SPECIFICATIONS

PROJECT:

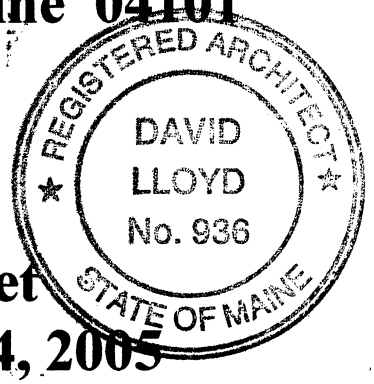
Renovations of
Congress Square Plaza
10 Congress Square Plaza
Portland, ME 04101

OWNER:

Plaza Associates at Congress Sq., L.P.
PACS, LLC, its General Partner,
491Humphrey Street
Swampscott, Ma 01907

ARCHITECT:

ARCHETYPE, P.A.
48 Union Wharf
Portland, Maine 04101



Bid Set
February 4, 2005

SECTION 00100

INDEX TO PROJECT MANUAL

Section:

Division 1- General Requirements

Division 2 – Site Work

Not Used

Division 3- Concrete

Not Used

Division 4 - Masonry

Division 5 – Metals

Not Used

Division 6 - Wood & Plastics

Division 7 - Thermal & Moisture Protection

07530 Flexible Sheet Roofing System

Division 8 - Doors & Windows

08301 Insulated Rolling Service Door
08520 Aluminum Windows

Division 9 - Finishes

09650 Vinyl Composition Tile Flooring &Vinyl Base
09680 Carpeting
09900 Painting

Division 10 - Specialties

10800 Toilet & Bath Accessories

Division 11 – Equipment

11450 Residential Equipment & Kitchens

Division 12 - Furnishings

Not Used

Division 13 – Special Construction

13945 Fire Protection Systems

Division 15 – Mechanical

15050 Basic Mechanical Materials & Methods
15250 Mechanical Insulation
15500 Heating, Ventilating & Air Conditioning
15782 Rooftop Units
15880 Air Distribution
15950 Controls
15990 Testing, Adjusting & Balancing

Division 16 – Electrical

16000 Basic Electrical Requirements
16721 Fire Alarm Systems

END OF SECTION

In this document where it reads CONTRACTOR substitute CONSTRUCTION MANAGER

AIA Document A201

General Conditions of the Contract for Construction

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

1987 EDITION

TABLE OF ARTICLES

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

INDEX

ARTICLE 1

GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

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

1.1.2 THE CONTRACT

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

1.1.3 THE WORK

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

1.1.4 THE PROJECT

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

1.1.5 THE DRAWINGS

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

1.1.6 THE SPECIFICATIONS

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

1.1.7 THE PROJECT MANUAL

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

1.2 EXECUTION, CORRELATION AND INTENT

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

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

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

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

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

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

1.3.1 The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, Subsubcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Subsubcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the

Work without the specific written consent of the Owner and Architect. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

1.4 CAPITALIZATION

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

1.5 INTERPRETATION

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

ARTICLE 2

OWNER

2.1 DEFINITION

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

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

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

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

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

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

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

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

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

2.3 OWNER'S RIGHT TO STOP THE WORK

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

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

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

ARTICLE 3

CONTRACTOR

3.1 DEFINITION

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

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

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

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

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

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

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor.

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

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

3.4 LABOR AND MATERIALS

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

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

3.5 WARRANTY

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

3.6 TAXES

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

3.7 PERMITS, FEES AND NOTICES

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

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

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

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

3.8 ALLOWANCES

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

3.8.2 Unless otherwise provided in the Contract Documents:

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

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

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

.4 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Clause 3.8.2.2 and (2) changes in Contractor's costs under Clause 3.8.2.3.

3.9 SUPERINTENDENT

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

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

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

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

3.10.3 The Contractor shall conform to the most recent schedules.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

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

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

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

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

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

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

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

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

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

3.13 USE OF SITE

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

3.14 CUTTING AND PATCHING

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

3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the

Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

3.15 CLEANING UP

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

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

3.16 ACCESS TO WORK

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

3.17 ROYALTIES AND PATENTS

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

3.18 INDEMNIFICATION

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

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

3.18.3 The obligations of the Contractor under this Paragraph 3.18 shall not extend to the liability of the Architect, the Architect's consultants, and agents and employees of any of them arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, the Architect's consultants, and agents and employees of any of them provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 4

ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

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

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

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

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

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

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

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

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

tractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

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

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

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

4.2.7 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

4.3 CLAIMS AND DISPUTES

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

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

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

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

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

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

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

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

4.3.6 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Paragraph 4.4.

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

4.3.8 Claims for Additional Time

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

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

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

4.4 RESOLUTION OF CLAIMS AND DISPUTES

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

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

4.4.3 If a Claim has not been resolved, the party making the Claim shall, within ten days after the Architect's preliminary response, take one or more of the following actions: (1) submit additional supporting data requested by the Architect, (2) modify the initial Claim or (3) notify the Architect that the initial Claim stands.

4.4.4 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect's decision will be made within seven days, which decision shall be final and binding on the parties but subject to arbitration. Upon expiration of such time period, the Architect will render to the parties the Architect's written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Architect may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.5 ARBITRATION

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

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

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

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

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

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

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

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

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

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITIONS

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

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

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

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

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

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

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

5.3 SUBCONTRACTUAL RELATIONS

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

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

ARTICLE 6

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

6.2 MUTUAL RESPONSIBILITY

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

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

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

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

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

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

6.3 OWNER'S RIGHT TO CLEAN UP

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

ARTICLE 7

CHANGES IN THE WORK

7.1 CHANGES

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

7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

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

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

7.2 CHANGE ORDERS

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

.1 a change in the Work;

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

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

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

7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

.1 mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 unit prices stated in the Contract Documents or subsequently agreed upon;

.3 cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 as provided in Subparagraph 7.3.6.

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

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

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

.1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' or workmen's compensation insurance;

.2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 additional costs of supervision and field office personnel directly attributable to the change.

7.3.7 Pending final determination of cost to the Owner, amounts not in dispute may be included in Applications for Payment. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

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

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

7.4 MINOR CHANGES IN THE WORK

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

ARTICLE 8

TIME

8.1 DEFINITIONS

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

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

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

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

8.2 PROGRESS AND COMPLETION

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

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

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

8.3 DELAYS AND EXTENSIONS OF TIME

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

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

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

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

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

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

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

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

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

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

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

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the

Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1.

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

9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

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

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

9.6 PROGRESS PAYMENTS

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

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

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

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

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

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

9.7 FAILURE OF PAYMENT

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

9.8 SUBSTANTIAL COMPLETION

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

9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or desig-

nated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. The Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

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

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Subparagraph 11.3.11 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

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

9.10 FINAL COMPLETION AND FINAL PAYMENT

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

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

9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims. The making of final payment shall constitute a waiver of claims by the Owner as provided in Subparagraph 4.3.5.

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

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

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

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

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

10.2 SAFETY OF PERSONS AND PROPERTY

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

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

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

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

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

10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

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

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

10.3 EMERGENCIES

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

ARTICLE 11

INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

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

.1 claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;

.5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and

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

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

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

11.2 OWNER'S LIABILITY INSURANCE

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

11.3 PROPERTY INSURANCE

11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.

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

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

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

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

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

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

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

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

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

11.3.7 Waivers of Subrogation. The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Paragraph 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

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

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

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

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

11.4 PERFORMANCE BOND AND PAYMENT BOND

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

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

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

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

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

12.2 CORRECTION OF WORK

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

12.2.2 If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date

or commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This period of one year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation under this Subparagraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

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

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

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

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

12.3 ACCEPTANCE OF NONCONFORMING WORK

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

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

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

13.2 SUCCESSORS AND ASSIGNS

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

13.3 WRITTEN NOTICE

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

13.4 RIGHTS AND REMEDIES

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

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

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so the Architect may observe such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

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

The Owner shall bear such costs except as provided in Subparagraph 13.5.3.

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

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

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

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

13.6 INTEREST

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

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor:

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

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

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

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

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

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

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

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

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

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

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

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

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

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

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

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

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

14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to jus-

tify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

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

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

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

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

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

14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

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

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

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

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

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 Construction Manager will be allowed the following Profit and Overhead on Change Orders: OH&P Construction Manager = 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 Construction Manager'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

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of renovations to the existing four buildings (buildings A, B, C and D) comprising Congress Square Plaza.

1. Project Location: 10 Congress Square Plaza, Portland, Maine

B. Owner: Plaza Associates at Congress Sq., L.P., PACS, LLC, its General Partner, 491Humphrey St Swampscott, Ma 01907

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

D. Construction Manager: The Construction Manager for the Project is Portland Builders, 63 Federal St., Portland, ME, 207-829-0118. Contact: Harvey Klugman.

The Work includes, but is not limited to:

- 100% repointing of all four buildings.
- Remediation of "steel jacking" in buildings "B" and "D".
- Remediation of "steel jacking at the ground level of building "A".
- Installation of cast stone masonry in building "A".
- Restoration and patching of brownstone masonry elements in building "A".
- Brick infill of existing masonry window openings currently covered with plywood.
- Reinforcement of existing roof framing in buildings "A" and "C".
- Replacement of existing steel tie rods at the steel truss on the roof of building "A".
- Rebuilding of a brick bearing condition at the loading dock.

