure of the switch only after the opening mechanism has been charged, to assure that the electrical tripping means shall immediately be in a condition to open the switch.

5) Ground-Fault Protection: The ground-fault protection system shall include a current sensor and appropriate relaying equipment. The current sensor shall enclose all phase and neutral conductors of the circuit to be monitored. The current sensor frame shall be so constructed that one leg can be opened to allow removal of sensor without disturbing the cables or requiring drop-links in the bussing. A test winding shall be provided to simulate the flow of ground-fault current through the current sensor, in order to test the complete system, including sensor pickup, relaying equipment and electric trip mechanism of the switch. The ground-fault relay shall be solid state construction and have adjustable pick-up for ground-fault currents from 200 amperes to 1600 amperes. Settings for individual relays shall be 400 amperes. Time delay provided by the ground-fault relay circuitry shall be nominally 2 seconds and shall

be permanently calibrated to preclude tampering with after installation.

6) Metering Compartment: Utility metering compartments shall comply with utility company requirements with meter sockets to receive the utility's meter.

7) Feeder Circuit Breakers: Group mounted molded case circuit breakers are to be totally front accessible. The circuit breakers are to be mounted in the switchboard to permit installation, maintenance and testing without reaching over any line side bussing. The circuit breakers are to be removable by the disconnection of only the load side cable terminations, and all line and load side connections are to be individual to each circuit breaker. No common mounting brackets or electrical bus connectors will be acceptable. Each circuit breaker is to be furnished with an externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the circuit breaker trip mechanism to operate as well as exercise the circuit breaker operating mechanisms.

8) Cable Entry: Limiter frame cabinet shall provide limter lugs on all conductors. Cable protectors shall be Chase-Shaw CP or equal.

2. Acceptable Manufacturers: Square D or approved equal.

3. Installation:

a. Install secondary service as shown on the drawings, as directed, and in conformance with the utility's requirements.

b. When installing surge arresters, make connections as short as possible. Remove any excess lead length. If leads have to be more than 12" long, twist leads tightly together. Wire size shall be minimum #10 AWG.

c. All primary and secondary conduit underground shall be encased in a minimum of 3" of concrete.

d. Coordinate the work with the utility company.

J. Grounding Conductors:

1. Grounding conductors shall be soft-drawn bare copper.

2. Insulated Grounding Wires shall be UL and NEC approved types, copper, with THWN or XHHW insulation color, identified green, except where otherwise shown on the drawings or specified.

3. Wire shall not be less than shown on the drawings and not less than required by the NEC.

K. Ground Clamps:

1. Ground clamps shall be cast bronze or cast copper and shall be UL listed for grounding connections.

2. Ground clamps shall be sized for the specific conductor and electrode to be clamped.

L. Grounding Connections: Connections shall be of the exothermic type welding process as manufactured by Cadweld or approved equal.

M. Equipment Grounding Connections: Connections shall be of the compression type solderless connectors.

N. Communication and Signaling Systems:

1. General:

a. All basic equipment shall be compatible and same manufacturer. All equipment shall be new material.

2. Conduit and Wire:

a. Wiring shall be in accordance with NEC, as shown on the drawings, and as recommended by the manufacturer. All wires shall be color coded and installed in metal conduit. Conduit fill shall not exceed 40% of the interior cross sectional area. Number and size of conductors shall be as recommended by the system manufacturer. Conduit shall be ½" minimum.

b. Wires in junction boxes and cabinets shall be permanently tagged and identified with nylon tags.

3. Terminal Boxes, Junction Boxes and Cabinets shall be galvanized steel in accordance with UL. Junction boxes shall have a volume 40% greater than required by the NEC. Minimum sized wire shall be considered as 14 AWG for calculation purposes.

4. Provide all necessary connectors, terminators, and adapters.

5. Resident Units: All single station smoke detectors in resident units shall be interlocked wired with sounder bases at 120 volt. This residential monitoring shall be separate from other system initiating devices. In the event of smoke detection in a unit all devices in that unit will sound. These residential detectors will not engage the general building alarm sequence, but will send a trouble signal to digital fire alarm main panel, see Section 16721 Fire Alarm.

PART 3: EXECUTION

3.01 INSTALLATION

A. General:

1. All work shall be in accordance with the National Electrical Code requirements as amended to date, with the local electrical utility company rules, the Fire Underwriter's requirements, and all local, State and Federal laws and regulations.

2. Conduits shall be of sizes required by the National Electrical Code. Exposed conduits shall be installed parallel or perpendicular to walls and ceiling, with right angle turns consisting of bends, fittings, or outlet boxes. No wire shall be installed until work, which might cause damage to wires or conduits, has been completed. Conduits shall be thoroughly cleaned of water or other foreign matter before wire is installed.

3. All splices shall be mechanically and electrically perfect, using crimp type wire connectors.

4. Provide all disconnect switches required by the N.E.C.

5. Mount disconnect switches and starters at a height of 48" above finished floor unless otherwise noted.

6. Provide all necessary hardware for mounting motor starters.

7. A typewritten schedule of circuits, approved by the Owner's Representative shall be on the panel directory cards. Three complete copies of all directories, neatly bound, shall be delivered to the Owner's Representative.

8. Mount the panelboard so that maximum height of circuit breakers above finished floor shall not exceed 78".

9. Circuit numbers indicated on the drawings are the actual numbers assigned to the circuit in the panelboard and shall not be varied without the consent of the Architect/Engineer.

