SPECIFICATIONS

PROJECT:

THE BAXTER LIBRARY
619 CONGRESS STREET
PORTLAND, ME

DEVELOPER:

NORTHLAND ENTERPRISES, LLC
ONE CITY CENTER, 4TH FLOOR
PORTLAND, ME 04101

ARCHITECT:

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

September 8, 2009
Issued for Bid

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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:
(Name and address)

and the Contractor:
(Name and address)

The Project is:
(Name and location)

The Architect is:
(Name and address)

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 3.2 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 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

(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.)

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 percent (%). 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 (%);

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 percent (%) 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

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

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

Number	Title	Date

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.

AIA DOCUMENT A201-1997

General Conditions of the Contract for Construction

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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

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The American Institute of Architects
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Washington, D.C. 20006-5292

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ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

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

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor, (3) between the Owner and Architect or (4) 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 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, systems, standards and workmanship for the Work, and performance of related services.

1.1.7 THE PROJECT MANUAL

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

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.1 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

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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 indicated results.

1.2.2 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.

1.2.3 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 CAPITALIZATION

1.3.1 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.

1.4 INTERPRETATION

1.4.1 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.

1.5 EXECUTION OF CONTRACT DOCUMENTS

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

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

1.6 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

1.6.1 The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect's consultants, and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. All copies of Instruments of Service, 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 the Architect's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in

the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants. 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 or Architect's consultants' copyrights or other reserved rights.

ARTICLE 2 OWNER

2.1 GENERAL

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 Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Subparagraph 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information 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.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 The Owner shall, at the written request of the Contractor, prior to commencement of the Work and thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Furnishing of such evidence shall be a condition precedent to commencement or continuation of the Work. After such evidence has been furnished, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

2.2.2 Except for permits and fees, including those required under Subparagraph 3.7.1, 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.

2.2.3 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. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

2.2.4 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

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.

2.3 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 may issue a written order to 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 three-day period. If the Contractor within such three-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 reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services 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 GENERAL

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.

3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

3.1.3 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.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Since the Contract Documents are complementary, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Subparagraph 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect as a request for information in such form as the Architect may require.

3.2.2 Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents. The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any nonconformity discovered by or made known to the Contractor shall be reported promptly to the Architect.

3.2.3 If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.6 and 4.3.7. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents unless the Contractor recognized such error, inconsistency, omission or difference and knowingly failed to report it to the Architect.

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 the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage.

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 or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed 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 may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order.

3.4.3 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 to 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 and 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 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 applicable to 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 appropriate responsibility for such Work and shall bear the costs attributable to correction.

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 to whom the Contractor has reasonable objection.

3.8.2 Unless otherwise provided in the Contract Documents:

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

.2 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 but not in the allowances;

.3 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 3.8.2.1 and (2) changes in Contractor's costs under Clause 3.8.2.2.

3.8.3 Materials and equipment under an allowance shall be selected by the Owner in sufficient time to avoid delay in the Work.

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 perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

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 field changes and selections made during construction, and one record copy of 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 by the Contract Documents the way by which 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. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.

3.12.5 The Contractor shall review for compliance with the Contract Documents, 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 which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.

3.12.6 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.

3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

3.12.8 The Work shall be in accordance with approved submittals except that 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 (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the 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. In the absence of such written notice the Architect's approval of a resubmission shall not apply to such revisions.

3.12.10 The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Subparagraph 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

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, PATENTS AND COPYRIGHTS

3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and 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 or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or 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 and to the extent claims, damages, losses or expenses are not covered by Project Management Protective Liability insurance purchased by the Contractor in accordance with Paragraph 11.3, 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), but only to the extent caused by the 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 Subparagraph 3.18.1 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' compensation acts, disability benefit acts or other employee benefit acts.

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 If the employment of the Architect is terminated, the Owner shall employ a new Architect against whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the former Architect.

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 an 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 one-year period for correction of Work described in Paragraph 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

4.2.2 The Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully 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 the quality or quantity of the Work. The Architect will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Subparagraph 3.3.1.

4.2.3 The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities 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 with each other through the Architect about matters arising out of or relating to the Contract. 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 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 that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require 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 or entities 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 in writing within any time limits agreed upon or otherwise with reasonable promptness. 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 initial 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 initiated by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 Time Limits on Claims. Claims by either party must be initiated 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 initiated by written notice to the Architect and the other party.

4.3.3 Continuing Contract Performance. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

4.3.4 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 conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but 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.

4.3.5 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 10.6.

4.3.6 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 this Paragraph 4.3.

4.3.7 CLAIMS FOR ADDITIONAL TIME

4.3.7.1 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.

4.3.7.2 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, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

4.3.8 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, or of others for whose acts such party is legally responsible, 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 discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

4.3.9 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so 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.

4.3.10 Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Subparagraph 4.3.10 shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

4.4.1 Decision of Architect. Claims, including those alleging an error or omission by the Architect but excluding those arising under Paragraphs 10.3 through 10.5, shall be referred initially to the Architect for decision. An initial decision by the Architect shall be required as a

condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered by the Architect. The Architect will not decide disputes between the Contractor and persons or entities other than the Owner.

4.4.2 The Architect will review Claims and within ten days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Architect is unable to resolve the Claim if the Architect lacks sufficient information to evaluate the merits of the Claim or if the Architect concludes that, in the Architect's sole discretion, it would be inappropriate for the Architect to resolve the Claim.

4.4.3 In evaluating Claims, the Architect may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Architect in rendering a decision. The Architect may request the Owner to authorize retention of such persons at the Owner's expense.

4.4.4 If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either provide a response on the requested supporting data, advise the Architect when the response or supporting data will be furnished or advise the Architect that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Architect will either reject or approve the Claim in whole or in part.

4.4.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefor and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be final and binding on the parties but subject to mediation and arbitration.

4.4.6 When a written decision of the Architect states that (1) the decision is final but subject to mediation and 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.

4.4.7 Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.4.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines prior to resolution of the Claim by the Architect, by mediation or by arbitration.

4.5 MEDIATION

4.5.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5 shall, after initial decision by the Architect or 30 days after submission of the Claim to the Architect, be

subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

4.5.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

4.5.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

4.6 ARBITRATION

4.6.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5, shall, after decision by the Architect or 30 days after submission of the Claim to the Architect, be subject to arbitration. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 4.5.

4.6.2 Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect. The demand for arbitration shall be filed in writing with the other party to the Contract and with the American Arbitration Association, and a copy shall be filed with the Architect.

4.6.3 A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.4.6 and 4.6.1 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.

4.6.4 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract 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 Claim 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.

4.6.5 Claims and Timely Assertion of Claims. The party filing 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.

4.6.6 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. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time 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 substitute.

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, including the responsibility for safety of the

Subcontractor's Work, 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 will 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 and Contractor 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 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

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 in Paragraph 4.3.

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 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 contractor's 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 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

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 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Subparagraph 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, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

7.1 GENERAL

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.

7.2 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 change in the Work;

.2 the amount of the adjustment, if any, in the Contract Sum; and

.3 the extent of the adjustment, if any, in the Contract Time.

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 prior to agreement on 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' 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. 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 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect will make an interim determination for purposes of monthly certification for payment for those costs. That determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a claim in accordance with Article 4.

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.

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 and Owner. 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 the Contract Documents or 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 morgages, 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 the commencement or 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 mediation and 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 in the Contract Documents.

9.3.1.1 As provided in Subparagraph 7.3.8, such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

9.3.1.2 Such applications may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

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 the costs of 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 evaluation of the Work 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, the 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 correction of minor deviations from the Contract Documents 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 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 withhold a Certificate for Payment or, because of subsequently discovered evidence, 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 for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.2, because of:

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

.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 a 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.

9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

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, plus interest as provided for in the Contract Documents.

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 that 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 prior to final payment. 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.

9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

9.8.4 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.

9.8.5 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. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of 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 Clause 11.4.1.5 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 on-site visits 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 the 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 canceled 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.

9.10.4 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.

9.10.5 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.

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.

10.2 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 HAZARDOUS MATERIALS

10.3.1 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

10.3.2 The Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. The Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up, which adjustments shall be accomplished as provided in Article 7.

10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, 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 or substance presents the risk of bodily injury or death as described in Subparagraph 10.3.1 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) and provided that such damage, loss or expense is not due to the sole negligence of a party seeking indemnity.

10.4 The Owner shall not be responsible under Paragraph 10.3 for materials and substances brought to the site by the Contractor unless such materials or substances were required by the Contract Documents.

10.5 If, without negligence on the part of the Contractor, the Contractor is held liable for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

10.6 EMERGENCIES

10.6.1 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' 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;

.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;

.7 claims for bodily injury or property damage arising out of completed operations; and

.8 claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

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

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

11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

11.3.1 Optionally, the Owner may require the Contractor to purchase and maintain Project Management Protective Liability insurance from the Contractor's usual sources as primary coverage for the Owner's, Contractor's and Architect's vicarious liability for construction operations under the Contract. Unless otherwise required by the Contract Documents, the Owner

shall reimburse the Contractor by increasing the Contract Sum to pay the cost of purchasing and maintaining such optional insurance coverage, and the Contractor shall not be responsible for purchasing any other liability insurance on behalf of the Owner. The minimum limits of liability purchased with such coverage shall be equal to the aggregate of the limits required for Contractor's Liability Insurance under Clauses 11.1.1.2 through 11.1.1.5.

11.3.2 To the extent damages are covered by Project Management Protective Liability insurance, the Owner, Contractor and Architect waive all rights against each other for damages, except such rights as they may have to the proceeds of such insurance. The policy shall provide for such waivers of subrogation by endorsement or otherwise.

11.3.3 The Owner shall not require the Contractor to include the Owner, Architect or other persons or entities as additional insureds on the Contractor's Liability Insurance coverage under Paragraph 11.1.

11.4 PROPERTY INSURANCE

11.4.1 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 written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional 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 11.4 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

11.4.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

11.4.1.2 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 in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

11.4.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

11.4.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

11.4.1.5 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.

11.4.2 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.

11.4.3 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.

11.4.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss 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.

11.4.5 If during the Project construction period the Owner insures properties, real or personal or both, at 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 11.4.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.4.6 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 11.4. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

11.4.7 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 causes of loss to the extent covered by property insurance obtained pursuant to this Paragraph 11.4 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.

11.4.8 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 11.4.10. 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.

11.4.9 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 4.6. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

11.4.10 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 is made, the dispute shall be resolved as provided in Paragraphs 4.5 and 4.6. The Owner as fiduciary shall, in the case of arbitration, make settlement with insurers in accordance with directions of the arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.5 PERFORMANCE BOND AND PAYMENT BOND

11.5.1 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.

11.5.2 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 examination 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 examine 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 at the Owner's expense. If such Work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense 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 BEFORE OR AFTER SUBSTANTIAL COMPLETION

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

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 In addition to the Contractor's obligations under Paragraph 3.5, 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. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Paragraph 2.4.

12.2.2.2 The one-year period for correction of Work 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.

12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Paragraph 12.2.

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 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.

12.2.5 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 one-year period for correction of Work 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. Except as provided in Subparagraph 13.2.2, 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.

13.2.2 The Owner may, without consent of the Contractor, assign the Contract to an institutional lender providing construction financing for the Project. In such event, the lender shall assume the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

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 that the Architect may be present for 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 that the Architect may be present for such procedures. Such costs, except as provided in Subparagraph 13.5.3, shall be at the Owner's expense.

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, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

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 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 issuance of an order of a court or other public authority having jurisdiction which requires all Work to be stopped;

.2 an act of government, such as a declaration of national emergency which requires all Work to be stopped;

.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; or

.4 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 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work 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.

14.1.3 If one of the reasons described in Subparagraph 14.1.1 or 14.1.2 exists, the Contractor may, upon seven 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.

14.1.4 If the Work is stopped for a period of 60 consecutive 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 14.1.3.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

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

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

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

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

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

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

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

.3 finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages 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 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Subparagraph 14.3.1. Adjustment of the Contract Sum shall include profit. 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 the Contract.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

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

.1 cease operations as directed by the Owner in the notice;

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

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

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

14.4.4 Amendment to AIA A201 - Change Order Proposals, Change Orders, and Applications for Payment to be submitted to Architect, Owner and MaineHousing Construction Analyst for review, approval, and signature.

SECTION 00700

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

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: The Baxter Library Renovation

1. Project Location: 619 Congress Street Portland, ME

B. Owner: Northern Enterprises, LLC, One City Center, Fourth Floor, Portland, ME 04101

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

The Work includes, but is not limited to:

- Demolition of site elements and building elements.
- Concrete foundation work at elevator tower and stair tower.
- Site and landscaping work to include excavation, grading, paving, utilities trenching and installation.
- Storm water drainage system.
- Brick repointing and replacement.
- Rough and finish carpentry.
- EPDM
- Steel and wood doors and frames.
- Aluminum windows.
- The building is fully sprinkled.

- The Work includes a hydraulic elevator.
- The Work includes plumbing and mechanical systems.
- The Work includes new electrical service, panels, switches devices and lighting.
- The Work includes fire alarm and smoke detection systems.
- The Work includes telephone and cable systems.

1.3 CONTRACT

A. The contract shall be AIA Document A121CMc - 2003101 – Standard Form of Agreement Between Owner and Construction Manager. See also AIA 201 General Conditions and Section 00700 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. This section does not apply to new work that has been installed as part of the Work.

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.
B. Cutting and patching of Structural Work shall be prohibited unless approved by the Engineer.
C. Cutting of Operational and Safety appurtenances shall be prohibited unless approved by the Architect and that other safety provisions have been implemented.

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, representatives of financial institutes and representatives of major sub-contractors. Within 48 hours of contract signing, CM shall submit to Owner the specified pre-construction submittals including the 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. Start-up authorization or certificates.
6. Completed CM Contract; Building Permits; Bonds.

B. Pre-construction meeting agenda will include following:

1. Processing application for payment.
2. Processing and distribution of submittals.
3. Maintenance of record documents and provisions of As-Built 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 and policy for visitors and non construction personal to site.
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 work, 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 and Owner.

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. Submit with attachments to MaineHousing.

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. Refer to specification section 01330 - Submittal Procedures for specific provisions for all submittals.

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 assures 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 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, as well as by the Contractor.

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. Except where indicated as being the Owner's responsibility, quality control services are the Contractor's responsibility, including those specified to be performed by an independent agency and not by the Contractor.

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

C. The Owner will engage and pay for services of an independent agency to perform the inspections and tests that are specified as Owner's responsibilities.

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

E. 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. 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.

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 and directly to MaineHousing in a timely manner.

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. Field office facility shall be sufficiently large to accommodate all persons and furniture/equipment convening for project meetings (progress and requisition meetings). 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.

1.13 TEMPORARY 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, including separation and recycling of waste material. 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 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.

1.27 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 aboratory 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.

D. MaineHousing Closeout Requirements – comply with the following MSHA requirements: See the following MSHA documents attached to this Section: Final Completion Check List, Certifications, Final Requisition, Incomplete Work Escrow.

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 02060

BUILDING DEMOLITION

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 the following:

1. Demolition and removal of all building components in the existing building that allows for implementation of new work including all mechanical electrical, plumbing and sprinkler.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Cutting and Patching" for cutting and patching procedures for demolition operations.
2. Division 1 Section "Construction Facilities and Temporary Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for demolition operations.

1.3 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.

B. Proposed dust-control measures.

C. Schedule of demolition activities indicating the following:

1. Dates for shutoff, capping, and continuation of utility services.

D. Inventory of items to be removed and salvaged.

E. Inventory of items to be removed by Owner.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Predemolition Conference: Conduct conference at Project site to comply with preinstallation conference requirements of Division 1 Section "Project Meetings."

PART 2 - EXECUTION

PART 3 - EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. Survey the condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.

E. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.2 UTILITY SERVICES

A. Owner will arrange for disconnecting and sealing indicated utilities serving structures to be demolished before start of demolition work, when requested by Contractor.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.

C. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

C. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of buildings to be demolished and adjacent buildings to remain.

1. Strengthen or add new supports when required during progress of demolition.

3.4 EXPLOSIVES

A. Explosives: Use of explosives will not be permitted.

B. Explosives: Do not bring explosives to the site or use explosives without written consent of Owner and authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to people or for damage to property due to blasting operations. Perform required blasting in compliance with governing regulations.

3.5 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

END OF SECTION 02060

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.

1.03 RELATED WORK:

A. Miscellaneous Metal: Section 05500

1. Expansion Anchors - Section 05500

2. Embedded Items - Section 05500

B. Anchor Rods: 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. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Provide welded wire fabric in flat sheets.

C. 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 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. Water: Potable.

D. Air-Entraining Admixture: ASTM C 260.

E. 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.

F. Normal range water reducing admixture: ASTM C 494 Type A containing no calcium chloride.

G. Accelerating Admixture: ASTM C 494, Type C or E.

H. Calcium Chloride not permitted.

2.04 RELATED MATERIALS:

A. Waterproofing Membrane: See 07135

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. 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.

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. Footings, Foundation Walls:
   a. Strength: 3500 psi @28 days, 3/4" aggr.
   b. W/C Ratio: 0.58

c. Entrained Air: 6% ± 1%
d. Slump: 3"±1"

2. 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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. 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.

E. 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.

3.09 TOP OF FOOTINGS AT STAIR CORES:

A. Trowel Finish: Apply trowel finish to surfaces indicated, including footing surfaces to be covered with carpet, resilient flooring, paint or other thin-film finish coating system.

1. After floating, begin first trowel finish operation. 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. Grind smooth any surface defects which would telegraph through applied floor covering system.

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.

C. 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.

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.

D. Refer to Section 04520 Brick Repointing & Replacement for restoration of masonry wall.

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.

2. PRODUCTS

2.1 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.

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. 3" "Shouldice" designer stone.

5. Shouldice Designer Stone, see drawings for size type and style. SHOULDICE DESIGNER STONE PHONE: (519) 935-2771 or (800) 265-3174.

2.2 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. Use 1800 psi minimum Type S mortar for reinforced masonry and where indicated.

b. 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.

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 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 04520
BRICK REPOINTING AND REPLACEMENT

Revised: 28 August 2009

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Repointing of brick to brick joints – Contractor is to include in his bid the cost of spot repointing areas deemed by the Architect and the Construction Manager to have the potential for water-infiltration and/or unacceptable mortar deterioration.
2. Replication of the color, texture and joint profile of the original tinted brick and stone pointing mortar.
3. Removal and replacement with new matching bricks of all spalled, cracked, damaged and missing bricks.
4. Patching of masonry with new or salvaged bricks where ferrous elements have been removed.
7. Rebuilding with original bricks areas of debonded face bricks.

B.

1. On a spot point basis, cut to 3/8" depth or to sound mortar all brick mortar joints and repoint with mortar matching existing as closely as possible. See 1.01, A.1. above.
2. Remove and replace all badly spalled, cracked, or deteriorated brick with new brick to match existing as closely as possible. See 1.01, A.3 above.
3. Infill all existing openings as shown on drawings.
4. Make new openings as shown on drawings.
5. Wash all masonry surfaces within work area.
7. Clean up and dispose of spent debris properly.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

B. International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.03 DEFINITIONS

A. Defective Mortar Joints: Joints in which mortar is missing, loose, spalled, eroded, powdered, broken, hollow, unsound, soft, or weathered more than 3/16 inch (5 mm) from original plane. Sound joints containing fine hairline cracks are excluded.

B. Defective Bricks: Bricks which have cracked, spalled or been previously patched or coated. Any brick that has lost its fire-skin and/or its integrity as a masonry unit.

1.04 SUBMITTALS

A. Submit under provisions of Section
   1. Samples: New replacement bricks to match originals in sufficient quantity to show full color and texture range, samples of brick ties and helical anchors.
   2. Manufacturer's data on all products used in this section including but not limited to: Cement, sand, lime, replacement bricks, brick ties and helical anchors.
   3. Qualification Statement: Brick masons qualifications, including previous projects.

1.05 QUALITY ASSURANCE

A. Installer:
   1. Minimum 5 years experience in work of this Section.
   2. Successful completion of at least 5 projects of similar scope and complexity within past 3 years.

B. Preconstruction Testing Laboratory Services: Under provisions of Section
   1. Select 4 samples from stockpiled material and existing construction. Test new and existing bricks to ensure that they are compatible.
   2. Test brick in accordance with ASTM C 67 Report the following for new and existing historic bricks:
      a) Compressive strength.
      b) Absorption.
      c) Initial rate of absorption.

C. Mockups:
   1. Replacement of Damaged bricks: Remove and replace existing damaged bricks in locations approved by project architect with new matching bricks.
      a) Prior to setting new bricks the mock up area will be evaluated for brick and mortar removal.
      b) Brick setting to be evaluated for brick matching and workmanship including alignment with existing courses and joint widths.
   3. Raking out and repointing procedures.
      a) 25 square feet (5' x 5') of raking out. Sample to be evaluated for depth of mortar removal, preservation of brick edges and flushing out of joint in preparation for repointing.

b) Mortar color and texture: Submit samples of matching mortar on boards or in channels. After preliminary approval of mortar color submitted on boards proceed with brick repointing mock-up.
c) Repoint 25 square feet (5' x 5') of brick joints with approved mortar. Sample to be evaluated for mortar color, texture and joint profile.
d) Work up to be evaluated for overall workmanship and procedures.

4. Rebuilding of areas of debonded or bowing brick masonry.
a) Remove all face bricks in area indicated by project architect.
b) Prior to re-setting bricks area shall be evaluated for mortar removal from existing wall and salvaged bricks.
c) Reset original bricks with brick ties – Helifix stainless steel 10mm dryfix masonry pinning system by Helifix North American Corp., Concord, Ontario, Canada. Mock up a 5' x 5' area to be evaluated for alignment with existing brick courses, joint width overall workmanship. Approved mockup may remain as part of the Work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect materials from moisture absorption and damage.

1.07 PROJECT CONDITIONS

A. Protection of Work:
1. Cover top of wall with strong waterproof membrane at end of each day or shutdown. Cover partially completed walls when work is not in progress.
2. Extend cover minimum of 24 inches (600 mm) down both sides; hold securely in place.
3. Prevent staining and damage to exposed masonry.
4. Protect sills, ledges, and projections from mortar droppings; remove droppings immediately.

B. Environmental Requirements:
1. Hot weather requirements: If ambient temperature is over 95 degrees F (35 degrees C) or relative humidity is less than 50 percent, protect from direct sun and wind exposure for minimum 48 hours after installation.
2. Cold weather requirements:
a) In accordance with IMIAC requirements.
b) Do not use frozen materials or build upon frozen work.

PART 2 – PRODUCTS

2.01 Materials General

A. Comply with referenced standards and other requirements indicated applicable to each type of material required.

B. Reference in the specifications to materials by trade name is to establish a standard of quality. It is not intended to exclude other manufacturers whose materials that, in the judgment of the Architect or his designated representative, are equivalent to those named based on sample panels.

2.02 Mortar Materials

A. Lime: ASTM C 207, Type S hydrated bag lime
B. Cement: ASTM C 150, Type I or Type II Portland cement. Cement must comply with ASTM C 91, not more than 0.30 % soluble alkali.
C. Sand: ASTM C 144: color, size and type to match existing mortar.
D. Water: Potable, clean and free from deleterious amounts of acids, alkalis and organic matter.
E. Pigments: Chemically pure mineral oxides, alkali proof and light fast as manufactured by Solomon Grind – Chem Services, Inc of Springfield, IL., Lander-Sigal or approved equal.

F. Mix proportions:
For brick repointing joints: 1:1:6 mixture of Type I or Type II (non-staining) Portland Cement, Type S hydrated bag lime and sand and pigment to match existing historical mortar..

For brick setting joints: 1:1:6 mixture of Type I or Type II Portland Cement, Type S hydrated bag lime and sand.

2.03 Bricks

A. Brick: Reuse existing bricks salvaged during removal of debonded outer wythe for repairing areas where bricks are bowing or debonding.

B. Brick: Provide new bricks as required to repair areas of cracked spalled or damaged bricks. New bricks to match existing in compressive strength, absorption, initial rate of absorption, color, size, and surface texture.

2.04 ACCESSORIES

A. Anchors: Stainless steel, ASTM A 167 Type 302 or 304. *(to be specified by project engineer)*

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to beginning work examine existing mortar joints to determine procedures required to match new mortar to existing, including:
   1. Order in which horizontal and vertical joints were tooled.
   2. Style of tooling including depth and profile.

3.02 REPLACEMENT OF DAMAGED AND MISSING MASONRY

A. Remove damaged and deteriorated masonry without damage to adjacent masonry.

B. Install new or salvaged masonry bricks where existing units are missing or were removed.

C. Establish lines, levels, and courses to match existing. Fit new masonry to bond and coursing of existing masonry.

D. Lay masonry plumb and true to line.

E. Do not shift masonry after mortar has achieved initial set. If adjustments must be made after initial set, remove mortar and replace with new.

F. Lay bricks in full mortar bed, with full head joints.

G. Do not butter corners or excessively furrow joints.

H. Cut masonry with straight, true cuts and clean, unchipped edges. Prevent oversized or undersized joints. Discard damaged units.

I. Where fresh masonry joins existing, or partially set masonry, remove loose masonry and mortar; clean and lightly wet exposed surface of set masonry.

3.03 RAKING OUT OF MORTAR JOINTS

A. Remove all mortar material from joints using hand tools. The use of hand held grinders or pneumatic tools will be allowed where joint widths can accommodate a single pass of the blade without touching either edge of the stone or bricks. Each mechanic must demonstrate proficiency in the use of hand held grinders or pneumatic tools.

B. Rake out joints to a minimum depth of 3/8" or until sound mortar is reached. Contractor to satisfy themselves as to existing conditions at the time of bidding. No allowances will be made for extra raking out work.

C. Remove mortar to provide reveals with square backs and to expose masonry for contact with pointing mortar. Remove dirt and loose debris.

D. Do not spall edges or widen joints.

E. If joints are flushed with water to remove debris, the flushing shall be done the day before mortar application to avoid excess moisture.

3.04 MORTAR APPLICATION

A. Moisten joints with clean water and stiff natural bristle brush before application of mortar to sufficient degree to avoid absorption of mortar water.

B. Thoroughly mix ingredients in quantities needed for immediate use.

C. Mix dry ingredients mechanically until uniformly distributed. Add water to achieve workable consistency.

D. Discard lumpy, caked, frozen and hardened mixes and mixes not used within 2 hours after initial mixing.

E. Do not use antifreeze compounds to lower freezing temperature of mortar.

F. First layer to create a uniform depth for later applications and to be thoroughly Compacted into cavities: apply mortar to a maximum thickness of 3/8"

G. After joints have been filled to a uniform depth, apply remaining mortar in successive ¼" thick layers: fully compact each layer and allow to dry to thumbprint hardness before applying next layer.

H. When final layer is thumbprint hard, tool to match approved sample joint.

I. Avoid feather-edging of mortar joint.

J. Immediately after repointing, remove excess mortar by light brushing with a natural bristle brush. Do not leave encrusted matter.

K. Keep mortar damp for 48 hours after pointing to permit proper hardening of mortar. The following cures are permissible:

a. Cover masonry temporarily with burlap, which is moistened periodically.

Or

b. Cover wall with plastic sheets temporarily to prevent evaporation.

3.05 CLEANING

A. The cleaning shall be done with clean water applied vigorously with fiber brushes. After cleaning with brushes the stone shall be thoroughly rinsed with clear water. Proprietary cleaning compounds containing caustic agents, intended for removing mortar smears shall not be used without the written approval of the Architect. The goal is to remove all smears before they set so that caustic agents are not required.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK:

A. Structural steel work includes, but is not limited to new steel columns, cap plates, base plates, beams, loose lintels, bearing plates anchor rods and leveling plates.

1.03 REFERENCE SPECIFICATIONS:

A. AISC "Code of Standard Practice for Steel Buildings and Bridges.

B. AISC "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design", including "Commentary" and Supplements thereto as issued.

C. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts".

D. AWS D1.1 "Structural Welding Code" - Steel.

E. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

1.04 SUBMITTALS

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for structural steel including mill reports, high-strength bolts, structural steel primer paint and structural steel top coat paint.

B. Shop Drawings:Submit shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.

C. Connection Design: Submit design calculations prepared and stamped by a Professional Engineer registered in the State of Maine for all connections not tabulated in the AISC "Manual of Steel Construction" (ASD or LRFD).

PART 2 PRODUCTS

2.01 MATERIALS:

A. Structural Steel Wide Flange Shapes: ASTM A992, Grade 50

B. Other Structural Steel Shapes, Plates and Bars: ASTM A36

C. HSS shapes (square, rectangular and round): ASTM A500, Grade B, Fy = 46 ksi

D. Anchor Rods: ASTM F1554, Grade 36 headed unless otherwise indicated

E. Unfinished Threaded Fastener sand threaded rods: ASTM A307, Grade A, regular low-carbon steel bolts and nuts

1. Provide hexagonal heads and nuts for all connections.

F. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325

2. Direct-tension-indicator bolts conforming to ASTM F1852 or direct-tension-indicating washers conforming to ASTM F959 may be used at Contractor's option.