- Installation of EPDM roofing over existing ballasted built-up roofing on buildings "B" and "C".
- Repair and patching of existing EPDM roofing on building "D".
- Removal of existing roofing and installation of EPDM roofing at Roof "E".
- Removal of existing roofing and roof deck at Roof "F". Installation of wood roof deck, roof drain system and EPDM roofing at Roof "F".
- Removal of existing wood floor at the mechanical space above the loading dock, installation of wood flooring.
- Painting of the existing steel truss system on Roof "A".
- Installation of insulated coiling overhead door at the loading dock.
- Removal of existing windows in all four buildings, installation of aluminum windows.
- Installation of VCT and vinyl tile in apartment units.
- Removal of existing carpet and installation of carpet in apartment units.
- Painting of apartment walls and trim.
- Removal of existing and installation of kitchen cabinets, bathroom vanities and countertops.
- Installation of refrigerators, ranges and range hoods in apartment units.
- Renovations of (16) HC apartments to HC standards.
- Update and additions to the fire alarm system.
- Update and additions to the sprinkler system.
- Installation of thermostats in all units.
- Installation of (2) automatic doors at Lobby 2 entry – see Section 01230 Alternates.
- Installation of (1) rooftop gas fired air handling unit.
- Replacement of all existing self contained heating control valves in the apartment units.
- Replacement of existing gaskets in the heating piping above the corridors ceiling on the third level.
- Upgrade of heat system pumping.

- Update of the grounding and outlets in all kitchens and baths.

1.3 CONTRACT

A. Project will be constructed under a construction manager contract.

1.4 USE OF PREMISES

A. General:

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.

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 01230

ALTERNATES

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 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Provide automatic door openers at (2) doors at the Entrance to Lobby 2 – see drawing A.21 for a plan of this entry.

END OF SECTION 01230

SECTION 01300

SUBMITTALS, MEETINGS AND RECORD DOCUMENTS

1. GENERAL

1.1 PRE-CONSTRUCTION MEETING

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

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

B. Pre-construction meeting agenda will include following:

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

1.2 CONSTRUCTION SCHEDULE

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

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

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

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

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

1.3 SCHEDULE OF VALUES

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

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

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

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

E. Itemize change orders separately as they are approved.

1.4 MEETINGS AND REPORTING

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

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

1.5 APPLICATION FOR PAYMENT

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

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

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

1.6 SHOP DRAWINGS, PROJECT DATA, SAMPLES

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

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

C. Architect/Engineer Review:

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

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

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

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

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

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

H. Submit as follows:

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

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

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

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

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

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

1.7 PROJECT RECORD DOCUMENTS

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

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

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

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

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

C. At completion of Work, deliver (3) sets completed record documents to Architect. Final payment for Project will not be made until Architect reviews and approves these documents.

1.8 SUBSTANTIAL COMPLETION

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

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

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

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

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

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

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

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

1.2 SUBMITTALS

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

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

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

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

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

1.3 SUBMITTAL PROCEDURES

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

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

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

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

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

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

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

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

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

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

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

1.4 PRODUCT DATA

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

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

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

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

1.5 SHOP DRAWINGS

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

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

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

1.5 SAMPLES

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

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

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

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

1.6 CERTIFICATES

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

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

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

1.7 MANUFACTURER INSTALLATION INSTRUCTIONS

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

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

1.8 CONTRACTING OFFICER ACTION

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

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

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400

QUALITY CONTROL SERVICES

1. GENERAL

1.1 DESCRIPTION

A. Quality control services include inspections and tests performed by independent agencies and governing authorities, 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 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. 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. 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 laboratory reports where applicable.

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

4. Provide cost information for the proposed change order.

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

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

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

1. GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

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

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

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

1.2 PROCEDURES AT SUBSTANTIAL COMPLETION

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

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

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

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

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

B. Inspection Procedures:

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

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

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

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

1.3 PROCEDURES AT FINAL ACCEPTANCE

A. Reinspection Procedure:

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

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

1.4 RECORD DOCUMENTATION

A. Record Drawings:

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

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

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

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

B. Maintenance Manuals:

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

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

1.5 GENERAL CLOSEOUT REQUIREMENTS

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

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

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

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

END OF SECTION

SECTION 04520- BRICK REPOINTING AND REPLACEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. 100% repointing of all brick to brick joints, 100% repointing of all brick to stone joints.
2. Provide itemized costs for repointing building A, building B, building C and building D.
3. Replication of the color, texture and joint profile of the original tinted brick and stone pointing mortar.
4. Removal and replacement with new matching bricks of all spalled, cracked, damaged and missing bricks.
5. Removal of ferrous elements imbedded in masonry wall.
6. Patching of masonry with new or salvaged bricks where ferrous elements have been removed.
7. Rebuilding with original bricks areas of debonded face bricks.
8. Removal and reinstallation of existing brick at locations of steel jacking.

B. Related Sections:
1. Section 04530- Stone Masonry Restoration

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. Prepare under provisions of Section
   2. Replacement of Damaged bricks: Remove and replace 25 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.

5. Steel jacking remediation.
a) Refer to Exterior Elevation Drawings A.7 – A.11 for locations of steel jacking. Refer to Drawing 2a-d/A.22 for detail drawings of steel jacking remediation.
b) At the full length of steel columns where steel jacking is indicated remove all bricks in area indicated on Drawing 2b/A.22.
c) Remove all rust from the full length of the exposed column per Drawing 2c/A.22. Provide a clean, corrosion free surface, paint.
d) Prior to re-setting bricks area shall be evaluated for mortar removal from existing wall and salvaged bricks.
c) Reset original bricks.

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.

1.08 SEQUENCING

A. After award of contract submit brief statement of project sequencing indicating start and finish dates.

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 2.5 times the joint height or until sound mortar is reached. Due to the excessive weathering of the mortar joints on Building A the depth of mortar removal on this project will probably exceed the standard depth of mortar removal in order to reach sound mortar. 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.

3.03.1 Cleaning

A. The face of all stonework shall be thoroughly cleaned after completion of the pointing and other work liable to soil the stone. The stonework shall be gone over and any mortar splashes or smears shall be carefully removed from the surface with scrapers.

B. 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.

SECTION 04720

CAST STONE

PART 1.00 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division1 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the cast stone work as shown on the drawings and specified herein, including but not necessarily limited to the following:

1. Building "A" - cast stone string course with egg and dart design below the sixth floor.

2. Building "A" - cast stone lintels at the fifth floor windows.

3. Building "A" - cast stone blocks of the segmental arch hoods at the six floor. Contractor is to include in his bid replacing 15% of the existing blocks. Blocks will be selected for replacement based on the extent of exfoliation of the brownstone – to be determined by Architect. Contractor is to provide a unit cost for replacement of additional blocks.

4. Building "A" Reinforcing and accessories as required by shop drawings signed and sealed by an engineer licensed in the state of Maine

1.03 RELATED WORK *(PLEASE MODIFY AS REQUIRED)*

A. RAKING OUT AND REPOINTING OF BRICK JOINTS –SECTION 04520

B. MASONRY RESTORATION - SECTION 04902.

C. CAST STONE AND NATURAL STONE INSTALLATION –SECTION 04905

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm with a minimum of five (5) years experience in manufacturing cast stone units similar to those indicated for this Project and

with a record of successful in-service performance, as well as sufficient production capacity to manufacture required units.

B. Source Limitations for Cast Stone: Obtain cast stone units through one source from a single manufacturer.

C. Reference Standards: Comply with the following:

1. Cast Stone Institute Technical Manual, current edition.

2. ASTM C 150; Specification for Portland Cement.

3. ASTM C 615; Specification for deformed and plain billet steel bars for concrete reinforcement.

4. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.

5. ASTM C 1194; Compressive strength, 5000 psi minimum for products at 28 days.

6. ASTM C 1195 or ASTM C 642: Absorption, 6% maximum for products at 28 days.

1.05 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for all cast stone units. Include dimensions, details of anchorages and reinforcement, if any; and indication of finished faces.

1. The shop drawings shall show the setting mark of each unit of cast stone and its location on the structure. The cast stone shall bear the same corresponding setting mark on an unexposed surface.

2. Shop drawings shall show exact profiles for each cast stone unit.

3. Include building elevations showing layout of units and locations of joints and anchors.

B. Calculations: Submit structural calculations for proposed stone anchors and reinforcement, signed and sealed by a structural engineer licensed in the state of Maine.

C. Samples:

1. Submit four 6" x 6" cast stone samples showing full range of colors and textures and finish for exposed surfaces. One sample will be selected at random and cut in half to expose aggregates. Resubmit as often as required if

suitable match for existing brownstone is not approved from first round of submittals.

2. Before cast stone materials are delivered to the job site, submit one full sized cast stone unit of each type required, showing approved color, texture profile and finish.

3. Submit new pattern prior to mold making for review or, if original stone unit is going to be used for mold making, submit corrected stone unit. Original stone unit may have to be corrected to make up for losses, holes, weathering or the removal of sulphate crusts that have collected on the surface.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of cast stone with requirements indicated.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of five completed brownstone replication projects with dates of completion, project names and addresses, names and addresses of architects and owners, and other information specified.

1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM†C†1364.

1.06 DELIVERY, STORAGE AND HANDLING

A. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.

2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

B. Store installation materials on elevated platforms, under cover, and in a dry location.

C. Protection:

1. Use all means necessary to protect cast stone and related materials before, during and after installation and to protect the installed work and materials of all other trades.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary for Architect's approval, at no additional cost to the Owner.

1.07 COORDINATION

A. Coordinate production and delivery of cast stone with masonry restoration work to minimize the need for on-site storage and to avoid delaying the Work.

PART 2.00 PRODUCTS

2.01 CAST STONE COLOR AND FINISH

A. The Cast Stone used in this work shall match color and texture of samples approved by the Architect and shall match the profiles of the original units.

B. The samples shall be approved by the Architect before the manufacturer shall be required to proceed with the work.

C. Exposed surfaces, unless otherwise specified, shall exhibit a typically fine grained texture similar to natural brownstone. No bug holes shall be permitted.

2.02 MOLDS AND MATERIALS

A. Certain changes in profile, section and wash may be required in the model/pattern phase in order to improve the durability and water shedding capability of the original units.

B. All models and patterns shall be prepared by skilled craftsmen in a correct and artistic manner in strict accordance with the spirit and intent of the original units and the contract drawings. Models shall be approved by Architect before any work is executed from them.

C. Provide forms and molds as required to produce finished surfaces. Accurately construct forms that are mortar tight and of sufficient strength to provide cast stone units of shape, lines and sizes shown.