10. Provide all necessary hardware for mounting panelboard.

11. Maintain 1-1/2" spacing between snow melting cable and roof surface. Do not anchor supports to roof.

12. Feeder circuit wiring shall be in conduit or EMT.

13. In general, conductors shall be in the same size from the last protective device to the load and shall have an ampacity the same as or greater than the ampacity of the protective device where the wire size is not shown on the drawings. Use the 60 degree C. ampacity rating for wire sizes # 14 through # 1. For 120v circuits, home runs longer than 50 feet shall be minimum #10 AWG, longer than 100 feet shall be minimum #8 AWG.

B. Grounding:

1. The entire electrical system shall be permanently and effectively grounded in accordance with Code requirements.

2. Connections to junction boxes, equipment frames, etc. shall be bolted.

3. Conduit Systems:

   a. Ground all metallic conduit systems.

   b. Conduit systems shall contain a grounding conductor sized per NEC table 250-95 or as shown on the drawings. Increase conduit size where necessary to accommodate the grounding conductor.

4. Feeders and Branch Circuits: Install green grounding conductors with all feeders and branch circuits.

5. Lighting Fixtures: Conduits shall not be used for grounding fixtures. Green equipment grounding conductor must be bonded to all fixtures.

C. Identification: Provide tags on each of all pulled wires giving location of the other end. Provide phenolic nameplates for all panelboards, motor starters, and disconnect switches (except switches located at motors).

D. Record Drawings: The Contractor shall keep on the job a set of prints showing any changes to the installation. These shall be given to the Engineer at the completion of the work.

E. Testing and Adjusting:

1. The entire installation shall be free from short circuits and improper grounds. Tests shall be made in the presence of the Engineer's representative.

2. Each individual lighting circuit shall be tested at the panel, and in testing for insulation resistance to ground, the lighting equipment shall be connected for proper operation. In no case shall the insulation resistance be less than that required by the National Electrical Code. Failures shall be corrected in a manner satisfactory to the Architects and Engineers.

3. Each system shall be completely tested and shall be adjusted for proper operation as required by the Engineer.

F. Instruction: Furnish the services of a competent instructor for not less than two four hour periods for instructing personnel in the operation and maintenance of the fire alarm system.

G. Communication and Signaling Systems:

1. Installation shall be in accordance with the NEC and as shown on the drawings.

2. The units shall be mounted as shown on the drawings.

3. All wiring shall be in conduit.

4. Tests: Provide the services of a competent, factory-trained engineer or technician authorized by the manufacturer of the system equipment to technically supervise and participate during all of the adjustments and tests for the system. Make all adjustments and tests in the presence of the Owner's Representative.

5. Final Inspection: At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect. The demonstration shall be made in the presence of the Owner's Representative.

END OF SECTION

SECTION 16721

FIRE ALARM SYSTEMS

PART 1: GENERAL

1.01 WORK INCLUDED:

A. This specification outlines the requirements for an automatic addressable fire detection and alarm system.

B. The work described in this specification consists of all labor, materials, equipment and services necessary and required to complete and test the automatic fire detection and alarm system. Any material not specifically mentioned in this specification or not shown on drawings but required for proper performance and operation shall be furnished and installed.

1.02 RELATED WORK

A. Section 13935 - Wet And Dry Pipe Sprinkler System

B. Section 16000 - Basic Electrical Requirements

1.03 REQUIREMENTS

A. This installation shall be made in accordance with the drawings, specification and the following:

1. National Electrical Code Article 760

2. National Fire Protection Association Standard (NFPA)

   No. 72 (Protective Signaling Systems)

   No. 72E (Automatic Fire Detectors)

   No. 90A Installation of Air Conditioning and Ventilating Systems

3. Local Codes and Authorities Having Jurisdiction

4. Underwriters Laboratories Inc. (UL) Publications:

   No. 38 Manually Actuated Signaling Boxes

   No. 50 Cabinets and Boxes

No. 217 Single and Multiple Station Smoke Detectors

No. 228 Door Closers-Holders for Fire Protective Signaling Systems

No. 268 Smoke Detectors for Fire Protective Signaling Systems

No. 268A Smoke Detectors for Duct Applications

No. 464 Audible Signaling Appliances

No. 521 Heat Detectors for Fire Protective Signaling Systems

No. 864 Control Units for Fire Protective Signaling Systems

No. 1481 Power Supplies for Fire Protective Signaling Systems

No. 1638 Visual Signaling Appliances

5. The Americans with Disabilities Act (ADA) – New 16 "ADA" apartments and public access areas of the complex.

6. American National Standards Institute (ANSI)

No. 17.1 Safety Code for Elevators and Escalators

B. Wiring requirements for shielding certain conductors from others or routing in separate raceways shall be as recommended by the manufacturer's documentation.

C. The system including all components shall be listed by Underwriters Laboratories, Inc. for use as a fire protective signaling system.

1.04 GENERAL

A. The Contractor shall furnish and install complete and ready for operation automatic fire detection and alarm system including control panel, detectors, annunciators, manual stations, alarm devices, wiring, components, appurtenances and accessories, and all wiring and connections to devices furnished by others.

B. The system and components shall be supplied by one manufacturer of established reputation and experience who shall have produced similar apparatus for a period of at least three (3) years and who shall be able to refer to similar installations rendering satisfactory service.