G. Electrodes for Welding: E70XX complying with AWS Code.

H. Structural Steel Primer Paint:

1. Interior Structural Steel: Fabricator's standard zinc rich, rust inhibitive primer

I. Structural Steel Top Coats:

1. Interior Structural Steel: None

J. Non Shrink Cement-Based Grout: See section 03300

K. Galvanizing: ASTM A123.

1. Items noted as "Black Galvanized" shall be finished in accordance with "Aged Galvanizing" by Duncan Galvanizing of Everett, MA or approved alternate.

PART 3 EXECUTION

3.01 ERECTION:

A. General: Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

B. Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds.

C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads.

D. Setting Plates and Base Plates: Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

E. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress.

F. Paint Damage: Touch up shop applied paint whenever damaged or bare..

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 and exterior 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
B. Gypsum Assemblies on Metal Framing Section 09260

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, gauges 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 (3) reproductions 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 railings, entry canopy and structural deck at entry.

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 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 miscellaneous grounds, blocking, sills, plates, shoes, shims, and furring, framing, framing anchors, and fasteners.

2. Furnishing and installing plywood wall back up panels and backer boards for telephone and electrical equipment.

3. Drilling concrete and 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.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. Finish Carpentry - Section 06200.

B. Flashing and Sheet Metal - Section 07500.

C. Caulking and Sealants - Section 07900.

D. Glazing - Section 08800.

E. Finish Hardware - Section 08710.

1.04 QUALITY ASSURANCE

A. Codes and Standards:

1. International Building Code - 2003

2. AITC Timber Construction Manual - 2004

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 PS20-05. Lumber shall bear the grade and trademark of the Association under whose rules it is produced and a mark of mill identification.

B. Engineered Wood Products: Privide wood products manufactured by Trus Joist/MacMillan or approved alternate.

C. Protect all lumber and keep dry, both in transit and at the job site.

D. All lumber shall be well seasoned and contain not more than 15% moisture content (marked "S-Dry").

E. 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, $F_{cÁ}$ = 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.

2.02 PRESERVATIVE TREATED LUMBER

A. The following wood members shall be Southern Yellow Pine Treated with CCA to 0.4 #/CF in accordance with AWPA C-18. Lumber embedded in or in contact with soil shall be treated to 0.6#/CF in accordance with MaineHousing's construction manual. 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.

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 a 15-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". Wall framing will conform to the Optimum Value Engineering framing practices detailed in Appendix A of this section.

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.

h. Use acoustical sealant along shoe and header of all party walls.

2. Cutting and Patching: Do all cutting, patching, heading and blocking required for work of all trades. Notify Telephone Company to place jacks at rough-in stages.

3. 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. Fastening:

1. Fastening shall be as indicated on the Design Drawings, or in accordance with Table 2304.9.1 of the International 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. Powder actuated fasteners shall not be substituted, except in the attachment of wall furring strips.

3. Fasteners shall be non-corrosive on exposed and exterior locations.

C. Firestops: Firestops of 2" nominal stock, shall be provided in all concealed spaces not otherwise cut off from passage of air from one space to another.

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.

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.

2.4 STAIR RISERS AND TREADS: 3/4" APA plywood.

2.6 STAIR SKIRTBOARDS: Pine

2.8 NAILS: 6d for 1/2" finish stock and 4d finish for thinner wood. Use 8d generally for nailing 3/4" wood trim to framing.

2.9 SCREWS, BOLTS & OTHER FASTENERS: as shown on Drawings with penetration into framing or blocking adequate to support loads shown. Where not shown, consult Architect.

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

END OF SECTION

SECTION 07010

PAINT REMOVAL

Sure Klean® Heavy Duty Paint Stripper Paint, Coating & Graffiti Removers Specification

PART 1 – GENERAL:

1. **Test Area**

Test a minimum 4 ft. by 4 ft. area on each type of masonry. Use manufacturer's application instructions. Let the test panel dry 3 to 7 days before inspection. Keep test panels available for comparison throughout the cleaning project.

2. **Inspection**
   Test area to be inspected and approved by architect and National Parks Service prior to continuation of work.

PART 2 – PRODUCTS:

1. **Manufacturer:** PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255; Fax: (785) 830-9797. E-mail: CustomerCare@prosoco.com

2. **Product Description**
   Sure Klean® Heavy Duty Paint Stripper, an alkaline formula with organic solvents, removes multiple layers of paint and graffiti from masonry surfaces. This "slow-working," extended-contact remover, remains active for 24 hours. One application of Heavy Duty Paint Stripper dissolves heavy accumulations of paint, most spray paint, lacquers and graffiti, restoring old masonry to its original appearance. Following paint removal, the masonry must be neutralized with the appropriate Sure Klean® product. Heavy Duty Paint Stripper contains no methanol, methylene chloride, or chlorinated solvents, and is water rinsable and nonflammable.

Technical Data
FORM: White gel
SPECIFIC GRAVITY: 1.293
pH: 14
WT./GAL.: 10.6 lbs.
TOTAL SOLIDS: N/A
ACTIVE CONTENT: N/A
FLASH POINT: > 200 degrees F (> 93 degrees C) ASTM D3278
FREEZE POINT: < -22 degrees F (< -30 degrees C)
SHELF LIFE: 2 years in tightly sealed, unopened container.

Limitations

- Product efficiency is reduced during cold weather. Surface and air temperatures should be at least 50 degrees F (10 degrees C) during application.
- Contains highly alkaline ingredients. Neutralize treated surfaces with Sure Klean® Limestone & Masonry Afterwash or other appropriate Sure Klean® cleaner.
- Do not use on wood. Alkaline ingredients raise the grain of wood and may interfere with paint adhesion or performance.
- Not appropriate for metal surfaces.

PART 3 – EXECUTION:

1. **Application**
   Before applying, read "Preparation" and "Safety Information" sections in the Manufacturer's Product Data Sheet for Heavy Duty Paint Stripper. Do not dilute or alter. Stir or mix well before use.

   A. Remove all loose and peeling paint using scraper. Let surface dry thoroughly.
   B. Apply approximately 1/8 inch coat of stripper.
   C. Leave paint stripper on the surface until the paint is obviously "lifted" or dissolved. If stripper is left on the surface unattended, take precautions to prevent pedestrians from coming near treated surfaces.
   D. Using pressure-rinsing equipment and working from the bottom of the treated surface to the top, thoroughly rinse the stripper and solubilized paint from the surface. Use as much water as possible. The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces. See also "Equipment" section of the Product Data Sheet.
   E. Reapply stripper if needed. Shorter dwell times are usually enough on second applications where only a little paint remains.

   Surface Neutralization
   When all paint has been removed, treated surfaces must be neutralized by applying a solution of Sure Klean® Limestone & Masonry Afterwash pursuant to the application instructions on the product label.

   F. Brush apply the prepared Afterwash to treated surfaces in a gentle scrubbing manner. Let Afterwash stay on the surface 3 to 5 minutes.
   G. Rinse the treated area thoroughly. Remove all traces of paste residue and solubilized paint coatings. Note: When rinsing, heated water (150-180°F; 65-82°C) improves removal efficiency and reduces rinse water and liquid waste.
   H. Using pH papers, pH pen or pH indicator solutions, check treated surfaces to ensure neutralization has been achieved. Repeat steps 6-7 above if needed until surface pH is 5.0 to 9.0.
   I. Let neutralized surface dry thoroughly. Before applying new surface coatings, check the cleaned surface again using pH papers, pH pen or pH indicator solutions. Check that surface pH is neutral. Inadequate neutralization may cause surface discoloration or failure of new surface coatings.

   Note: When removing 15-20 coats of paint, a second application directly over the first application (before rinsing) often improves stripping efficiency. Let the first coat dwell for the predetermined time before the second application.

Note: Failure to neutralize the surface may result in an alkaline residue that may cause unsightly white haze and interfere with adhesion of clear sealers and paint coatings. If the waste generated through paint stripping operations is classified as "hazardous," contractors must consult and comply with current federal, state and local regulations regarding containment, transport and disposal of hazardous waste. See also "Lead-Based Paint Removal" section of the manufacturer's product data sheet.

END OF SECTION

SECTION 07530
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Fully adhered EPDM sheet roofing, roof insulation, elastomeric flashing and shop formed metal edge strips.

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.

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 (10) 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 (10) 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. 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 ISO 95+ by Firestone, H-Shield by Hunter Panels or approved equal.
B. Over roof deck or foam insulation, install one layer of APA rated 7/16" oriented strand board (OSB) with screws only. Nails are not acceptable.
C. Tapered edge strips to be 1-1/2" by 18" fiberboard.

2.02 MEMBRANE ROOF SYSTEM

A. Membrane roofing to be fully adhered .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 OSB.
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 METAL FLASHING

A. Edge strip and concealed clips to be formed using .040" mill finish aluminum.

2.04 FASTENERS

A. Use annular-ring aluminum nails to secure the new aluminum edge strip.
B. Use fasteners recommended by the membrane manufacturer to secure anchor bars and termination bars.
C. 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.

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. OSB to be installed with a 1/16"-1/8" gap at all joints.
B. Fasten insulation to the roof deck with the appropriate screws and plates. Fastener quantity and layout must meet the requirements of the EPDM manufacturer to obtain their wind speed warranty.
C. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses, leaving no gaps and 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 7/16" OSB 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.
E. Raise existing curb height as necessary to obtain a minimum of 8" high flashing.

3.05 FASCIA AND EDGE STRIPS

A. Bottom edge of aluminum 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.

3.06 CAP FLASHING

A. Remove existing cap flashing. Cut a new reglet to a minimum depth of 1-1/4". Secure new cap flashing with lead wool plugs at 24" on center. Seal joint with NP1 by Sonneborn.

3.07 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.

3.08 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.

3.09 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

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 - exterior doors and frames shall be thermally broken.
b. Steel frames for wood doors - exterior doors and frames shall be thermally broken.
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 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.

G. Exterior frames shall include a thermal break.

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 08520
ALUMINUM WINDOWS

Part 1 – GENERAL

1.1 REFERENCES

A. Drawings A5.01, A5.02 and A5.03 illustrate a window system that meets the specifications included in this section and those included in Section 08581 Storm Windows.
   - The aluminum window system specified in this section is based on the "Series 400 Double Hung Window" by Universal Window Company, Marlboro, MA.
   - The storm / screen window system shall be "ating (MOL-OP)" by Allied Window, Inc., Cincinnati, Ohio.

   - Other equal window systems submitted by Bidders that meet the requirements of the Construction Documents, specifications and drawings, will be considered.

B. The general conditions, supplementary conditions and applicable portions of division 1 of the specifications are a part of this section, which shall consist of all labor, equipment and materials necessary to complete all quality control work indicated on the drawings, herein specified or both.

C. The following minimum provisions standards and tolerances shall apply to all work under this contract. Where stricter standards and tolerances are specified, they shall take precedence over these standards and tolerances. Owner reserves the right to define intent of specifications.

D. Manufacturer will have been producing the model window used on this project for similar projects for a minimum of five years.

E. Manufacturer must provide documentation of three (3) previous window installation projects of similar scale to this project that have received approval for historic tax credits by the National Park Service

F. It will be the bidder responsibility to verify all quantities and type of windows.

1.2 SCOPE

A. The work of this section consists of supply and installation of aluminum windows, aluminum cladding and related items, as indicated on the drawings and specified herein. Window openings vary in size, shape and configuration - refer to drawings for window types, quantities, details and locations of window openings. The work includes but is not limited to the following:

   1. Double hung windows, thermally broken with tilt-in sash and factory balances. Side load will not be acceptable.

[redacted]Half Screens – mounted to the interior side of the window. [redacted]

3. Factory glazing in accordance with Section 08520, 2.1, E.

4. Sealant within window system

5. Hardware, accessories and appurtenances.

[redacted]

7. Removal and disposal of existing sash, [redacted] and window glass. [redacted]

1.3 **SUBMITTALS**

A. Shop drawings showing installation conditions throughout and catalogue cuts shall be submitted for approval. Shop drawings shall include elevations of all windows types (minimum scale ½ inch equals 1 foot); sections at jamb, head, sill, meeting rail, and applied muntin (minimum scale 3" – 1'-0") and **full size** details of every condition indicating thickness of aluminum, fastenings, the size and spacing of anchor, method of glazing, details of operations hardware, method and materials for weather-stripping, and method of attaching screens.

B. Submit color chips for selection by architect.

C. One complete full-size sample window and window trim installed on site in an existing window opening for approval. Sample shall be complete with hardware (including handicap hardware), glazing, weather-stripping, anchors, screen and other accessories, and shall be furnished in the color black.

D. National Fenestration Rating Council certifications and test results documenting compliance with the Performance Criteria included in Section 08520, 2.1, J, 1 – 8. Testing shall be performed by a prequalified testing service per Section 01400, 1.4.

PART 2 – PRODUCTS

2.1 **GENERAL REQUIREMENTS**

A. All windows shall be of the thermally broken type, including sash and frame members.

B. MATERIALS: Aluminum shall be of commercial quality aluminum alloy 606315 free from defects impairing strength durability. All window members shall be of extruded aluminum and shall have a guaranteed minimum ultimate tensile strength of 22,000 PSI,

and a yield of 670,000 PSI. Secondary members such as self-alignment clips, weather-stripping, guides, etc. shall be made of a suitable and compatible material.

C. HARDWARE: Double hung units shall be equipped with an integral lift handle on bottom sash; bottom of upper sash to have a continuous integral pull down handle. Both upper and lower sash shall be counter balanced so that they remain open in any position. Balances shall be heavy-duty Ultra-Lift type for bottom sashes and standard block and tackle for top sash as customary with the manufacturer and suitable for installation required. Balances shall conform to AAMA 902.2. Tilt latches to be recessed with allen type tamper proof screws.

   Windows requiring pushing, pulling, or lifting to open (for example, double-hung, sliding, or casement and awning units without cranks) should require no more than 5 lb (22.2 N) to open or close.

   Locks, cranks, and other window hardware in Type A handicap units shall comply with ADA Section 4.27 requirements for controls and operating mechanisms.

D. FINISH: Standard finish shall be factory-applied thermo setting acrylic enamel equal to Duracron. Finish shall meet AAMA 603.7 specification. Color selected by architect from manufacturer's standard.

E. GLAZING: Both sashes shall be channel glazed using a marine type flexible vinyl-glazing channel. The overall glass thickness of 1" consisting of two lites of minimum 1/8" glass (or as required by load) with Low E one side separated by a desiccant filled aluminum spacer with a delchem Hot Melt sealant.

F. Top sash to be held by "anti-creep" latch.

G. Head and sill extrusion shall have a trimmable fin (+/- ½"). This allows for a maximum daylite opening.

H. Sealant: NP1 single component, non-sag polyurethane by Sonneborn Building Products, Chemrex, Inc., Shakopee, Minnesota. Complies with ASTM C920, Type S, Grade NS, Class 25. ANSI/UL263 4 hour fire rating, Design Nos. U900Z014, U9002Z037; USDA Compliant.

I. Backer Rod: Sonneborn Closed-Cell Backer Rod by Sonneborn Building Products. Provide closed-cell polyethylene rod designed for use with cold applied joint sealants. Provide backer rod of size required for joint design. Color of sealant will be selected by Architect from manufacturer's standard color range.

J. Performance Criteria: All windows to conform to the following criteria:
   1. Air infiltration: 0.30 or less, as certified by the National Fenestration Rating Council.

[redacted]

4. Water resistance: There shall be no leakage as defined in the high performance test method with a test pressure of 9.75 PSF.
5. Uniform Load Deflection Test: Under an exterior uniform load of 40 PSF no member in the completely assembled window shall deflect more that 1/135 of its span. Test shall be conducted in accordance of ASTME 330-70.
6. Uniform Load Structural Test: The window shall be subjected separately to an exterior uniform load of 60 PSF and an interior uniform load of 60 PSF (1.5 x design pressure). Tests shall be conducted in accordance with ASTME 330-70
7. Condensation Resistance Factor: The window shall be tested in accordance with AAMA 1502.6 standards and tests of thermal performance, and shall have a condensation resistance factor of no less than 46.
8. Wind Load Rating: 35 psf or higher.

PART 3 – EXECUTION

3.1 **INSTALLATION**

A. Work Included: Provide labor, materials and equipment necessary to complete the work of the Replacement Window Contract, and with out limiting the generality thereof include:

1. Remove existing wood sash, frame and trim.
2. Windows and cladding to be installed level, plumb, straight and square, with no twisting of sash or frame members.
3. Windows to be properly shimmed to maintain position and all conditions of item.
4. Windows to be securely fastened to building using anchors suitable for existing substrates and structural loads.
5. Windows to be installed in strict accordance with approved shop drawings.
6. Sealant Preparation: remove loose materials and foreign matter which impair adhesion of sealant.
7. Sealant Application: install appropriate size backer rod of size larger than joint according to manufacturer's recommendations. Apply materials in accordance with manufacturer's recommendations, install beads of proper width and depth; tool as recommended by manufacturer; immediately remove surplus sealant. Remove uncured sealant with Reducer 390, xylene, toluene, or MEK. Remove cured sealant with razor, scrapping, or mechanically.

3.2 **CLEANING**

A. Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance and to prevent fouling of weathering surfaces and weather-stripping, and to prevent interference with the operation of hardware.

3.3 **PRODUCT HANDLING**

A. All materials shall be delivered, stored, handled, and installed so as not to be damaged or deformed. Product should not be stored in high heat areas (+120º F) e.g. closed, unvented storage container.

3.4 GUARANTEES AND TEST DATA

A. Provide manufacturer's guarantees and independent test results indication compliance with AAMA specifications and performance criteria. Manufacturer's standard guarantee shall be for a minimum of one year.

B. Insulated glass units shall be provided with a five-year warranty unless otherwise approved by the architect.

3.5 COORDINATION

Coordinate work with that of all other trades affecting or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the contract.

END OF SECTION

SECTION 08581
STORM WINDOWS

PART 1 – GENERAL

1.1 SCOPE. Provide and install interior storm window / screen system - interior installation, lift out frame, divided lights, bottom operable, operating interior screen based on Magnetic One Lite – Operating (MOL-OP) by Allied Window, Inc., Cincinnati, Ohio.

1.2 All aluminum windows of the types and sizes shown in the plans and/or as called for in this specification shall be furnished with all necessary hardware, fasteners and miscellaneous equipment as herein specified and shall be manufactured by Allied Window, Inc., OR EQUAL. Quality standards shall be as described within these specifications.

PART 2 – MATERIALS

2.1 ALLOYS. Aluminum shall be of commercial quality and of proper alloy for window construction free from defects impairing strength and durability. All straight extruded sections shall be of 6063-T5 alloy and temper and shall have a minimum ultimate tensile strength of 22,000 P.S.I. and a yield of 16,000 P.S.I.

2.2 WINDOW MEMBERS. All sash members shall be of extruded aluminum with a 3/8" x 1" dimension. All extrusions shall be of sufficient strength to perform as designed. Window members shall have a nominal wall thickness of not less than .062". All corner keys shall be of extruded aluminum. High-energy foam-backed magnetic tape shall be applied to jamb rails of removable panel/assembly.

2.3 FASTENERS. All screws and other miscellaneous fastening devices incorporated shall be zinc plated, cadmium plated or other non-corrosive metals compatible with aluminum.

2.4 HARDWARE/MAGNETIC SEAL. Head receptor to be extruded aluminum U-channel with dimensions of ½" x 5/8" and with nominal wall thickness of not less than .046". The magnetic seal is accomplished by the use of one (1) of these jamb stop alternatives:

- 2.4.1 Foam-backed steel tape applied to U-channel noted above
- 2.4.2 Foam-backed steel tape applied directly to prime window frame system
- 2.4.3 Foam-backed steel tape applied to aluminum angle
- 2.4.4 Steel angle or channel

2.5 WEATHERSTRIPPING. Bottom rail of panel/assembly shall incorporate flexible "sill-seal" weatherstripping. Operating track jamb members shall be lined with pile weatherstripping equal to Stan-pro #525-160.

PART 3 – CONSTRUCTION

3.1 ASSEMBLY. All windows shall be assembled in a secure and workmanlike manner. The master frame and insert frame(s) shall be of mitered head and sill. Frame rails and stiles shall be neatly joined together using extruded aluminum corner keys staked in place.

3.2 SASH. The operable bottom sash shall be removable and be equipped with a full bottom rail lift handle. Heavy-duty spring-loaded latches shall be provided for variable sash positions for ventilation.

PART 4 – FINISH

The exposed surfaces of all aluminum members shall be clean and free from serious surface blemishes. Standard finishes shall be electrostatically applied baked acrylic enamel in white, colonial white, beige, black or bronze – as chosen by architect. Painted finish shall meet AAMA 603.6. Optional custom color finish to be two-part polyurethane paint (air dried).

PART 5 – SCREEN(S)

Extruded screen insert frame (3/8" x 1 1/16") with extruded aluminum corner keys shall be provided. Standard screen cloth is charcoal aluminum 18 x 16 mesh securely held in frame with vinyl spline.

PART 6 – GLASS AND GLAZING

6.1 GLASS. Glass shall be not less than "B" quality. Standard factory glazing shall be "DSB" (1/8") tempered glass.

6.2 GLAZING MATERIAL. Glass shall be held in place with removable and reusable vinyl glazing splines. Vinyl shall be manufactured from virgin polyvinyl chloride. All corners shall be neatly mitered.

PART 7 – INSTALLATION

The installer shall securely fasten windows in place to a straight, plumb and level condition, without distortion of the windows and shall make final adjustments for proper operation in accordance with the manufacturer's instructions.

PART 8 – WARRANTY

Manufacturer shall provide a five (5) year warranty against faulty materials, paint and workmanship.

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. Painting 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.

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. 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.

C. Volatile Organic Compound (VOC) emissions from paints & coatings must not exceed the VOC limits of Green Seal's Standards GS-11 requirements.
   1. Non-flat: 150 g/l
   2. Flat: 50 g/l

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. Wood Door Frames & Trim & Miscellaneous interior wood trim: Benjamin Moore Wood Primer and two (2) coats Latex Semigloss.

D. All Exterior Wood – Two (2) coats latex exterior grade paint.

E. Wood Doors – One (1) coat primer, three (3) coats latex eggshell.

F. Exterior steel railings painted with Tnemec, two (2) coats, plus primer.

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 drop cloths, 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.

D. 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. All Exterior wood and stairs.

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".

B. Interior Window Sill, Door Frames & Trim, baseboard and Miscellaneous Interior Wood Trim- one (1) coat primer and two (2) coats finish for all soft wood. Contractor to verify with construction manager as to window type.

C. Exterior misc. doors see elevations – Two (2) coats latex exterior grade paint. Prep all wood and prime as necessary.

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) 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, 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 Stanley 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 Construction Manager 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 (27' +/-) as shown on Drawings
Power supply:	208 v 3 phase, 60 cycle.
Machine Location:	As shown on Drawings
Stops & Openings:	Three (3) stops.
Car Enclosure:	High pressure laminate interior panels, six (6) recessed lights in Lexan 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 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:	3 Phase Power 40 HP Max
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, or a self contained submersible of manufactures standard type.

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.

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. Shall have built in diagnostics, no proprietary tools required to service unit.

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.

W. Operation (Selective Collective Automatic Push-button): Control of the elevator car shall be automatic in operation by means of a push-button in the car marked for each of the landing levels served and an "up-down" button at each intermediate landing with a call button at each terminal landing, wherein all stops registered by the momentary pressure of landing or car buttons shall be maintained until the car answers the call. An emergency stop switch shall be provided in the car push-button station which, when in the off position, will render the elevator inoperative, and which will enable attendant or passenger to stop the car at any point during its travel. Opening of this switch shall not cancel registered calls, and when the switch is closed the car will continue to answer calls that have been registered. Each landing station shall contain an illuminated push-button which shall "light-up" when pressed to indicate that a call has been registered to bring the car to that particular landing. A time delay non-interference feature shall be incorporated in the control mechanism to allow simple time for opening and closing car and hoistway doors before it is again placed in motion.

X. Special Emergency Service:

1. Special Emergency Service Operation shall be provided in compliance with the latest revision of the ASME/ANSI A17.1 or CAN3-B44 Code.

2. Special Emergency Service Phase I to return the elevator non-stop to a designated floor shall be initiated by an elevator smoke detector system or a keyswitch provided in a lobby fixture.

3. The smoke detector system is to be furnished by others. The elevator contractor shall provide contacts on the elevator controller to receive signals from the smoke detector system.

4. A key switch in the car shall be provided for in-car control of each elevator when on Phase II of Special Emergency Service.

5. If an elevator is on independent service when the elevator is recalled on Phase I operation, a buzzer shall sound in the car and a message indicator will be activated.

6. NOTE: Building to be provided with stand by emergency generator for elevator use. Contractor shall install per I.B.C. sections 3003.1.1 – 3003.1.4.

END OF SECTION

SECTION 16010 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish all materials, labor, tools, transportation, incidentals, and appurtenances to complete in every detail and leave in working order all items of work called for herein or shown on the accompanying drawings, including work related to:
   1. Electrical service entrance.
   2. Electrical demolition of existing equipment and wiring identified to be removed to facilitate renovations.
   3. Electrical distribution including new circuit breaker panelboards, and associated feeders.
   4. Electrical branch circuits, including wiring and devices.
   5. Interior lighting including luminaires, lamps, wiring and controls.
   6. Exterior lighting including luminaires, and wiring and controls.
   7. Fire alarm system including initiating/notification devices, and all associated wiring.
   8. Cable television system, including empty site service conduit and interior outlets and wiring.
   9. Telephone system wiring including site service entrances, wiring terminal blocks, interior outlets and wiring.
   10. Network wiring including equipment racks, interior outlets and wiring.
   11. Intrusion detection system including entry door motion sensors, keypad station, control panel, and associated wiring.
   12. Surveillance system including cameras, system software and associated wiring.

B. Include any minor items of work necessary to provide a complete and fully operative electrical system.

C. The Contractor for this work is referred to Bidding Requirements, General Conditions, Special Conditions, Temporary Services and other pertinent Sections of these Specifications. These sections describe work that is a part of this Contract as contained in Division 01. The following General Provisions amplify and supplement these Sections of Specifications. In cases of conflicting requirements, the stipulations set forth in Division 01 supersede and must be satisfied by the Contractor.

1.2 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. ANSI/NFPA 72 - National Fire Code.

C. ANSI/NFPA 101 - Life Safety Code.

D. OSHA 1910 - Occupational Safety and Health Act.

E. ADA - Americans with Disabilities Act.

1.3 GENERAL REQUIREMENTS

A. Contractor shall read the entire specifications covering other branches of work. He is responsible for coordination of his work with work performed by other trades.

B. Consult all Contract drawings which may affect the location of any equipment or apparatus furnished under this work and make minor adjustments in location as necessary to secure coordination. Contractor shall consult architectural reflected ceiling plans for exact locations of ceiling mounted lighting fixtures. Contractor shall consult architectural interior elevations for mounting heights of wiring devices, fire alarm devices and clock panels. Contractor shall consult architectural exterior elevations for mounting heights of wall mounted exterior lighting fixtures.

C. System layout is schematic and exact locations shall be determined by structural and other conditions. This shall not be construed to mean that the design of the system may be arbitrarily changed. The equipment layout is to fit into the building as constructed and to coordinate with equipment included under other Divisions of work.

D. Contractor shall contact the Owner's Representative immediately if he notices any discrepancies or omissions in either the drawings or the specifications, or if there are any questions regarding the meaning or intent thereof.

E. Submit all changes, other than minor adjustments, to the Architect for approval before proceeding with the work.

1.4 SUBMITTALS

A. Submit under provisions of the following and Division 01.

B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.

C. Mark dimensions and values in units to match those specified.

D. Contractor shall check all shop drawings for dimensional correctness, interferences and conformance to specifications and plans. Stamp drawings "approved" and indicate when stipulated check has been made before forwarding them. Identify submittal data by project name and equipment identification number.

1.5 REGULATORY REQUIREMENTS

A. Complete installation shall conform with all applicable Federal, State and Local laws, Codes and Ordinances, included but not limited to latest approved editions of the following:
   1. State Building Codes.
   2. State Elevator Code.
   3. Specific Construction Safety Requirements, State Industrial Commission.

4. National Electrical Code - NFPA 70.
5. National Fire Code - NFPA 72.
6. Life Safety Code - NFPA 101.
7. Occupational Safety and Health Act (OSHA) of 1971 and all amendments thereto.
8. ADA - Handicap Accessibility Requirements.

B. Nothing contained in the drawings and specifications shall be construed to conflict with these laws, codes and ordinances, and they are thereby included in these specifications. All work shall comply with the 2008 edition of NFPA 70, The National Electrical Code. It shall be the Contractor's responsibility to assure that electrical work is in full compliance with the NEC.

C. The Contractor shall visit the site to become familiar with all existing conditions affecting this work. No claim will be recognized for extra compensation due to failure of contractor to familiarize himself/herself with the conditions and extent of proposed work.