D. Molds to be taken from stones removed from building. Stone may require repair prior to mold making to correct for losses or weathering. Where the existing profile is severely deteriorated or where stones can not be removed from the building, models to be carved by the cast stone fabricator.

2.03 CAST STONE MATERIALS

A. General: Comply with ASTM C1364 and the following:

1. Portland Cement: ASTM C150, Type I, containing not more than 0.60 percent total alkali when tested according to ASTM C114.

2. Fine aggregate shall be carefully graded and washed natural sands, or manufactured sands meeting ASTM C33, except that gradation may vary to achieve desired finish and texture.

3. Coarse aggregate shall be carefully graded and washed natural gravel, or crushed graded stone such as granite, or other durable stone meeting ASTM C33, except that gradation may vary to achieve desired finish and texture. Coarse aggregate shall be brown crushed stone from Scofield Stone in New Jersey or approved equal. Coarse aggregate shall be brown rather than white, gray or any other color.

4. Coloring: All colors added shall be inorganic (natural or synthetic) iron oxide pigments meeting ASTM C979 excluding the use of a cement grade of carbon black pigment, and shall be guaranteed by the manufacturer to be light fast and lime proof. The amount of pigment shall not exceed ten (10) percent by weight of the cement used.

5. Air-Entraining Admixture: ASTM C260, certified by the manufacturer to be compatible with other admixtures used.

   a. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 5 to 7 percent.

B. Reinforcement: Deformed steel bars complying with ASTM A615/A615M.

1. Epoxy Coating: ASTM A775/A775M.

2. Reinforcing bar sizes shall be as shown on approved shop drawings. The material covering in all cases shall be at least twice the diameter of the bars. Stone shall be fully reinforced to take all stresses including handling, temperature changes and structural stresses.

2.03 CAST STONE UNITS

A. Provide cast stone units complying with ASTM C1364.

1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C666, Procedure A, as modified by ASTM C1364.

B. All Cast Stone used in this work shall have a minimum compressive strength of five thousand (5000) lbs. per square inch and absorption of not greater than five (5) percent when tested in accordance with ACI 704.

C. Absorption: 6 percent maximum at 28 days, per ASTM C 1195 or ASTM C 642.

C. Reinforce units as indicated and as required by ASTM C1364. Use epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of material.

D. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.

1. Slope exposed horizontal surfaces at least 1:12, unless otherwise indicated.

2. Provide drips on projecting elements, unless otherwise indicated.

E. Casting Tolerances: Maintain casting, bowing, warping and dimension tolerance to within the following:

1. Overall dimension for height, width and length of units: Plus zero of unit dimension to minus 1/8" in each direction.

2. Bowing or warping: Not to exceed 1/360 of the span.

2.04 FABRICATION

A. Yard cure units until the sum of the mean daily temperatures for each day equals or exceeds 350 deg F.

C. Acid etch or sandblast units to remove cement film from surfaces indicated to be finished if require to match existing brownstone units.

D. Cast stone shall have sharp arrises to match profiles on approved shop drawings. Provide stone with sinkages to receive anchors.

PART 3.00 - EXECUTION

Installation of cast stone is specified under Section 04905 - Stone Setting and Cast Stone Installation.

END OF SECTION 04720

SECTION 04902

MASONRY RESTORATION

PART 1.00 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division1 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the masonry restoration work as shown on the drawings and specified herein, including but not necessarily limited to the following:

a. Retooling of existing brownstone profiled units in areas designated on the contract drawings to remove loose and delaminating stone.

b. Fabrication and installation of brownstone dutchmen.

d. Recarving of in place of decorative brownstone elements that are to remain.

f. Surface preparation of brownstone to receive cementitious patching material and installation of patching material.

g. Pinning of cracked or broken units.

h. Removal of stone and brick masonry from in front of corroded steel members in areas indicated on contract drawings. Re-setting of brick and stone units after repairs to steel members.

2. General :

a. Removal of caulking at all existing caulked joints.

b. Repointing of mortar joints is specified under SECTION 04520

c. Provide all necessary protection and take all necessary precautions to protect adjacent surfaces, building occupants, and pedestrians.

1.03 RELATED WORK

A. RAKING OUT AND REPOINTING OF JOINTS –SECTION 04520

B. CAST STONE AND NATURAL STONE INSTALLATION –SECTION 04905

1.04 DEFINITIONS AND GOALS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

C. High-Pressure Spray: 800 to 1200 psi 4 to 6 gpm.

D. Dutchmen: The removal of areas of unsound stone from a single unit and the installation of a piece of the same stone, cut, carved and tooled to match.

E. Retooling: The goal of retooling is to remove from the surface of stone units, areas of deteriorated stone and incompatible tool marks. Retooling shall remove from the surface the minimum amount of stone required to achieve a uniform surface. After retooling, stone edges shall match the planes created by the edges of adjacent stones so that a straight, tight, water shedding joint between units is created.

F. Recarving: The goal of recarving is to recreate the lines, forms and shapes of carved ornament by removing deteriorated stone and carving the remaining sound substrate to match existing building ornamentation.

G. Honing: The goal of honing is to create a uniform flat surface on brownstone units. Honing should be of sufficient depth to remove all unsound material and deep gouges from the faces of the stones. Edges of honed units should align so that a uniform, straight, water shedding joint is created.

H. Patching: The goal of patching is to remove areas of deteriorated stone from individual units and recreate missing lines, forms and shapes with a compatible material that has the color and texture of the original stone.

I. Washdown: The goal of washdown, after tooling and honing, is to remove white crushed stone residue and stone dust from masonry surfaces.

1.05 QUALITY ASSURANCE:

A. Restoration Specialist:

1. Work of this Section must be performed by an experienced stone restoration firm that has completed work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance, having not less than 5 years comparable experience.

2. Field Supervision: Restoration specialist firm shall maintain an experienced full-time supervisor on the Project site during all times that stone restoration work is in progress.

B. Field-Constructed Mock-Ups: Contractor shall prepare the following sample panels on the building where directed by the Architect. Obtain Architect's acceptance of visual qualities before proceeding with the work. Retain all mock-ups in undisturbed condition, suitably marked, during construction as standards for judging completed work.

1. Masonry Tooling and Repair: Prepare sample panels for each type of masonry restoration process, including tooling, honing, dutchmen and patching. Erect mock-up panels into an existing wall, as directed by Architect, to demonstrate quality of materials and workmanship.

a. The Contractor shall install a mock-up of each of type of restoration work after award of the Contract and prior to the commencing of all work.

b. No work shall commence on the installation of the mock-up until all appropriate samples have been approved.

c. The location of the mock-up shall be selected by the Architect and shall include conditions to be anticipated during the repair work.

d. After approval of the completed mock-up it shall be an integral part of the finished work.

e. Mock-up shall include provisions for containing dust created during masonry restoration processes. Include method for collecting and disposing of run-off from rinsing operations. See requirements under Paragraph 1.09, below.

C. Source of Materials: Obtain materials for masonry restoration from a single source for each type of material required (grout materials, cement, sand, etc.) to ensure match of quality, color, and texture.

1.06 SUBMITTALS:

A. Restoration Program:

1. Submit written program for each phase of restoration process, including sequencing, coordination between trades, and schedule for each phase of the work. Describe in detail materials, methods and equipment to be used for each phase of restoration work. See Paragraph 1.05 for mock-up requirements.

2. Shop Drawings:

   Submit for approval shop drawings showing the location, size and anchoring detail of each stone dutchman.

B. Dust Control Program

1. Prior to commencing masonry restoration work, Contractor shall submit written program for control of stone dust, water runoff, etc. during tooling, honing and stone replacement operations.

   Program shall include protection at windows, air intakes and other building openings to minimize disruption of occupant's continuous use at all interior spaces. If necessary, all windows, air intake vents, and air conditioning vents must be covered or temporary ductwork provided, to prevent stone dust from entering air intake system.

2. Environmental Regulations: Describe testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous waste. Submit applicable local environmental regulations.

3. Protection: Describe methods for protecting surrounding areas, building occupants, pedestrians, vehicles, and adjacent building surfaces from contact with falling stone chips, dust, and rinse water during the course of the work.

B. Product Data: Submit manufacturers' technical data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements. Submit Material Safety Data Sheets for each product used in the restoration.

C. Samples: Submit, for verification purposes, prior to mock-up erection, three samples each of the following:

1. Each type of tooling and honing, on brownstone samples.

2. Each type of cementitious patching material, applied to a 12 inch by 12 inch plywood panel, showing range of color and proposed texture. Repeat a sample of the selected color in a masonry unit as directed by the project architect.

3. Each type of mortar for grouting dutchmen.

4. Each type of anchor.

5. Each type of adhesive.

D. Calculations: Submit structural calculations for proposed stone anchors, signed and sealed by a structural engineer licensed in the state of Maine.

1.07 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

B. Protect masonry restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.

Store aggregates, covered and in a dry location, where grading and other required characteristics can be maintained and contamination avoided.

C. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

D. Store materials on site only as needed for work to be performed during the week. Maintain storage off-site for long term storage of materials.

1.08 PROJECT CONDITIONS:

A. Do not repair masonry with patches or grouts unless air temperatures are between 45 deg F and 85 deg F and will remain so for at least 48 hours after completion of work.

B. Hot-Weather Requirements: Protect restoration work when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90 deg. F and above.

C. Prevent grout or mortar used in patching and repair work from staining face of surrounding masonry and other surfaces. Remove immediately grout and mortar in contact with exposed masonry and other surfaces.

D. Protect sills, ledges and projections from mortar droppings.

E. Remove and replace masonry elements in a sequence that will not impair the strength or stability of the remaining structure.

1.09 SAFETY PRECAUTIONS:

A. Dust Control: See Paragraph 1.06 for requirements of dust control program.

B. Contractor shall make all necessary precautions to prevent building occupants, pedestrians, etc. from coming in contact with harmful materials, rinse water, or dust from masonry restoration operations.

C. Protect all surfaces outside scope of contract from damage during course of work.

D. Flammable solvent based materials shall be kept away from fire or flame. Provide portable extinguishers at job site for emergency use. Remove used container, rags, and packaging from site each day.