C. All references to model numbers and other pertinent information herein is intended to establish minimum standards of performance, quality and construction, and is based upon equipment designed and manufactured by Pyrotronics, or approved equal by FCI, Notifier, Autocall, or pre-approved equal as addressed through bidding addendum. It is not the intent of these specifications to eliminate competitive equipment.

D. Any equipment proposed as equal to that specified herein shall conform to the standards herein, and the manufacturer must supply proof of having produced similar equipment, now giving satisfactory service. In addition, the Contractor must obtain the Architect/Engineer's or Owner's approval in writing ten (10) working days prior to bidding equipment other than as specified. The manufacturer's name, model numbers, and three copies of working drawings and engineering data sheets shall be submitted for approval. Included in the submittal shall be a written statement from the manufacturer of the substituted equipment that it does in fact equal the features, functions, and performance of the specified equipment.

1.05 SPECIAL CONDITIONS

A. The manufacturer or his authorized distributor shall confirm that within reasonable distance of the job site there is an established agency which stocks a full complement of parts and offers service during normal working hours on all equipment to be furnished, and that the agency will supply parts without delay and at reasonable cost.

B. All material and equipment shall be new and unused.

C. All individual components and composite systems shall be designed for continuous operation without undue heating or change in rated values, and shall be properly fused.

1.06 SYSTEM DESCRIPTION AND FUNCTION

A. The automatic fire detection and alarm system shall consist of main control panel, printer, a fire command station containing emergency voice/alarm communications system control, firemen's communication system, along with remote annunciators, detection devices and manual stations wired in accordance with the schedule on the drawings and shall function as specified herein.

B. The system shall be capable of being expanded at any time up to the predetermined maximum capacity of the system.

C. The system shall be capable of being programmed in the field, by a non-computer trained person, via the optional system printer. All programmed information shall be stored in non-volatile memory.

D. The system shall be capable of operating both addressable and non-addressable ionization, thermal and photoelectric detecting devices, manual stations and water-flow switches.

E. The control panel shall provide power, annunciation, supervision and control for the fire detection and alarm system. The control panel shall be modular in construction, and contain equipment meeting the requirements of Part 2 of this specification as necessary to operate according to the schedule in this specification and applicable drawings. The system shall be designed such that alarm indications override trouble condition. The panel shall be capable of measuring the sensitivity of the addressable ionization and photoelectric detectors connected to it.

F. External circuit supervision shall not require additional wires other than the pair used for detection or alarm (only two wires shall be used from the control panel to each loop of initiating devices and two wires for the audible devices). These two wires shall provide both supervision and alarm signals. There shall be no loss of supervision for Class "B" wired addressable devices. Class "A" supervision shall be provided by adding an additional pair of wires.

G. The system shall be a coded, zoned, electrically supervised, low-voltage fire alarm system.

H. The system shall function as follows when any public or non-residential area or duct detector, manual station or water-flow switch operates:

1. Audio Voice/Strobe indicating appliances to notify for evacuation.

2. Emergency voice/alarm communication system and appliances to notify evacuation.

3. Automatically notify fire department or central station.

4. Display individual detector and/or zone number on alpha-numeric display with optional user defined message.

5. Light an indicating lamp on the device initiating the alarm.

6. Shut down the HVAC system and operate dampers as shown on the schedule.

7. Activate the elevator return sequence and shut down the elevator in accordance with ANSI 17.1.

8. Notification device in each apartment unit tied to central station.

9. There shall be no limit, other than maximum system capacity, as to the number of addressable devices which may be in alarm simultaneously.

I. Residential Apartment Units: The System Shall Function as follows: When an apartment unit (residential) shall have sounder bases and to be monitored by the fire control panel. This residential monitoring shall be a separate channel than other system initiating devices. In the event of smoke detection in unit all devices in the unit will sound together and send a problem signal to the main panels. Provide visual strobes in ADA units.

J. Firemen's Communication System: Furnish in Stairs Towers and where indicated a communication system for use by the fire department that will tie to Fire Command Center.

1.07 SUBMITTALS

A. In accordance with Section 01340 - Shop Drawings, Product Data and Samples, furnish the following:

1. Shop Drawings:

a. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

b. Include ratings, power requirements, battery calculations, dimensions, mounting, equipment, device arrangement, complete wiring diagrams, connection diagrams with terminal identification, material and description of operation.

c. Show main graphic annunciator layout, riser diagram and auxiliary functions.

2. Manuals:

a. Submit simultaneously with the shop drawings, companion copies of complete operating and maintenance manuals including technical data sheets, wiring diagrams, and information for ordering replacement parts.

b. Two weeks prior to final inspection, deliver four copies of final updated operating and maintenance manuals to the Owner. Each manual shall contain, but not be limited to the following:

1) A statement of guarantee including date of termination and name and phone number of the person to be called in the event of equipment failure.

2) 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 trouble shooting manual explaining what might be wrong if a certain malfunction occurs and explaining how to test the primary internal parts of each piece of equipment, shall be delivered to the Owner upon completion of the system.

3) 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 manufacture and local supplier of each item.

4) A complete set of reproducible as-builts, showing installed wiring and color coding and wire tag notations for 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. A copy of the as-built print shall be submitted to the fire department prior to final acceptance.