D. Obtain and pay for all necessary permits. Request inspections from authority having jurisdiction.

1.6 RECORD DRAWINGS

A. Record any changes in location of concealed boxes, underground utility service conduits, manholes, in-ground wiring boxes, and similar construction on a set of prints and deliver them to the Owner's Representative upon completion of the work.

B. Record location and depth of exterior work carefully for future reference.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide a Complete Instruction and Maintenance Manual: Prepare in the form of an instructional manual for use by Owner's personnel. Provide one (1) draft copy and two (2) final copies.
   1. Format:
      a. Size: 8-1/2" x 11", 20 lb. minimum weight white paper for typed pages, either manufacturer's printed data, or neatly typewritten.
      b. Drawings: Provide reinforced punched binder tab, bind in with text. Fold larger drawings to size of text pages. Clear plastic "binding tape" (not "Scotch" tape) applied to edge of sheet and then punched is acceptable.
      c. Single-sheet product literature and contractor-prepared pages: Provide reinforced punched binder tab. Clear plastic "binding tape" (not "Scotch" tape) applied to edge of page and then punched is acceptable.
      d. Provide indexed tabs and flyleaf for each separate product, or each piece of operating equipment. Include typed description of product, and major component parts of equipment.
      e. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS".
      f. Binders:
         1) Commercial quality three-ring binders with durable and cleanable plastic covers, 1" minimum, 2" maximum ring size.

2) When multiple binders are used, collate the data into related consistent groupings and provide a spine label that includes the volume number and contents of the binder.

B. Provide content as listed in separate Sections of Division 26 of these specifications.

1.8 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.9 COORDINATION WITH WORK PROVIDED UNDER DIVISION 15

A. Electrical work for mechanical systems equipment furnished under Division 15 shall be coordinated with these respective Divisions.

B. Power wiring and connections shall be provided under Division 16 for all Division 15 equipment, including:
1. Branch circuit power wiring.
2. Local disconnect switches for 208-volt single and equipment items (except where an integral means of disconnect is specified to supplied with the equipment item by the manufacturer).
3. Magnetic motor starters for 208-volt single and equipment items (except where an integral starter is specified to supplied with the equipment item by the manufacturer or where a variable speed drive is provided under Division 23).
4. SPST Manual motor starter switch for 120-volt motors.

C. Work provided under Division 15 shall include:
1. Motors.
2. Motor speed controller switches.
3. Low-voltage automatic temperature controls and associated wiring.
4. Heat tracing for piping, and associated controls.
5. Variable speed drives for motors.

D. In general, motors will be furnished and installed under other Divisions of work as a factory-installed item. Unless they are factory installed on equipment units supplied under other Divisions, all safety switches and motor starters shall be furnished and installed by the Electrical Contractor. Coordinate prior to submission of bid.
1. Electrical Contractor shall obtain all wiring diagrams necessary to connect and control equipment requiring electrical energy.

1.10 FIRESTOPPING

A. Firestopping around electrical cable, conduit and/or boxes and firestopping within boxes shall be as specified under Section 16111 to maintain fire ratings at walls, floors and ceilings. The Contractor shall coordinate penetrations of rated surfaces with the architectural drawings and specifications to assure that the proper fire rating is achieved.

1.13 TEMPORARY POWER AND LIGHTING

A. The Contractor shall be responsible for provision of temporary electrical power and lighting as required to facilitate construction work.
   1. Temporary electrical power shall be obtained from the existing electrical distribution system. The Contractor shall make all necessary provisions for the connection of a temporary power service.
   2. The Contractor shall provide temporary electrical power distribution as required to facilitate construction activities including:
      a. Wire/conduit
      b. Over-current protection
      c. Receptacle outlets
      d. Motor disconnect means
      e. Grounding
   3. The Contractor shall provide temporary lighting as required to facilitate construction activities.
   4. All temporary electrical power and lighting shall be completely removed prior to substantial completion of the project.

1.14 SUBSTANTIAL AND FINAL COMPLETION

A. Refer to General Conditions and Supplementary Conditions.

B. Substantial Completion shall not be considered unless all systems are tested and verified for adherence with Contract Documents and any work remaining is less than one percent of the total Contract Value of this Section.
   1. Record Drawings, Operation and Maintenance Manuals, Acceptance Demonstrations, Owner personnel training, spare parts or extra materials required, test reports, warranties and certifications of installation inspections shall be submitted and accepted prior to Substantial Completion.

C. Final Completion shall be when all work under this Section is completed as defined by the Contract Documents and accepted by the Architect-Engineer.

D. When Architect-Engineer determines Work is complete, close out submittals will be considered.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish new and undeteriorated materials and of a quality not less than what is specified.

B. The selection of materials and equipment to be furnished shall be governed by the following:
   1. Where single trade name, brand of manufacturer or material is listed in the specification, the exact equipment listed shall be used in the bid.
   2. Where more than one name is listed, Contractor may select any one of the several brands specified.
   3. Where trade name, brand of manufacturer of equipment or material is listed in the specification followed by the word "or approved equal," the Contractor may substitute product of equal quality from another manufacturer for consideration by the Engineer.

PART 3 - EXECUTION

3.1 PROTECTION AND CLEANING

A. Protect all electrical work and products against damage during construction and pay the cost of repair or replacement of electrical products made necessary by failure to provide suitable safeguards or protection.

B. After all work has been inspected and approved, thoroughly clean all equipment, provided under this work.

C. Repair all dents and scratches in factory prime or finish coated on all electrical equipment.

3.2 CUTTING AND PATCHING

A. Cut and patch as required to install new work. Patching shall match existing surfaces in kind and finish.

B. Obtain prior approval from the Engineer before cutting any structural members.

3.3 EXCAVATION COORDINATION

A. The Contractor shall contact *Dig Safe* at least three business days, but not more than 30 calendar days, in advance of any excavation work (1-888-DIGSAFE).

END OF SECTION 16010

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

1.2 RELATED SECTIONS

A. Section 16130 - Boxes

PART 2 - PRODUCTS

2.1 MATERIAL AND EQUIPMENT

A. Blank box plates shall be as specified under Section 16130.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Disconnect and make safe all electrical services to equipment that is to be removed under this Contract. All removals will be performed by the General Contractor, except as specified herein.

B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits use personnel experienced in such operations.

C. Provide blank covers for abandoned outlet boxes that are not removed.

D. Where existing electrical circuits that are required to remain active are interrupted by new construction, provide wiring and splice boxes as required to maintain circuit continuity.

3.2 REMOVAL AND DISPOSAL OF HAZARDOUS MATERIALS

A. The Contractor shall remove and dispose of all electrical equipment that contains hazardous substances according to the requirements of the State of Maine Department of Environmental Protection and the Federal Environmental Protection Agency. Such materials shall include, but are not necessarily limited to PCPs, PCBs, mercury and lead paint. The Contractor shall pay all costs associated with the transportation to and the disposal of such items at sites that are recognized and licensed by the State and Federal authorities.

3.3 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or are to be reused.
   1. Removal of existing electrical switchgear panelboards and transformers that are to be demolished or relocated shall be provided under Division 16.

END OF SECTION 16060

SECTION 16111 - CONDUIT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Rigid metal conduit and fittings.

B. Electrical metallic tubing and fittings.

C. Flexible metal conduit and fittings.

D. Liquid-tight flexible metal conduit and fittings.

E. Non-metallic conduit and fittings.

F. Fire stopping.

G. Sealing of conduit penetrations through walls.

1.2 RELATED SECTIONS

A. Section 16141 - Wiring Devices.

B. Section 16721 - Fire Alarm and Smoke Detection System.

1.3 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.

C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

D. NEMA TC-2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

E. NEMA TC-3 - PVC Fittings for use with Rigid PVC Conduit and Tubing.

1.4 SUBMITTALS

A. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Electrical boxes are shown in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.

2.2 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. EMT: ANSI C80.3. galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression type.

2.3 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: steel.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.4 PLASTIC CONDUIT AND FITTINGS

A. Conduit: NEMA TC-2 Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC-3.

2.5 LIQUID-TIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Flexible metal conduit with PVC jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.6 CONDUIT SUPPORTS

A. Conduit Clamps, Straps, and Supports: Steel or malleable iron.

2.7 FIRE STOP

A. Fire stopping materials shall be NRTL listed to UL 1479 (ASTM E814). Installation methods shall conform to a UL fire stopping system. Submit specifications and installation drawings for the type of material to be used. Fire stopping materials shall be as manufactured by *3M, International Protective Coatings Corp., Specified Technologies, Inc., Carborundum Company, RayChem, Nelson Fire Stop* or approved equal.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. Size conduit for conductor type installed, 3/4-inch minimum.

B. Arrange conduit to maintain headroom and present a neat appearance.

C. Route conduit parallel and perpendicular to walls, ceiling joists, and adjacent piping. In spaces where exposed ceiling joists exist, route conduit at ceiling deck between joists. Do not drill through joists without prior permission from Architect.

D. Maintain minimum 6-inch clearance between conduit and heat sources such as flues, steam pipes and heating appliances.

E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

H. Support conduit at spacing not to exceed limits stipulated in NFPA 70.

3.2 INSTALLATION

A. Cut conduit square using a saw or a pipecutter; de-burr cut ends.

B. Bring conduit to the shoulder of fittings and couplings and fasten securely.

C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.

D. Install no more than the equivalent of three 90-degree bends between boxes.

E. Use conduit bodies to make sharp changes in direction, as around beams.

F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 1-inch size.

G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

I. Provide No. 12 AWG insulated conductor or suitable nylon pull rope in empty conduit, except sleeves and nipples.

J. Install expansion joints where conduit crosses building expansion joints.

K. Where conduit penetrates walls or floors, seal opening around conduit. Use UL listed foamed silicone elastomer compound for fire rated walls.

L. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket.

M. Do not install conduits within the poured-in-place floor slabs above grade.

N. Where conduit(s) pass(es) from refrigerated or cooled atmosphere to warmer areas where condensation of water vapor may occur within raceways, conduit bodies sealed with "Duct Seal" type compound shall be provided after conductors are installed.

O. Flexible conduit shall not exceed three (3) feet in length.

P. Install top of underground conduit 30 inches (min.) below finished grade.

Q. Slope underground conduit away from building.

R. Use rigid galvanized steel conduit sweeps for underground elbows in conduit sizes 2 inch and larger.

3.3 INSTALLATION SCHEDULE

A. Underground Installations: PVC Schedule 40.

B. Exposed Outdoor Locations: Rigid steel conduit.

C. Concealed Interior Locations: Electrical metallic tubing.

D. Exposed Interior Locations: Electrical metallic tubing (Utility Room 016 and Mechanical Room M3 only).

E. Interior Motor Connections: Flexible metal conduit.

F. Exterior Motor Connections: Liquid-tight flexible conduit.

3.4 FIRE STOP INSTALLATION

A. Provide fire stop for all cables and conduits and conduit sleeves that pass through fire-rated partitions, ceilings and/or floors.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

3.6 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

END OF SECTION 16111

SECTION 16112 – SURFACE RACEWAY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface metal raceway.

1.2 REFERENCES

A. NECA (National Electrical Contractors' Association) Standard of Installation.

1.3 SUBMITTALS

A. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 SURFACE METAL RACEWAY – Type 1

A. Manufacturers:
   1. *Wiremold* V500 Series.
   2. Substitutions: Or Approved Equal.

B. Description: Sheet metal channel with fitted cover. Provide all necessary fittings to make a fully completed installation.
   1. Size: 3-1/4" wide by 17/32" deep.
   2. Channel Finish: Ivory enamel.
   3. Fittings, Boxes, etc.: Furnish manufacturer's standard accessories.

2.2 SURFACE METAL RACEWAY – Type 2

A. Manufacturers:
   1. *Wiremold* AL5200 Series.
   2. Substitutions: Or Approved Equal.

B. Description: Extruded aluminum channel with fitted cover. Raceway shall include internal divider to separate power wiring from telecommunications wiring. Provide covers for power

receptacle outlets and telephone/network outlets. Provide all necessary fittings to make a fully completed installation.

1. Size: 5" wide by 2" deep.
2. Power receptacle outlets: As specified under Section 16141.
3. Telephone/network outlets: As specified under Section 16746.
4. Channel/Cover Finish: Raceway shall be factory painted to color as specified by the Architect.
5. Fittings, Boxes, etc.: Furnish manufacturer's standard accessories.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide Type 2 surface raceway as indicated on the contract drawings.

B. Except in mechanical and electrical rooms, conceal all wiring within partitions or above ceilings to the greatest extent practical. Provide Type 1 surface metal raceway only where wiring cannot be concealed. Prior to the commencement of work, the Contractor shall attend a pre-construction meeting on site with the Architect to identify the proposed routing of all Type 1 surface raceway. No surface raceway shall be installed without the prior approval of the architect.

C. Install products in accordance with manufacturer's instructions.

D. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.

E. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

F. Obtain paint from raceway manufacturer and touch up any scratches or defects in pre-painted Type 2 surface raceway prior to substantial completion.

END OF SECTION 16112

SECTION 16123 – BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building wire and cable.

B. Metal clad cable

C. Wiring connectors and connections.

1.2 RELATED SECTIONS

A. Section 16111 – Conduit.

B. Section 16130 – Boxes.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

1.5 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper unless indicated as aluminum or "AL". Aluminum conductors may be substituted for copper only for the service entrance feeder.

C. If Aluminum conductors are substituted for copper conductors, size conductors to match feeder requirements for conductor ampacity and voltage drop.

D. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

E. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.1 BUILDING WIRE AND CABLE

A. Wiring Manufacturers:
   1. *Alcan* (Aluminum).
   2. *Triangle PWC* (Copper).
   3. Substitutions: Or Approved Equal.

B. Description: Single Conductor insulated wire.

C. Conductor: Copper conductors except compact section aluminum allowed for service entrance conductors.

D. Insulation Voltage Rating: 600 volts.

E. Insulation Type: THW or XHHW.

F. Insulation Color: Color of all service, feeder, branch, motor control, and signaling circuit conductors shall be green for grounding conductors, and white for neutrals. The color of the ungrounded conductors in different voltage systems shall be as follows:
   1. 120/208 volt, 3-phase
      a. Phase A – Black
      b. Phase B – Red
      c. Phase C - Blue

2.2 METAL CLAD CABLE

A. Manufacturers:
   1. *AFC Cable Systems* (Copper).
   2. Substitutions: Or Approved Equal.

B. Description: ANSI/NFPA 70, Type MC.

C. Conductor: Copper only.

D. Insulation Voltage Rating: 600 volts.

E. Insulation Temperature Rating: 60 degrees C.

F. Insulation Material: Thermoplastic.

G. Armor material: Aluminum.

H. Armor Design: Interlocked metal tape.

I. Jacket: None.

2.3 MANUFACTURERS - WIRING CONNECTORS

A. Connector manufacturers:
   1. *Burndy*
   2. *3M*
   3. *Ideal*
   4. *Thomas and Betts*

B. Description: Compression set or twist-on type with integral molded insulation and internal metallic compression ring or spiral screw-on connecting device.

PART 3 - EXECUTION

3.1 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.2 WIRING METHODS

A. Concealed Interior Locations: Type MC Cable.

B. Exposed Interior Locations: Building wire in conduit or surface raceway (surface raceway with prior approval only).

C. Service Entrance: Building wire in conduit.

D. Panelboard Feeders: Building wire in conduit.

E. Exterior Locations: Building wire in conduit.

3.3 INSTALLATIONS

A. Install products in accordance with manufacturers' instructions.

B. Indications of wire sizes on Drawings are based on copper conductors. The Contractor may elect to substitute aluminum conductors for the service entrance conductors; however, wiring sizes shall be selected to provide equal (or greater) ampacity ratings to that for copper conductors, and conduit sizes shall be increased to provide 40% fill (maximum).

C. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

D. Use stranded conductors for control circuits.

E. Use conductor not smaller than 12 AWG for power and lighting circuits.

F. Use conductor not smaller than 16 AWG for control circuits.

G. Use 10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.

H. Pull all conductors into raceway at same time.

I. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

J. Protect exposed cable from damage.

K. Support cables above accessible ceiling, using spring metal clips or cable ties to support cables from structure. Do not rest cable on ceiling panels. Support Type MC cable at spacing as identified in NFPA 70.

L. Group cables together neatly and secure as bundles where practical. Route cables parallel and/or perpendicular to building framing members or adjacent walls.

M. Neatly train and lace wiring inside boxes, equipment, and panelboards.

N. Clean connector surfaces before installing lugs and connectors.

O. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

P. Terminate aluminum conductors with tin-plated aluminum-bodied compression connectors only. Fill with anti-oxidant compound before installing conductor.

Q. Use suitable reducing connectors or mechanical connector adapters for connecting aluminum conductors to copper conductors.

R. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

S. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

T. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.4 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection.

B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

C. Verify continuity of each branch circuit conductor.

END OF SECTION 16123

SECTION 16130 - BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

C. Floor Boxes.

1.2 RELATED SECTIONS

A. Section 16141 - Wiring Devices

B. Section 16721 - Fire Alarm and Smoke Detection System.

1.3 REFERENCES

A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. ANSI/NFPA 70 - National Electrical Code.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.4 SUBMITTALS

A. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Electrical boxes are shown in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include ½ inch male fixture studs where required.

B. Cast Boxes: NEMA FB 1, Type FD. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.2 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS1, galvanized steel.

2.3 FLOOR BOXES

A. Manufacturers:
   1. *Wiremold*, Model RC4 Series
   2. Substitutions: Or Approved Equal.

B. Description: Poke-thru style floor box UL listed for installation in unprotected steel deck floors with concrete toppings. Floor box shall conform to standards contained in NFPA 70 Section 300-21.

C. Floor Box Components:
   1. Floor box assembly shall be made up of an insert and an activation cover. Overall poke-thru assembly length shall be 16" 3/8" [416mm].
      a. Insert: The insert body shall have the necessary channels to provide complete separation of power and communication services. There shall be one 3/4" trade size channel for power and two 1/2" trade size channels for communication cabling. The channels shall be arranged such that communication cables can be conduit protected and connected to the insert body using a die-cast zinc conduit connector with two 1/2" trade size threaded openings to accept both rigid and flexible conduit connections. The insert shall also consist of two 20-amp duplex receptacles. The four receptacles shall be prewired with six #12 AWG THHN solid conductors. Each duplex receptacle shall be wired with individual neutral and individual ground wires. The power receptacles shall be capable of being wired as standard receptacles or for isolated ground. Circuit identifiers shall be clearly marked on each duplex receptacle and a wiring diagram shall be stamped inside the junction box. The insert body shall also contain a nonmetallic bracket that will accommodate two connectivity modular inserts. The bracket shall allow the inserts to mount flush and recessed. The body shall consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material will be held securely in place in the insert body and shall not have to be adjusted to maintain the fire rating of the unit and the floor slab. The insert shall have a spring steel-retaining ring that will hold the poke-thru device in the floor

slab without additional fasteners. The poke-thru insert shall also consist of a 3/4" trade size conduit stub that is connected to the insert body and a 24.5 cubic inch [402ml] stamped steel junction box for wire splices and connections. The stamped steel junction box shall also contain the necessary means to electrically ground the poke-thru device to the system ground.

b. Activation Cover: The trim flange shall be manufactured of die-cast aluminum alloy with a brushed aluminum finish with a lacquer sealant. A gasket shall be attached to the underside of the trim flange to maintain scrub water tightness. The trim flange shall be 8 1/4" [210mm] in diameter. The activation slide cover shall be 6 1/4" [159mm] in diameter. The activation cover shall be manufactured from textured Polycarbonate or PVC and shall be black color. The slide holder assembly shall be flush with the floor and provide "Dead-front" protection that allows the receptacle covers to snap back into place when receptacle is not in use. A gasket shall be attached to the underside of the cover assembly to maintain scrub water tightness by preventing water, dirt, and debris from entering the power and communication compartments. The device shall also have accommodation for two communication connectors. The cover shall have individual slides that allow access to the communication connectors and will close over the connectors when not in use. Each activation cover shall also provide locations to adhere labels to identify both power and communication circuits.

c. Communication Modules Mounting Accessories: The poke-thru device manufacturer shall provide two UTP communications devices. Communication connectors shall be capable of being installed either flush or recessed. To accommodate the communication solutions, the device shall accept discrete keystone type connectivity devices from various manufacturers. All communication inserts shall be nonmetallic. The system shall provide for connection of other modular inserts for additional communication options. The unit will also be supplied with two Category 6 keystone connectors. The unit shall also accommodate a mechanism to permit protection of communication cabling. This mechanism shall be zinc die-cast with two openings to accept both flexible and rigid conduit. Openings shall accept 1/2" trade size conduit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

E. Install boxes to preserve fire resistance rating of partitions and other elements.

F. Align adjacent wall-mounted outlet boxes for fire alarm devices, switches, receptacle outlets, intercom call stations, telecommunications outlets, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished areas.

H. Do not install flush mounting boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24 inches separation in acoustic rated walls.

I. Where two (2) or more single-gang boxes are to be installed side-by-side, mount boxes a stud-width apart.

J. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

K. Use stamped steel bridges to fasten flush mounting outlet box between studs.

L. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

M. Use adjustable steel channel fasteners for hung ceiling outlet box.

N. Do not fasten boxes to ceiling support wires.

O. Support boxes independently of conduit.

P. Use gang boxes where more than one device is mounted together. Do not use sectional box.

Q. Use gang box with plaster ring for single device outlets.

R. Use cast outlet box in exterior locations and wet locations.

S. Install knockout closure in unused box openings.

T. Verify the exact location of floor boxes with Architect prior to installation.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

END OF SECTION 16130

SECTION 16141 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Wall Dimmers

C. Receptacles.

D. Device plates.

1.2 RELATED SECTIONS

A. Section 16111 – Conduit

B. Section 16130 – Boxes

1.3 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 6 - Wiring Device Configurations.

1.4 SUBMITTALS

A. Submit under provisions of Division 01 and Section 16010.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 WIRING DEVICES

A. *Pass and Seymour* model numbers are listed below to establish configuration and type. Equal devices by other manufacturers listed herein will be accepted.
   1. *Hubbell*
   2. *Leviton*
   3. *Bryant*
   4. Substitutions: None permitted.

B. Single Pole Single Throw (SPST)
   1. Description: style NEMA WD 1, heavy-duty, AC only general-use snap witch.
   2. Device Body: Ivory plastic with toggle handle.
   3. Voltage Rating: 120-277 volts, AC.
   4. Current Rating: 20 amperes.
   5. Model Number: CS20AC1-I

C. Wall Switches – 3 Way
   1. Description: Identical to SPST switches except 3-way operation.
   2. Model Number: CS20AC3-I

D. Boiler Cut-Off Switches
   1. Description: Heavy-duty, AC only, double pole single throw snap switch.
   2. Device Body: Red plastic with toggle handle.
   3. Voltage Rating: 120-277 volts AC.
   4. Current Rating: 20 amperes.
   5. Model Number: PS20AC2-RED

2.2 WALL DIMMERS

A. Compact Fluorescent:
   1. Description: Electronic slide-type wall station dimmer rated as compatible for compact fluorescent dimming ballast being controlled.
   2. Ratings: 16 amperes at 120V
   3. Color: Ivory
   4. Model Number: *Lutron* NF-10-IV
   5. Substitutions: Equivalent dimmer rated to match 3-wire dimming ballast supplied with Type B5 luminaires.

B. Incandescent Dimmers
   1. Description: Electronic slide-type wall station dimmer rated to operate incandescent lamps.
   2. Ratings: 1000 watts
   3. Color: Ivory
   4. Model Number: *Lutron* N-1000-IV
   5. Substitutions: Or Approved Equal.

2.3 RECEPTACLES

A. General Use:
   1. Description: NEMA WD 1; heavy-duty type, 125-volt grounded duplex receptacle.
   2. Device Body: Ivory, nylon face.
   3. Configuration: NEMA 5-20.
   4. Model number: BR20-I.

B. Ground Fault:
   1. Description: UL 498, 544, 943; 125 volt, ground fault interrupt type duplex receptacle with TEST and RESET.
   2. Device Body: Ivory, Thermoplastic.
   3. Configuration: NEMA 5-20.
   4. Model Number: 2095-I.

2.4 WALL PLATES

A. Decorative Cover Plate: Smooth nylon.
   1. Standard Devices: Ivory color.
   2. Boiler Cut-Off Switches: Red color, engraved: "EMERGENCY."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet boxes are installed at proper height.

B. Verify wall openings are neatly cut and will be completely covered by wall plates.

C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install receptacles with grounding pole on top.

E. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

F. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Install wall switches 48 inches above finished floor.

B. Install convenience receptacles 18 inches above floor, or as noted on the Drawings.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION 16141

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Fastening hardware.

1.2 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

A. Support Channel: Galvanized or painted steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors or beam clamps.

B. Anchors and Fasteners:
   1. Concrete Surfaces: Use expansion anchors.
   2. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
   3. Wood Elements: Use wood screws.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit. Do not use powder-actuated anchors.

D. Install surface-mounted cabinets and panelboards with minimum of four anchors.

E. Bridge studs top and bottom with horizontal members to support flush-mounted cabinets and panelboards in stud walls.

END OF SECTION 16190

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates and tape labels.

B. Panelboard and load center directories.

C. Underground marker tape.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, black letters on a white background.

B. Underground Warning Tape: 6" wide plastic tape, colored red with suitable legend describing buried electrical lines: Model UT27737-6 as manufactured by *Emedco*, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.

D. Install underground warning tapes at all buried lines 6" below finished grade.

3.2 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter Height: ¼ inch.

B. Mount panelboard nameplates on inside of trim cover.

3.3 PANELBOARD AND LOAD CENTER DIRECTORIES

A. Provide a typed directory of panel circuit load descriptions for all panelboards and load centers. Mount directory to inside of panel cover.

END OF SECTION 16195

SECTION 16421 UTILITY SERVICE ENTRANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide new incoming electrical utility service entrance.

B. Provide new incoming telephone utility service entrance.

C. Provide new incoming cable television utility service entrance.

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1.2 RELATED SECTIONS

A. Section 16111 - Conduit.

B. Section 16123 - Wire and Cable.

C. Section 16450 - Grounding.

D. Section 16470 - Panelboards.

E. Section 16721 – Fire Alarm System.

F. Section 16742 - Telephone System.

G. Section 16745 - Cable Television

1.3 ELECTRICAL SYSTEM DESCRIPTION

A. Electrical Service Description: The existing underground electrical utility line shall be replaced, and a new underground electrical service shall be provided as shown on the Contract Drawings. The contractor shall coordinate with the utility company all the work required to complete this project.

B. Work associated with the new electrical services shall be coordinated with:

Jamie Cough
Central Maine Power Company
162 Canco Road
Portland, Maine 04103

C. Arrange with *CMP* to modify the existing underground utility line at Deering Street as required. Arrange with *CMP* to provide a new 208/120 volt, 3-phase secondary service to be extended from existing manholes to a new service panel located in the Electrical Room.

D. Work by *CMP*: The Contractor shall make all necessary arrangements with *CMP* to provide the following:
   1. Modifications to the existing underground utility line at Deering Street.
   2. Provision of secondary service entrance conductors.

E. Work by Contractor: The Contractor shall provide the following:
   1. Conduit for the electrical service entrance.
   2. Service meter center at the building.
   3. Service grounding.

F. Work by General Contractor:
   1. Utility trench and excavation.

1.4 TELEPHONE SYSTEM DESCRIPTION

A. Telephone Service Description: A new underground telephone service shall be provided as shown on the Contract Drawings. The contractor shall coordinate with the utility company all the work required to complete this project.

B. Arrange with *FairPoint* to modify the existing overhead utility line at the rear entrance drive as required. Also, arrange with *FairPoint* to provide a new underground service from the existing utility pole to the building. Telephone service cable shall be extended underground to new telephone service termination equipment in the Electrical Room in the building.

C. Work by *FairPoint:* The Contractor shall make all necessary arrangements with *FairPoint* to provide the following:
   1. Modification of existing overhead telephone service line at the rear entrance drive as required.
   2. Provide new underground telephone service cables from the existing utility pole.
   3. Service entrance connections for the facility, including wiring termination means, and service cables at the service demarcation point in the building.

D. Work by Contractor: The Contractor shall provide the following:
   1. Underground conduits between the existing utility pole and the service termination equipment at the Electrical Room in the building.

1.5 CABLE TELEVISION SYSTEM DESCRIPTION

A. Cable Television Service Description: A new underground cable television service shall be provided as shown on the Contract Drawings. The contractor shall coordinate with the utility company all the work required to complete this project.

B. Arrange with *Time-Warner* to modify the existing overhead utility line at the rear entrance drive as required. Also, arrange with *Time-Warner* to provide a new underground service from the existing utility pole to the building. Cable television service cable shall be extended underground to new cable service termination equipment in the Electrical Room in the building.

C. Work by *Time-Warner:* The Contractor shall make all necessary arrangements with *Time-Warner* to provide the following:
   1. Modification of existing overhead cable service line at the rear entrance drive as required.
   2. Provide new underground cable television service cables from the existing utility pole.
   3. Service entrance connections for the facility, including wiring termination means, and service cables at the service demarcation point in the building.