E. All containers at job site shall be properly labeled indicating contents.

F. Maintain at job site, in a loose-leaf binder, Material Safety Data Sheets for all materials used.

G. Properly fitting NIOSH/OSHA approved respirators are required during stone tooling, honing and stone removal operations.

H. Portable emergency eye wash equipment and first aid kit shall be kept on site.

I. Have approved laboratory take air quality samples at various interior and exterior locations during restoration operations.

J. Comply with applicable federal, state, and local environmental regulations regarding testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous waste.

1.10 SEQUENCING/SCHEDULING:

A. Perform masonry restoration work in a logical sequence. Submit sequencing for the following items in general work plan.

1. Remove deteriorated portions of existing stone masonry and install dutchmen.

3. Remove existing masonry units scheduled to be replaced with new stone units, specified under SECTION 04905 - Stone Setting.

4. Remove existing masonry units scheduled to be replaced with cast stone, specified under SECTION 04720 - Cast Stone, and SECTION 04905 - Stone Setting.

5. Remove existing masonry and repair with cementitious patching materials in locations indicated by project architect.

6. Recarve existing brownstone decorative elements to remain.

7. Tool existing brownstone ashlar surfaces to recreate rockface finish.

8. Hone existing brownstone units in areas indicated by project architect.

9... Point all masonry joints, specified under SECTION 04110 - Pointing.

1.11 ESTIMATED QUANTITIES WITH ADD/DEDUCT UNIT PRICES:

A. Provide itemized costs as per SECTION 01020 – Allowances and SECTION 01025- Unit Prices.

PART 2.00 - PRODUCTS

2.01 GROUT FOR DUTCHMEN SEAMS:

A. Materials: Jahn M-40 or approved equal.

2.02 CEMENTITIOUS PATCHING MATERIALS:

A. Premixed cementitious patching material formulated to match the color and texture of the existing masonry that does not contain any acrylic, latex, or other synthetic polymer additives. The mortar need only be mixed with water at the site. The mortar must be vapor permeable, frost and salt resistant, shrink resistant, and be physically compatible with the substrate, including, but not limited to porosity, tensile, and compressive strength.

1. Factory-Mixed Patching Mortar: Jahn M-70 Restoration Mortar or approved equal.

2.03 STONE FOR DUTCHMEN REPAIR

New or salvaged East Longmeadow Brownstone to match existing brownstone as it appears after cleaning.

2.04 ANCHOR MATERIALS:

A. Adhesive Anchors shall consist of a threaded anchor rod, a cylindrical wire mesh screen tube, and an injectible adhesive material. Injection adhesive system shall be HIT HY20 as manufactured by Hilti, Inc. Tulsa OK. or approved equal.

B. Anchor rods shall be stainless steel Type 304 of dimensions specified, meeting the requirements of ASTM F-593 (condition CW).

PART 3.00 - EXECUTION

3.01 GENERAL:

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, and surrounding buildings from damage or injury resulting from masonry restoration work.

B. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.

C. Dispose of run-off from rinsing operations by legal means and in manner which prevents damage to adjacent building materials, pedestrians, and water penetration into building interiors.

D. Seal, pack, mask or repair all openings and joints to minimize water damage or dust infiltration into building.

E. Dry brush, scrape or blow off all large accumulation of dirt and foreign material from sills, ledges, brackets, cornices, etc.

3.02 BROWNSTONE TOOLING AND HONING:

A. Tooling: Remove deteriorated surface of stone and re-establish rockface finish. Remove only the minimum amount of stone required to achieve a uniform surface. Edges of tooled stones shall be in plane with edges of adjacent stones in order to achieve a straight uniform weather struck mortar joint. Ledges or lips between adjacent stones will not be accepted.

B. Replace, at no cost to the owner, all stones that in the opinion of the project architect have been damaged beyond repair because of improper retooling performed under this portion of the contract.

C. Honing: Hone all stones to the level determined in the control mock up. Honing of stones shall be performed with a sequence of increasingly finer grit wheels or abrasive pads mounted on electric or pneumatically powered grinders. Honed stones with circular grinder marks will not be accepted. By overlapping joints between stones create a uniform surface with the edges of one stone in plane with the edges of the adjacent stone. Ledges or lips between stones will not be accepted.

D. Replace, at no cost to the owner, all stones that in the opinion of the project architect have been damaged beyond repair because of improper honing performed under this portion of the contract.

3.03 STONE DUTCHMEN:

A. Inspection: Prior to cutting out for the installation of new brownstone the Contractor shall verify all locations where stone is scheduled for removal by submitting shop drawings indicating the location and sizes of each dutchman unit. Obtain approval for locations, sizes and anchor details prior to cutting out of stone.

The Contractor shall notify Architect in writing if conditions in the field differ from those indicated on the Contract Documents or stone shop drawings.

B. Carefully cut out by hand, for installation of dutchmen at locations and of dimensions indicated, or as directed by the Architect, any masonry which is scheduled to receive dutchmen. Cut out without damaging surrounding masonry to remain. Obtain approval of cutting masonry anchors encountered at cut outs for dutchmen. Cut sides and backs of stone reveals flat with 90 degree corners.

C. Remove mortar, loose particles, old patches and debris from existing surrounding masonry in preparation for replacement. Clean with stiff brushes or by flushing with water and compressed air.

D. Stone Installation:

1. General: All dutchmen shall be installed level, plumb, square and true within the allowable tolerances. The units are to be positioned in such a manner that no dimensional error is allowed to occur. Horizontal and vertical seams shall be correctly aligned and of uniform width.

2. Set dutchman with specified adhesives in the position to which it is assigned in accordance with the approved setting drawings.

3. Drill new 3/8" diameter horizontal holes into the new stone and into the existing masonry back-up. The drilled holes shall be blown clean of drill dust with an air gun.

4. Tape around hole to prevent spillage of adhesive onto face of masonry. Using tape, or clay, hold adhesive back from the face of the stone at least 1 inch. Grout face of seam with specified grout tinted to match the adjacent stone.

5. Install the "Hilti HY 100 Fastener System per the Manufacturer's specifications.

6. The stainless steel threaded rod shall be cleaned and degreased as necessary to remove all contaminants which may hinder the adhesive bond.

7. All surfaces that are in contact with adhesive must be free of dirt or dust, paint, glaze, grease, oil, rust, or other contaminant. Surface may be dry or damp (no free water). The adhesive shall come in contact with clean sound surfaces.

3.04 BROWNSTONE RECARVING:

A. Recarve in place existing deteriorated ornament or profiles. All carving shall be executed by trained stone carvers with prior experience carving sandstone. All work shall match the spirit and intent of the original carvings.

3.05 MASONRY PATCHING:

A. Preparation.

1. All patches shall match profile of existing adjacent masonry.

2. At areas to receive patches, remove all loose mortar, patches, and damaged unsound masonry. Cut away an additional 1/2" of the substrate to ensure the surface to be patched is solid and stable. "Sound" masonry with hammer to verify its integrity. Remove all sealant residue. Cut pocket into masonry with hand tools only, unless otherwise directed by the Architect, so that it flares wider as it deepens. The flaring shall not exceed 1/2" wider at back than face. In all cases do not leave thin slivers of masonry at surface. Roughen surface to provide key for patch material.

B. Mixing of Repair Mortars:

1. Do not mix more material than can be used within 30 minutes. Discard any material that has been mixed for 30 minutes or more.

2. Mixing ratios:

a. Brownstone: Jahn M70; Approximately 5 1/2 parts dry material to 1 part water.

b. Grout for Dutchmen Seams: Jahn M40 premixed

3. Mix water and dry ingredients well. Adjust amount of water depending on the weather and the porosity of the substrate in accordance with the Manufacturer's printed instructions.

C. Application:

1. Apply mortar mix using a trowel in a series of lifts with no waiting period or scratch coat necessary between layers, up to a total maximum thickness of 3". For patches thicker than 3", apply mortar in two layers, allowing the first layer to cure for a while before applying the second layer. If a cement skin forms, scrape approximately 1/16" of mortar off, dampen the first layer before applying the second layer. Use light pressure during the applications. Work mortar firmly into the surface of the masonry, including corners.

2. Build up patching material so that it is slightly above adjacent masonry surface. Allow 15-30 minutes to set slightly, and then scrape off excess

material using a straight edge. Do not press down or "float" the patch. Where patches occur at panel edges or corners. form mortar to match the profile of the surrounding masonry. In all cases, finish patch so that it is as indistinguishable as possible from the adjacent masonry.

3. Lightly mist the patch with water to wet the entire surface of the finished patch approximately 30 minutes to one hour after completion on hot sunny days and approximately 2 hours on cool or cloudy days. Time will vary with temperature and humidity. Mist at least once a day, but as often as possible on the two days following the patch installation.

4. Unacceptable patches are those with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture. Remove patches and refill to provide patches free of these defects.

5. Keep adjacent masonry surfaces clean and free of mortar.

3.05 Cleaning:

A Washdown: All tooled and hones surfaces shall be washed down to remove white stone residue from surface of brownstone. Honing and tooling shall not be considered accepted until surfaces have been evaluated after cleaning.

B Wash masonry surfaces using clean potable water dispensed under low pressure from a power washer fitted with a 45 degree fan tip. Hold wand at a downward angle at least 2 feet from stone surface. Power washing marks of any sort will not be accepted.

SECTION 04905

STONE SETTING AND CAST STONE INSTALLATION

PART 1.00 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division†1 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the stone setting and cast stone installation work as shown on the drawings and specified herein, including but not necessarily limited to the following:

1. Removal of full or partial brownstone units and installation of new cast stone units.

2. All necessary protection and precautions to protect adjacent surfaces, building occupants, and pedestrians.

1.03 RELATED WORK

A. RAKING OUT AND REPOINTING OF JOINTS –SECTION 04520

B. MASONRY RESTORATION - SECTION 04902.

1.04 QUALITY ASSURANCE:

A. Restoration Specialist:

1. Work of this Section must be performed by an experienced stone restoration firm that has completed work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance, having not less than 5 years comparable experience.