5) Individual factory issued manuals shall contain all technical information on each piece of equipment installed. In the event such manuals are not obtainable from the factory, it shall be the responsibility of the Contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.

3. Certifications: Submit certification of fire alarm operator tests.

1.08 WARRANTY

A. All equipment and systems shall be warrantied by the Contractor for a period of one year following acceptance. The warranty shall include parts, labor, prompt field services, pick-up and delivery.

B. Provide one year testing and maintenance, (minimum of two inspections) which shall consist of:

1. Regularly and systematically examining all detectors, manual stations, panels, relays, pressure switches and accessories pertaining to the system.

2. Regularly and systematically examine, adjust and clear all the electrical and mechanical components of water flow switches.

3. Tests and written reports which certify that all initiating devices have been tested and which indicate the result of the inspection test as required by the authority having jurisdiction.

C. The system supplier shall offer, complete with cost, a test and maintenance agreement providing the same service as described in Paragraph B to commence after expiration of test and maintenance included in this contract.

1.09 Instruction:

A. Furnish the services of a competent instructor for not less than two (2) four-hour periods for instructing personnel in the operation and maintenance of the system.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All units of equipment shall be manufactured by Pyrotronics, Notifier or approved equal.

2.02 MATERIALS AND EQUIPMENT

A. All materials, equipment, accessories, devices and other facilities and appurtenances covered by these specifications or noted on the contract drawings and on the Contractor's approved working drawings and installation specifications shall be new, best suited for its intended use and shall conform to applicable and recognized standards for their use. All equipment shall be the standard cataloged products of a single manufacturer.

B. Control Equipment

1. The control panel shall provide power, annunciation, supervision and control for the detection and alarm system. The control panel shall be modular in construction, and contain all modules necessary to operate according with this section and applicable drawings. The system shall be capable of reading and displaying at the control panel, the sensitivity of remote addressable ionization and photoelectric detection devices. Individual addressable detection device alarm threshold shall be adjustable from the control panel. The detection system shall remain 100% operational and capable of responding to an alarm condition while in the routine maintenance mode. Addressable detection devices shall be individually identified by the system, and any quantity of addressable detection devices shall be in alarm at any time up to the total number connected to the system.

2. The control panel shall be capable of supporting non-addressable as well as addressable detection devices.

3. The panel annunciator shall be a 32 character alpha-numeric display, which shall provide an optional user definable message associated with each detection device or zone.

4. Dynamic supervision of system electronics, wiring, detection devices and software shall be provided by the control system. Failure of system hardware or wiring shall be indicated by type and location on the alpha-numeric annunciator. Software and processor operation shall be monitored by an independent hardware watchdog, which will indicate their failure. The system shall provide fail safe operation, i.e., incoming alarms shall automatically override all other modes of operation, and the panel shall automatically return to normal operating mode from any operator initiated mode.

5. Ground-fault detection shall be provided for all initiating and audible circuits. All system modules shall be capable of operation in any unused panel location. Lamp test capability shall be provided to test all visual panel indicators and associated software. Provisions shall be made for remote trouble and remote alarm silencing switches. The control panel shall be equipped with a silence before reset feature, designed to prevent accidental system reset during an alarm condition.

6. The system alarm lamp shall flash upon receipt of any alarm condition. Acknowledgement of the alarm by operation of the silence switch shall silence the audible alarm and cause the alarm lamp to light steadily. Receipt of subsequent alarms shall cause the audible devices to resound and the alarm lamp to flash.

7. The system trouble lamp shall flash and an integral trouble buzzer hall sound upon the occurrence of any trouble condition. Acknowledgement of the trouble condition by operation of the silence switch shall silence the audible alarm and cause the trouble lamp to light steadily. Receipt of subsequent troubles shall cause the trouble buzzer to resound and the trouble lamp to flash.

8. Individual input and output device addressability as well as remote sensitivity measurement shall all be performed on the same pair of wires. Wiring may be Class "A" or "B". When Class "B" wiring is used, no special wiring sequence shall be required on addressable device circuits, an unlimited number of wiring branches shall be permitted with no loss of supervision. The system shall be capable of having all addressable devices in alarm simultaneously.

9. The service mode shall permit the arming and disarming of individual detection or output devices as well as manually operating output devices. Status of these devices shall be displayed upon command from the control panel. The panel shall automatically return to normal mode in the event the panel remains unattended in the service mode.

10. The panel shall be capable of receiving and processing alarms even when in the service mode.

11. The control shall operate from a three wire 120 VAC supply, or when so configured 120 VAC and internal 24V back-up battery. All power connections whether AC or DC shall be separately fused within the control. Light emitting diodes (LED's) shall be included to indicate (green) system power, (yellow) trouble, and (red) alarm;

trouble and alarm shall also be annunciated on an alpha-numeric display which will give device number and location plus diagnosis of trouble. Momentary contact switches shall provide for Locate, Next Alarm, Next Trouble, Acknowledge/Silence and Reset. An audible device shall sound within the control for alarm or trouble. This device shall have two (2) distinct sounds, and shall be silenceable by the acknowledge/silence switch. Alarms shall override any trouble condition.

12. The control power supply shall be capable of powering up to 960 addressable early warning detectors and at least four (4) audible signal circuits. All system expansion modules shall interconnect through a card edge connector and shall require no inter-module wiring.