D. Work by Contractor: The Contractor shall provide the following:
   1. Underground conduits between the existing utility pole and the Utility Room in the building.

1.6 QUALITY ASSURANCE

A. Conform to the requirements of ANSI/NFPA 70 - National Electrical Code.

B. Conform to the requirements of:
   1. *Central Maine Power Company.*
   2. *FairPoint.*
   3. *Time-Warner*

1.7 UTILITY SERVICE CHARGE ALLOWANCE

A. The Contractor shall include under Division 16 an allowance of $40,000.00 to cover the cost of utility service charges. This allowance will be paid according to actual utility company invoices received.

PART 2 - PRODUCTS

2.1 UTILITY SERVICES MATERIALS

A. Conduit shall be as specified in Section 16111.

B. Electrical service conductors shall be as specified in Section 16123.

C. Service grounding shall be as specified in Section 16450.

D. Approval: Service meter shall be approved by the *Central Maine Power Company*.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all service related work in conformance with the standards and requirements of the serving utility.

END OF SECTION 16421

SECTION 16441 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Disconnect Switches.

B. Fuses.

1.2 REFERENCES

A. NEMA KS 1 - Enclosed Switches.

B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Acceptable manufacturers:
   1. *Square D.*
   2. *General Electric.*
   3. *Siemens*
   4. Substitutions: None permitted

B. Non-fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front with switch in ON position. Handle lockable in OFF position.

C. Fusible Switch Assemblies: NEMA KS 1, Type HD, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: designed to accommodate Class R fuses.

D. Enclosures: NEMA KS 1; Type 1. For indoor locations; Type 3R for outdoor locations.

2.2 FUSES

A. Acceptable manufacturers:
   1. *Bussman*.
   2. *Shawmut-Gould*.
   3. Substitutions: Or Approved Equal.

B. Fuses 600 amperes and less: ANSI/UL 198E, Class RK5 dual element.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide unfused disconnect switches for general motors, except where packaged equipment is supplied by the manufacturer with integral means of disconnect.

B. Provide fused disconnect switches for elevator controller, feeder and for elevator cab branch circuit power.

C. Mount disconnect switch handle 60 inches (maximum) above adjacent working surface, with not less than 36 inches clearance in front of switch (floor to ceiling).

END OF SECTION 16441

SECTION 16450 – GROUNDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Service ground system.

B. Feeder and branch circuit wiring grounding.

C. Electrical equipment and raceway grounding and bonding.

D. Telecommunications system grounding.

1.2 RELATED SECTIONS

A. Section 16123 – Building Wire and Cable.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

1.5 SERVICE GROUND SYSTEM DESCRIPTION

A. The service ground shall include ground conductors and electrodes at the service entrance. Provide a bonding conductor, sized per Article 250 of NFPA 70, from the service ground to the water service entrance pipe.

1.6 FEEDER AND BRANCH CIRCUIT GROUNDING DESCRIPTION

A. All feeders and branch circuits shall include a separate insulated (green) grounding conductor.

1.7 TELECOMMUNICATIONS SYSTEM GROUNDING DESCRIPTION

A. The telephone service termination board shall include a separate ground conductor connected to the main service ground system.

B. All network racks shall include a separate ground conductor connected to the system ground at the telephone service termination board.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Feeder and Branch Circuit Ground Conductors: Insulated conductors per Section 26 05 19.

B. Service Ground Conductor: Bare copper stranded wire, sized as indicated on the Drawings.

C. Ground Electrodes: 5/8" diameter by 8 feet long, copper clad steel rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Terminate each ground conductor end on a grounding lug, bus, or bushing.

B. Connect the service ground to service ground electrodes as well as to the water service entrance pipe (attach ground ahead of water meter).

C. Provide a sufficient number of service ground electrodes to provide a resistance from the system neutral connection to a convenient ground reference point not exceeding 10 ohms.

D. Install all ground system components in conformance with Article 250 of NFPA 70.

3.2 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Measure ground resistance from system neutral connection at service entrance to confirm that resistance does not exceed 10 ohms.

END OF SECTION 16450

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Service/Distribution Panelboard.

B. Branch Circuit Panelboards.

C. Surge Protected Panelboards.

1.2 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation."

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA PB 1 - Panelboards.

D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards rated 600 Volts or Less.

E. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.

F. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Division 01 and Section 26 00 00.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker sizes.

C. Operating and Maintenance Manuals: Provide for panelboards, enclosed circuit breakers and electrical use submeters.

1.4 SPARE PARTS

A. Panelboard Cover Keys: Furnish 4 each to Owner.

PART 2 – PRODUCTS

2.1 SERVICE/DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS

A. Acceptable Manufacturers.
1. *Square D.*
2. *Cutler-Hammer.*
3. *General Electric.*
4. *Siemens.*
5. Substitutions: None Permitted.

B. Description
1. Panelboards: NEMA PB1; Circuit breaker type with bolt-on circuit breakers.
2. Enclosures: NEMA PB 1; Type 1.
3. Cabinet Sizes:
   a. Branch Circuit Panelboards: 5 ¾ inches deep; 20 inches wide.
   b. Service/Distribution Panelboard: 9-1/2 inches deep; 44 inches wide.
4. Provide cabinet fronts with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel
5. Provide copper buses for all panels and load centers. Service/distribution panel shall be rated as indicated on the single-line diagram in the contract drawings.
6. Minimum Integrated Short Circuit Ratings:
   a. Branch Circuit Panelboards: 25,000 AIC
   b. Service/Distribution Panelboard: 100,000 AIC
7. Molded Case Circuit Breakers: NEMA AB 1; thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits.
8. Provide circuit breaker accessory trip units and auxiliary contacts as indicated.

2.2 SURGE PROTECTED PANELBOARDS (Panel D1)

A. Description: Provide panelboards with built-in integral high frequency range power filter conforming to UL 1283, and high performance suppression conforming to UL 1449.

B. Operating Characteristics:
1. Single Pulse Surge Current Capacity:

L-N	80,000 Amps
L-G	80,000 Amps
L-L	80,000 Amps
N-G	80,000 AMps

2. Surge line Testing @ 1.2 x 50µsec: 20 kV > 2500 impulses.
3. Maximum Continuous Operating Voltage: 115% of Normal.
4. EMI/RFI High Frequency Noise Power Filter:

Frequency	100kHz	1MHz	10MHz	100MHz
Attenuation (dB)	34	51	51	48
Attenuation Ratio	50:1	350:1	500:1	250:1

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide panelboards as indicated on the Contract Drawings.

B. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.

C. Height: 6 feet to top of panelboard.

D. Clearance: 3 feet front clearance, floor to ceiling with no foreign pipes, ducts, or other system equipment.

E. Provide filler plates for unused spaces.

F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

3.2 FIELD QUALITY CONTROL

A. Measure state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION 16470

VOLTS:	120/208	AMPS	225		MAIN:	MLO		**PANEL:**	**P1 SECTION 1**					
MOUNT:	SURFACE	PHASE:	3		WIRES:	4		LOCATION:	ELECTRICAL 126					

BREAKER		DESCRIPTION	CKT	TYPE	CKT	LOAD			CKT	TYPE	CKT	DESCRIPTION	BREAKER	
A	P		VA		NO.	A	B	C	NO.		VA		P	A
20	1	TELECOM EQUIOMENT	1000	O	1	1400			2	R	400	ELEV MACH RM RECEPT	1	20
20	1	FIRE ALARM PANEL	500	O	3		1000		4	O	500	ELEVATOR CONTROLS	1	20
20	1	FIRE ALARM BOOSTERS	500	O	5			900	6	R	400	ELEVATOR PIT RECEPT	1	20
20	1	SECURITY PANEL	500	O	7	1700			8	R	1200	RECEPTACLES	1	20
20	1	LIGHTING CONTROL PNL	500	O	9		1700		10	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	11			2300	12	R	1300	RECEPTACLES	1	20
20	1	RECEPTACLES	600	R	13	1800			14	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	15		1800		16	R	1000	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	17			1600	18	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	19	1700			20	R	900	RECEPTACLES	1	20
20	1	SPARE	500	S	21		1000		22	S	500	SPARE	1	20
20	1	SPARE	500	S	23			1000	24	S	500	SPARE	1	20
100	3	PANEL P1 SECTION 2	10731		25	11231			26	S	500	SPARE	1	20
100	3	PANEL P1 SECTION 2	9473		27		9973		28	S	500	SPARE	1	20
100	3	PANEL P1 SECTION 2	8793		29			9293	30	S	500	SPARE	1	20
		PHASE TOTALS				17831	15473	15093						

CONNECTED VOLT-AMPERES=	48397
CONNECTED AMPERES=	134
DEMAND VOLT-AMPERES=	28347
DEMAND AMPERES=	79

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT:	**BAXTER LIBRARY**
PROJ. NO:	08-0036C
DATE:	09/04/09
STATUS:	FOR CONSTRUCTION

Bartlett Design

LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: P1 SECTION 2**

MOUNT: SURFACE PHASE: 3 WIRES: 4 LOCATION: ELECTRICAL 126

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
20	1	RECEPTACLES	1000	R	31	1800			32	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	33		2000		32	R	1000	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	35			2000	34	R	1000	RECEPTACLES	1	20
20	1	RECEPTACLES	900	R	37	2100			36	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	39		1800		38	R	1000	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	41			2200	40	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	43	2300			42	R	1100	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	45		2109		44	L	909	LIGHTS	1	20
20	1	RECEPTACLES	800	R	47			1709	46	L	909	LIGHTS	1	20
20	1	LIGHTS	1391	L	49	2531			48	L	1140	STAIRWELL LIGHTS	1	20
20	1	LIGHTS	1476	L	51		2564		50	L	1088	EXTERIOR LIGHTS	1	20
20	1	LIGHTS	1384	L	53			1884	52	S	500	SPARE	1	20
20	1	SPARE	500	S	55	1000			54	S	500	SPARE	1	20
20	1	SPARE	500	S	57		1000		56	S	500	SPARE	1	20
20	1	SPARE	500	S	59			1000	58	S	500	SPARE	1	20
20	1	SPARE	500	S	61	1000			60	S	500	SPARE	1	20
		PHASE TOTALS				10731	9473	8793						

CONNECTED VOLT-AMPERES= 28997

CONNECTED AMPERES= 80

DEMAND VOLT-AMPERES= 18647

DEMAND AMPERES= 52

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

PROJ. NO: 08-0036C

DATE: 09/04/09

STATUS: FOR CONSTRUCTION

Bartlett Design

LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: P2 SECTION 1**

MOUNT: SURFACE PHASE: 3 WIRES: 4 LOCATION: JANITOR CLOSET 207

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
20	1	RECEPTACLES	1000	R	1	2000			2	R	1000	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	3		1600		4	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	5			1200	6	R	400	KITCHEN RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	7	2700			8	R	1500	REFRIGERATOR	1	20
20	1	TELECOM EQUIPMENT	500	O	9		1100		10	R	600	KITCHEN RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	11			2100	12	R	900	RECEPTACLES	1	20
20	1	RECEPTACLES	900	R	13	2100			14	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	15		2200		16	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	17			2200	18	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	19	2000			20	R	1000	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	21		2500		22	R	1500	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	23			2000	24	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	25	1600			26	R	800	RECEPTACLES	1	20
20	1	SPARE	500	S	27		1000		28	S	500	SPARE	1	20
20	1	SPARE	500	S	29			1000	30	S	500	SPARE	1	20
20	1	SPARE	500	S	31	1000			32	S	500	SPARE	1	20
20	1	SPARE	500	S	33		1000		34	S	500	SPARE	1	20
20	1	SPARE	500	S	35			1000	36	S	500	SPARE	1	20
100	3	PANEL P2 SECTION 2	9750		37	10250			38	S	500	SPARE	1	20
100	3	PANEL P2 SECTION 2	10673		39		11173		40	S	500	SPARE	1	20
100	3	PANEL P2 SECTION 2	9958		41			10458	42	S	500	SPARE	1	20
				PHASE TOTALS		21650	20573	19958						

CONNECTED VOLT-AMPERES= 62181

CONNECTED AMPERES= 173

DEMAND VOLT-AMPERES= 34431

DEMAND AMPERES= 96

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

PROJ. NO: 08-0036C

DATE: 09/04/09

STATUS: FOR CONSTRUCTION

Bartlett Design

LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: P2 SECTION 2**

MOUNT: SURFACE PHASE: 3 WIRES: 4 LOCATION: JANITOR CLOSET 207

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
20	1	RECEPTACLES	800	R	43	1800			44	R	1000	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	45		2200		46	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	47			2000	48	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	49	2000			50	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	1300	R	51		2500		52	R	1200	RECEPTACLES	1	20
20	1	LIGHTS	1208	L	53			2408	54	R	1200	RECEPTACLES	1	20
20	1	LIGHTS	937	L	55	1950			56	L	1013	LIGHTS	1	20
20	1	LIGHTS	960	L	57		1973		58	L	1013	LIGHTS	1	20
20	1	LIGHTS	900	L	59			1550	60	L	650	LIGHTS	1	20
20	1	SPARE	500	S	61	1000			62	S	500	SPARE	1	20
20	1	SPARE	500	S	63		1000		64	S	500	SPARE	1	20
20	1	SPARE	500	S	65			1000	66	S	500	SPARE	1	20
20	1	SPARE	500	S	67	1000			68	S	500	SPARE	1	20
20	1	SPARE	500	S	69		1000		70	S	500	SPARE	1	20
20	1	SPARE	500	S	71			1000	72	S	500	SPARE	1	20
20	1	SPARE	500	S	73	1000			74	S	500	SPARE	1	20
20	1	SPARE	500	S	75		1000		76	S	500	SPARE	1	20
20	1	SPARE	500	S	77			1000	78	S	500	SPARE	1	20
20	1	SPARE	500	S	79	1000			80	S	500	SPARE	1	20
20	1	SPARE	500	S	81		1000		82	S	500	SPARE	1	20
20	1	SPARE	500	S	83			1000	84	S	500	SPARE	1	20
				PHASE TOTALS		9750	10673	9958						

CONNECTED VOLT-AMPERES= 30381

CONNECTED AMPERES= 84

DEMAND VOLT-AMPERES= 18531

DEMAND AMPERES= 51

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

PROJ. NO: 08-0036C

DATE: 09/04/09

STATUS: FOR CONSTRUCTION

Bartlett Design

LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: P3 SECTION 1**

MOUNT: SURFACE PHASE: 3 WIRES: 4 LOCATION: ELECTRICAL 343B

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
20	1	RECEPTACLES	1200	R	1	2000			2	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	3		1500		4	O	500	TELECOM EQUIPMENT	1	20
30	2	COPIER	2500	R	5			3100	6	R	600	RECEPTACLES	1	20
30	2	COPIER	2500	R	7	3500			8	O	1000	DATA NETWORK RACK	1	20
20	1	RECEPTACLES	1000	R	9		2000		10	R	1000	RECEPTACLES	1	20
30	2	COPIER	2500	R	11			3700	12	R	1200	RECEPTACLES	1	20
30	2	COPIER	2500	R	13	3500			14	R	1000	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	15		2200		16	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	17			2400	18	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1000	R	19	2200			20	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	21		1600		22	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	900	R	23			1700	24	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	25	2000			26	R	1200	RECEPTACLES	1	20
20	1	SPARE	500	S	27		1000		28	S	500	SPARE	1	20
20	1	SPARE	500	S	29			1000	30	S	500	SPARE	1	20
20	1	SPARE	500	S	31	1000			32	S	500	SPARE	1	20
20	1	SPARE	500	S	33		1000		34	S	500	SPARE	1	20
20	1	SPARE	500	S	35			1000	36	S	500	SPARE	1	20
100	3	PANEL P2 SECTION 2	12552		37	13052			38	S	500	SPARE	1	20
100	3	PANEL P2 SECTION 2	11093		39		11593		40	S	500	SPARE	1	20
100	3	PANEL P2 SECTION 2	11495		41			11995	42	S	500	SPARE	1	20
				PHASE TOTALS		27252	20893	24895						

CONNECTED VOLT-AMPERES= 73040

CONNECTED AMPERES= 203

DEMAND VOLT-AMPERES= 42140

DEMAND AMPERES= 117

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

PROJ. NO: 08-0036C

DATE: 09/04/09

STATUS: FOR CONSTRUCTION

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LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: P3 SECTION 2**

MOUNT: SURFACE PHASE: 3 WIRES: 4 LOCATION: ELECTRICAL 343B

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
20	1	RECEPTACLES	1200	R	43	2400			44	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	800	R	45		1600		46	R	800	RECEPTACLES	1	20
20	1	RECEPTACLES	700	R	47			1300	48	R	600	RECEPTACLES	1	20
20	1	WINDOW OPERATORS	1000	O	49	2400			50	R	1400	RECEPTACLES	1	20
20	1	WINDOW OPERATORS	1000	O	51		2200		52	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	53			2400	54	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	55	2200			56	R	1000	RECEPTACLES	1	20
20	1	LIGHTS	1443	L	57		2343		58	R	900	RECEPTACLES	1	20
20	1	LIGHTS	900	L	59			2467	60	L	1567	LIGHTS	1	20
20	1	LIGHTS	900	L	61	1400			62	S	500	SPARE	1	20
20	1	LIGHTS	900	L	63		1950		64	L	1050	LIGHTS	1	20
20	1	LIGHTS	1128	L	65			2328	66	L	1200	LIGHTS	1	20
20	1	LIGHTS	855	L	67	2152			68	L	1297	LIGHTS	1	20
20	1	SPARE	500	S	69		1000		70	S	500	SPARE	1	20
20	1	SPARE	500	S	71			1000	72	S	500	SPARE	1	20
20	1	SPARE	500	S	73	1000			74	S	500	SPARE	1	20
20	1	SPARE	500	S	75		1000		76	S	500	SPARE	1	20
20	1	SPARE	500	S	77			1000	78	S	500	SPARE	1	20
20	1	SPARE	500	S	79	1000			80	S	500	SPARE	1	20
20	1	SPARE	500	S	81		1000		82	S	500	SPARE	1	20
20	1	SPARE	500	S	83			1000	84	S	500	SPARE	1	20
				PHASE TOTALS		12552	11093	11495						

CONNECTED VOLT-AMPERES= 35140

CONNECTED AMPERES= 98

DEMAND VOLT-AMPERES= 23190

DEMAND AMPERES= 64

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

PROJ. NO: 08-0036C

DATE: 09/04/09

STATUS: FOR CONSTRUCTION

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LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: M1 SECTION 1**

MOUNT: SURFACE PHASE: 3 WIRES: 4 LOCATION: MECHANICAL 122

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
20	1	B-1	1800	M	1	3600			2	M	1800	B-2	1	20
20	3	P-1	1900	M	3		3800		4	M	1900	P-2	3	20
20	3	P-1	1900	M	5			3800	6	M	1900	P-2	3	20
20	3	P-1	1900	M	7	3800			8	M	1900	P-2	3	20
20	3	HP-104	1340	M	9		4055		10	M	2715	HP-106	3	30
20	3	HP-104	1340	M	11			4055	12	M	2715	HP-106	3	30
20	3	HP-104	1340	M	13	4055			14	M	2715	HP-106	3	30
25	3	HP-101	1994	M	15		4709		16	M	2715	HP-102	3	30
25	3	HP-101	1994	M	17			4709	18	M	2715	HP-102	3	30
25	3	HP-101	1994	M	19	4709			20	M	2715	HP-102	3	30
20	1	SPARE	500	S	21		1000		22	S	500	SPARE	1	20
20	1	SPARE	500	S	23			1000	24	S	500	SPARE	1	20
80	3	PANEL M1 SECTION 2	14920		25	15420			26	S	500	SPARE	1	20
80	3	PANEL M1 SECTION 2	15388		27		15888		28	S	500	SPARE	1	20
80	3	PANEL M1 SECTION 2	15388		29			15888	30	S	500	SPARE	1	20
		PHASE TOTALS				31584	29452	29452						

CONNECTED VOLT-AMPERES= 90488

CONNECTED AMPERES= 251

DEMAND VOLT-AMPERES= 45244

DEMAND AMPERES= 126

CIRCUIT TYPE CODES		DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

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DATE: 09/04/09

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LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: M1 SECTION 2**

MOUNT: SURFACE PHASE: 3 WIRES: 4 LOCATION: MECHANICAL 122

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
20	3	HP-103	1345	M	31	3339			32	M	1994	HP-105	3	25
20	3	HP-103	1345	M	33		3339		34	M	1994	HP-105	3	25
20	3	HP-103	1345	M	35			3339	36	M	1994	HP-105	3	25
20	2	CHP-11	916	M	37	1832			38	M	916	CHP-13	2	20
20	2	CHP-11	916	M	39		1832		40	M	916	CHP-13	2	20
20	2	CHP-12	916	M	41			1832	42	M	916	CHP-14	2	20
20	2	CHP-12	916	M	43	1832			44	M	916	CHP-14	2	20
60	3	COOLING TOWER	4515	M	45		6315		46	M	1800	AUH-1	2	20
60	3	COOLING TOWER	4515	M	47			6315	48	M	1800	AUH-1	2	20
60	3	COOLING TOWER	4515	M	49	6917			50	M	2402	CU-1	3	20
20	1	SPARE	500	S	51		2902		52	M	2402	CU-1	3	20
20	1	SPARE	500	S	53			2902	54	M	2402	CU-1	3	20
20	1	SPARE	500	S	55	1000			56	S	500	SPARE	1	20
20	1	SPARE	500	S	57		1000		58	S	500	SPARE	1	20
20	1	SPARE	500	S	59			1000	60	S	500	SPARE	1	20
			PHASE TOTALS			14920	15388	15388						

CONNECTED VOLT-AMPERES= 45696

CONNECTED AMPERES= 127

DEMAND VOLT-AMPERES= 22848

DEMAND AMPERES= 63

CIRCUIT TYPE CODES		DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

PROJ. NO: 08-0036C

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LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: M2**

MOUNT: RECESSED PHASE: 3 WIRES: 4 LOCATION: JANITOR CLOSET 207

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
25	3	HP-202	1994	M	1	3988			2	M	1994	HP-203	3	25
25	3	HP-202	1994	M	3		3988		4	M	1994	HP-203	3	25
25	3	HP-202	1994	M	5			3988	6	M	1994	HP-203	3	25
40	3	HP-201	3651	M	7	4567			8	M	916	CHP-21	2	20
40	3	HP-201	3651	M	9		4567		10	M	916	CHP-21	2	20
40	3	HP-201	3651	M	11			4567	12	M	916	CHP-22	2	20
20	2	CHP-26	1280	M	13	2196			14	M	916	CHP-22	2	20
20	2	CHP-26	1280	M	15		2560		16	M	1280	CHP-23	2	20
20	2	CHP-27	1280	M	17			2560	18	M	1280	CHP-23	2	20
20	2	CHP-27	1280	M	19	2196			20	M	916	CHP-24	2	20
25	3	HP-204	1994	M	21		2910		22	M	916	CHP-24	2	20
25	3	HP-204	1994	M	23			2910	24	M	916	CHP-25	2	20
25	3	HP-204	1994	M	25	2910			26	M	916	CHP-25	2	20
20	1	SPARE	500	S	27		1000		28	S	500	SPARE	1	20
20	1	SPARE	500	S	29			1000	30	S	500	SPARE	1	20
20	1	SPARE	500	S	31	1000			32	S	500	SPARE	1	20
20	1	SPARE	500	S	33		1000		34	S	500	SPARE	1	20
20	1	SPARE	500	S	35			1000	36	S	500	SPARE	1	20
		BLANK			37	0			38			BLANK		
		BLANK			39		0		40			BLANK		
		BLANK			41			0	42			BLANK		
				PHASE TOTALS		16857	16025	16025						

CONNECTED VOLT-AMPERES= 48907

CONNECTED AMPERES= 136

DEMAND VOLT-AMPERES= 24454

DEMAND AMPERES= 68

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

PROJ. NO: 08-0036C

DATE: 09/04/09

STATUS: FOR CONSTRUCTION

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LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 225 MAIN: MLO **PANEL: M3**

MOUNT: RECESSED PHASE: 3 WIRES: 4 LOCATION: ELECTRICAL 343B

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
40	3	HP-301	3651	M	1	5645			2	M	1994	HP-305	3	25
40	3	HP-301	3651	M	3		5645		4	M	1994	HP-305	3	25
40	3	HP-301	3651	M	5			5645	6	M	1994	HP-305	3	25
25	3	HP-302	1994	M	7	3988			8	M	1994	HP-306	3	25
25	3	HP-302	1994	M	9		3988		10	M	1994	HP-306	3	25
25	3	HP-302	1994	M	11			3988	12	M	1994	HP-306	3	25
25	3	HP-303	1944	M	13	4659			14	M	2715	HP-307	3	30
25	3	HP-303	1944	M	15		4659		16	M	2715	HP-307	3	30
25	3	HP-303	1944	M	17			4659	18	M	2715	HP-307	3	30
30	3	HP-304	2715	M	19	6366			20	M	3651	HP-308	3	40
30	3	HP-304	2715	M	21		6366		22	M	3651	HP-308	3	40
30	3	HP-304	2715	M	23			6366	24	M	3651	HP-308	3	40
20	1	SPARE	500	S	25	1000			26	S	500	SPARE	1	20
20	1	SPARE	500	S	27		1000		28	S	500	SPARE	1	20
20	1	SPARE	500	S	29			1000	30	S	500	SPARE	1	20
20	1	SPARE	500	S	31	1000			32	S	500	SPARE	1	20
20	1	SPARE	500	S	33		1000		34	S	500	SPARE	1	20
20	1	SPARE	500	S	35			1000	36	S	500	SPARE	1	20
		BLANK			37	0			38			BLANK		
		BLANK			39		0		40			BLANK		
		BLANK			41			0	42			BLANK		
				PHASE TOTALS		22658	22658	22658						

CONNECTED VOLT-AMPERES= 67974

CONNECTED AMPERES= 189

DEMAND VOLT-AMPERES= 33987

DEMAND AMPERES= 94

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

PROJECT: **BAXTER LIBRARY**

PROJ. NO: 08-0036C

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LIGHTING & ELECTRICAL ENGINEERING

942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 AMPS 100 MAIN: MLO **PANEL: D1**

MOUNT: RECESSED PHASE: 3 WIRES: 4 LOCATION: SERVER 102

BREAKER A	BREAKER P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD A	LOAD B	LOAD C	CKT NO.	TYPE	CKT VA	DESCRIPTION	BREAKER P	BREAKER A
20	1	DATA NETWORK RACK	1000	O	1	3500			2	R	2500	RECEPTACLES	2	30
20	1	DATA NETWORK RACK	1000	O	3		3500		4	R	2500	RECEPTACLES	2	30
20	1	DATA NETWORK RACK	1000	O	5			3500	6	R	2500	RECEPTACLES	2	30
20	1	DATA NETWORK RACK	1000	O	7	3500			8	R	2500	RECEPTACLES	2	30
20	1	TELECOM EQUIPMENT	500	O	9		1700		10	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	11			2400	12	R	1200	RECEPTACLES	1	20
20	1	RECEPTACLES	1200	R	13	3700			14	R	2500	RECEPTACLES	2	30
20	1	SPARE	500	S	15		3000		16	R	2500	RECEPTACLES	2	30
20	1	SPARE	500	S	17			1000	18	S	500	SPARE	1	20
20	1	SPARE	500	S	19	1000			20	S	500	SPARE	1	20
20	1	SPARE	500	S	21		1000		22	S	500	SPARE	1	20
20	1	SPARE	500	S	23			1000	24	S	500	SPARE	1	20
		BLANK	500		25	500			26			BLANK		
		BLANK	500		27		500		28			BLANK		
		BLANK	500		29			500	30			BLANK		
		PHASE TOTALS				12200	9700	8400						

CONNECTED VOLT-AMPERES= 30300

CONNECTED AMPERES= 84

DEMAND VOLT-AMPERES= 15150

DEMAND AMPERES= 42

PROVIDE INTEGRAL TRANSIENT SURGE SUPPRESSION

	CIRCUIT TYPE CODES	DEMAND FACTOR
L	LIGHTS	1.0
M	MOTORS	0.5
R	RECEPTACLES	0.5
H	HEAT	1.0
O	OTHER	0.5
S	SPARE	0.5

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942 WASHINGTON STREET BATH, MAINE 04530

TEL (207) 443-5447 FAX (207) 443-5560

SECTION 16481 - ENCLOSED MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manual motor starters.

B. Combination magnetic motor starters.

1.2 REFERENCES

A. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA ICS 1 - Industrial Control Devices, Controllers, and Assemblies.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

PART 2 - PRODUCTS

2.1 MOTOR STARTERS

A. Acceptable Manufacturers (combination motor starters).
   1. *Cerus Industrial*
   2. Substitutions: Or approved equal.

B. Acceptable Manufacturers (manual motor starters).
   1. *Square D*
   2. *General Electric*
   3. *Siemens*
   4. Substitutions: None permitted.