2. Field Supervision: Restoration specialist firm shall maintain an experienced full-time supervisor on the Project site during all times that stone restoration work is in progress.

B. Field-Constructed Mock-Ups: Work of this Section must comply with previously completed mock-ups. Contractor shall prepare the following sample panels on the

building where directed by the Architect. Obtain Architect's acceptance of visual qualities before proceeding with the work. Retain all mock-ups in undisturbed condition, suitably marked, during construction as standards for judging completed work.

1. Prepare sample panels of representative cast stone installation. Erect mock-up panels into an existing wall, as directed by Architect, to demonstrate quality of materials and workmanship.

   a. The Contractor shall install a mock-up of each of the various conditions after award of the Contract and prior to the commencing of all work.

   b. No work shall commence on the installation of the mock-ups until all appropriate samples have been approved.

   c. The location of the mock-ups shall be selected by the Architect and shall include conditions to be anticipated during the full scope of the project.

   d. After approval the completed mock-ups shall be an integral part of the finished work.

C. Source of Materials: Obtain materials for masonry restoration from a single source for each type of material required (cement, sand, pigment etc.) to ensure match of quality, color, pattern, and texture.

1.05 SUBMITTALS:

A. Restoration Program:

1. Submit written program for each phase of stone setting and cast stone installation. Describe in detail materials, methods and equipment to be used for each phase of work, including hoisting and rigging. See Paragraph 1.05 for mock-up requirements.

2. Protection: Include a description of methods for protecting surrounding areas, building occupants, pedestrians, vehicles, and adjacent building surfaces during stone setting and cast stone installation procedures.

B. Product Data: Submit manufacturers' technical data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

C. Samples: Submit, for verification purposes, prior to mock-up erection, three samples each of the following:

1. Each type of anchor.

2. Each type of adhesive.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

B. Protect masonry restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.

Store aggregates, covered and in a dry location, where grading and other required characteristics can be maintained and contamination avoided.

C. Protect grout and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

D. Store materials on site only as needed for work to be performed during the week. Maintain storage off-site for long term storage of materials.

1.07 PROJECT CONDITIONS:

A. Hot-Weather Requirements: Protect restoration work when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90†deg†F (32†deg†C) and above.

B. Protect sills, ledges and projections from mortar droppings.

C. Remove and replace masonry elements in a sequence that will not impair the strength or stability of the remaining structure. Provide temporary shoring as required.

1.08 SAFETY PRECAUTIONS:

A. Dust Control Program Prior to commencing masonry restoration work, Contractor shall submit for review a program for control of stone dust, water runoff, etc. during stone replacement operations. Program shall include protection at windows, air intakes and other building openings to minimize disruption of occupant's continuous use at all interior spaces. If necessary, all windows, air

intake vents, and air conditioning vents must be covered or temporary ductwork provided, to prevent stone dust from entering air intake system.

Contractor shall indicate all necessary precautions to prevent building occupants, pedestrians, etc. from coming in contact with harmful materials or dust from masonry restoration operations.

B. Protect all surfaces outside scope of contract from damage during course of work.

C. Flammable materials shall be kept away from fire or flame. Provide portable extinguishers at job site for emergency use. Remove used container, rags, and packaging from site each day.

D. All containers at job site shall be properly labeled indicating contents.

E. Maintain at job site Material Safety Data Sheets for all materials used.

F. Portable emergency eye wash equipment and first aid kit shall be kept on site.

G Comply with applicable federal, state, and local environmental regulations regarding testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous waste.

PART 2.00 - PRODUCTS

2.01 MORTAR FOR SETTING STONE AND CAST STONE:

A. Mortar Materials:

1. Portland Cement: ASTM C 150, Type I.

2. Hydrated Lime: ASTM C 207, Type S.

3. Aggregate for Mortar: ASTM C 144, unless otherwise indicated.

4. Water: Clean, free of oils, acids, alkalis and organic matter.

5. No calcium chloride or admixtures containing calcium chloride shall be used in the mortar.

B Mortar Mixes:

1. General:

a. Measurement and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not

measure by shovel, use known measure. Mix materials in a clean mechanical batch mixer.

b. Mixing Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix which will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 1-to-2 hours. Add remaining water in small portions until mortar of desired consistency is reached. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

2. Do not use admixtures of any kind in mortar, unless otherwise indicated.

3. Mortar Proportions:

A Mortar for Setting Masonry: Type N mortar, in accordance with ASTM C270, 1 part white Portland cement, 1 part lime, 6 parts colored mortar aggregate.

B Mortar for Pointing Cast Stone: As specified in Section 04520 Brick Repointing.

2.02 ANCHOR MATERIALS:

A. Adhesive Anchors shall consist of a threaded anchor rod, a cylindrical wire mesh screen tube, and an injectible adhesive material. Injection adhesive system shall be HIT HY20 as manufactured by Hilti, Inc. Tulsa OK. or approved equal.

B. Anchor rods shall be stainless steel Type 304 of dimensions specified, meeting the requirements of ASTM F-593 (condition CW).

PART 3.00 - EXECUTION

3.01 GENERAL:

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, and surrounding buildings from damage or injury resulting from masonry restoration work.

B. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.

C. Dispose of run-off from rinsing operations by legal means and in manner which prevents damage to adjacent building materials, pedestrians, and water penetration into building interiors.

D. Seal, pack, mask or repair all openings and joints to minimize water damage or dust infiltration into building.

E. Dry brush, scrape or blow off all large accumulation of dirt and foreign material from sills, ledges, brackets, cornices, etc.

3.02 INSPECTION

A. Prior to the installation of the new cast stone units, the Contractor shall verify all locations where stone is scheduled for removal. The contractor shall notify Architect in writing if conditions in the field differ from those indicated on the Contract Documents or stone shop drawings.

B. Examine masonry installation areas and conditions and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

C. Remove mortar, loose particles, old patches and debris from existing surrounding masonry in preparation for replacement. Clean with stiff brushes or by flushing with water and compressed air.

3.03 BROWNSTONE REMOVAL AND REPLACEMENT:

A. Carefully remove by hand at locations indicated, or as directed by the Architect, any masonry units which are scheduled for removal. Cut out full units from joint-to-joint and in manner to permit installation of full size replacement units, and without damaging surrounding masonry. Maintain adjoining construction in an undamaged condition.

B. Carefully cut out by hand, for installation of dutchmen at locations and of dimensions indicated, or as directed by the Architect, any masonry which is scheduled to receive dutchmen.

3.04 CAST STONE SETTING

1. General: All masonry shall be erected level, plumb, square and true within the allowable tolerances. The units are to be positioned in such a manner that no dimensional error is allowed to occur. Horizontal and vertical joints shall be correctly aligned and uniform joint width shall be maintained. Plastic shims that are placed at the bed joints to assure proper joint size, must be left projecting past the face for easy removal after grouting but prior to pointing.

2. Drill new horizontal holes into the new unit and into the existing masonry back-up to the specified depth. The drilled holes shall be blown clean of drill dust with an air gun.

3. Tape around hole to prevent spillage of adhesive onto face of masonry.

4. Install the Hilti HIT HY20 Fastener System into the masonry back-up, per the Manufacturer's specifications. The stainless steel threaded rod shall be cleaned and degreased as necessary to remove all contaminants which may hinder the adhesive bond, prior to installation. Comply with manufacturer's requirements for adhesive curing time.

5. All surfaces that are in contact with adhesive must be free of dirt or dust, paint, glaze, grease, oil, rust, or other contaminant. Surface may be dry or damp (no free water). The adhesive shall come in contact with clean sound surfaces.

6. Fill drilled hole in new unit with grout and align with threaded rod in back-up. Spread unit with a full bed of mortar at back, top, and bottom of unit and install in the position to which it is assigned in accordance with the approved setting drawings.

7. RAKE OUT MORTAR USED FOR LAYING STONE BEFORE MORTAR SETS AND POINT NEW MORTAR JOINTS TO COMPLY WITH REQUIREMENTS FOR REPOINTING EXISTING STONE.

8. Cleaning: Scrub the face of all cast stone with a fiber brush, using soap powder and water. Rinse thoroughly with clean running water. Remove mortar on the face of cast stone units. Use no acids or prepared cleaners without the cast stone Manufacturer's approval.

9. Cast stone shall show no obvious repairs or imperfections other than minimal color variations when viewed with the unaided eye under good typical lighting at a twenty (20) foot distance.

3.05 PROTECTION AND INSPECTION

A. Fully protect projecting masonry units against damage. Replace damaged units at no additional cost to the Owner.

B. Upon completion of the work, thoroughly inspect all installed stone and cast stone and verify that all units have been installed in accordance with the provisions of this Section; make all necessary adjustments.

END OF SECTION 04905

SECTION 06100
ROUGH CARPENTRY

PART I - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: The drawings and the general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Work covered by this Section includes the furnishing of all labor, material, equipment and accessories, and the performing of all operations in connection with the wood framing, other carpentry as indicated on the Drawings and/or specified within this Section.

B. The work covered by this Section includes, but is not necessarily limited to, the following:

1. Furnishing and installing all rough carpentry, including rafter and beam framing, blocking, plates, shoes, shims, and furring, framing anchors, and fasteners.

2. Drilling masonry and drilling and tapping of metal work as required for installation of rough carpentry.

3. Any other items of carpentry necessary to complete work properly.

1.04 QUALITY ASSURANCE

A. Codes and Standards:

1. International Building Code - 2000

2. AITC Timber Construction Manual - 1994

3. NFPA National Design Specification For Wood Construction - 1991

PART 2 - PRODUCTS

2.01 LUMBER

A. Lumber shall conform to American Softwood Lumber Standard Voluntary Product Standard PS20-70. Lumber shall bear the grade and trademark of the Association under whose rules it is produced and a mark of mill identification.