13. The control shall be capable of measuring and adjusting the sensitivity of detectors. An alpha-numeric display shall be provided to display custom messages and give readings of detector sensitivity, detector by detector. Each device on an addressable initiating circuit shall be checked continuously to include the following: sensitivity, response, opens, shorts, ground faults, functionality and status.

14. The control shall report the failure of a device's transmitting component(s), open or shorted, on an addressable initiating circuit. The device shall be recognized and identified by location within the circuit to the specific device, and all other devices on the circuit shall continue to function properly.

15. The control shall report, by specific device number, any device removed from an addressable initiating circuit and all other devices shall continue to function.

16. The control shall allow changing the status of configured circuits (arming or disarming and changing status of relays). If any change in status degrades system operation as configured, a trouble condition shall be reported and remain until system operation again meets configured status.

17. The control shall perform multiple operations at the same time. These operations shall include but not be limited to timed functions and multiple configured sequences.

18. The control shall support a printer terminal. This terminal shall be used for permanent records of the Control's status and detector chamber voltages, and shall also be capable of system control as configured.

19. The control shall allow for expansion and shall also be configurable without system interwiring.

20. The control shall allow for up to two hundred field programmable changes by non-computer trained personnel.

21. The system shall provide a hard copy written record of all alarms, troubles, and system activity by means of full carriage width terminal to print detection device designations and location messages on a single line of up to 128 characters wherein 32 are reserved for device or zone custom identification.

22. New unacknowledged alarms and troubles shall be distinctively displayed on both the visual display and the printer and differentiated from previous alarm and troubles.

23. The system shall automatically indicate the total quantity of alarms and of troubles which have occurred prior to reset at the control unit.

24. No alarm or trouble indication shall be resettable until it has been acknowledged. It shall not be possible to reset the system until all alarms have been acknowledged.

25. It shall be possible to display up to 127 alarms and up to 127 trouble indications, one at a time, on the digital annunciator and as a list on a printer.

26. The printer or digital annunciator shall be capable of listing, upon request:

    a. Alarms with time, date and location.

    b. Troubles with time, date and location.

    c. Status of output functions, "on" or "off".

    d. Sensitivity of addressable smoke detectors.

    e. Detection device number, type and location.

    f. Status of remote relays, "on" or "off".

    g. Acknowledgement time and date.

    h. Signal silence time and date.

i. Reset time and date.

27. The system shall be capable of:

a. Counting the number of addressable detectors within a "zone" which are in alarm.

b. Counting "zones" which are in alarm.

c. Counting the number of addressable detectors which are in alarm on the system.

d. Differentiating among types of addressable detectors such as smoke detectors, manual stations, water-flow switches, thermal detectors.

e. Assigning priorities to types of detectors, zones or groups of detectors.

f. Cross-zonings.

28. Control functions shall be assigned on the basis of system initiation patterns of detection devices such as "anding" zones, counting zones, counting devices, "anding" groups, and "anding" types of detection devices.

29. Control functions shall be assigned on the basis of time of day, day of week, and with a holiday schedule of up to thirty (30) holidays per year. Each addressable detection device shall report its condition to the system control unit every four (4) seconds in a manner such that failure of the connections to or internal electronics of the device will result in a trouble signal which identifies the specific device involved.

30. Addressable dual chamber ionization and photoelectric type smoke detector sensitivity shall be reported at the control panel when requested. The electronic readout of detector sensitivity shall be equivalent to sensitivity readings made with a meter for a non-addressable detector, but shall be read at the control panel digital annunciator.

31. It shall be possible to change the detector sensitivity from the control panel within maximum and minimum values as defined by the UL listing of the detectors.

32. The system shall be capable of listing detector chamber voltage settings on the printer for permanent record.

33. Water-flow switches, air duct smoke detectors, tamper switches, OS and Y valves, manual stations, and thermal detectors shall be equipped with an electronic address device which shall be supervised identically as addressable detectors.

34. Water-flow switch alarm operation and automatic sprinkler system supervisory switches shall be wired and annunciated in conformance with the National Fire Code.

35. A trouble signal shall be initiated for each addressable device for which the automatic sensitivity measurement is too insensitive.

36. The system shall be capable of operating conventional two-wire, Class "B" detector circuits terminated on end-of-line devices or Class "A", field selectable, detector circuits and connected in series/parallel per the manufacturer's recommendations. These non-addressable detector circuits shall be capable of operating interchangeable, plug-in detectors of the following types: dual chamber ionizations, photoelectric, flame, and rate anticipation thermal as well as manual stations and non-plug-in thermals of any type.

37. Alarm and troubles from non-addressable detector circuits (zones) shall be annunciated and cause output functions in the same manner as addressable detection devices including a location message for each zone.

38. The supervised and powered parallel output circuits shall be capable of use as audible signal circuits, fire extinguishing release circuits, municipal tie, remote station connection or general alarm release service. They shall be capable of providing 1.5 amp at 24 VDC.

39. Provide control relays in the fire alarm control unit having dry contacts rated 120 VAC 5 amp inductive as required.

40. Remote relays located on detector bases or double gang outlets throughout the building shall be controlled in the same manner as panel mounted relays.