C. Manual Motor Starters
   1. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, 1 pole, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, and toggle operator.
   2. Enclosure: ANSI/NEMA ICS 6; Type 1 for interior locations, Type 4 for exterior locations.

D. Magnetic Motor Starters
   1. Motor Starter shall be enclosed in a Type 1 or Type 4 UL rated enclosure. Type 1 enclosure shall include pre-cut holes for conduits with removable plugs.
   2. Motor Starter shall be rated for NEMA class B motors for AC-3 switching and AC-4 switching. Starter shall be sized to equivalent NEMA rating for AC-3 switching.
   3. Controls and annunciation shall include Hand- OFF- Auto keypad with 20 mm snap dome actuation. Keypad shall be water tight and liquid tight. LED indication shall include Hand, Off, Auto, Run and Overload. Overload reset shall be available by holding Hand and Off for five seconds.
   4. Control inputs shall include: Auto Wet input, Auto Dry input, Permissive Auto input, Damper Status Input and Override Input. Automatic control inputs shall be capable of accepting a transistorized input without the need for interposing relays. Wet control inputs shall accept AC or DC inputs from 10 to 138VACor DC.
   5. Damper control shall be built into the starter to provide 24VAC or 120VAC damper control and monitoring.
   6. Override input shall disable the starter from operating in either Hand or Auto mode.
   7. Protective Functions-
      a. Electronic Overload shall provide phase failure and phase loss protection, stall, and class 1 - 30 selectable overload protection. Phase failure protection shall initiate when phase loss is greater than 70% for 3 seconds or phase unbalance is greater than 50% for more than 5 seconds.
      b. Cycling fault protection shall be integral to the starter. Cycling fault shall be enabled whenever the starter is cycled more than 1000 times in a one hour period. This feature shall be selectable to be disabled. Cycling fault shall cause overload LED to blink rapidly.
   8. Motor Starters shall be equipped with an integral Motor Circuit that is UL listed 508. The breaker and shall carry a UL 508F rating (up to 100A frame size) which provides for coordinated short circuit rating for use with the motor contactor and provides an interrupting rating for the breaker and contactor combination.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motor control equipment in accordance with manufacturer's instructions.

B. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

C. Mount combination type motor starters locally to equipment being served, with top at 60 inches (maximum) above adjacent floor, with not less than 36 inches clearance in front of starter (floor to ceiling).

END OF SECTION 16481

SECTION 16510 - INTERIOR LIGHTING

1.1 SECTION INCLUDES

A. Interior lighting fixtures, lamps, and ballasts.

B. Lighting fixture supports.

1.2 RELATED SECTIONS

A. Section 16530 – Exterior Lighting.

B. Section 16535 – Emergency Lighting Equipment

1.3 DEFINITIONS

A. CCF: Crest factor.

B. CCT: Color temperature.

C. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.
   2. Ballast data.
   3. Operating characteristics.
   4. Lamp data.

B. Operation and Maintenance Data: For lighting equipment.

C. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

A. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lamps: 10 of each type and rating installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Luminaires:
   1. Provide products as specified in Interior Lighting Fixture Schedule.

B. Electronic Fluorescent Ballasts for T8 Lamps
   1. 2-Lamp non-dimming ballasts:
      a. *Sylvania* QHE 2x32T8/UNV ISH-SC Series
      b. Substitutions: Equivalent ballast by *Advance* or *Universal.*
   2. 1-Lamp non-dimming ballasts:
      a. *Sylvania* QHE 1x32T8/UNV ISH-SC Series
      b. Substitutions: Equivalent ballast by *Advance* or *Universal.*

C. Electronic Fluorescent Ballast for T5 Lamps
   1. 1-Lamp non-dimming ballasts:
      a. *Sylvania* QTP 1x28/UNV PSN Series
      b. Substitutions: Equivalent ballast by *Advance* or *Universal.*

D. Electronic Compact Fluorescent Ballasts
   1. 1-Lamp non-dimming ballasts
      a. *Sylvania* QTP 1/2xCF/UNV PM (single 32 watt)
      b. Substitutions: Equivalent ballast by *Advance* or *Universal.*
   2. 2-Lamp non-dimming ballasts
      a. *Sylvania* QTP 2x26/32/42CF/UNV PM (two-lamp 32 watt)
      b. Substitutions: Equivalent ballast by *Advance* or *Universal.*
   3. 1-Lamp dimming ballasts

a. Lutron FDB-T432-120-1-S
b. Substitutions: Equivalent ballast by *Advance* or *Universal.*

E. Fluorescent and Compact Fluorescent Lamps:
1. *Osram Sylvania*
2. *General Electric*
3. *Philips*
4. Substitutions: None Permitted.

2.2 STANDARD NON-DIMMING BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. Electronic Ballasts: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output.

B. T8 Fluorescent Lamps
1. Starting Method: Instant Start
2. Ballast Factor: 1.20 (minimum)
3. Circuit Type: Parallel
4. Lamp Frequency: > 40 kHz
5. Lamp CCF: < 1.7
6. Starting Temperature: 60 F
7. Input Frequency: 60 Hz
8. Total Harmonic Distortion (THD): <10%
9. Power Factor: >98%
10. Voltage: Universal 120-277 volts
11. Maximum Input Wattage:
a. Single Lamp T8, 17-Watt: 17 watts at 120V
b. Two Lamp T8, 17-Watt: 32 Watts at 120V
c. Single Lamp, T8, 32-Watt: 33 Watts at 120V
d. Two Lamp T8, 28-Watt: 65 Watts at 120V

C. T5 Fluorescent Lamps
1. Starting Method: Programmed Start
2. Ballast Factor: 1.00
3. Circuit Type: Series
4. Lamp Frequency: > 40 kHz
5. Lamp CCF: < 1.6
6. Starting Temperature: 0 F
7. Input Frequency: 60 Hz
8. Total Harmonic Distortion (THD): <10%
9. Power Factor: >98%
10. Voltage: Universal 120-277 volts
11. Maximum Input Wattage:
a. Single Lamp T8, 21-Watt: 32 watts at 120V

2.3 FLUORESCENT, COMPACT FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

B. 17-Watt, T8 Fluorescent Lamps:
   1. Base: Medium Bi-Pin
   2. Initial Lumens: 1375 (minimum)
   3. Mean Lumens: 1305 (minimum)
   4. CCT: 3500K
   5. CRI: 85 (minimum)
   6. Life: 24000 hours (3 hours/start)

C. 28-Watt, T8 Fluorescent Lamps:
   1. Base: Medium Bi-Pin
   2. Initial Lumens: 2725 (minimum)
   3. Mean Lumens: 2590 (minimum)
   4. CCT: 3500K
   5. CRI: 85 (minimum)
   6. Life: 36000 hours (3 hours/start)

D. 28-Watt, T5 Fluorescent Lamps:
   1. Base: Mini Bi-Pin
   2. Initial Lumens: 2730 (minimum)
   3. Mean Lumens: 2594 (minimum)
   4. CCT: 3500K
   5. CRI: 85 (minimum)
   6. Life: 20000 hours (3 hours/start)

E. 14-Watt, T5 Fluorescent Lamps:
   1. Base: Mini Bi-Pin
   2. Initial Lumens: 1200 (minimum)
   3. Mean Lumens: 1116 (minimum)
   4. CCT: 3500K
   5. CRI: 85 (minimum)
   6. Life: 20000 hours (3 hours/start)

F. 26-Watt, T4 Quad Tube Compact Fluorescent Lamps:
   1. Base: 4-pin, G24q-3
   2. Initial Lumens: 1710
   3. Mean Lumens: 1470
   4. CCT: 3000K
   5. CRI: 82
   6. Life: 12000 hours (3 hours/start)

2.4 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 05 29 "Supporting Devices" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gauge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Do not use grid as a sole support element.
   1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
   2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
   3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
   4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:
   1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
   2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
   3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Aim adjustable accent lighting fixtures as directed by the Engineer.

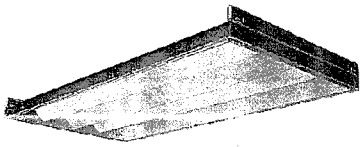
E. Install fixtures in full conformance with manufacturers' instructions.

END OF SECTION 16510

Project:	**Baxter Library Renovation**	**Bartlett Design**
Location:	Portland, Maine	942 Washington Street, Bath, ME
Date:	September 4, 2009	(T) 207-443-5447 (F) 207-443-5560

LIGHTING FIXTURE SCHEDULE

Lamp numbers refer to *Osram Sylvania* designations. Also approved are equal lamps manufactured by *General Electric*, and *Philips*. All fixtures are 120 volt, unless specifically noted otherwise.
NOTE: All fluorescent ballasts shall be low harmonic type (≤ 10%).

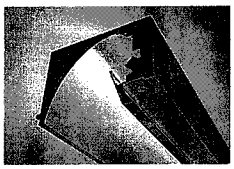


Dimensions: Length = 4' - 0" Width = 2'-0"" Recess Height = 3 3/8"

Type: **A1**
Description: Recessed light with dropped acrylic diffusers. Provide electronic, instant start high ballast factor ballast.
Lamps: (2) F028/835/XP/SS/ECO
Manufacturers: *Columbia* # EPC24-232G-CV-EHL-U

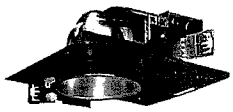
Dimensions: Length = 2' - 0" Width = 2'-0"" Recess Height = 3 3/8"

Type: **A2**
Description: Similar to Type A1 except 2 x 2.
Lamps: (2) F017/835/XP/ECO
Manufacturers: *Focal Point Lighting* # EPC22-232G-CV-EHL-U



Dimensions: Length = 4' - 0" Width = 8 3/4" Recess Height = 7 3/4"

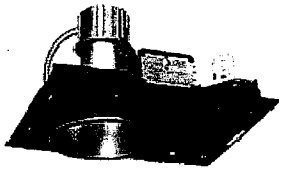
Type: **A3**
Description: Recessed open perimeter light with direct light distribution. Provide electronic, low harmonic ballast. Provide all necessary fittings including end caps, etc. to make a complete system.
Lamps: (1) F028/835/XP/SS/ECO
Manufacturers: *Focal Point Lighting* # FW3-NS-1T8-1C-120-S-RC-HW-4'



Dimensions: Aperture = 5 3/4" Diameter = 7" Recess Height = 6 1/8"

Type: **B1**
Description: Recessed open down-light with semi-specular aluminum reflector. Provide electronic, non-dimming ballast.
Lamps: (2) CF26DD/E/835
Manufacturers: *Prescolite* # CFR626EB-ST372A-SS

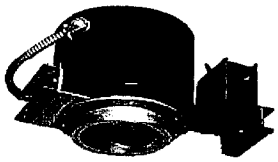
Type: **B2** **NOT USED**



Dimensions: Aperture = 5 3/4" Diameter = 7"
Recess Height = 11 3/8"

Type: **B3**
Description: Recess down-light with regressed prismatic lens. Install luminaires within shower enclosures within bathrooms as shown on plans. Provide electronic non-dimming ballast. Luminaire shall be UL listed for wet locations.
Lamps: (1) CF26DD/E/835
Manufacturers: *Prescolite* # CFQ626EB-STF602-SS-PL-WT

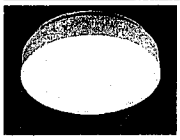
Type: **B4**
Description: Similar to Type B1 except one lamp.
Lamps: (1) CF26DD/E/835
Manufacturers: *Prescolite* # CFR6126EB-ST372A1-SS-WT



Dimensions: Aperture = 6" Diameter = 6 3/4"
Recess Height = 7 17/32"

Type: **B5**
Description: Recessed down-light wall wash luminaire with regressed prismatic spread lens. Provide electronic non-dimming ballast.
Lamps: (1) CF26DD/E/835
Manufacturers: *Prescolite* # CFTW632EB-ST612

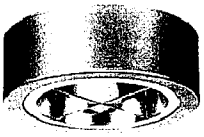
Type: **B6 NOT USED**



Dimensions: Diameter = 14" Height = 3 3/16"

Type: **C1**
Description: Surface ceiling mount luminaire with white acrylic diffuser. Luminaire finish shall be white. Provide electronic non-dimming ballast.
Lamps: (2) CF26DD/E/835
Manufacturers: *American Scientific Lighting* # HOR/226

Type: **C2 – C4 NOT USED**

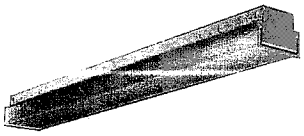


Dimensions: Diameter = 11 1/2" Height = 4 1/2"

Type: **C5**
Description: Surface ceiling mount cylindrical luminaire with clear Alzak reflector with parabolic cross blade baffle. Provide electronic dimming ballast.
Lamps: (2) CF26DD/E/835
Manufacturers: *Prescolite* # CFSCB826EB-DM-WH-STCB8CL-SS

Dimensions: Length = 13 1/4" Height = 5 1/4" Projection = 5 1/8"

Type: **E1**
Description: Wall mounted emergency light with self contained sealed nickel cadmium battery with ten year rated life. Battery shall be rated to operate fixture lamps for 90 minutes upon loss of normal power. Mount bottom of fixture at 7' - 0" AFF. Fixture housing shall be white.
Lamps: (2) By Manufacturer
Manufacturer: *Dual Lite* # LZ35-12V

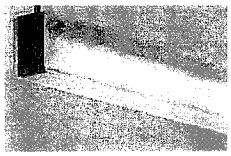


Dimensions: Width = 6 3/4" Height = 4 7/16" Length = 4' – 0"

Type: **J1**
Description: Surface ceiling mount wraparound light with acrylic prismatic lens. Provide electronic non-dimming ballast.
Lamps: (1) FO28/835/XP/ECO
Manufacturers: *Columbia Lighting* # PT4-132-E120

Dimensions: Width = 9" Height = 2 27/32" Length = 4' – 0"

Type: **J2**
Description: Similar to Type J1 except larger and two lamps.
Lamps: (2) FO28/835/XP/ECO
Manufacturers: *Columbia Lighting* # WC4-232-E120



Dimensions: Length = 46.50" Width = 2.35" Height = 2.35"

Type: **J3**
Description: Suspended linear luminaire with translucent acrylic diffuser. Provide electronic non-dimming ballast.
Lamps: (2) FP28/835/ECO
Manufacturer: *Eureka Lighting* # 3550-48-FRO-F.T5

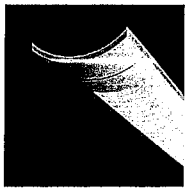
Type: **J4**
Description: Similar to Type J3 except surface mounted.
Lamps: (2) FP28/835/ECO
Manufacturer: *Eureka Lighting* # 3550-48-FRO-F.T5

Type: **J5**
Description: Similar to Type A2 except surface mounted.
Lamps: (2) F017/835/XP/ECO
Manufacturer: *Columbia* # EPC22-232G-CV-EHL-U -EPC22-2

Type: **J6**
Description: Similar to Type A1 except surface mounted.
Lamps: (2) FO28/835/XP/ECO
Manufacturer: *Columbia* # EPC24-232G-CV-EHL-U-EPC24-2

Dimensions: Width = 4 1/2" Height = 10" Projection = 3"

Type: **L1**
Description: Thin profile surface wall luminaire, UL listed for damp locations with polycarbonate diffuser. Mount in elevator pit 24" above pit floor. Fixture shall be 120 volts.
Lamps: (1) CF13DD/835
Manufacturers: *Luraline* # M3384 WAC WH 13H



Dimensions: Length = 4'-0" Width = 9" Luminaire Height = 2.6"

Type: **N1**
Description: Pendant hung direct/indirect luminaire with extruded aluminum housing that includes a bottom down-light cross-blade louver. Provide electronic instant start high power factor ballast. Suspend luminaire with adjustable aircraft cable.
Lamps: (2) FO28/835/XP/ECO
Manufacturers: *Finelite* # S12-ID-WCB-4'-2T8-SC-91W-OPEN-120-FE-C4

Dimensions: Length = 12'-0" Width = 9" Luminaire Height = 2.6"

Type: **N2**
Description: Similar to Type N1 except 12 foot length.
Lamps: (6) FO28/835/XP/ECO
Manufacturers: *Finelite* # S12-ID-WCB-12'-2T8-SC-91W-OPEN-120-FE-C4

Dimensions: Length = 8'-0" Width = 9" Luminaire Height = 2.6"

Type: **N3**
Description: Similar to Type N1 except 8 foot length.
Lamps: (4) FO28/835/XP/ECO
Manufacturers: *Finelite* # S12-ID-WCB-8'-2T8-SC-91W-OPEN-120-FE-C4

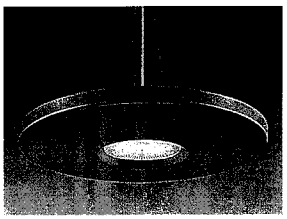
Dimensions: Length = 4'-0" Width = 12" Luminaire Height = 3 1/4"

Type: **N4**
Description: Pendant hung direct/indirect luminaire with extruded white cross-blade baffles and perforated metal side shielding. Provide electronic instant start high power factor ballast. Suspend luminaire with adjustable aircraft cable.
Lamps: (2) FO28/835/XP/ECO
Manufacturers: *Finelite* # S2-4'-2T8-SC-120-AC

Dimensions: Length = 8'-0"" Width = 12" Luminaire Height = 3 1/4"

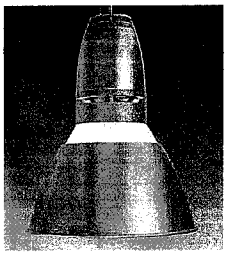
Type: **N5**
Description: Similar to Type N4 except 8 foot length.
Lamps: (4) FO28/835/XP/ECO
Manufacturers: *Finelite* # S2-8'-2T8-SC-120-AC

Type: **R1** **NOT USED**



Dimensions: Diameter = 36" Luminaire Height = 2.70"
Overall Height = 39"

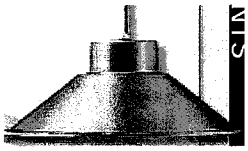
Type: **R2**
Description: Suspended indirect luminaire with steel housing and white luminous acrylic diffuser. Luminaire finish shall be titanium silver. Provide electronic non-dimming ballast. Suspend luminaire from existing ceiling medallion.
Lamps: (4) CF42DT/E/IN/835
Manufacturers: *Focal Point* # FMEP-26-SD-442TT-1C-120-S-TS



Dimensions: Diameter = 14.72" Luminaire Height = 18.87"

Type: **R3**
Description: Suspended luminaire with direct/indirect distribution. Luminaire shall include white borosilicate glass ring to provide uplight. Luminaire finish shall be titanium silver. Provide electronic non-dimming ballast. Suspend luminaire from sloped wood ceiling.
Lamps: (4) CF42DT/E/IN/835
Manufacturers: *Focal Point* # FSN-RUW-442TT-1C-120-S

Type: **R4** **NOT USED**



Dimensions: Diameter = 14" Luminaire Height = 5 1/2"

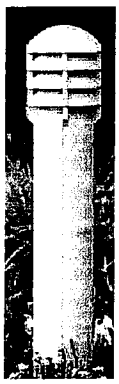
Type: **R5**
Description: Suspended luminaire with direct downlight shade. Suspend luminaire to height as indicated by architect Luminaire finish shall be titanium silver.
Lamps: (1) 75A19
Manufacturers: *Luraline* # RT 14 STEM SILVER

Dimensions: Diameter = 14.72" Luminaire Height = 18.87"

Type: **R6**
Description: Identical to Type R3 except with two lamps.
Lamps: (2) CF42DT/E/IN/835
Manufacturers: *Focal Point* # FSN-RUW-242TT-1C-120-S

Dimensions: Width = 8.70" Projection = 8.70" Height = 8.70"

Type: **S1**
Description: Surface wall mounted luminaire aluminum housing and tempered glass lens. Luminaire shall be classified as full cut-off with an asymmetric forward throw optical distribution. Luminaire finish shall be black. Mount at height as directed by Architect.
Lamps: (1) MCP50/U/MED/830PB
Manufacturers: *We-ef Lighting* # 622-6041-120V



Dimensions: Diameter = 6" Height = 32"

Type: **S2**
Description: Bollard light with anchor bolt base, aluminum housing and aluminum shielding louvers. Bollard finish shall be white.
Lamps: (1) MCP50/U/MED/830PB
Manufacturers: *Kim Lighting* # CB32/50MH120/WH-P

Luminaire Dimensions: Width = 3 3/8" Height = 5 1/4"
Track Dimensions: Length = 12' – 0"

Type: **T1**
Description: Two circuit track lighting system with low-profile lighting heads. Lighting heads shall include a black face baffle. Lighting heads and track finish shall be white. Provide track lighting heads as indicated on plans.
Lamps: (1) 75PAR30/HAL/FL40 (per lighting head)
Manufacturers: *Prescolite* # AKTSFP30-WH (lighting head)
Prescolite # AKT12-WH (track)

Type: **T2**
Description: Identical to Type T1 except wall mounted.
Lamps: (1) 75PAR30/HAL/FL40 (per lighting head)
Manufacturers: *Prescolite* # AKTSFP30-WH (lighting head)
Prescolite # AKT12-WH (track)

Track Dimensions: Length = 8' – 0"

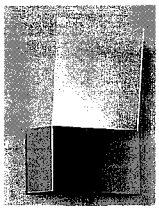
Type: **T3**
Description: Identical to Type T1 except wall mounted and eight feet long.
Lamps: (1) 75PAR30/HAL/FL40 (per lighting head)
Manufacturers: *Prescolite* # AKTSFP30-WH (lighting head)
Prescolite # AKT8-WH (track)

Track Dimensions: Length = 8' – 0"

Type: **T4**
Description: Identical to Type T1 except eight feet long.
Lamps: (1) 75PAR30/HAL/FL40 (per lighting head)
Manufacturers: *Prescolite* # AKTSFP30-WH (lighting head)
Prescolite # AKT8-WH (track)

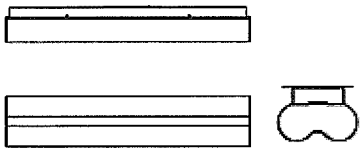
Dimensions: Length = 21 1/4" Width = 5" Depth = 1 1/8"

Type: **U1**
Description: Surface under cabinet task light luminaire with acrylic lens. Provide electronic non-dimming ballast.
Lamps: (1) F13T5/WW
Manufacturers: *Columbia* # UCS21-113-PH120



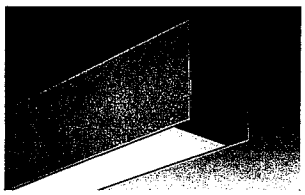
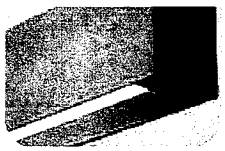
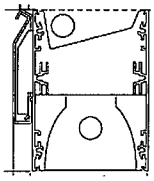
Dimensions: Width = 8.70" Projection = 3.90" Height = 12.80"

Type: **W3**
Description: Surface wall mounted luminaire with frosted translucent glass diffuser. Provide electronic non-dimming ballast. Mount at height as directed by Architect.
Lamps: (1) CF26DD/E/835
Manufacturers: *Eureka Lighting* # 3415-S S-FRO-CF.D.26



Dimensions: Length = 24.25" Projection = 3.45" Height = 5"

Type: **W4**
Description: Surface wall mounted light with white blown glass diffuser. Luminaire finish shall be chrome. Provide electronic non-dimming ballast. Mount at height as directed by Architect. Mount horizontally above vanity mirror in toilet rooms. Mount vertically in stairwells.
Lamps: (2) FP14/835/ECO
Manufacturers: *Eureka Lighting* # 3213-CHR-WH-2XF.T5.14

Dimensions: Length = 8' - 0" Projection = 3.20" Height = 4.50"

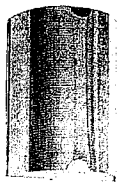
Type: **W5**
Description: Small profile surface wall mounted luminaire with flushed opal white satin lens. Luminaire finish shall be white. Provide electronic non-dimming ballast. Mount at height as directed by Architect.
Lamps: (4) FP28/835/ECO
Manufacturers: *Focal Point Lighting* # FAVDW-FL-11T5-1C-120-S-WM-WH-8'

Dimensions: Length = 4' - 0" Projection = 3.20" Height = 3.75"

Type: **W6**
Description: Similar to Type W5 except direct only distribution and four-foot long.
Lamps: (1) FP28/835/ECO
Manufacturers: *Focal Point Lighting* # FAVCW-FL-1T5-1C-120-S-WM-WH-4'

Dimensions: Length = 9 1/2" Height = 2 13/16" Recess Height = 7/8"

Type: **W8**
Description: Recessed LED step light with die-cast aluminum housing. Luminaire shall have tempered opal glass lens. Luminaire finish shall be white.
Lamps: LED by Manufacturer
Manufacturer: *FC Lighting* # FCLS101-120V-277V-6W-WH



Dimensions: Width = 8" Height = 11" Projection = 4"

Type: **W9**
Description: Surface wall light with satin chrome finish and white acrylic diffuser. Provide a non-dimming electronic ballast. Mount at height as directed by Architect.
Lamps: (2) CF26DD/E/835
Manufacturer: *American Scientific Lighting* # PIA-226-HPF

Dimensions: Length = 13" Height = 9" Projection = 1 7/8"

Type: **X1**
Description: Wall mounted thermoplastic exit sign with red letters and white housing. Fixture shall include LED lamps. Fixture shall include an integral battery rated to operate fixture for 90 minutes upon loss of normal power. Provide directional arrows as indicated on the drawings.
Lamps: By Manufacturer
Manufacturer: *Dual Lite* # LX-U-R-W-E

Type: **X2**
Description: Identical to Type X1 except ceiling mount.
Lamps: By Manufacturer
Manufacturer: *Dual Lite* # LX-U-R-W-E

Dimensions: Length = 13 5/8" Height = 11" Projection = 2 3/8"

Type: **X3**
Description: Surface wall mounted edge-lit exit sign with green letters and white trim. Fixture shall include LED lamps. Provide directional arrows as indicated on the drawings.
Lamps: By Manufacturer
Manufacturer: *Dual Lite* # CVES-1-G-N-E

SECTION 16530 - EXTERIOR LIGHTING

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 the following:
   1. New wall mounted exterior luminaires with lamps and ballasts.
   2. New bollard luminaires with lamps and ballasts.

1.3 RELATED SECTIONS

A. Section 16450 - Grounding

B. Section 16510 – Interior Lighting.

1.4 DEFINITIONS

A. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.5 SUBMITTALS

A. Product Data: For each luminaire and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
   2. Details of attaching luminaires and accessories.
   3. Luminaire materials.
   4. Ballasts, including energy-efficiency data.
   5. Lamps, including life, output, and energy-efficiency data.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Lamps: 5 of each type and rating installed.

PART 2 - PRODUCTS

2.5 MANUFACTURERS

B. In Lighting Fixture Schedule in Section 16510 provide products as specified.

2.6 LUMINAIRES, GENERAL REQUIREMENTS

B. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

E. Exposed Hardware Material: Stainless steel.

F. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

2.7 BALLASTS FOR HIGH INTENSITY DISCHARGE LAMPS

B. Metal Halide Ballasts: Pulse start core and coil magnetic ballasts.
   1. Power Factor: 90 percent, minimum
   2. Starting Temperature: -20 F
   3. Insulation Class: H
   4. ANSI Code:
      a. M-110 for 50 watt lamps

2.8 LAMPS

B. Manufacturers
   1. *Osram-Sylvania*
   2. *General Electric*
   3. *Phillips*
   4. Substitutions: None Permitted

C. HID Lamps:
   1. Metal Halide
      a. Type: Pulse Start, clear, medium base
      b. Watts: 50
      c. Initial Lumens: 4100 (minimum)
      d. CRI: 88 (minimum)

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

C. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

3.2 BOLLARD INSTALLATION

A. Provide concrete foundation bases for bollard lights.
   1. Diameter: 12 inches
   2. Burial Depth: 48 inches
   3. Projection: Flush with paving surface.

B. Coordinate foundation locations with Landscape plans to avoid conflict with tree roots and/or vegetation. Where unavoidable conflict occurs, notify Architect.

C. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:
   1. Water, Gas, Electric, Communication, and Sewer Lines: 5 feet.

3.3 GROUNDING

A. Ground luminaires according to Section 16450 "Grounding".

3.4 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

END OF SECTION 16530

SECTION 16535 EMERGENCY LIGHTING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Emergency lighting units.

B. Exit signs.

C. Emergency ballasts.

1.2 REFERENCES

A. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.

B. NEMA WD1 - General Purpose Wiring Devices.

1.3 REGULATORY REQUIREMENTS

A. Conform to NFPA 101 for installation requirements.

1.4 RELATED SECTIONS

A. Section 16510 – Interior Lighting

1.5 SUBMITTALS

A. Submit product data under provisions of Division 1 and Section 16010.

B. Provide product data on emergency lighting units.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of each luminaire.