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

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

D. All two inch nominal framing lumber shall have the following minimum base values, unless otherwise noted:

1. Extreme Fiber Stress in Bending, F_b = 750 psi.

2. Horizontal Shear, F_v = 70 psi.

3. Compression Perpendicular to Grain, $F_{cÁ}$ = 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.

E. Engineered Wood Products: Provide engineered wood products manufactured by TrusJoist/MacMillan or approved alternate.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Wood Framing:

1. General Requirements:

a. Wood construction practices shall conform to recommendations of the NFPA "National Design Specification" and the AITC "Timber Construction Manual".

b. All members are to be installed as shown on the drawings.

c. When individual members have built-in camber, the members shall be placed with camber up.

d. No cutting of holes or notches in trusses for pipe, conduit or other reasons will be allowed.

e. All bearing surfaces shall be horizontal and even over the entire width of support.

f. Accurately and properly fit and brace all work. Secure in proper position and orientation. Framing, studding and blocking shall be as indicated on the Design Drawings, or as required by the work.

g. Cooperate with all other trades as required.

2. Concrete or Masonry Contact: All wood material in contact with concrete or masonry shall be given two coats of green Cuprinol wood preservative. Note: Wood sills shall be pressure treated, not paintable treated.

3. Cutting and Patching: Do all cutting, patching, heading and blocking required for work of all trades.

C. Fastening:

1. Fastening shall be as indicated on the Design Drawings, or in accordance with Table 2305.2, of the BOCA National Building Code.

2. Framing supported by concrete or masonry shall be anchored with built-in threaded bolts or lags, as indicated on the design drawings

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

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 07530
FLEXIBLE SHEET ROOFING SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Fully adhered EPDM sheet roofing, tapered and flat roof insulation, elastomeric flashing, lead coated copper cap flashing, Metal-Era fascia system, See Drawings A.6 Roof Plan and A.6a Roof Details.

1. **Roof "A"** – no work on roof "A"

2. **Roof "B"** – existing ballasted low slope built-up asphalt roofing on concrete deck. Perform non-destructive roof moisture survey; identify wet insulation. **Contractor to provide unit cost per square foot for removal and replacement of wet insulation**. Sweep loose gravel, install 2" ISO insulation, ½" high density fiberboard, 0.060 fully adhered EPDM membrane. Install lead coated cap flashing at adjoining walls and metal roof edge per details.

3. **Roof "C"** - existing ballasted low slope built-up asphalt roofing on wood deck. Perform non-destructive roof moisture survey; identify wet insulation. **Contractor to provide unit cost per square foot for removal and replacement of wet insulation**. Sweep loose gravel, install 2" ISO insulation, ½" high density fiberboard, 0.060 fully adhered EPDM membrane. Install lead coated cap flashing at adjoining wall and metal roof edge per details.

4. **Roof "D"** - existing low slope epdm roofing on concrete deck. Perform non-destructive roof moisture survey; identify wet insulation. **Contractor to include in his bid the cost of removing 1,500 square foot of wet insulation and replacing it with same. Contractor to also provide unit cost per square foot for removal and replacement of additional discovered wet insulation.** Install 0.060 fully adhered EPDM membrane. At adjoining wall sawcut reglet (1) course above existing termination bar, install lead coated copper flashing.

5. **Roof "E"** – existing low slope smooth surface asbestos built-up roofing on wood deck. Remove existing roofing system, abate asbestos in roofing and flashing. Install 1" ISO, ½" high density fiberboard, 0.060 fully adhered EPDM membrane – taper to sump. Install lead coated cap flashing at adjoining walls.

6. **Roof "F"** - existing ballasted low slope built-up asphalt roofing on wood deck. Remove roofing system in total and remove roof penetrations,

(skylight, vent). Remove wood roof deck. Install new 2X6 t&g roof deck. Install 1" ISO, ½" high density fiberboard, 0.060 fully adhered EPDM membrane. Install (2) roof drains, and leaders to existing interior roof drain system. Verify existing interior roof drain system is clear and free of leaks. Install lead coated cap flashing at adjoining walls.

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.

1.04 SUBMITTALS

A. Sample ten (10) year watertight warranty for the EPDM membrane. **Warranty shall include wind speeds up to 100 miles per hour. The standard 55 MPH is not acceptable for this job.**

B. Sample twenty (20) year material warranty for the EPDM membrane.

C. Current EPDM membrane manufacturer's application specifications.

D. Manufacturer's details of the proposed fascia system.

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 full system warranty and twenty (20) year material warranty shall be issued by the EPDM membrane manufacturer. **Warranty shall include wind speed up to 100 MPH.**

B. The roofing contractor shall furnish the Owner with his personal two (2) year watertight warranty.

PART 2 PRODUCTS

2.01 ROOF INSULATION

A. Tapered roof insulation to be polyisocyanurate closed-cell foam core and manufacturer's standard facing laminated to both sides, complying with FS HH-I-1972/2, Class 1. The minimum thickness at the drains to be 1.0" and will taper at the rate of 1/8" per foot to a maximum thickness of 5.0" thirty two feet (32') from the drains.

B. Roof insulation to be polyisocyanurate closed-cell foam core and 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, E'NRG'Y 2 by NRG Barriers or approved equal.

C. Over all foam insulation, install one layer of 7/16" APA rated oriented strand board (OSB).

2.02 MEMBRANE ROOF SYSTEM

A. Membrane roofing to be fully adhered .060" EPDM sheet roofing furnished in twenty five foot wide (25') rolls (or wider) by Firestone, Carlisle, Versico or approved equal. Roof membrane to be fully adhered to the 7/16" 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. Seam tape will be required for all field seams.

2.03 ROOF DRAINS

A. Roof drains shall be Zurn model Z-100 or approved equal. On Roofs B and C extend existing roof drains with drain extender by R.A.C.

2.04 METAL FLASHING

A. Fascia to be Anchor-Tite AF-50 by Metal-Era, Inc. or approved equal. Anchor bar to be 12'-0" lengths, extruded from 6063-T6 alloy aluminum, 0.10" thick, pre-slotted 12" on center. Snap-on fascia cover to be .040" Kynar 500 finished

aluminum. Color to be selected by the Architect.

B. Cap flashing to be formed using 16 ounce lead coated copper.

2.05 FASTENERS

A. Use fasteners recommended by the membrane manufacturer to secure anchor bars and termination bars.

B. Fasteners used to secure roof insulation to the concrete 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.

B. Fasten insulation to the roof deck with the appropriate screws and plates. Fastener quantity and layout must meet FM 1-90 requirements and any additional requirements that may be imposed by the EPDM manufacturer to meet their **100 MPH** wind speed warranty.

C. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses with no gaps to form a complete thermal envelope.

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 in strict accordance with the manufacturer's specifications.

3.04 FLASHING - - WALLS, PARAPETS, CURBS AND VENTS

A. Use the longest pieces of material which are practical. All flashing and terminations shall be done in accordance with the applicable manufacturer's

details.

B. 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.

3.05 FASCIA

A. Install fascia system in strict accordance with the manufacturer's printed instructions.

3.06 ROOF DRAINS

A. Install new roof drains in accordance with the manufacturer's instructions.

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.

3.8 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. be cleaned, restored and replaced as required.

D. All debris shall be removed from the premises promptly and the construction area left clean daily.

3.10 INSPECTION AND TESTING

THE OWNER RESERVES THE RIGHT TO INSPECT AND TEST ALL CONSTRUCTION OPERATIONS AND MATERIALS.

A. Any defect or noncompliance discovered by inspection shall be reported to the contractor who shall promptly remove any defective material from the site.

B. The Owner reserves the right to inspect the work or parts of it as he chooses. His failure to inspect the work in progress shall not relieve the contractor of the responsibility for properly executing the contracted work, nor shall it impair the Owner's right to reject deficiencies he may subsequently discover.

PART 4 JOB CONDITIONS

A. Roofing to be applied in dry weather.

B. Completed roof areas shall not be trafficked. The work shall be coordinated to prevent this situation by working toward the roof edges.

C. This project is subject to compliance with all requirements of the Occupational Safety and Health Administration (OSHA). All work on this project must meet the requirements of all applicable state and local codes, laws and ordinances.

END OF SECTION

SECTION 08301

INSULATED ROLLING SERVICE DOOR

Part 1 - GENERAL

1.1 DESCRIPTION

A. Work covered by this section includes furnishing of and paying for all materials, labor, services, equipment, licenses, taxes, other items, and appliance necessary for the execution and completion of all work specified herein and/or shown on the drawing.

B. The work described in this section of the specifications includes, but is not limited to, the following:

1. 18' x 11' (Contractor to field verify dimensions) Insulated Rolling Service Door and related accessories.

1.2 REFERENCE STANDARDS

A. FS QQ-S-775 - Steel Sheets, Carbon, Zinc-coated (Galvanized) by the Hot-dip Process.

B. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

1.3 SUBMITTALS

A. Shop Drawings: Submit complete shop and erection drawings. Show locations of doors, sizes and anchorage details.

B. Manufacturer's Literature: Submit manufacturer's complete descriptive data including installation instructions.

1.4 DELIVERY AND STORAGE

A. Deliver doors in manufacturer's packaging complete with installation instructions.

B. Indicate pertinent dimensioning, general construction, component connections and details, anchorage methods, hardware locations and installation details.

Part 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Manufacturers:

1. Atlas Door Corporation
2. The Cookson Company
3. Kinnear
4. North American Door
5. Pacific Rolling Door Co.
6. Cornell Inc.
7. Or approved equal.

B. Door shall be motor operated with manual over ride. Provide motor with quick disconnect from door for emergency manual operation. Locking mechanism shall provide day lock security and deadbolt-type night security. Provide remote 3 button control station requiring constant pressure on downward travel of door.

C. Curtains shall be formed of flat interlocking steel slats designed to safely resist a wind pressure of 20 pounds per square feet with an allowable fiber stress of 22,000 psi. Slats shall be flat and constructed of minimum 16 gauge steel. Curtain shall roll up on a drum supported on brackets and shall be balanced by helical springs.