41. The system power supply shall be provided with an integral uninterruptable power source or UPS. This UPS shall provide continuous power to the system in the event of a commercial power failure. Transfer from commercial to standby power shall be

instantaneous to insure proper processor operation, and indicated by flashing the system power LED. Batteries shall be sized to provide 60 hours of standby operation followed by 10 minutes of alarm. A dual rate battery charger shall be provided which is capable of recharging the batteries to 80% capacity in 12 hours. Loss of commercial power shall be annunciated as a system trouble. System trouble shall be indicated for over or under voltage conditions, blown fuse or disconnected batteries. The system shall visually and audibly indicate operation from standby power. The system shall automatically restart upon the return of power. No operator intervention shall be required.

42. The control panel enclosure shall be earth tones in color, suitable for surface or semi-flush mounting. A locked door shall be provided to limit access to individuals authorized access to the panel.

43. All modules shall be plug-in, dynamically supervised and easily replaceable. Field wiring shall be connected to the panel with removable multi-conductor connectors to facilitate rapid removal and replacement of both the module and wiring for ease of servicing the panel.

44. Visual indicators shall be long-life LED's. Modules capable of initiating a system trouble shall display individual trouble indications on the alpha-numeric annunciator.

45. Addressable Input Module:

    a. Addressable/programmable initiating circuits shall be provided by a Pyrotronics Addressable Input Module, Model INX. The module shall be system interconnected by a card edge connector, and shall be operable by the control unit.

    b. Each initiating circuit shall consist of a two (2) wire circuit, allowing multiple T-taps, and not requiring any end of line device for supervision. Each initiating circuit shall accommodate up to thirty (30) addressable/programmable initiating devices. Each circuit shall be capable of Class "A" or Class "B" wiring.

    c. Upon activation of any addressable/programmable device installed in the circuit, the system shall automatically report the status of the device and initiate the sequence of operations specified for that device, i.e., alarm, local, general, reporting, trouble reporting only, etc. Alarm shall have priority over trouble. Trouble conditions shall be

reported to include the device number, location and type of trouble.

d. All addressing initiating devices on all circuits may be in alarm at the same time and perform the sequences of operation prescribed by the system configuration. If there are more than 127 alarms the message "more than 127 alarms" will appear and any alarms after 127 will still have all of their required functions performed.

e. The initiating circuits shall maintain complete reporting of device status while in trouble, due to any addressable device having its active transmitting component fail, open or shorted.

f. The initiating circuits shall detect a line break and provide information to the control panel allowing the user to determine between which two (2) devices the break has occurred.

g. The Model INX module shall be Underwriters Laboratories, Inc. listed.

46. Zone Input Module:

a. Detection line circuit monitoring shall be provided by a Pyrotronics Zone Input Module, Model ZNX. This module shall be system interconnected by a card edge connector and shall be operable by the XL3 control unit. Connection of field wiring shall be by screw terminals on a card edge connector.

b. Each circuit shall be capable of Class "A" or "B" wiring. Class "B" a 50ufd 50V capacitor end-of-line device shall be required. Each zone shall accommodate up to thirty (30) Pyrotronics ionization or photoelectric detectors, or five (5) Pyrotronics flame detectors as well as any quantity of shorting type contact devices.

c. Upon actuation of any detector or device installed in a zone circuit, that particular zone shall lock into alarm and the zone identification and location shall be annunciated at the XL3 control unit. Zone troubles such as opens shall be annunciated at the XL3 control unit, giving zone identification and trouble description. Alarm information and transmission shall have priority over trouble.

d. The Model ZNX module shall be Underwriters Laboratories, Inc. listed.

47. Programmable Signal Module:

a. An output circuit for operation of DC audible devices, leased line or city tie, or halon release shall be provided by Programmable Signal Module, Model SPX. This module shall be system interconnected by a card edge connector, and shall be operable by the XL3 control unit.

b. Upon command by the XL3 control unit, the output circuits will respond as configured. Leased line or city tie circuits shall be limited energy outputs. All signal circuits shall require and be fitted with an end-of-line device. The output current shall be at least 1.5 amps per circuit and each circuit shall be fused separately.

c. The module shall be supervised by the XL3 control unit for open and shorted circuits. Open circuits shall report trouble only and respond with circuit identification. A shorted circuit shall respond in a similar manner. Each output circuit shall be individually fused with replaceable fuses.

d. Output circuits may be user controlled. If such control degrades system configuration, a trouble condition shall be reported.

e. The Model SPX module shall be Underwriters Laboratories, Inc. listed.

48. Programmable Supplementary Relay Module:

a. For control of air handling units and elevators there shall be provided a Pyrotronics Programmable Supplementary Relay Module, Model POX. It shall contain four independent relays, fitted with form "C" contacts, rated at 120 VAC, 5 amps inductive, Pyrotronics Model POX.

C. Alarm Initiating Devices:

1. General:

a. All addressable and non-addressable ionization, photoelectric and thermal detectors shall be capable of being

intermixed on the same control panel. All detection devices shall contain an integral alarm LED. All addressable detectors shall be individually identifiable by zone.