PART 2 - PRODUCTS

2.1 INCANDESCENT EMERGENCY LIGHTING UNITS

A. Emergency Lighting Unit: Self-contained unit with rechargeable storage batteries, charger, and lamps.

B. Battery: 12 volt, lead-cadmium type, with 1.5-hour capacity to supply the connected lamp load.

C. Charger: Dual-rate charger, capable of maintaining the battery in a full-charge state during normal conditions, and capable of recharging discharged battery to fully charged within 12 hours.

D. Lamps: 5-watt minimum, sealed-beam type.

E. Indicators: Provide lamps to indicate AC ON and RECHARGING.

F. Provide switch to transfer unit from normal supply to battery supply.

G. Unit Voltage: 120 volts, AC.

2.2 SELF-CONTAINED EMERGENCY POWER EXIT SIGNS

A. Type: Exit signs with integral battery-operated emergency power supply, including power failure relay, test switch, AC ON pilot light, battery, and fully-automatic two-rate charger.

B. Battery: Sealed lead acid or lead calcium cell, requiring no maintenance or replacement for 10 years under normal conditions.

C. Lamps: LED

D. Directional Arrows: Provide universal directional arrows.

E. Voltage: Dual voltage rated, suitable for operation on either 120 volts AC or 277 volts AC.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units plumb and level.

B. Aim directional lamp heads as directed.

C. Connect power to emergency lighting units to nearest lighting circuit ahead of all switches.

D. Provide wiring as indicated on drawings.

END OF SECTION 16535

SECTION 16721 - FIRE ALARM AND SMOKE DETECTION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, and wiring as shown on the drawings and specified herein.

1.2 REFERENCES

A. Underwriters Laboratories Inc. (UL) - USA:

1.	No. 38	Manually Actuated Signaling Boxes
2.	No. 50	Cabinets and Boxes
3.	No. 864	Control Units for Fire Protective Signaling Systems
4.	No. 268	Smoke Detectors for Fire Protective Signaling Systems
5.	No. 268A	Smoke Detectors for Duct Applications
6.	No. 346	Waterflow Indicators for Fire Protective Signaling Systems
7.	No. 464	Audible Signaling Appliances
8.	No. 521	Heat Detectors for Fire Protective Signaling Systems
9.	No. 1971	Visual Notification Appliances

B. National Fire Protection Association (NFPA) - USA:

1.	No. 13	Sprinkler Systems
2.	No. 70	National Electric Code (NEC)
3.	No. 72	National Fire Alarm Code
4.	No. 101	Life Safety Code

1.3 REGULATORY REQUIREMENTS

A. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Local Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Auxiliary Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

D. The system shall have proper listing and/or approval from the following nationally recognized agencies:

1.	UL	Underwriters Laboratories Inc
2.	ULC	Underwriters Laboratories Canada
3.	FM	Factory Mutual
4.	MEA	Material Equipment Acceptance (NYC)
5.	CSFM	California State Fire Marshal

E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

F. The system shall conform to all applicable building codes.
1. Local and State Building Codes.
2. State Elevator Code

1.4 SYSTEM DESCRIPTION

A. Basic Performance:
1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B), Style 6 (Class A) or Style 7 (Class A) Signaling Line Circuits (SLC).
2. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B) or Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) or Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
4. All circuits shall be power-limited, per UL864 9th edition requirements.
5. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm when wire NFPA Style 6/7.
6. Alarm signals arriving at the main FACP shall not be lost following a primary power failure or outage of any kind until the alarm signal is processed and recorded.

1.5 BASIC SYSTEM FUNCTIONAL OPERATION

A. The Secondary Power Source of the fire alarm control panel will be capable of providing at least 24 hours of backup power with the ability to sustain 5 minutes in alarm at the end of the backup period.

B. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
1. The system Alarm LED on the FACP shall flash.
2. A local sounder with the control panel shall sound.
3. A backlit 80-character LCD display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

4. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm.

C. Elevator Interface:
1. Interlock alarm system heat detectors at the top and bottom of elevator shaft, and in the Elevator Machine Room with the elevator power service shunt trips such that an alarm condition at any of these detectors shall automatically disable the associated elevator electrical service feeder. Provide an interlock between the fire alarm system smoke detectors at the Elevator Lobbies on each floor, and the smoke detector in the Elevator Machine Room, such that:
   a. An alarm activation by either the detector at the second or third floor Lobbies, or at the detector in the Elevator Machine Room, shall automatically send the elevator to the first floor Lobby.
   b. An alarm condition activated by the first floor Lobby smoke detector shall automatically send the elevator car to the second floor.

1.6 SUBMITTALS

A. General:
1. Submit shop drawings under provisions of Division 1 and Section 16010.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:
1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

C. Manuals:
1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications

1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

1.7 GUARANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.8 MAINTENANCE

A. Maintenance and testing shall be on a semi-annual schedule or as required by the local AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:
   1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
   2. Each circuit in the fire alarm system shall be tested semiannually.
   3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 (2002 Edition) Chapter 10.

B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

1.9 POST CONTRACT EXPANSIONS

A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules, and addressable control modules

equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.

D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the cost of initiating devices or notification appliances connected to the addressable monitor/control modules.

E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

PART 2 PRODUCTS

2.3 EQUIPMENT AND MATERIAL, GENERAL

D. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.

E. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

F. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.4 WIRE

D. Wire:
1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).

5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a minimum wiring distance of 10,000 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.
6. All field wiring shall be electrically supervised for open circuit and ground fault.
7. The fire alarm control panel shall be capable of T-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the amount of T-taps, length of T-taps etc., are not acceptable.

E. Terminal Boxes, Junction Boxes and Cabinets:
1. All boxes and cabinets shall be UL listed for their use and purpose.

2. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.
3. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Main panel notification circuits (NACs 1 & 2) shall also automatically synchronize any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.

2.5 MAIN FIRE ALARM CONTROL PANEL

D. Manufacturers:
1. *Notifier* NFW-50 (Fire Warden-50)
2. Substitutions: Or Approved Equal.

E. The FACP shall contain a microprocessor-based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

F. Operator Control
1. Acknowledge Switch:
   a. Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
   b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
2. Alarm Silence Switch:
   a. Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition.

The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. Alarm Activate (Drill) Switch:
   a. The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
4. System Reset Switch:
   a. Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
5. Lamp Test:
   a. The Lamp Test switch shall activate all system LEDs and light each segment of the liquid crystal display.

G. System Capacity and General Operation
1. The control panel shall provide, or be capable of, expansion to 50 intelligent/addressable devices.
2. The control panel shall include two Form-C programmable relays which can be used for Alarm, Supervisory, and a fixed Trouble relay rated at a minimum of 2.0 amps @ 30 VDC and 0.5 amps @ 30 VAC . It shall also include two programmable Notification Appliance Circuits (NACs) capable of being wired as Class B (NFPA Style Y) or Class A (NFPA Style Z).
3. The fire alarm control panel shall include an operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
4. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes. The control unit will support the ability to upgrade its operating program using FLASH memory technology. The unit shall provide the user with the ability to program from either the included keypad, a standard PS2-style PC keyboard or from a computer running upload/download software.
5. The system shall allow the programming of any input to activate any output or group of outputs. Systems which have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or REQUIRE a laptop personal computer are not considered suitable substitutes.
6. The FACP shall provide the following features:
   a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
   b. Detector sensitivity test, meeting requirements of NFPA 72, Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
   c. The ability to display or print system reports.
   d. Alarm Verification.

e. Positive Alarm Sequence (PAS pre-signal), meeting NFPA 72 (2002 Edition) 6.8.1.3 requirements.
f. Rapid manual station reporting.
g. Non-alarm points for general (non-fire) control.
h. Periodic detector test, conducted automatically by the software.
i. Walk test, with a check for two detectors set to same address.

7. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Main panel notification circuits (NACs 1 & 2) shall also automatically synchronize and be programmable for any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock or Gentex with no need for additional synchronization modules.

H. Central Microprocessor

1. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
2. The microprocessor shall contain and execute all specific actions to be taken in the condition of an alarm. Control programming shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file.
4. A special program check function shall be provided to detect common operator errors.
5. An auto-programming capability (self-learn) shall be provided to quickly identify devices connected on the SLC and make the system operational.
6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download. This program shall also have a verification utility which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in incompliance with the NFPA 72 requirements for testing after system modification.

I. Local Keyboard Interface

1. In addition to an integral keypad, the fire alarm control panel will accept a standard PS2-style keyboard for programming, testing, and control of the system. The keyboard will be able to execute the system functions ACKNOWLEDGE, SIGNALS SILENCED, DRILL and RESET.

J. Display

1. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.
3. The display shall contain an alphanumeric, text-type display and dedicated LEDs for the annunciation of AC POWER, FIRE ALARM, SUPERVISORY, TROUBLE, and ALARM SILENCED conditions.

4. The display keypad shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
5. The display shall include the following operator control switches: ACKNOWLEDGE/STEP, ALARM SILENCE, DRILL (alarm activate), and SYSTEM RESET.

K. Signaling Line Circuit (SLC)
1. The SLC interface shall provide power to and communicate with up to 50 devices of any type including: intelligent detectors (ionization, photoelectric or thermal), addressable pull stations, intelligent modules (monitor or control). Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.
2. The CPU shall receive information from all intelligent detectors to be processed to determine whether normal, alarm or trouble conditions exist for each detector. The software shall automatically compensate for the accumulation of dust in each detector up to allowable limits. The information shall also be used for automatic detector testing and for the determination of detector maintenance conditions.
3. The detector software shall meet NFPA 72 (2002 Edition), Chapter 10 requirements and be certified by UL as a calibrated sensitivity test instrument.

L. Serial Interfaces
1. The system shall provide a means of interfacing to UL Listed Electronic Data Processing (EDP) peripherals using the EIA-232 communications standard.
2. An annunciator RS-485 (ANN-Bus) bus shall be used to connect an UL-Listed 80-column printer anywhere within the 6,000 range of the serial bus connection. The printer shall communicate with the control panel using an RS-485 converter/interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz. The interface shall contain both a 9-pin serial and standard centronics parallel connector. Either shall be capable of connection to a serial or parallel printer.
3. The annunciator RS-485 (ANN-Bus) bus shall also provide connection to additional addressable modules supporting remote 80 character LCD text annunciators that mimic the standard panel display and controls. Said annunciators shall support remote acknowledge, silence, drill and reset functions and shall be enabled via a keyswitch. The bus shall also provide connection to addressable modules supporting up to 40 LEDs for use with a graphic annunciator.

M. The control panel will have the capability of to a Municipal Box for compliance with applicable NFPA standards.

N. Digital Alarm Communicator Transmitter (DACT). The DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.
1. The DACT shall be an integral component of the fire alarm control panel requiring no interconnecting wiring or supervisory circuitry.
2. The DACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.

3. The DACT shall be completely field programmable locally from the control panel keypad or remotely over a phone line using upload/download PC software.
4. The DACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
5. Communication shall include vital system status such as:
   a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
   b. Independent Addressable Device Status
   c. AC (Mains) Power Loss
   d. Low Battery and Earth Fault
   e. System Off Normal
   f. 12 and 24-Hour Test Signal
   g. Abnormal Test Signal (per UL requirements)
   h. EIA-485 Communications Failure
   i. Phone Line Failure
6. The DACT shall support independent zone/point reporting when used in the Contact ID format. In this format, the DACT shall support the transmission of up to 50 addressable points with the system. This enables the central station to have exact details concerning the location of the fire for emergency response.

O. Enclosures:
1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall provide for the viewing of all indicators.
4. The cabinet shall accept a chassis containing the PCB and to assist in quick replacement of all the electronics including power supply shall require no more than two bolts to secure the panel to the enclosure back box.
5. The cabinet shall also support a mechanical secured optional dress panel limiting access to the internals of the panel.
6. One EIA-232 interface shall be used to connect an UL-Listed 80-column printer. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.

P. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24-volt power supply or as a booster for powering Notification Appliances.
1. The FCPS shall offer up to 8.0 amps (6.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 18.0 amp hour batteries.
2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a control relay. Four NAC outputs, wired NFPA Style Y or Z, shall be available for connection to the Notification devices.
3. The FCPS shall optionally provide synchronization of all connected strobes or horn strobe combinations when System Sensor, Wheelock, or Gentex devices are installed.
4. The FCPS shall function as a sync follower as well as a sync generator.

5. The FCPS shall include a surface mount backbox.
6. The Field Charging Power Supply shall include the ability to delay the reporting of an AC fail condition per NFPA requirements.
7. The FCPS shall provide 24 VDC regulated and power-limited circuitry per UL 864 9th edition standards.

Q. Power Supply:
1. The main power supply for the fire alarm control panel shall provide 3.7 amps of available power for the control panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.
4. The main power supply shall continuously monitor all field wires for earth ground conditions.
5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.

R. Wall Combination Speaker/Strobes:
1. Operating voltage: 24 VDC.
2. Strobe Intensity: Selectable 15, 17/75, 30, 70, 110 candela.
3. Speakers:
   a. 25 or 70.7 volt with four selectable power taps.
   b. Frequency Range: 400-4000 Hz.
   c. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.
4. Mounting: Flush.

S. Wall Visual Only Devices: Shall meet the requirements of Section B listed above for visibility.

T. Waterflow Indicator:
1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.
3. All waterflow switches shall come from a single manufacturer and series.
4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

U. Sprinkler and Standpipe Valve Supervisory Switches:
1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.
3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4-inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.
5. The switch housing shall be finished in red baked enamel.
6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

V. Specific System Operations
1. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently programmed for verification of alarm signals. The alarm verification time period shall not exceed 2 minutes.
2. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
3. Point Read: The system shall be able to display the following point status diagnostic functions:
   a. Device status
   b. Device type
   c. Custom device label
   d. Device zone assignments
4. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
5. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 500 events. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety.
   a. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
7. The fire alarm control panel shall include Silent and Audible Walk Test functions - Silent and Audible. It shall include the ability to test initiating device circuits and Notification Appliance Circuits from the field without returning to the panel to reset the system. The operation shall be as follows:

a. The Silent Walk Test will not sound NACs but will store the Walk Test information in History for later viewing.
b. Alarming an initiating device shall activate programmed outputs, which are selected to participate in Walk Test.
c. Introducing a trouble into the initiating device shall activate the programmed outputs.
d. Walk Test shall be selectable on a per device/circuit basis. All devices and circuits which are not selected for Walk Test shall continue to provide fire protection and if an alarm is detected, will exit Walk Test and activate all programmed alarm functions.
e. All devices tested in walk test shall be recorded in the history buffer.

8. Waterflow Operation
   a. An alarm from a waterflow detection device shall activate the appropriate alarm message on the control panel display; turn on all programmed Notification Appliance Circuits and shall not be affected by the Signal Silence switch.
9. Supervisory Operation
   a. An alarm from a supervisory device shall cause the appropriate indication on the control panel display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
10. Signal Silence Operation
    a. The FACP shall have the ability to program each output circuit (notification circuit or relay) to deactivate upon depression of the Signal Silence switch.
11. Non-Alarm Input Operation
    a. Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

2.6 SYSTEM COMPONENTS:

D. Addressable Pull Box (manual station)
1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

E. Intelligent Photoelectric Smoke Detector
1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
2. The detectors shall be ceiling-mounted and available in an alternate model with an integral fixed 135-degree heat-sensing element.

3. Each detector shall contain a remote LED output and a built-in test switch.
4. Detector shall be provided on a twist-lock base.
5. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.
6. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall periodically flash to indicate that the detector is in communication with the control panel.
7. The detector shall not go into alarm when exposed to air velocities of up to 1500 feet per minute (fpm).
8. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
9. All field wire connections shall be made to the base through the use of a clamping plate and screw.

F. Intelligent Thermal Detectors
1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

G. Addressable Dry Contact Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any normally open dry contact device) to one of the fire alarm control panel SLCs.
2. The monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box.
3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

H. Two-Wire Detector Monitoring
1. Means shall be provided for the monitoring of conventional Initiating Device Circuits populated with 2-wire smoke detectors as well as normally open contact alarm initiating devices (pull stations, heat detectors, etc).
2. Each IDC of conventional devices will be monitored as a distinct address on the polling circuit by an addressable module. The module will supervise the IDC for alarms and circuit integrity (opens).
3. The monitoring module will be compatible, and listed as such, with all devices on the supervised circuit.
4. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

5. The monitoring module shall be capable of mounting in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or in a surface mount backbox.

I. Addressable Control Relay Module
1. Addressable control relay modules shall be provided to control the operation of fan shutdown and other auxiliary control functions.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control relay module will provide two dry contact, Form-C relays. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relays may be energized at the same time on the same pair of wires.
4. The control relay module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

J. Isolator Module
1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Style 6 (Class A) or Style 4 (Class B branch). The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

2.7 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

D. Addressable Devices - General
1. Addressable devices shall employ the simple-to-set decade addressing scheme. Addressable devices which use a binary-coded address setting method, such as a DIP switch, are not an allowable substitute.
2. Detectors shall be addressable and intelligent, and shall connect with two wires to the fire alarm control panel signaling line circuits.
3. Addressable smoke and thermal (heat) detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
4. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance.

The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 10.

5. Detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a base with a built-in (local) sounder rated for a minimum of 85 DBA, a relay base and an isolator base designed for Style 7 applications.
6. Detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel.
7. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
8. Detectors shall provide address-setting means using decimal switches.

2.8 BATTERIES

D. Upon loss of Primary (AC) power to the control panel, the batteries shall have sufficient capacity to power the fire alarm system for required standby time (24 or 60 hours) followed by 5 minutes of alarm.

E. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

F. If necessary to meet standby requirements, external battery/charger systems may be used.

2.9 MUNICIPAL FIRE ALARM MASTER BOX

A. Provide municipal fire alarm master transmittal box as directed by the City Fire Department to match the City's standard.

B. Provide communications cable for fire alarm master box to be connected to the municipal fire alarm circuit at Deering Street.

1. Description: IMSA Spec 20-2 shielded, 3-twisted-pair, 600 volt, #16 AWG conductor with black polyethylene jacket. Obtain approval from City Fire Department for cable prior to purchasing.

2.10 REMOTE ANNUNCIATIOR

A. Provide an LCD flush-mounted remote annunciator *Notifier* LCD-80 or equal. Annunciator shall include an 80-character back-lit liquid Crystal Display (20 characters times 4 lines). Annunciator shall include control switches for system acknowledge, signal silence, and system re-set.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All wiring shall be run in conduit ir surface raceway as specified under Section 16111 and Section 16112.

C. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

D. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

E. Manual pull stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed 48 inches (122 mm) above the finished floor.

F. Indicating stations shall be installed 80 inches (315 mm) above finished floor.

G. Provide a municipal alarm box and connect to the closest municipal alarm wiring.

3.2 TEST

A. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

D. Verify activation of all waterflow switches.

E. Open initiating device circuits and verify that the trouble signal actuates.

F. Open and short signaling line circuits and verify that the trouble signal actuates.

G. Open and short notification appliance circuits and verify that trouble signal actuates.

H. Ground all circuits and verify response of trouble signals.

I. Check presence and audibility of tone at all alarm notification devices.

J. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

K. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

L. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION

A. At the final inspection, a minimum NICET Level II technician shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."

END OF SECTION 16721

SECTION 16722 - SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Contractor shall provide a complete surveillance system including IP digital surveillance cameras and all associated wiring. Wiring shall extend from camera locations to the Server Room and shall be terminated on network rack patch panels.

1.2 RELATED SECTIONS

A. Section 16111 – Conduit

B. Section 16112 – Surface Raceways

C. Section 16130- Boxes

D. Section 16746 – Structured Cabling

1.3 REFERENCES

A. National Fire Protection Association (NFPA): NFPA 70 - National Electrical Code.

B. Underwriters Laboratories Incorporated (UL):
1. UL 609 – Local Burglar Alarm Units.
2. UL 634 – Connectors and Switches for Use with Burglar Alarm Systems.
3. UL 639 – Intrusion Detection Devices.
4. UL1023 – House-hold Burglar Alarm Systems.
5. UL 1076 – Proprietary Burglar Alarm Units and Systems.

1.4 REQULATORY REQUIREMENTS

A. Comply with requirements of NFPA 70.

B. Comply with UL Standard 609, 1023, and 1076.

C. FM Compliance: Provide FM-approved intrusion detection systems and components.

1.5 SYSTEMS DESCRIPTION

A. Surveillance System: Provide a complete IP digital camera surveillance system to be connected to the local area network and to the Internet for web-based browser control. System shall include all necessary software to allow for the following features:
1. Monitoring of JPEG format images by web browser access to IP address of cameras.
2. Provision of MPEG-4 movie image compression format.
3. Cameras rated for low-light performance of 0.2 footcandles at a sensitivity of 10x.

4. Cameras with control of views in both the horizontal and vertical directions from a personal computer with a wide angle view covering 140 degrees for panning and 120 degrees for tilting.
5. Software shall facilitate automatic controlling of up to eight cameras with a single computer key stroke.
6. Software shall store up to 60 alarm images with date, time, and type of alarm.
7. Software shall facilitate automatic notification of alarm events by email.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1 and Section 16010.

B. Provide wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes.

C. Submit manufacturer's installation instructions under provisions of Division 1 and Section 16000.

D. Submit manufacturer's certificate under provisions of Division 1 and Section 16010 that the system meets or exceeds specified requirements.

1.7 PROJECT RECORD DRAWINGS

A. Submit documents under provisions of Division 1 and Section 16010.

B. Record actual locations and devices, and routing of surveillance wiring.

1.8 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide written operating and maintenance instructions as specified in Section 16010. Include product data and operation/maintenance information for all system components.

B. The Owner may assign personnel to participate with the Contractor during installation. Without delaying work, familiarize the Owner's personnel with the installation, equipment, and maintenance.

C. During tests and adjustments, permit the Owner's personnel to observe. When feasible, explain the significance of each test.

D. Provide sufficient training to personnel selected by the Owner on operation and basic maintenance of all systems and equipment.

E. Employ manufacturer's field representative to demonstrate system operation to designated Owner personnel.

F. Conduct walking tour of project and briefly describe function, operation, and maintenance of each component.

G. Use submitted operation and maintenance manual as reference during demonstration and training.

H. Provide the owner with a training program designed to make all administrative control station users familiar with the operation of the surveillance system.

1.9 COORDINATION

A. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the engineer and Owner.

1.10 WARRANTY

A. The Contractor shall warranty all electronic components for five (5) years and workmanship and labor for a period of one (1) year from the date of system acceptance or beneficial usage by the Owner. Neither the final payment, nor any provisions in the contract documents shall relieve the Contractor (or General Contractor) of the responsibility for faulty materials and/or workmanship for a period of one year. This Contractor shall remedy any defects due thereto, and pay for any damage to work resulting wherefrom.

PART 2 - PRODUCTS

2.1 SURVEILLANCE SYSTEM

A. Products specified herein are referenced by *Panasonic* model numbers. Equal products by the following manufacturers will also be accepted:
   1. *IQinvision*
   2. *Axis*
   3. *Sony*

B. Surveillance IP Cameras: *Panasonic* WV-NM100 Series.
   1. Provide cameras meeting the following functions:
      a) Pick-up Device: 1/4 type solid state image sensor
      b) Effective Pixels: 660 (H) x 492 (V) pixels
      c) Min. Illumination: 2 lx (electronic sensitivity x 10), 10 lx (electronic sensitivity off)
      d) Picture Sampling at Image Sensor: 30 ips
      e) Lens: Fixed focal type
      f) Panning Angle: 140 degree
      g) Tilting Angle: 120 degree
      h) Pan/Tilt Preset: Eight (8) position
      i) Image Compression Type: JPEG/MPEG-4 Selectable (requires standard plug-in software for MPEG-4)

j) Image Size: JPEG: VGA (640 x 480), QVGA (320 x 240), QQVGA (160 x 120), MPEG-4: CIF (352 x 288), QCIF (176 x 144)
k) Protocol Supported: TCP/IP, UDP/IP, HTTP, FTP, SMTP, RTP, DNS, DDNS, DHCP, ARP, BOOTP, SNMP, NTP
l) Network: 10Base-T/100Base-TX (RJ-45 x 1)
m) Alarm Interface: Alarm input x 1, Alarm output x 1, Aux output x 1
n) Power Supply: DC9V
o) Power Consumption: 9W
p) Ambient Operating Temperature: 0° C- +40° C
q) Dimensions: 93 (W) x 95 (H) x 61.5 (D) mm
r) Weight (approx.): 180g (0.4 lbs.)

2.2 WIRE AND CABLE

A. Provide 4-pair CAT6 cable for each camera (and for future camera locations as identified on the plans) as specified under Section 16746.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

B. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install system according to NFPA 70, applicable codes, and manufacturer's published instructions.

B. Comply with UL Standard 681.

C. Wiring Method: Install wiring along network cable paths as identified on the plans. Splices and/or taps in wiring are not permitted.

D. Install all components in full conformance with manufacturer's instructions.

E. Install cameras on walls at heights as directed by Architect.

F. Where indicated on the plans, provide cable and termination box above ceilings for future IP cameras. Extend wiring to closest data room, and terminate at network patch panels.

G. Provide a 9V DC battery for each IP camera.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of factory-authorized service representative to supervise field assembly and connection of components and system pre-testing, testing, adjustment, and programming.

B. Inspection:
1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
2. Verify that cameras are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

C. Pre-testing: Align and adjust system and perform pre-testing of components, wiring, and functions to verify conformance with specified requirements. Correct deficiencies by replacing malfunctioning or damaged items with new items. Retest until satisfactory performance and conditions are achieved.

D. Acceptance Operational Tests:
1. Perform operational system tests to verify conformance with specifications.
2. Provide minimum 10 days notice of acceptance test performance schedule to Architect who will coordinate with Owner.

E. Re-testing: Correct deficiencies and retest until total system meets the requirements of Specifications and complies with applicable standards.

END OF SECTION 16722

SECTION 16723- INTRUSTION DETECTION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Intrusion detection devices.

B. Alarm control panel.

1.2 RELATED SECTIONS

A. Section 16010 – General Electrical Requirements.

B. Section 16111 – Conduit.

C. Section 16112 – Surface Raceway.

D. Section 16130 – Boxes.

E. Section 16123 – Building Wire and Cable.

1.3 REFERENCES

A. National Fire Protection Association (NFPA): NFPA 70 - National Electrical Code.

B. Underwriters Laboratories Incorporated (UL):
   1. UL 609 - Local Burglar Alarm Units.
   2. UL 634 - Connectors and Switches for Use with Burglar-Alarm Systems.
   3. UL 639 - Intrusion Detection Devices.
   4. UL 1023 - Household Burglar-Alarm Systems.
   5. UL 1076 - Proprietary Burglar Alarm Units and Systems.

1.4 REGULATORY REQUIREMENTS

A. Comply with requirements of NFPA 70.

B. Comply with UL Standard 609, 1023, and 1076.

C. FM Compliance: Provide FM-approved intrusion detection systems and components.

1.5 SYSTEM DESCRIPTION

A. Design Requirements:

1. System: Central microprocessor and a communications link to perform monitoring and alarm functions. System physically and electronically modular with provision for field expansion. System self-monitoring and self-diagnostic.
2. Communication Link: Voice grade dial-up line and dedicated to intrusion detection, alarm service, and control of security related functions.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1 and Section 16010.

B. Provide wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes.

C. Submit manufacturer's installation instructions under provisions of Division 01 and Section 16010.

D. Submit manufacturer's certificate under provisions of Division 01 and Section 16010 that the system meets or exceeds specified requirements.

1.7 PROJECT RECORD DRAWINGS

A. Submit documents under provisions of Division 01 and Section 16010.

B. Record actual locations and devices, and routing of alarm wiring.

1.8 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide written operating and maintenance instructions as specified in Section 16010. Include product data and operation/maintenance information for all system components.

B. The Owner may assign personnel to participate with the Contractor during installation. Without delaying work, familiarize the Owner's personnel with the installation, equipment, and maintenance.

C. During tests and adjustments, permit the Owner's personnel to observe. When feasible, explain the significance of each test.

D. Provide sufficient training to personnel selected by the Owner on operation and basic maintenance of all systems and equipment.

E. Employ manufacturer's field representative to demonstrate system operation to designated Owner personnel.

F. Conduct walking tour of project and briefly describe function, operation, and maintenance of each component.

G. Use submitted operation and maintenance manual as reference during demonstration and training.

H. Provide the owner with a training program designed to make all administrative control station users familiar with the operation of the security system.

1.9 COORDINATION

A. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the engineer and Owner.

1.10 WARRANTY

A. The Contractor shall warranty all electronic components for five (5) years and workmanship and labor for a period of one (1) year from the date of system acceptance or beneficial usage by the Owner. Neither the final payment, nor any provisions in the contract documents shall relieve the Contractor (or General Contractor) of the responsibility for faulty materials and/or workmanship for a period of one year. This Contractor shall remedy any defects due thereto, and pay for any damage to work resulting therefrom.

PART 2 - PRODUCTS

2.1 INTRUSION DETECTION SECURITY SYSTEM

A. Products specified herein are referenced by *DSC Security Products* model numbers. Equal products by the following manufacturers will also be accepted:
   1. *Ademco*
   2. *Radionics.*
   3. Substitutions: Approved equal.