D. Insulation: Polyurethane foamed in place and to fill all voids providing continuous insulation protection the full height of the slat. Insulation is to be self-bonding to the two interior galvanized steel surfaces.

E. Bottom Rail: The curtain shall have a rolled-steel bottom bar consisting of two angles of equal weight, one on each side, fastened to the bottom of curtain. In addition, doors shall have a compressible neoprene, rubber, or vinyl seal attached to bottom rail.

F. Finish: Curtain slats and hoods shall have G90 Class zinc coating in accordance with requirements of ASTM A525, and shall be phosphate treated. All other surfaces of door parts shall be given a shop coat of rust-inhibiting paint.

G. Guides shall be standard rolled-steel angles not less than 3/16 inch thick, and shall form a channel pocket of sufficient depth to retain the curtain in place under the wind pressure specified. Guides shall be securely attached to adjacent construction with 3/8 inch masonry anchors spaced near each end and not over 30 inches apart.

H. Roller shaft shall be constructed of steel pipe of proper diameter and thickness for the size of curtain. Deflection shall not exceed 0.03 inch per foot of span. Ends of roller shall be closed with cast iron plugs machined to fit pipe. An oil-tempered, helical, counter-balancing steel spring capable of producing sufficient torque to assure easy operation of the door curtain from any position shall be installed within the roller. Provisions shall be made for spring-tension adjustment from outside of bracket without removing the hood.

I. Provide and install slide bolts on interior face at each side of curtain, suitable for padlocks.

J. Hood: Minimum 24 gauge galvanized sheet metal with stiffening beads or flanges and top weatherstripping consisting of a continuous rubber seal fastened to the inside of the hood and contacting the top of the curtain thus forming a weather baffle.

K Bearings Supporting Pipe and Curtain: Grease packed, precision ball bearings or self-lubricating graphite bearings.

L. Weatherstripping: Full length neoprene weatherseals applied between guide leg and flat surface of curtain and between guide leg and inside of curtain.

M. Provide two 200 sq. inch (max) vision panels each door.

N. Provide door with bottom bar reversing system that will stop and reverse a closing door on contact.

Part 3 - EXECUTION

3.1 INSTALLATION

A. Install steel roll-up door according to manufacturer's printed instructions and the following:
B. Adjust operating mechanisms, counter-balance assemblies and hardware for easy operation.

1. Installation shall be neat and secure with guides set straight, true and plumb.
2. Door horizontal members shall be parallel to head of exterior opening.

C. Adjust operating mechanisms, counter-balance assemblies and hardware for easy operation.

D. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION

SECTION 08520
ALUMINUM WINDOWS

Part 1 – GENERAL

1.1 REFERENCES

A. 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.

B. 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.

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

D. 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 total 820; openings vary in size, shape and configuration - refer to Drawings A.5 and A.5a for window types, quantities and details; refer to Exterior Elevation Drawings A.7 – A.11 for locations of window openings. Such work includes but is not limited to the following:

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

2. Half Screens

3. Factory glazing in accordance with glass specifications.

4. Sealant within window system

5. Hardware, accessories and appurtenances. **See Drawing 1/A.5 for required hardware in the (16) HC units.**

6. Alcoa aluminum 0.032 gauge 2000 series window cladding, finish color to match window. Fabricate on site, as required, from .032 gauge aluminum sheet with Kynar finish, all exterior window trim. Trim to include radius brick mold with appropriate rectangular applique, mullion coverage, head coverage (arched and square) and full sill pan to replicate and fit tightly over original trim presently hidden beneath existing aluminum panning system. New aluminum brick mold, head and sill to match existing prototype installation.

7. Window Types G1 and G2 to receive cladding only – existing windows to remain.

8. Removal and disposal of existing aluminum window and panning.

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), 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 Type C window (similar to that detailed on Drawing A.5a) and window cladding installed on site in an existing window opening for approval. Sample shall be complete with hardware, glazing, weather-stripping, anchors, screen and other accessories, and shall be furnished in the color black.

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.

D. FINISH: Standard finish shall be factory-applied thermo setting acrylic enamel equal to PPG Duracron. Finish to 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. **Lower sash in the (16) HC units, see Drawing 1/a.5 to receive tempered glass.**

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.

PERFORMANCE CRITERIA

All double hung to conform to the following criteria:

1. Air infiltration: Not to exceed .10 cfm/ft @ 25 mph.
2. Water resistance: There shall be no leakage as defined in the high performance test method with a test pressure of 9.75 PSF.
3. 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.

4. 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
5. 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.

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 aluminum window and cladding.
   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 (+120° 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.

SECTION 09650

VINYL COMPOSITION TILE FLOORING AND VINYL BASE

1. GENERAL:

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK

A. SCOPE: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

B. Extent of Vinyl Composition Tile Flooring and Vinyl Base: **45 kitchens, 72 bathrooms (kitchens and bathrooms vary in size).**

1.3 SUBMITTALS

A. Submittals under this Section shall include:

1. Manufacturers' data and installation instructions on all specified products;
2. Color range;
3. Samples of vinyl composition tile flooring and vinyl base
4. Shop drawings indicating materials, pattern number, tile number, and manufacturer.

2. PRODUCTS:

2.1 VINYL COMPOSITION TILE: Shall be " Mannington Essentials 1/8" gauge.

2.2 SUBSTITUTIONS: The contractor may substitute resilient flooring specified by manufacturer's name with a product manufactured by a different company only with approval of Architect. The substituted product shall be of equal quality and price range.

2.3 VINYL BASE MOLDING – shall be Johnsonite Cover Base 4", 1/8 gauge. Submit color for Architect's approval. See Architectural Drawings for locations.

2.4 ADHESIVES: shall be as recommended by the manufacturer.

3. EXECUTION:

3.1 Flooring contractor is to be responsible for removal and disposal of all existing flooring to be removed.

3.2 INSTALLATION shall be done by skilled craftsmen using the adhesives recommended by the manufacturer and in accordance with the manufacturer's instructions. The flooring contractor shall examine the subfloors and report all defects which have to be corrected before the application of flooring starts. Concrete floors shall be smooth, free of any grooves and depressions, and brushed clean of any foreign matter. Install all resilient flooring with joints tight, floor true, level and even with no bubbles, pops or other visible defects. Cut to and around all permanent fixtures keeping vinyl tight to fixtures. Vinyl also shall be installed under fixtures such as baseboard heating, and glued tight. Wrap vinyl base around exterior corners.

3.3 DURING WORK PROGRESS, remove all excess materials, extraneous mastic, and debris resulting from operations, which may disrupt the work of other trades. The Contractor shall be responsible for keeping the floors clean, unstained and undamaged until the final completion of the building.

END OF SECTION

SECTION 09680

CARPET

1. GENERAL

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK:

A. SCOPE: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

B. Removal and disposal of existing carpeting.

C. Installation of "Roberts Strips" for carpeting.

D. Installation of Carpeting as shown on plans or noted in these Specifications.

E. Extent of carpet: **(82) living rooms, (80) dining rooms, (88) bedrooms. (Rooms vary in size.)**

1.3 QUALITY ASSURANCE

A. Finished installation shall comply with fire test specified in applicable Building Code.

B. Architect/Engineer shall review first finished space for workmanship. Accepted space shall serve as project standard.

C. All carpets will meet UM44D

1.4 SUBMITTALS

A. Submittals under this Section shall include:

1. Manufacturer's specifications and installation instructions on all specified products.
2. Samples: one piece, 18" x 18", of each color and type of carpet provided.

B. Deliver to Owner, neatly packaged and labeled, all usable carpet scraps over 2 sq. ft. or 8 in. in least dimensions: 1 percent of each type and color of carpet provided, in 12 ft. wide rolls; and 1 percent of each type of edge strip provided, in standard lengths.

C. Provide written maintenance program.

2. PRODUCTS

2.1 CARPET shall be as follows:

A. Units: Buildings "A" & "C" Henry 20, pad Merit 24 oz. - FHA approved. Buildings "B" & "D" Henry 20, direct glue - FHA approved.

B. Corridors: Buildings "A" & "C" Henry 20, pad Merit 24 oz. - FHA approved. Buildings "B" & "D" Henry 20, direct glue - FHA approved

3. EXECUTION:

3.1 JOB CONDITIONS:

A. Flooring contractor is responsible for removing and disposing of all existing carpet to be removed

B. Examine Subfloor for dampness, loose material, excessive irregularity, oily or waxy areas impeding adhesion, or other conditions which would prevent proper installation. Verify that no incompatible curing compound has been used on newly-poured concrete. Commencement of work constitutes acceptance of subfloor.

C. Broom-clean or vacuum surfaces to receive carpet, before beginning installation. Apply primer-sealer to plywood or concrete sub-floor, if recommended by carpet or adhesive manufacturer.

D. Before proceeding with complete installation of carpet, install a representative sample area of each type of carpet provided over each type of substrate, to test for compatibility of adhesive to substrate at glue-down installation, and verify general appearance of finished installation. If sample is securely bonded after 72 hours, final installation may proceed.

3.2 INSTALLATION

A. Install carpet by tackless method, except for handicap units which will be D.G.

B. Field measure each space to receive carpet. Do not scale drawings. Before beginning installation, verify that floor telephone and electrical outlets have been installed.

C. At glue-down installations, apply manufacturer's recommended adhesive in accordance with manufacturer's instructions, observing proper safety precautions. Apply adhesive in a uniform film with a steel trowel and proper size notches for correct coverage. Avoid applying excess quantities so that adhesive bleeds through joints. Apply adhesive only in area which dries or films over. Avoid soiling adjacent walls and floors with adhesive. Promptly remove any spillage. Broom or roll carpet to remove air bubbles and insure bond.

D. Install carpet wall to wall unless noted otherwise. Fit carpet neatly into breaks, recesses, closets and alcoves, against bases, around pipes and penetrations, under saddles and thresholds, and around permanent cabinets and equipment. Install Schluter metal strip

wherever carpet edge does not abut vertical surface, of appropriate configuration to provide smooth transition to adjacent material. Allowable variation from level for finished installation: 1/4 in. from level in any direction when tested with 10 ft. straight-edge.