2. Addressable Ionization Smoke Detector:

   a. The addressable ionization type product of combustion detector shall be listed by Underwriters Laboratories, Inc. The detector shall be a plug-in, twist/lock unit. The detector shall contain two ionization chambers and solid state indicator lamp. The reference chamber shall compensate against sensitivity changes due to changes in environmental temperature, humidity and barometric pressure. The sensing chamber shall be open to the outside elements through a protective cover which will permit products of combustion to enter, while preventing foreign matter from entering and causing unwanted alarms.

   b. The addressable detector sensitivity shall be individually adjustable from the control panel. It shall also be possible to accurately measure the addressable detector's sensitivity from the control panel. Relative sensitivity measurements providing no readout of discrete sensitivity will not be considered as being equivalent.

   c. The addressable ionization detector shall be dynamically supervised, indicating a trouble condition at the control panel when the detector is unable to sense a fire condition due to both internal and external operating conditions or malfunctions.

   d. The detector mounting base shall be of the twist/lock type with screw terminals for field wiring. Pigtails or in-line connectors shall not be permitted. It shall be possible to secure the detector in the base with a concealed locking mechanism to prevent unauthorized removal. When locked in its base, detector removal shall require a special unlocking tool. The addressable ionization products of combustion detector shall be a Pyrotronics Model DI-X3.

3. Addressable Photoelectric Smoke Detector:

   a. The addressable photoelectric smoke detector shall be listed by Underwriters Laboratories, Inc. The detector shall contain a long life light emitting diode (LED) as its light source, and photo diode as a light receiver. An automatic

gain control circuit shall be provided to maintain correct sensitivity by compensating for detector aging and dirt accumulation. The detector shall be a plug-in twist/lock unit which allows for easy connection to its mounting base.

b. It shall be possible to adjust and/or electronically measure the sensitivity of each individual addressable detector from the control panel. Relative sensitivity or manual test methods which check the detector at the maximum allowable obscuration will not be considered as being equivalent.

c. The addressable photoelectric detector shall provide complete supervision of the detector optics. The detector shall be supervised for complete failure of the LED light source or a critical reduction in the light output of the LED caused by excessive dirt which could not normally be compensated for by the automatic gain control circuit. The detector mounting base shall be of the twist/lock type with screw terminals. Pigtails or in- line connectors shall not be permitted. It shall be possible to secure the detector in the base with a concealed locking mechanism to prevent unauthorized removal. Detector removal shall require a special unlocking tool. The addressable photoelectric smoke detector shall be a Pyrotronics Model PEX-3000.

4. The addressable thermal detectors shall be of the rate compensated fixed temperature type and shall be listed by Underwriters Laboratories, Inc. The addressable thermal detectors shall be individually annunciated on the control panel. The addressable thermal detectors shall contain an integral alarm lamp. The addressable thermal detector shall be Pyrotronics DT-X3-135.

5. The intelligent interface module shall be listed by Underwriters Laboratories, Inc. This unit is designed to provide an interface for direct shorting contact devices to the XL3's Addressable Input Model INX. This unit is used with water flow switch, tamper switch and OS and Y valves. The addressable/programmable interface module shall be a Pyrotronics Model TRI-2, TRI-2R, or TRI-2D as required.

6. The addressable manual fire pull station shall be listed by Underwriters Laboratories, Inc. The addressable manual fire station shall be non-coded and shall operate on any addressable detection circuit. The addressable manual fire station shall be individually

annunciated on the control panel. The addressable manual station shall be a Pyrotronics Model MSX-2.

7. The air duct smoke detector shall be listed by Underwriters Laboratories, Inc. The air duct detector shall operate on a cross-sectional air sampling principle to overcome stratification and the skin effect. The air duct detector shall consist of a standard addressable/non-addressable ionization/photoelectric detector mounted in an air duct sampling assembly and sampling tube that protrudes across the duct of the ventilating system. The air duct detector shall retain the features of the addressable/non-addressable ionization/photoelectric detector, and be installed in the ventilating duct as indicated in the manufacturer's instructions. The air duct detector shall be a Pyrotronics AD-3 with the appropriate non-addressable or addressable detector, provide remote alarm indicator/test/key switch for fire department testing and control.

8. Waterflow Switch: See Division 13 – Wet and Dry Pipe Sprinkler System, Standpipe and Fire Pump.

9. Supervisory Device and Tamper Switch: See Division 13 – Wet and Dry Pipe Sprinkler System, Standpipe and Fire Pump.

D. Alarm Indicating Devices

1. Visual Unit: Pyrotronics Model SVMT-F (Flush) strobe.

2. Alarm Strobe/Horns shall be of the polarized 24 VDC type. The mechanisms shall contain an aerospace grade aluminum diaphragm, blued, tempered and polished armature, and tungsten contact points, all housed in a die-cast frame and grill assembly. The alarm horn shall be UL listed with multi-tapered intensity level control. The alarm horn shall be a Pyrotronics Model EHM-D (Flush), EHM-E (Surface).

3. Audio Voice/Visual Unit shall be mounted on a semi-flush visual unit with back box.

E. Pull Station Enclosure shall be 8" x 6" x 6", NEMA 1, with mounting plate, hinged cover and lock (lock to be furnished by Owner, to be installed by the Contractor) shall be suitable for flush or semi-flush mounting, painted red with 5/8" high white letters reading "Fire Alarm Pull Station".

F. Remote Annunciators:

1. Furnish and install remote annunciators as shown on plans. The annunciators shall be capable of being flush or surface mounted for indoor applications. The unit shall be capable of having a remote key reset feature. Removal of the front cover shall provide easy access.

2. The remote annunciators shall have the following options:

   a. Supervised remote trouble indication.

   b. Key operated remote alarm reset.

   c. Key operated remote alarm silence with resound feature.