B. System Motion Detectors
   1. Dual-Technology Motion Detectors: *DSC Security Products* Model Number F2-220/DM-W.
      a. PIR/ultrasonic wall mounted detectors with a 30x70 foot coverage.

C. Intrusion System Control Panel
   1. Control Panel: *DSC Security Products* # PC4020/PC4204.
   2. Comply with UL Standard 1076.
   3. Cabinet: Lockable steel enclosure. Arrange panel so operations required for testing or for normal operation and maintenance are performed from front of enclosure. Accommodate components and allow ample gutter space for interconnection of panels and field wiring. Identify each enclosure by engraved, laminated, phenolic resin

nameplate. Identify individual components and modules within cabinets with permanent labels.

4. Control Panel Features:
   a. Auxiliary power: 12 VDC, 1A max.
   b. Two (2) AH battery.
   c. Integral digital communicator.
   d. Eight (8) hard-wired zones.
   e. Selectable response time.
   f. Touch-tone or pulse communication.
   g. Reportable capabilities:
      (1) Split.
      (2) Dual.
      (3) Split dual true dial tone detection.
   h. Low Battery reports 11.2 - 11.6 VDC.
   i. AC loss and restoration reporting supported.

D. System Power Supply
   1. Normal System Power Supply: 120 V 60 Hz from locked disconnect device. System components are supplied with power through system control panel.
   2. Power Source Transfer: When normal power is interrupted, system is automatically switched to backup supply without degradation of critical system function or loss of signals or status data.
      a. Backup Source: Batteries in power supplies of individual system components. Such batteries are an integral part of power supplies of components.

E. System Keypad Station
   1. Keypad: DSC Security Products Model Number LCD 4500.
      a. Programmable wall mounted keypad to control three zones of intrusion detector.
         (1) Display: 2-line, 32-character LCD.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work.

B. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with work until unsatisfactory conditions have been corrected.

C. By beginning work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost.

3.2 INSTALLATION

A. Install system according to NFPA 70, applicable codes, and manufacturer's published instructions.

B. Comply with UL Standard 681.

C. Wiring Method: Conceal wiring above ceilings or within partitions except in unfinished spaces.

D. Wiring Within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Provide and use lacing bars and distribution spools.

E. Number of Conductors: As recommended by system manufacturer for functions indicated.

F. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull and outlet boxes, terminal cabinets, and equipment enclosures.

G. Tighten connections to comply with tightening torques specified in UL Standard 486A.

H. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so media are identified and coordinated with system wiring diagrams.

I. Install power supplies and other auxiliary components for detection devices at alarm control panel

J. Grounding: Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common mode returns, noise pickup, cross talk, and other impairments.

K. Provide wall mounted motion detectors as follows:
   1. Dual Technology Detectors:
      a. Stair 230
      b. Corridor 106

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of factory-authorized service representative to supervise field assembly and connection of components and system pre-testing, testing, adjustment, and programming.

B. Inspection:
   1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
   2. Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

C. Pre-testing: Align and adjust system and perform pre-testing of components, wiring, and functions to verify conformance with specified requirements. Correct deficiencies by

replacing malfunctioning or damaged items with new items. Retest until satisfactory performance and conditions are achieved.

D. Acceptance Operational Tests:
   1. Perform operational system tests to verify conformance with specifications. Test modes of system operation and intrusion detection. Methodically test for false alarms in each zone of space intrusion detection devices by simulating activities outside indicated detection patterns.
   2. Provide minimum 10 days notice of acceptance test performance schedule to Architect who will coordinate with Owner.

E. Re-testing: Correct deficiencies and retest until total system meets the requirements of Specifications and complies with applicable standards.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 1 year of date of Final Acceptance, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide up to 2 visits to site for this purpose at no additional cost.

END OF SECTION 16723

SECTION 16745 – CABLE TELEVISION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide cable television service entrance.

B. Provide new cable TV interior wiring, wiring taps, backboards and outlet jacks.

1.2 RELATED WORK

A. Section 16010 – General Electrical Requirements

B. Section 16111 – Conduit

C. Section 16130 –Boxes

D. Section 16190 – Supporting Devices

E. Section 16746 – Data Network System

1.3 SUBMITTALS

A. Product Data: Submit physical and operating characteristics of interior cable and outlet jacks under the provisions of Section 16010 and Division 1.

1.4 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Section 16010 and Division 1.

B. Accurately record location of cable TV outlets.

1.5 CABLE TELEVISION SERVICE

A. Empty underground conduit shall only be provided for future cable TV service.

PART 2 - PRODUCTS

2.1 VIDEO CABLE SYSTEM

A. Approved Manufacturers:
   1. *Belden*

2. *CommScope*
3. *General Cable*
4. Substitutions: Or Approved Equal.

B. The video cable shall be coaxial copper-clad center conductor, foam polyethylene dielectric, quad-shield aluminum-Mylar-aluminum foil type, aluminum braid shield and non-contaminating polyvinyl chloride jacket. Cable shall have 75 ohm impedance with 80 dB shielding. No discontinuity shall exist within 54-216 MHZ and 470-890 MHZ bands. Cable shall be used as follows:

1. Hardline backbone cable shall be equivalent to *CommScope* QR 540 Hardline Coax Cable.
   a. The trunk/backbone cable shall be home run directly to video headend location. If field amplification is required to increase dB levels, the amplification hardware must be installed in applicable IDFs or MDFs.
   b. Backbone cable shall meet or exceed the following nominal attenuation and shall not exceed 1000 feet from headend:

5mhz	.13db/100'
30mhz	.34db/100'
50mhz	.43db/100'
108mhz	.63db/100'
220mhz	.93db/100'
400mhz	1.26db/100'
750mhz	1.80db/100'
865mhz	1.90db/100'
1000mhz	2.10db/100'

2. Drop Cable shall be equivalent to *CommScope* RG-6/U, utilize quad-shielding
   a. Plenum-Rated Cable: #2227K CMP rated jacket for Plenum applications.
   b. Drop cable shall meet or exceed the following nominal attenuation specifications and shall not exceed 100 feet to tap on A/V Distribution Trunk/Backbone cable:

1mhz	.21db/100'
10mhz	.65db/100'
50mhz	1.46db/100'
100mhz	2.04 db/100'
200mhz	2.98db/100'
400mhz	4.46db/100'
700mhz	5.89db/100'
900mhz	7.47db/100'

1000mhz	8.02db/100'

3. Underground service cable shall be equivalent to *CommScope* RG-11.

C. Video Cable Connectors
1. Connector type shall be compatible with cable type.
2. Connector types:
   a. "F" connector - 75 ohm with hexagonal 3/4 inch compression termination.
   b. BNC" connector - 75 ohm with hexagonal 3/4 inch compression termination.

D. Video Cabling Splitting Devices
1. Cable tap/splitting devices shall be used in the system as required to meet specified signal strength at each jack location. These units shall utilize a die cast housing and RF shielding exceeding local cable company requirements (minimum -80dB) and be equipped with flanges to permit mounting on any flat surface and shall meet FCC specifications on radiation.
2. Passive Splitters shall have a rated frequency range of 5-1000 Hz and shall be equivalent to Blonder Tongue XRS series.
3. Two-way splitters shall have a maximum splitting loss of 3.8 dB. Four-way splitters shall have a maximum splitting loss of 8.4 dB. Directional couplers shall be available in nominal tap loss values of 8, 12, and 16 dB and the return loss of any terminal shall be 18 dB or higher.
4. Terminating Resistor: Terminating resistors with 75 ohm impedance shall be installed at unused ports and feeder line ends. Terminating resistors shall be designed to cover the frequency range from 5 MHZ to 890 MHZ with minimum return loss of 25 dB at UHF and 30 dB across the VHF band.
5. Directional Coupler Tap, Flush Mounted: Directional coupler type taps shall be provided as required for signal distribution. The taps shall be fully shielded and in compliance with FCC rules pertaining to radiation. The taps shall be available in isolation values of 3, 8, 12, 16, 20, and 24 dB. Frequency response through any port shall be from 5 MHZ to 890 MHZ.
6. The directional coupler taps shall provide a single RF outlet with a type "F" connector. A through match shall be 18 dB minimum and back match shall be in excess of 14 dB. Any combination of taps shall provide a minimum isolation between tap ports of 30 dB. Through connection to the tap shall be made by standard type "F" fittings. The tap shall be housed in a rugged cast aluminum case and shall be above first floor lay-in ceilings.
7. Directional Coupler Multi-Tap, Surface Mounted: Eight-way directional couple-type taps shall be provided as required for signal distribution. The taps shall be fully shielded and in compliance with FCC rules pertaining to radiation. All connections to the unit shall be by standard type "F" connectors. The taps shall be available in isolation value of 20 dB.
8. The frequency response shall be from 12 MHZ to 890 MHZ and the return loss at any port shall be no less than 14 dB. Isolation between any two tap outlets shall be no less than 30 dB from 5 MHZ to 400 MHZ and no less than 15 dB from 470 MHZ to 806 MHZ.
9. The tap shall be housed in a rugged cast aluminum housing provided with flanges to permit mounting on any flat surface.

2.2 VIDEO OUTLET BOXES

A. Outlet Boxes: Sheet metal as specified in Section 16130.

2.3 VIDEO OUTLETS

A. Manufacturers:
   1. *Leviton* model Quickport Series
   2. *AMP*
   3. *Hubbell*
   4. Substitutions: Or Approved Equal.

B. Recessed Single Outlet Wall Type: "F" style threaded coaxial cable connector suitable for back wiring and mounting in a standard electrical box. Jack shall include a plastic ivory faceplate and mounting lugs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify that field measurements are as shown on Drawings.

C. Beginning of installation means installer accepts existing conditions.

3.2 VIDEO OUTLETS

A. Provide video outlet boxes and jacks as shown on Drawings.

B. Provide recessed (flush) mounted video outlet boxes in all finished areas.

C. Do not install recessed video outlet boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24 inches separation in acoustic rated and fire rated walls.

D. Secure recessed video outlet boxes to interior wall and partition studs. Accurately position to allow for surface finish thickness.

E. Install video outlet boxes at height indicated on Drawings.

F. Adjust video outlet jacks and wall plates to be flush and level.

3.3 VIDEO WIRING

A. Route interior cable concealed in partitions and above ceilings. Exposed wiring may be provided only in unfinished mechanical rooms or unfinished attics.

B. Do not make splices of video cables.

C. Provide video cables continuous from outlet jacks to cable taps and service point.

D. Support video cables with telecommunications supporting devices as specified under Section 16190.

END OF SECTION 16745

SECTION 16746 - DATA NETWORK SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section of the specification includes the furnishing, installation, connection and testing of a complete Structured Cabling System (SCS). The SCS is defined as all required equipment and cabling including hardware, termination blocks, cross connect wire, patch panels, patch cords, telecommunication outlets, UTP and fiber optic cable installed and configured to provide a computer data, and voice connectivity from each data or voice device to the network file server or voice network/switch designated as the service point of the local area network. Provide all equipment required to form a complete, operative, and coordinated system as shown on the drawings and specified herein. Components of the SCS shall include, but are not limited to, the following:

1. Optical fiber cable.
2. Optical fiber connectors.
3. Optical fiber patch panels
4. Telecommunications data network racks.
5. Network patch panels.
6. Telecommunications data network outlet jacks.
7. Intra-building telecommunications cable.
8. Network patch cords.

1.2 RELATED SECTIONS

A. Section 16010 – General Electrical Requirements.

B. Section 16111 – Conduit.

C. Section 16130 –Boxes.

D. Section 16190 – Supporting Devices.

E. Section 16450 – Grounding.

1.3 REFERENCES

A. ANSI/TIA/EIA 568A - Electronic Industries Association Telecommunications Industry Association - Commercial Building Telecommunications Wiring Standards.

B. ANSI/TIA/EIA 568-A1 - Propagation Delay and Delay Skew specifications.

C. ANSI/TIA/EIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces.

D. ANSI/TIA/EIA TSB-67 - Transmission Performance Specifications for Field Testing of Unshielded. Twisted Pair Cabling Systems, October 1995.

E. ANSI/TIA/EIA TSB-72 - Centralized Optical Fiber Cabling Guidelines, October 1995.

F. ANSI/TIA/EIA TSB-75 - Additional Horizontal Cabling Practices for Open Offices.

G. ANSI/TIA/EIA 607 - Grounding and Bonding Requirements for Telecommunications in Commercial Buildings.

H. ANSI/TIA/EIA 606 - Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

I. Institute of Electrical and Electronics Engineers (IEEE)

1.4 QUALIFICATIONS

A. Installer: Company specializing in the installation of telecommunications systems, including installation and certification of "Category 6" cabling and optical fiber cable. Company shall have five (5) years (minimum) documented experience on completed projects. All work shall be performed and supervised by telecommunications technicians who are qualified to install voice, data and image cabling systems and to perform related tests. The telecommunications technicians employed shall be fully trained and qualified by the manufacturer of the test equipment for the installation. Evidence that the Contractor is a current certified installer of the manufacturer must be provided in writing prior to commencing work.

B. System: The cabling system shall conform to the current of industry standard ANSI/TIA/EIA 568A. Certification shall be provided that the system will support applications for which it is designed including Category 6 intra-building telecommunications cable performance.

1.5 QUALITY ASSURANCE

A. Contractor Quality Assurance:
1. Provision of all manufactured components, installation, wiring, and testing shall be the responsibility of a single contractor.
2. Maintain the same person in charge of work throughout installation.
3. Supply and install any incidental equipment needed in order to result in a complete and operable system.
4. Verify correctness of parts lists and equipment model numbers and conformance of each component with manufacturer's specifications.
5. Unless otherwise specified, supply only new equipment, parts and material, and operate only as required for testing as part of installation procedure.

B. Manufacturer Quality Control for Telecommunications Data Network Systems
1. All systems components and products specified shall be supplied by a single manufacturer, with the exception data racks and other hardware that is not defined as part of the channel test configuration by TIA/EIA TSB67, Transmission Performance

Specifications for Field Testing of unshielded Twisted-Pair Cabling Systems and shall be as specified herein. Unless the words "Or Approved Equal" are included, only the manufacturers listed will be considered.

2. Each system is to be fully tested upon completion of installation in accordance with PART 3 - EXECUTION of this specification.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 16010 and Division 1.

B. Submit for review prior to the submission of any Submittal, an itemized list of manufacturers of material and equipment and of Subcontractors proposed to be used under this Section. Include a Schedule of anticipated submittal and anticipated lead times after release of reviewed Submittal.

C. Provide a Submittal Index, with column headings, that clearly identifies the information requested herein, for each and every item submitted. Each and every specification sheet submitted shall include a page number in the lower outside corner of the sheet, double sided specification sheets shall be identified by two (2) separate page numbers. The Submittal Index Column Headings shall identify the following minimum information: Submittal *Page Number(s)* of specification sheet(s) for each item, *Description* of each item, *Manufacturer's* Name for each item, Manufacturer's *Model Number* for each item, *Quantity* of each item being provided.

1. Any submittal which does not include a submittal index that provides a minimum of the information requested herein shall be rejected without further review and returned to the applicable parties.

D. Submittal shall include complete Specifications, including type of materials, electrical characteristics, capacities, performance and power requirements to determine compliance with Contract Documents. All data submitted shall be complete and shall apply only to this specific project. All extraneous material shall be deleted or marked out. Items to be supplied shall be specifically indicated using a method that will be visible after photocopying.

E. Regardless of any information included in the submittal submitted for review, the requirements of the Drawings and Specifications shall not be superseded in any way by the review. Review by the Architect-Engineer does not relieve responsibility for submittal errors or from meeting the requirements of the Contract Documents.

F. It is intended that Submittal data be complete and accurate at the first submission. If the Submittal is returned marked "Resubmit" only one additional submission will be permitted.

G. Equipment shall be of proper size for its allotted space. Equipment may be disassembled as required, where it does not invalidate the manufacturers' warranty, so that it can be installed through available window, door, or louver openings.

H. Submit related Submittal at one time. SUBMIT ALL ITEMS IN A SPECIFICATION SECTION AT THE SAME TIME. Incomplete submittal will be held until a complete submittal is accumulated

or may be rejected without further review and returned to the applicable parties. Include a copy of the Specification Paragraphs pertaining to the items submitted.

I. If proposed equipment deviates from the Specifications or Drawings, indicate in writing on Company letterhead those differences and provide sufficient data to justify acceptance. FAILURE TO INDICATE DEVIATIONS OR SUBSTITUTIONS IMPLIES FULL COMPLIANCE WITH DRAWINGS AND SPECIFICATIONS.

J. The term "by others" or similar wording shall not be used on Submittal. Submittal shall state by whom related items of work are to be provided. Where not indicated, it is implied that the work or item is provided under this Section.

K. Indicate clearly all equipment, components or assemblies that are not Nationally Recognized Testing Laboratory (NRTL) listed or labeled. Failure to indicate otherwise implies NRTL listing or labeling. Products found not to be NRTL listed or labeled where such listing or labeling is available shall be replaced.

L. Product Data: Submit catalog data sheets or other published materials showing appearances, electrical ratings characteristics and connection requirements, performance characteristics, dimensions, weights, installation methods, and space requirements of equipment and their accessories, as listed below and required by the individual paragraphs:
   1. Identification Methods
   2. Grounding and Bonding
   3. Test Report Formats
   4. Test Equipment
   5. Test Procedures

M. Shop Drawings: Submit shop drawings indicating physical size and arrangement, (plans and elevations) construction details, provisions for conduits, access requirements for installation and maintenance, finishes, and materials used in fabrication. Supplement shop drawings with wiring diagrams and information as described under Product Data. Provide shop drawings as required by the individual paragraphs.

1.7 TRAINING

A. Give detailed instructions, prior to the Substantial Completion of the work, to the responsible personnel designated by the Owner in the operation and maintenance of all work installed under this Section. A letter with two copies containing the name of the person or persons to whom the instructions were given and the dates of the instruction period shall be submitted to the Architect-Engineer at the completion of the project.

1.8 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Section 16010 and Division 1.

B. Accurately record location of telecommunications outlets.

1.9 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions. Include wire and cable lengths within 10 feet of length shown for all local data outlets.

C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

D. PRIOR TO BEGINNING ANY WORK the Contractor shall coordinate the proposed layout of each IDF Closet and the MDF room as well as intended wiring layouts to confirm maximum allowable wiring drop distances as specified herein.

1.10 OPERATION AND MAINTENANCE DATA

A. Submit data under provisions of Division 01.

B. Prepare three sets of Owner and Maintenance containing Manufacturer" catalogs, other similar data including the necessary photographic equipment cuts, wiring diagrams and final reviewed Shop Drawings and Product Data covering all equipment and devices furnished or installed under this Section. These manuals shall provide complete instructions for the proper operation and use of the equipment together with instructions for lubrication and periodic maintenance and for trouble shooting. Operating instructions shall be specific for each system and shall include copies of posted specific instructions. This manual shall contain only that information which specifically applies to this project and all unrelated material shall be deleted or clearly crossed out.

C. The Owner and Maintenance Manual material shall be bound in 3-ring binders and indexed. On the edge of the binder provide a clear see-through plastic holder with a typed card indicating the Project name, the Architect-Engineer's name, the Installer's name and the Volume number (e.g., Vol. No. 1 of 2).

D. Provide name, address and telephone number of the manufacturer's representative and Service Company for all items supplied so that the source of replacement parts and service can be readily obtained.
   1. Include copies of manufacturer's and Installer's warranties and maintenance contracts and performance bonds properly executed and signed by an authorized representative.

E. Include copies of all test reports and certifications.

PART 2 - PRODUCTS

2.1 UNSHIELDED TWISTED PAIR (UTP) CABLING SYSTEM

A. Approved Manufacturers:
   1. *Belden*
   2. *CommScope*
   3. *Berk-Tek*
   4. *General Cable*
   5. *Mohawk*
   6. Substitutions: Or Approved Equal.

B. UTP Pin/pair Termination Assignment: The UTP cabling systems shall have TIA/EIA T568B pin/pair termination assignment. All conductors provided shall be properly and consistently terminated at both ends throughout the entire systems.

C. Horizontal Cable -Voice & Data:

   1. Voice Cable shall be TIA/EIA Category 6 Unshielded Twisted Pair (UTP) cable, as specified.
   2. Electrical Characteristics for 24 AWG Extended Frequency Category 6 cable:
      a. DC Resistance (max) 8.9
      b. DC Resistance Unbalanced (max) 3.0
      c. Input Impedance, 1.0 to 100 MHz =100 +/- 15, 100 to 350MHz = 100 +/- 22
      d. Characteristics Impedance, 1 to 350 MHz = 100 +/- 15%
      e. ACR @ 100KHz, db (min) of 21
      f. PS-ACR @ 100MHz, db (min) of 19
      g. Delay Skew (max) ns/100m is 25
      h. Nominal Velocity of Propagation (NVP), % speed of Light, 70
   3. Electrical Characteristics:

Frequency	Max. Atten. Db/100m	ELFEXT bd (min)	PS-ELFEXT bd (min)	PS-NEXT bd (min)	NEXT bd (min)	SLR db (min)	Return Loss db (min)
772kHz	1.8	66	63	70	72	-	-
1MHz	2.0	64	61	68	70	24.5	20.0
4MHz	4.1	52	49	59	61	24.5	23.0
8MHz	5.8	46	43	54	56	24.5	24.5
10MHz	6.5	44	41	53	55	24.5	25
16MHz	8.2	40	37	50	52	24.5	25.0
20MHz	9.3	38	35	48	50	24.5	25.0
25MHz	10.4	36	33	47	49	24.0	24.3
31.25MHz	11.7	34	31	45	47	23.5	23.6
62.5MHz	17.0	28	25	41	43	22.0	21.5
100MHz	22.0	24	21	38	40	21.0	20.1

155MHz	28.1	20	17	35	37	20.1	18.8
200MHz	32.4	18	15	33	35	19.5	18.0
300MHz	41.0	14	11	31	33	18.6	16.8
350MHz	44.9	13	10	30	32	18.3	16.3

1. Compliance of 24 AWG Extended Frequency Category 6 cable:
   a. ISO/IEC 11801
   b. ANSI/TIA/EIA 586-5 (Category 5E)
   c. ANSI/ICEAA S-90-661 (Category 5X-100)
   d. NEWA WC 63.1 (Category 5)
   e. UL Listed Type MPR/CMR
   f. (UL) CMG
2. Non-plenum rated cable - CM rated jacket for Non-plenum applications.
3. Plenum rated cable - CMP rated jacket for Plenum applications.
4. Riser rated cable - CMR rated jacket for Riser applications.

E. Backbone Cable-Voice (Category 5e)
   1. TIA/EIA Category 6 Unshielded Twisted Pair (UTP)
      a. Able shall meet or exceed all current specifications for Category 5e cable per EIA/TIA, 24AWG, 25-pair cable.
      b. Backbone cable shall match-up all pairs (4-pairs from each work area outlet) to the MDF.
      c. Non-plenum rated cable - CM rated jacket for non-plenum rated applications.
      d. Plenum-rated cable – CMP rated jacket for plenum rated applications.
      e. Riser rated cable – CMR rated jacket for Riser applications.

F. Patch Panels
   1. Patch panels shall be EIA nineteen inch (518mm), rack mounted, TIA/EIA Category 6, UL Category 6 type patch panels with integral printed circuit board, color-coded, high density, IDC type terminations and 8 position modular jacks. Keyed jacks are not allowed. Jacks shall be able to withstand at least a minimum of 2000 mating cycles without any transmission degradation.

2.2 110 WIRING BLOCKS/CROSS CONNECTOR BLOCKS

A. Cross Connector Blocks Manufacturers:
   1. *Ortronics* model OR-30600150/OR-110ABC6050
   2. Substitutions: or approved equal

B. Description: 200-pair 19" x 7" rack mount panel with 110 wiring blocks. Provide termination kit and termination labels.

2.3 OPTICAL FIBER CABLE SYSTEM

A. Approved Manufacturers:

1. *Belden*
2. *CommScope*
3. *Berk-Tek*
4. *Siecor*
5. *Optical Cable Corp.*
6. Substitutions: Or Approved Equal.

B. Fiber Optic Backbone Cable
   1. Multimode fiber optic cable: Cable shall be NRTL certified to TIA/EIA 492CAAA, 492AAAA EIA/TIA 568B Series standard, TSB72 and ANSI X3T9.5 fiber optic specifications, 62.5/125 micron, 1300 nm, graded video, dual window 6 pair (12 strand) tight buffer, multimode distribution cable.
      a. Riser-rated multi-mode cable - OFNR jacket, distribution cable for Riser applications.
      b. Plenum rated, multi-mode cable - OFNP jacket, distribution cable for Plenum applications.
      c. The maximum attenuation measured at 23 degrees C. shall be 3.75 dB/km @ 850 nm and 1.5 dB/km @ 1300 nm. The minimum bandwidth shall be 160 MHZ @ 850 nm and 500 MHZ @ 1300 nm.
   2. Modular Connectors and Couplers
      a. Fiber optic modular connectors/couplings shall be NRTL listed and TIA/EIA compliant, type "SC" terminations. Connectors and couplings shall be able to withstand at least a minimum of 2000 mating cycles without any transmission degradation. Maximum optical loss budget shall not exceed .75 dB per termination and 1.5 dB per mated pair.
      b. The connectors and couplings shall be compatible with the installed fiber optics: multi mode 62.5/125 micron optics.
      c. Fiber optic connectors shall be terminated by the following methods:
         1) Hot Melt
         2) Heat Cured Epoxy
         3) Ultra Violet Cured Epoxy
         4) Anarobic
         5) Mechanical Splice with Index Matching Gel
      d. Fiber optic connectors and couplers shall be provided by a single Manufacturer.
      e. Multimode connectors shall be beige in color.
   3. Fiber Optic Patch Panels
      a. Patch panels shall be capable of terminating 12 pair (24 strands) of a fiber optic cable.
      b. Patch panels shall be rack mounted 1.75 inch (44mm) high EIA nineteen inch (518mm) wide, rack mounted, drawer type with integral cable management, patch panels pre-loaded with duplex SC couplings.
   4. Fiber Optic Patch Cables
      a. Provide NRTL certified EIA/TIA 492AAAA, EIA/TIA 568B Series standard performance tested patch cables as required for a complete operational system. Patch cables shall be factory pre-connectorized, two strand, "SC" type connectors, tight buffer. Patch cables connectors shall be provided by the same manufacturers as the fiber optic connectors and couplings.

b. Patch cables shall match the fiber optic system installed, multimode 62.5/125 micron.

c. One strand of the patch cable shall have a distinguishing mark throughout its entire length to simplify the distinction between Transmitting (Tx) and Receiving (Rx) at the patching area. Color coded factory marked (Tx-Rx) connectors are preferred.

5. Fiber Optic Cable Management

a. Each equipment rack shall have horizontal and vertical cable management panels and brackets.

D. Horizontal cable management shall be EIA nineteen inch (482mm) rack mounted 1.75 inch (44mm) high drawer panel with integral cable management and shall be provided for each fiber optic patch panel. This cable management drawer panel is for the fiber optic patch cables and is separate from the fiber optic patch panel drawer.

2.4 TELECOMMUNICATIONS DATA NETWORK RACK

A. Description: Five(5) floor mounted free-standing, 84" high by 15" deep equipment racks shall be provided. Each rack shall include three (3) 48-port, CAT 6 rated cable patch panels for local cabling. The rack shall include an electrical power strip (*APC* model Number NET9RM, or equal) and a 500 VA rated uninterruptible power supply (UPS) UNIT. Also located within these racks shall be system routers and switches as required, to be purchased and installed by the Owner.

2.7 TELECOMMUNICATIONS DATA NETWORK OUTLET JACKS

A. Manufacturers:

1. *Leviton* "Quickport" Series
2. *AMP*
3. *Hubbell*
4. *Ortronics*
5. *Panduit*
6. Substitutions: Or approved equal.

B. Each Outlet shall consist of the following:

1. Single gang or dual gang face plate shall be thermoplastic (nylon) with number of voice, data, video and sound jacks as indicated in the Specifications and Drawings.
2. Electrical Subcontractor shall provide 4" square backboxes for all Single gang and Dual gang outlet face plates. Provide single gang and dual gang plaster rings for the specified Single gang and Dual gang outlet face plates.
3. Refer to Electrical drawings for placement of Work Area Outlets.
4. Outlets:

a. Data Outlet - shall consist of two (2) blue color modular Category 6 RJ-45 8-position connectors mounted on single gang faceplate, with the capabilities listed below. Provide blanks for faceplate

1) Two (2) RJ45 connectors shall be used for data and cabled to relevant IDF/MDF patch panel with two (2) 4-pair Category 6 unshielded twisted pair cables.

b. Data/Voice Outlet – shall consist of one (1) blue color modular Category 6 RJ-45 8-position connector and one (1) grey color modular Category 6 RJ-45 connector, both mounted on a single-gang faceplate.
   1) One (1) RJ-45 connector (blue) shall be used for data and one (1) RJ-45 connector (grey) shall be used for voice. Connectors shall be cabled to relevant IDF/MDF patch panels with two (2) 4-pair Category 6 unshielded twisted pair cables.

c. Single Voice Outlet – shall consist of one (1) grey color modular Category 6 RJ-45 8-position connector, mounted on a single-gang faceplate.
   1) One (1) RJ-45 connector (grey) shall be used for voice. Connector shall be cabled to relevant IDF/MDF patch panel with one (1) 4-pair Category 6 unshielded twisted pair cable

d. Combination Data/Voice Video Outlet – shall consist of two (2) blue color modular Category 6 RJ-45 8-position connectors, two (2) grey color modular Category 6 RJ-45 connectors, and a single video "F" style connector, all mounted on a single-gang faceplate.
   1) Two (2) RJ-45 connectors (blue) shall be used for data and two (2) RJ-45 connectors (grey) shall be used for voice. Connectors shall be cabled to relevant IDF/MDF patch panels with two (2) 4-pair Category 6 unshielded twisted pair cables.
   2) "F" style video connector specified under Section 27 15 00.23 cabled to the video cabling taps in the closet IDF/MDF room.

2.8 BONDING AND GROUNDING JUMPER CABLE

A. Manufacturer: Provide products meeting the requirements of the Drawings and Specifications from one of the following manufacturers:
   1. *Belden* (No. 8669)

B. Jumper cable shall be hollow braided, 60 amp capacity, copper.

C. Provide equal conduct of as described in "B" above for aluminum equipment.

D. Jumpers shall have compression or exothermic type terminals on both ends of cables. Terminals shall be compatible with jumper cable material and equipment material in order to not have any degenerative reaction.

2.9 EQUIPMENT/CABLE IDENTIFICATION

A. All equipment and cabling shall be properly identified by means of clear and concise labels. All identification shall meet or exceed the minimum requirements of EIA/TIA568A, 606 and BICSI standards.

B. Permanently label, using pre-printed labels, all cables and terminations. Handwritten or embossed type labels are specifically prohibited.
   1. Label all equipment racks, panels and cross connect blocks uniquely.
   2. Label patch panels and cross connect blocks numerically, top-to-bottom.

3. Label cable segments by designated incoming cable.

C. Labels

1. Provide color-coded labels with CODED identifiers as follows:
   a. Conduits and other pathways shall be labeled at all end points including equipment rooms, telecommunications closets, pull boxes and the like. Provide adhesive labels on the conduit with at least one label within each space that the conduit passes through. Labels shall be attached by means of the label adhesive and color-coded pressure-sensitive tape wrapped around conduit at least one and one half times.
   b. Cables shall have double lapped adhesive labels at all end points including Work Area Outlets, telecommunication closets and equipment rooms. Cables shall also have factory imprinted manufacturer's name, part number and the NRTL certified UL EIA/TIA category rating designation at a minimum of two foot (610mm) intervals along the entire length of the cable.
   c. Termination hardware shall have adhesive labels on both the front and rear (if accessible) of the hardware.
   d. Insert Labels shall be provided in each Work Area Outlet patch panel termination hardware (top of jack) cross connect blocks (edge of block) and the like.
   e. Outlet boxes, junction boxes and the like shall have adhesive labels attached on the inside and located where visible from the outlet opening.
   f. Grounding and bonding system shall have engraved labels at each ground bar and backbone grounding cable as it passes through each room. Each bonding jumper shall have heat shrink labels at all end points.
2. Labels shall be constructed of approved material in order to meet the legibility, defacement, adhesion (adhesive labels only), and exposure requirements of UL 969. All labels shall be mounted horizontally in order to be read from left to right.
   a. Adhesive Labels shall be constructed of color-coded paper with a clear polyester over laminate, Brady USA, Inc. PermaShield, RayChem TMS or approved equal. Adhesive material used shall be approved for material being attached to, typeface shall be medium density, Helvetica, 1/8 inch (3mm) high black characters unless indicated otherwise.
   b. Heat-Shrink Labels shall be constructed of color-coded flame retardant, heat shrinkable polyolefin, Brady USA, Inc, RayChem TMS or approved equal. Typeface shall be medium density, Helvetica 1/8 inch (3mm) high black characters unless indicated otherwise.
   c. Insert Labels shall be constructed of color-coded paper inserted behind clear plastic label holder. Work Area Outlets shall have white color labels inserted behind a flush mounted (recessed) plastic window. Patch panels and cross connect block may have continuous clear plastic insertion strips label holders with label strips. Label strips shall have distinct markings to indicate where one jack or cross connect ends and the adjacent one starts. Typeface shall be medium density, Helvetica 1/8 inch (3mm) high black characters unless indicated otherwise.
   d. Each Network Interface Outlet shall have each of its eight-position modular jacks provided with a color-coded, embossed modular ICON. The telephone jack icon shall be red and shall have either the word "VOICE" or a telephone logo. The

data jack icon shall be blue and shall have either the word "DATA" or a computer logo. The Network Interface Outlet jack provided shall also be able to have additional ICON types such as but not limited to "LAN1 " or "LAN2" and the like available for use. Coordinate with the Owner through the Architect-Engineer, the specific icon's required for this project.

e. Handwritten or embossed labels are not allowed.

2.11 PATCH CORDS

A. Patch cords shall match the characteristics of UTP cable and shall be in lengths as required. Provide terminations at each cable end.
   1. Test each cord according to the requirements listed under paragraph 3.4.
   2. Provide one patch cord for each local outlet drop.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify that field measurements are as shown on Drawings.

C. Beginning of installation means installer accepts existing conditions.

3.2 TELECOMMUNICATIONS DATA NETWORK OUTLET JACKS

A. Install and connect data outlet jacks in boxes at locations indicated on Drawings.

B. Install outlet jacks in accordance with manufacturer's instructions.

3.3 TELECOMMUNICATIONS DATA NETWORK WIRING

A. Provide continuous, unspliced, UTP horizontal drop cable from data/voice patch panels at equipment racks to each local data/voice outlet jack.

B. Optical fiber cable and intra-building telecommunications cable shall be handled, installed, and supported in conformance with manufacturer's recommendation and EIA/TIA 569. During the laying of cable, the Contractor shall take care not to over stress the cable. After cables are installed, the Contractor shall make sure that all parts of the cable are supported properly and are stress-free at both ends and throughput their length.

C. The Contractor shall insure that the installed bending radius of optical fiber cable and intra-building telecommunications conforms to the manufacturer's requirements. At no location shall a cable's static or dynamic bending radius be exceeded.

D. Conceal intra-building telecommunications cable within the attic, above accessible ceilings or in walls. All telecommunications cables shall be run in conduit.

E. Do not make splices in optical fiber cable or intra-building telecommunications cable.

F. All 4 pairs of each unshielded twisted pair (UTP) intra-building telecommunications cable shall be terminated on a single port. The splitting of cable pairs between different jacks is not permitted.

G. Terminating intra-building telecommunications cable pairs (Category 6) shall have a maximum of 13mm (0.5 inches) of cable untwisted before termination.

3.4 CABLE TESTING

A. Sub-contract with a independent testing company to test and certify all intra-building telecommunications cabling to identify pair reversal, crossed pairs, opens and shorts. Testing shall comply with ANSI/TIA/EIA 568A, TSB67. Perform test using a network analyzer, Microtest Penta scanner, or approved equal. Test results shall be documented, corrections implemented and re-testing conducted and documented. In addition, documentation shall be presented to show the length of the cable between outlet jack and the telecommunications rack. Submit written test results for review and acceptance.

B. Attenuation testing for optical fiber cable shall be performed after the fiber is installed. Provide documentation of test results.

3.5 GROUNDING

A. Each equipment rack shall be connected to the telecommunications ground as specified in Section 16450 and in accordance with applicable code requirements as per EIA/TIA 607. Communication bonding and grounding shall be in accordance with the NEC® and NFPA. Horizontal cables shall be grounded in compliance with ANSI/NFPA 70 and local requirements and practices. Horizontal equipment includes cross connect frames, patch panels and racks, active telecommunication equipment and test apparatus and equipment. Provide a Telecommunications Bonding Backbone utilizing a #6-AWG or larger bonding conductor that provides direct bonding between equipment rooms and telecommunications closets. This is part of the grounding and bonding infrastructure (part of the telecommunications pathways and spaces in the building structure), and is independent of equipment or cable. All data equipment shall be properly grounded in the Telecommunications Rooms per manufacturers requirements.

3.6 UPS UNITS

A. Provide a rack mounted UPS unit for all telecommunications equipment racks.

END OF SECTION 16746

SECTION 16950 - LIGHTING CONTROLS

1.1 SECTION INCLUDES

A. This extent of lighting control system work is indicated by drawings and by the requirements of this section. It is the intent of this section to provide an integrated, energy saving lighting control system including a Lighting Control Panel, Occupancy Sensors and Low-Voltage Control Switches from a single supplier. Contractor is responsible for confirming that the panels and sensors interoperate as a single system.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling and power-limited circuits.

1.4 REGULATORY REQUIREMENTS

A. National Fire Protection Association (NFPA): NFPA 70 – National Electrical Code

B. Underwriters Laboratories Incorporated (UL):
   1. UL 916 - Energy Management Equipment
   2. UL 508 – Industrial Control Panels

1.5 SUBMITTALS

A. Product Data: For control panels, low-voltage switches and plates, occupancy sensors, automatic daylighting control system components, and conductors and cables.

B. Shop Drawings: Detail assemblies of standard components, custom assembled for specific application on this Project.
   1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
   2. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
   3. Wiring Diagrams: Power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.

C. Coordination Drawings: Submit evidence that lighting controls are compatible with connected control devices and systems specified in other Sections.
   1. Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.
   2. For networked controls, list network protocols and provide statements from manufacturers that input and output devices meet interoperability requirements of the network protocol.

D. Programming Documentation:
   1. Program instruction manuals.
   2. Device address list.

E. Field quality-control test reports.

F. Software licenses and upgrades required by and installed for operation and programming of digital and analog devices.

G. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain lighting system components through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with 47 CFR, Subparts A and B, for Class A digital devices.

D. Comply with NFPA 70.

1.7 PROJECT RECORD DRAWINGS

A. Submit documents under provisions of Division 1 and Section 26 00 00.

B. Record actual locations and devices, and routing of alarm wiring.

1.8 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide written operating and maintenance instructions as specified in Section 26 00 00. Include product data and operation/maintenance information for all system components

B. The Owner may assign personnel to participate with the Contractor during installation. Without delaying work, familiarize the Owner's personnel with the installation, equipment, and maintenance.

C. During tests and adjustments, permit the Owner's personnel to observe. When feasible, explain the significance of each test.

D. Provide sufficient training to personnel selected by the Owner on operation and basic maintenance of all systems and equipment.

E. Employ manufacturer's field representative to demonstrate system operation to designated Owner personnel.

F. Conduct walking tour of project and briefly describe function, operation, and maintenance of each component.

G. Use submitted operation and maintenance manual as reference during demonstration and training.

H. Provide the owner with a training program designed to make all users familiar with the operation of the Lighting Control System.

1.9 COORDINATION

A. Coordinate lighting control components to form an integrated interconnection of compatible components.
   1. Match components and interconnections for optimum performance of lighting control functions.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship or from transient voltage surges within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of program input/output to execute switching or dimming commands.
      b. Failure of modular relays to operate under manual or program commands.
      c. Damage of electronic components due to transient voltage surges.
   2. Warranty Period: Two years from date of Substantial Completion.
   3. Extended Warranty Period Failure Due to Transient Voltage Surges: Eight years.
   4. Extended Warranty Period for Electrically Held Relays: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Lighting systems equipment shown on the Drawings and specified herein is based on equipment as manufactured by *Hubbell Building Automation*.

2.2 NETWORK LIGHTING CONTROL SYSTEM

A. Network Data Line: The distributed intelligent lighting control network shall consist of intelligent lighting control devices consisting of but not limited to relays, touch tablet graphic user interfaces, controllers, enclosures, switch stations, photo sensors, occupancy sensors, and miscellaneous components linked together via a single data line that uses the Echelon/LonTalk™ protocol for communications.

B. The distributed intelligent lighting control network shall facilitate data transmission between the distributed intelligent lighting control systems devices over a twisted pair of wires at 78K baud. Network communication shall use the LonWorks communication protocol to transmit/receive and negotiate messaging between networked devices.

C. Network wiring shall be unshielded, twisted pair data communication wire with insulation ratings as required by local codes. The network shall support free topology wiring allowing loop, star, bus or any mixed combination of connection topologies between devices.

D. Wiring distances shall be up to 1500 feet for free topology, 8000 feet for linear bus terminated topology.

E. Communication over the network shall allow any switch input from any device to be linked to any relay output or group of relay outputs in the lighting control system for complete, unrestricted control.

F. Network Technology: The distributed intelligent lighting control network shall consist of intelligent devices such as lighting control panels, switch stations, photo sensors and motion sensors that communicate with each other using the ANSI/EIA/CEA 709.1 protocol over one or more communications channels.

G. Peer-to-Peer (P2P): The distributed intelligent lighting control network shall consist of true peer-to-peer network. In order to eliminate the potential of a single point of failure there shall be no master controller or node required for system operation. All nodes shall be capable of communicating with each other without the need of these types of devices. Systems which utilize master controllers or master/slave networking concepts shall not be acceptable.

H. Network Topology: The lighting control system specified herein shall utilize a 2-wire topology free polarity insensitive powered network. Devices connected to the network shall be capable of doing so without regard for network topology or wiring polarity. Systems, which require the contractor to follow any kind of networking topology or to pay attention o the wiring polarity, are not acceptable.

I. Network Capacities: Up to 32,000 individual distributed intelligent (NODES) shall be capable of being connected together within a single network.

J. Programming: The distributed intelligent lighting control systems hall be capable of being programmed from any point or points anywhere on the system network. Systems that require a single point of system access are not acceptable. The lighting control network must remain completely functional during this process. Lighting control systems that must be taken "OFF LINE' for programming are not acceptable. All programming changes shall take effect immediately as they are programmed.

K. System Updates and Upgrades: All device installed upon the distributed intelligent lighting control system network shall be capable of having their programs updated and/or upgraded over the network systems which require hardware or memory chips to be replaced to perform upgrades are not acceptable. Software and firmware upgrades shall be made available free of charge for the life of the system.

L. Lighting Control Panels

1. Where shown on the drawings, the Contractor shall furnish and install lighting control panels of the quantities, sizes, and types shown on the drawings and/or specified herein.
2. Lighting panels shall contain relays, and other devices of the sizes and quantities indicated on the drawings and specified herein.
3. Hardware Features:
    a. Controller Backbox: Each lighting control panel shall be provided with a factory furnished, UL listed NEMA 1 enclosure designed for wall mounting. Backbox must be capable of being shipped ahead of controller chassis insert to allow for rough-in of all electrical connections prior to receipt of the controller chassis insert.
    b. Controller Finish: Each lighting control panel shall be of welded construction primed and painted with a powder coat finish. Unpainted or galvanized enclosures are not acceptable.
    c. Controller Chassis Insert: Each lighting control panel shall be provided with a factory or field installable controller chassis insert. Controller chassis insert shall contain all controller electronics, power supplies, relays, and other required components. Controller chassis inserts shall arrive at the project site completely prewired and requiring only the connection of lighting circuits and network cable. Systems that require field assembly of controllers or chassis inserts are not acceptable.
    d. High-Voltage/Low-Voltage Separation: Each programmable lighting controller shall be provided with a mechanical barrier that separates all high-voltage components and wiring from all low-voltage components and wiring. An additional barrier shall be installed within the high-voltage section that shall provide isolation between normal and emergency circuits where required.
    e. Controller Covers: Each programmable lighting controller shall be provided with a dead front screw-held hinged locking cover that is designed for either surface or flush mounting.
4. Electrical:
    a. Controller Power Supply: Each programmable lighting controller shall be provided with a single triple-rated, UL listed Class 2 transformer capable of either being connected to 120/277 or 347 VAC primary (+ or -20% VAC, 50 to 60 Hz).

b. Connections: All connections shall be made to clearly and permanently labeled termination points.

5. Lighting Control Panel Electronics:
   a. Controller Module: Each lighting panel shall be provided with a LonWorks controller module that shall provide for all of the lighting panels controller functions, these functions shall include but not be limited to real time clock, LonWorks network interface, scheduling, relay control, monitoring, status and diagnostic information.
   b. I/O Controller: I/O (input/output) cards shall be provided to expand the controller capability from 8 to 48 relay outputs in groups of 8.I/O controller cards shall be completely self-configuring and shall not require settings of any kind in order to be configured for use within the lighting control panel.
   c. Capacity: Each controller shall be capable of controlled 1 to 48 individual lighting control relays. Controllers shall be available in three sizes: 16, 32 and 48 relay outputs. Relay must be capable of being individually added to or removed from the lighting controller for the purpose of service or expansion of the controllers capabilities.
   d. Diagnostic Aids: Each lighting control panel shall be provided with a status LED to indicate current operational status. Each relay output shall have an LED pilot to indicate the current status of all controlled relay outputs.
   e. Data Protection and Storage: All programmed data shall be stored in nonvolatile flash memory that shall protect all stored programming data from loss during a power outage for a minimum period of 20 years without power of any type.
   f. Power Failure and Power-Up Options: Each lighting control panel shall be provided with circuitry that shall automatically shut down the controller whenever the incoming power fails. When power is returned to the controlled, one of the following power-up modes will be implemented (user selectable) for each controlled relay output in the system.
   g. No Action: Upon restoration of incoming control power, the lighting control panel electronics shall be restarted and resume normal operations, and all circuits will be maintained in the condition they were last in.
   h. Forced ON: Controller will force selected relay output(s) to the ON state after power-up.
   i. Forced OFF: Controller will force selected relay output(s) to the OFF state after power-up.

6. Blink Alert: Each relay output within the lighting control panel shall be individually programmable to blink prior to being turned OFF. Blink alert times shall be adjustable between 1 and 15 minutes. Relays programmed for the blink alert function shall blink prior to turning OFF to warn occupancies of the upcoming OFF event. If an ON command is received during the blink alert time, relay output will be overridden and left ON for the override time. Override times shall be adjustable from 1 to 3 hours.

7. Real-Time Clock: Each lighting control panel shall have its own Real-Time Clock, which shall be used to perform all time-controlled functions. Real-Time Clock functions shall include time of day, day of week, date and automatic daylight savings and leap year adjustments. Time clock shall be protected against loss of time during a power outage for a period of up to 60 days without power of any type. Systems, which utilize a single central time clock, are not acceptable.

8. Astronomical Clock: Each lighting control panel shall contain an astronomical time clock that shall calculate sunrise and sunset times based on the geographical positioning information provided during the programming of the system. Sunrise and sunset times may be used as activation times for any system timer. In addition to sunrise and sunset time activation, the control shall be capable of programming activation time for the system time for before and after these times based on an offset of 1 to 999 minutes either before or after the calculated sunrise or sunset event.
9. Time-of-Day Scheduling: Each programmable lighting control panel shall be provided with a minimum of 99 scheduled events for use in developing time-of-day automated schedules. Each schedule shall have the ability to turn any relay or group of relays ON or OFF or activate a preset lighting scene and the scheduled time. Schedules shall be day-of-week selectable and may be programmed to activate on any combination of days of the week (Sunday through Saturday), on all days, or to activate on a specific date only ("Holiday Schedule"). Each non-holiday scheduled event shall be capable of being programmed either to halt operation on holidays or to ignore holidays and continue normal operations on holidays.
10. Manual Relay Overrides: Lighting control panel relays shall be provided with 2 means of manual override.
11. Mechanical Manual Override: Each relay shall be provided with a manual override switch. It shall be possible to change the state of each relay without the need for the controller electronics or any other part of the system to be operational or powered. Lighting control panels that require power to be applied in order to change or maintain the state of relays are not acceptable.
12. Push Button Override: In addition to but not in lieu of the mechanical manual override each relay output shall be supplied with an ON and OFF manual override push-button with LED pilot that shall allow the system user to view the current status and/or manually override any relay output to the ON or OFF state.
13. True Relay Status Feedback: Each lighting control panel shall be provided with circuitry that shall monitor the actual current status of each relay.
14. Staggered Relay Activation: Lighting control panels shall be designed to stagger relays ON and OFF to limit the impact of switching multiple lighting loads ON or OFF at the same time.

M. 20 Amp Relays
1. Electrical Contractor shall provide and install quantities of mechanically latching lighting control relays as indicated on the drawings and schedules as specified herein. Electrically held or non-mechanically latching relays shall not be considered.
2. Lighting control relays shall be individually UL and CUL listed and shall bear labels indicating compliance. Lighting control relays shall be tested to UL Standard 508 for both safety and endurances and bare labels signifying compliance.
3. Lighting control relays shall be designed and tested to have a minimum cycle life of 30,000 ON/OFF cycles @ FULL LOAD switching into any and all loads that the relay is rated to control. Manufacturer shall provide test data certifying compliance to this section.
4. Lighting control relays shall be specifically designed for control of 120, 277, or 347 VAC lighting loads including but not limited to incandescent, low-voltage, neon, cold ca-

thode, LED, fluorescent and HID lighting sources at a full 20 AMPS and motor loads of 1/2 Hp @ 120 VAC or 1.5 Hp @ 277 VAC.

5. Lighting control relays shall be designed with a mechanical latching mechanism that shall hold the relay in its last activated state indefinitely, with no change of state during an interruption of power.
6. Lighting control relay shall contain an electrical means of monitoring the current status of the relay contacts electronically isolated, but mechanically linked to the main contacts for the purpose of true status monitoring and pilot light activation.
7. Each lighting control relay shall include a mechanical means of turning the relay ON or OFF without the need for electrical power of any kind.
8. Each lighting control relay shall include a mechanical visual indicator showing the current status of relay itself.

N. Touch Tablet Graphic User Interface

1. The Electrical Contractor shall provide LX Touch Tablet Graphic User Interface(s) as shown on drawings and described herein.
2. The LX Touch Tablet Graphic User Interface shall consist of a microprocessor-based lighting control station specifically designed for the control of lighting control systems.
3. To provide for clarity of operation a high resolution graphic liquid crystal display with wide viewing angle and an electroluminescent backlight shall be used to display system information in both alphanumeric and graphical format.
4. All programming shall be accomplished through the use of a graphical user interface.
5. The LX Touch Tablet Graphic User Interface shall provide the system user access to the following system features:
   a. Current status of any device on the systems network.
   b. Time and date information and programming.
   c. Astro-clock and daylight saving time adjustments.
   d. Scheduling
   e. Manual overrides.
   f. System programming.
   g. System diagnostics.
6. All programming information stored in the LX Touch Tablet Graphic User Interface shall be stored in nonvolatile flash memory preventing loss of stored information in the event of a power failure up to 20 years.
7. The LX Touch Tablet Graphic User Interface shall be capable of being to the lighting control system at any point on the network. One or multiple LX Touch Table Graphic User Interface shall be capable of being connected to the system at any time.
8. The LX Touch Tablet Graphic User Interface shall contain no special programming causing it to become a required part of the lighting control system it is being utilized with. The lighting control system shall provide full-functionality with or without this device attached to the system.

O. Lx Networked Switch Stations

1. The Electrical Contractor shall provide and install networked switch station of the types and quantities shown on the drawings and specified herein.
2. Network switch stations shall be injection molded and designed to mount in a standard single-gang junction box with standard Decora switch plate opening.

3. Networked switch stations shall be available in three colors: white, almond, and gray.
4. Networked switch stations shall be 2-button standard configurations.
5. Labeling and switch identification shall be accomplished through the use of hot-stamped labels, permanently attached to the switch face itself. Silk-screened or painted labeling shall not be acceptable.
   a. Button 1: 'ON'
   b. Button 2: 'OFF'
6. Each networked switch station shall be provided with both pilot and non-pilot version of buttons, which can be selected by the Contractor at the time of installation or change at any time throughout the life of the system. Switch stations, which require switches to be ordered with, or without pilots and are not field-modifiable shall not be considered.
7. Network switch stations shall connect to the self-powered topology free network via a single pair of wires. Network switch stations requiring more than two wires or requiring that the Installing Contractor install them with a stick topology or maintain correct polarity are unacceptable.
8. Buttons on LX networked switch stations shall be programmed to perform the following functions:

LOW-VOLTAGE LIGHTING SWITCH SCHEDULE

Switch Designation	Lighting Control Panel	Relays Controlled	Switch Location	Switch Locations
S_{O1}	LC1	1, 2, 3, 4, 5	Production 137	First Floor Lighting Circuits (P1 # 46, 48, 49, 51, 53)
S_{O2}	LC1	1, 2, 3, 4, 5	Recreation 121	First Floor Lighting Circuits (P1 # 46, 48, 49, 51, 53)
S_{O3}	LC1	1, 2, 3, 4, 5	Office 107	First Floor Lighting Circuits (P1 # 46, 48, 49, 51, 53)
S_{O4}	LC1	6, 7, 8, 9, 10, 11, 12	Stair 230	Second Floor Lighting Circuits (P2 # 53, 55, 56, 57, 58, 59, 60)
S_{O5}	LC1	6, 7, 8, 9, 10, 11, 12	Café 225	Second Floor Lighting Circuits (P2 # 53, 55, 56, 57, 58, 59, 60)
S_{O6}	LC1	6, 7, 8, 9, 10, 11, 12	Waiting 204	Second Floor Lighting Circuits (P2 # 53, 55, 56, 57, 58, 59, 60)
S_{O7}	LC1	13, 14, 15, 16, 17, 18, 19, 20	Work Stations 337	Third Floor Lighting Circuits (P3 # 57, 59, 60, 61, 63, 64, 65, 66)
S_{O8}	LC1	13, 14, 15, 16, 17, 18, 19, 20	Presentation 321	Third Floor Lighting Circuits (P3 # 57, 59, 60, 61, 63, 64, 65, 66)
S_{O9}	LC1	13, 14, 15, 16, 17, 18, 19, 20	Work Stations 306	Third Floor Lighting Circuits (P3 # 57, 59, 60, 61, 63, 64, 65, 66)
S_{O10}	LC1	21	Work Area 400	Mezzanine Floor Lighting Circuit (P3 # 67)
S_{O11}	LC1	22	Stair 1 First Floor	Stair 1 Lighting (Circuit P1 #50)

S_{O12}	LC1	22	Stair 1 Second Floor	Stair 1 Lighting (Circuit P1 #50)
S_{O13}	LC1	22	Stair 1 Third Floor	Stair 1 Lighting (Circuit P1 #50)
S_{O14}	LC1	22	Stair 2 First Floor	Stair 2 Lighting (Circuit P1 #50)
S_{O15}	LC1	22	Stair 2 Second Floor	Stair 2 Lighting (Circuit P1 #50)

2.3 OCCUPANCY SENSORS

A. Ceiling mounted passive-infrared sensors shall be *Hubbell* model OMNIIR.
   1. Sensor shall use a micro-processor for motion signal analysis and internal self-adjustment. Sensor shall adapt automatically to changing room conditions. Sensor micro-processor shall monitor PIR background levels and automatically make corresponding adjustments. Sensor shall recognize any motion detected within 15 seconds of turning off the lighting as a false off. Sensor shall recognize as a false on, the failure to detect motion 6 seconds after motion is detected initially.
      a. Test Setting: 8 second timeout.
      b. Timer Adjustability: 8 to 40 minutes (factory set at 15 minutes).
      c. Sensitivity: Adjustable from 0 to 100%.
      d. Indicator Light: LED.
      e. Detection Field: 360 degrees.
      f. Coverage: 450 square feet.
      g. Voltage: 24 volts DC.

B. Occupancy sensor power packs shall be *Hubbell* model UVPP.
   1. Power packs shall include an integral transformer and relay designed for switching 20-ampere loads. Power packs shall be capable of being installed within a standard 4-inch square electrical box.
      a. Input Voltage: 100-277VAC
      b. Output Rating: 24VDC, 150 mA

2.4 CONDUCTORS AND CABLES

A. Classes 2 Control Cables: Multi-conductor cable with copper conductors not smaller than No.18 AWG.

PART 3 - EXECUTION

3.1 WIRING INSTALLATION

A. Wire interior lighting circuits as well as all exterior lighting circuits through relays in the relay control panels as indicated in the Lighting Control Panel Schedule included in this specification. Provide local interior light switches shall provide for timed override of program schedules. Individual override switches shall control the lighting control panel relays as indicated in the Switch Schedule included in this specification.

B. Comply with NECA 1.

C. Wiring Method: Install low-voltage wiring in raceways except where installed above suspended accessible ceilings. Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" Minimum conduit size shall be 1/2 inch (13 mm).

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

E. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

F. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

G. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in terminal cabinets, equipment enclosures, and in junction, pull, and outlet boxes.

H. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to provide full commissioning services including the inspection, testing, field-assembled components adjustments and system start-up. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. Test for circuit continuity.
   2. Verify that the control panel features are operational.
   3. Check operation of local override controls.
   4. Test system diagnostics by simulating improper operation of several components selected by Architect.

3.3 ADJUSTING

A. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance in adjusting sensors and to assist Owner's personnel in making program changes to suit actual occupied conditions.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting controls. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 16950