G. Furnish a battery backed area for firemen call/voice intercom system from the fire alarm remote annunciator location to all places required. Each area location shall be indicated at the remote annunciator location. If the annunciator is used to indicate the location of a call, the number of annunciator points shall be increased by the number of area locations. Furnish all required amplifiers, speakers, phones, batteries, battery chargers, etc., for a complete and operational system. At each area, there shall be audio and visual indications that a call has been placed and that the call has been answered.

PART 3: EXECUTION

3.01 INSTALLATION

A. Control and other panels shall be mounted with sufficient clearance for observation and testing. All fire alarm junction boxes must be clearly marked for easy identification. All wiring shall be in conduit, EMT thin-wall or other approved methods. Flexible connectors shall be used for all devices mounted in suspended lay-in ceiling panels. All conduit, mounting boxes, junction boxes and panels shall be securely hung and fastened with appropriate fittings to insure positive grounding throughout the entire system.

B. No wiring other than that directly associated with fire alarm detection, alarm or auxiliary fire protection functions shall be permitted in fire alarm conduits. Wiring splices are to be avoided to the extent possible, and if needed they must be made only in junction boxes and shall be crimp connected. Transposing or changing color coding of wires shall not be permitted. Wire nut-type connections are not acceptable. All conductors in conduit containing more than one wire shall be labeled on each end with "E-Z markers" or equivalent. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal.

Cabinet terminals shall be numbered and coded. All controls, function switches, etc. shall be clearly labeled on all equipment panels.

C. All wiring shall be checked and tested to insure that there are no grounds, opens or shorts.

D. Check to see that the duct smoke detectors shut down the ventilation equipment.

E. Installation shall be in accordance with the NEC Article 760, and as shown on the drawings.

F. Installation shall be as shown on the drawings and on the manufacturer's wiring diagrams, and shall be performed under the supervision of a factory-trained representative.

G. All pull boxes, junction boxes, etc., shall be painted red. Conduit shall be painted with a 2" wide red stripe at 5' 0" intervals.

H. Wire the roof top unit starter coils in series with the duct detector relay contacts (one contact for the supply fan) to shut down the unit if duct detector alarms.

I. All wiring shall be color-coded and tagged and shall be checked for continuity, short circuiting, and resistance to ground.

J. Provide all necessary mounting brackets or duct modifications required for mounting the duct smoke detectors.

K. A factory-trained technician shall be present during final inspection and shall instruct the Owner in system operation.

L. The Contractor shall coordinate the programming of the system with the Owner. Room designations shall be as shown on the drawings or as furnished by the Owner.

M. Furnish fire alarm code cards. Cards shall be red with white letters. The card stock shall be approximately 1/32" thick, smooth bright white finish on one side, matte finish on the other side, accept printing ink.

N. Pull stations shall be mounted in pull station enclosures. If semi-flush enclosures are used, the space between the enclosure and wall shall be sealed with grout or other approved methods.

3.02 TESTS AND REPORTS

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. Make all adjustments and tests in the presence of the Owner's Representative.

B. When the systems have been completed and prior to the final inspection, furnish testing equipment and perform the following tests in the presence of the Owner's Representative.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity and insulation.

2. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.

3. Open fire alarm detector circuits to see if trouble signal actuates.

4. Ground fire alarm station detector and verify response of trouble signals.

5. Test the remote annunciator to see if it functions properly.

6. Check code transmission of all fire detection devices.

7. Check installation, supervision, operation and sensitivity of smoke detectors as recommended by the manufacturer to ascertain that they will avoid false alarm signals and will function as specified.

8. Check to see that the duct smoke detectors shut down the ventilation equipment.

9. Perform any other tests recommended by the equipment manufacturer.

10. Connections to Fire Department Master Box.

C. The Contractor shall perform all electrical and mechanical tests required by the equipment manufacturer's certification form. In addition, he shall measure and adjust each of the smoke detectors to the maximum stable sensitivity setting. This must be performed with the detector at its operational location and under normal operational environmental conditions in the area. Bench settings are not acceptable. All test and report costs shall be in the Contract price. A check-out report shall be prepared by the installation technicians and submitted in triplicate, one copy of which will

be registered with the equipment manufacturer. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.

2. Indication that all equipment is properly installed and functions and conforms with these specifications.

3. Test of individual zones as applicable.

4. Serial numbers, locations by zone and model number for each installed detector.

5. Voltage (sensitivity) settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.

6. Response time on thermostats and flame detectors (if used).

7. Technician's name, certificate number and date.

D. After completion of all the tests and adjustments listed above, the Contractor shall submit the following information to the Architect/Engineer:

1. "As-built" conduit layout diagrams including wire color code and/or tag number.

2. Complete "as-built" wiring diagrams.

3. Detailed catalog data on all installed system components.

4. Copy of the test report described in Paragraph C above.

E. Final tests and inspection shall be held in the presence of Architect/Engineer's representatives and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost.

F. The completed smoke detection system shall be tested to ensure that it is operating properly. This test will consist of exposing the installed units to a standard fire test. Failure of the devices to detect the smoke within required time shall be considered a failure of the system and all detectors in that system shall be readjusted or replaced. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) and begin

another ninety (90) day test period. As required by the Architect/Engineer, the Contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the Owner has obtained beneficial use of the building under test.

G. If the requirements provided in the paragraph above are not completed within one (1) year after beginning the test described therein, the Contractor shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Owner's Representative.

END OF SECTION