E. Seams shall be flat, free from puckering, without twists, free from frayed edges. Coat edges with seam adhesive at glue-down installation, hot-melt tape at cushion, and as recommended by manufacturer. Patterns at seams shall match exactly. Cut raw edges on a slight angle with surface yarns extending outward over backing material so that surface yarns mingle neatly at seams.

F. Seams shall be in accordance with approved seaming shop drawings and samples. No seams will be accepted perpendicular to openings such as doors, stairs, and entries. Seams at doors shall be centered directly under doors. Seam at corridor change of direction shall follow inner wall line across corridor.

G. Provide removable cut-out pieces over flush equipment requiring access such as telephone and power outlets. Cut-outs shall be neatly edged and securely held in place with double-edged tape all around.

H. Remove adhesive spots from carpet immediately with solvent. Trim loose pieces of face yarn with sharp scissors. Upon completion of installation, remove rubbish, selvages, wrapping paper, small scraps, etc., and vacuum with commercial-type vacuum cleaner. Remove soiling, by shampoo if necessary. Cover finished work with kraft paper or polyethylene until Substantial Completion.

END OF SECTION

SECTION 09900

PAINTING

1. GENERAL

1.1 DESCRIPTION OF WORK

A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

B. The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

1. Painting interior walls, door trim, window trim, etc. Extent of painting: **61 units**.

2. Painting of exposed metal sprinkler piping.

3. Painting of metal cornice at Buildings "A", "B" and "C".

4. Painting of steel columns exposed during steel jacking remediation – see Drawings 2a-d/A.12.

NOTE: All colors to be selected by Architect. .

1.2 SUBMITTALS

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

B. Submit as follows:

1. Manufacturer's data, application instructions, and color chips on all specified products.

2. Paint schedule covering all surfaces to be painted.

3. Contractor to provide 4' x 8' test panels in finished spaces for up to 3 trials for each required color selection. Test panel colors to be selected by Architect. Final color to be approved by Architect from test panels.

4. Provide as maintenance material, a minimum of one gallon of each type and color of paint used on job, in labeled and well-sealed containers, for future touch-up. Also provide typed list of each type and color of paint used on job, including name of distributor from whom paint may be obtained.

2. PRODUCTS

2.1 General

A. Paint: Acceptable manufacturers, unless specific manufacturer is noted: California Products Corporation, Benjamin Moors, Pratt & Lambert, Sherwin-Williams, Tnemec.

B. All products used shall be manufacturer's top quality product for each type of finish specified.

2.2 MATERIALS

A. Where primer is called for, use primer recommended by manufacturer for particular combination of substrate and finish coat. Where painting over shop-applied primers, verify that finish paint proposed for field application is compatible with shop primers actually used.

B. Metal Sprinkler Piping: Benjamin Moore Ironclad Retardo - one (1) coat alkyd primer and sealer, two (2) coats alkyd eggshell enamel.

C. All Gypsum Walls and Ceilings to be painted: Primer - Benjamin Moore Vinyl Latex Primer Sealer.

C. Finish-Walls – (2) coats Benjamin Moore Moorcraft Latex Eggshell.

D. Finish Ceiling – (2) coats Flat Ceiling White

E. Interior woodwork, doors, door frames & trim - one (1) coat Primer; two (2) finish coats Semigloss Latex.

F. Metal Cornice: (1) coat Series 135 chembuild epoxy coating by Tnemec, (2) coats Series 1075 aliphatic acrylic coating by Tnemec.

G. Steel Column: (1) coat primer, (2) finish ZRC High Zinc Content Coating by ZRC Worldwide, 145 Enterprise Drive, Marshfield, MA.

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. Maintain temperature at interior locations between 50 and 75 degrees F, maximum 80 percent relative humidity, while paint is being applied. Provide adequate ventilation, by mechanical means if necessary, for drying of paint and prevention of condensation and mildew. Do not apply finish in areas in which dust is being generated.

D. Protect finished surfaces and equipment not being painted with masking tape, canvas dropcloths, polyethylene sheets, etc. Items such as lighting switch covers, fixture canopies, and door handles shall be temporarily removed, carefully stored, and replaced after painting, or carefully covered during painting operations.

3.2 PREPARATION

A. Preparation of newly-installed materials to receive finish painting is specified under those Sections installing materials. This includes, but is not necessarily limited to: touch-up of damaged shop coats; taping, sealing and sanding of drywall; patching masonry; sanding finish wood; and cleaning off grease, oil, dirt, mildew, factory-applied protective coatings, and other foreign materials.

B. At wood surfaces to be painted, scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

C. Before beginning work under this Section, verify that preparation of substrates under other Sections has been done as specified. Thoroughly remove water, dirt, and dust with clean cloths, brooms, or brushes.

D. Steel Jacking Remediation – prepare exposed steel per SSPC- SP 2, Hand Tool Cleaning.

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.

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.

END OF SECTION

SECTION 10800

TOILET AND BATH ACCESSORIES

1. GENERAL

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the items listed as indicated on Drawings.

2. PRODUCTS:

2.1 TOILET PAPER HOLDERS: shall be Nutone Hallmack "Coronado" series. Extent of holders – **126 holders.**

2.2 GRAB BARS: Stainless steel, 1 ¼ " diameter, concealed mounting with snap flange, satin finish; Bobrick B-5806 Series, lengths as shown on drawings. Extent of bars – **refer to Drawing A.20 for quantities and locations of bars.**

2.5 Surface Mounted Medicine Cabinet: Vienna 155124, 24 x 26 x 5½, with lights by NuTone, #SB22129, 24 x 4 x 5 1/2. Extent of medicine cabinets – **93 cabinets.**

2.6 Tub Resurfacing: extent of tub resurfacing – **81 tubs.**

2.7 Watercloset: American Standard Cadet #2292.100, 1.6GPF, pressure assisted, elongated bowl, siphon jet, vitreous china, flushometer tank, floor mounted, 14 1/8" high rim. McGuire #166 angle supply w/wheel handle stop, wall flange, all chrome plated. Church #48TL white, elongated, closed front seat w/cover. Extent of waterclosets – **5 waterclosets.**

2.8 **NOTE**: Blocking for all accessories and grab bars must be provided.

2.9 **NOTE**: The contractor shall submit shop drawings on every item specified in this section. There shall be no substitutions without a written explanation from the subcontractor that the specified item is equal with the item specified by the architect. All substitutions shall be approved by the Architect and the Owner.

3. EXECUTION:

3.1 All work shall be done by experienced craftsmen in first-class manner and high-grade finish.

3.2 All installations shall be in accordance with layout shown on plans and in strict conformity with the manufacturer's recommendations and secured into blocking or other framing with screws of adequate length and size to properly support accessories. Grab bars must be able to sustain a 300# direct load pulling down or out on it.

END OF SECTION

SECTION 11450

RESIDENTIAL EQUIPMENT AND KITCHENS

1. GENERAL:

1.1 REFERENCES

A. Drawings and general provisions on Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK

A. The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the following items as indicated on Drawings.

B. Kitchen Cabinets - wall hung and base and countertops according to layout on drawings. Extent of kitchen cabinets: **153 kitchens. (Kitchens vary in size and layout.)**

C. Kitchen Sinks – Elkay Pacemaker model PSR-2522-75-4, 25"x22", 20 ga, type 302 stainless steel. McGuire #151 strainer and tailpiece. McGuire #2165 ½" angle supplies w/wheel stops, all chrome plated. McGuire #8089 adjustable P-trap w/cleanout and brass nipple to wall w/cast escutcheon, all chrome plated. Extent of sinks: **153 kitchens.**

D. Kitchen Faucet – Symmons Symmetrix No. S-248-2, 8" center deck mount, conventional swing faucet, hose & spray, metal lever handles, washerless valve cartridges, all chrome plated. Extent of faucets: **153 kitchens**

E. Bathroom Vanities and Countertops. Faucet – Symmons Symmetrix No. S-2408-2, centerset, metal lever handles, metal pop-up drain, washerless valve cartridges, all chrome plated. McGuire #167 angle supplies w/wall flange, wheel handle stop and 12" flexible copper risers, all chrome plated. McGuire #8090 adjustable P-trap, 1 ¼" x 1 ½", cleanout plug, #2127 brass nipple to wall w/cast escutcheon, all chrome plated Extent of vanities: **126 vanities.**

F. Refrigerator. Extent of refrigerators: **82 refrigerators.**

G. Kitchen Ranges and Range Hoods. Extent of ranges and hoods: **84 ranges, 103 hoods.**

1.3 SUBMITTALS

A. Submit manufacturer's product data and installation recommendations for all specified products.

B. Architect reserves the right to require samples of all products to be submitted. Acceptable samples will be returned and may be used in the work.

C. Submittals for countertops shall be in accordance with Section 06200, Finish Carpentry.

2. PRODUCTS

2.1 Kitchen Cabinets:

A. Shall be of wood construction, with wood finished reverse beveled doors, self closing hinges, adjustable shelves, dual tracks for drawers with nylon guides.

B. Cabinet doors to be Armstrong Bali, color Honey. Cabinets to be Armstrong Premier Series. Countertops to be No-Drip postform plastic laminate, Pionite AT921, Sand Spectrum / Or Equal.

2.2 Bathroom Vanities: Shall be of wood construction, with wood finished reverse beveled doors, self closing hinges, adjustable shelves, dual tracks for drawers with nylon guides. Cabinet doors to be Armstrong Bali, color Honey. Cabinets to be Armstrong Premier Series. Top shall be equal to "Oasis Marble Tops" with built in bowl available through FW Webb Co. (207) 784-4575. Coordinate with plumber for drilling holes to receive faucet. Kitchen counter tops to be rounded edge preformed plastic laminate color by Architect.

2.3 Unit Refrigerator shall be Frigidaire FRT17B3A frostless, refrigerator-freezer, 17 cu. ft. – white.

2.4 Unit Kitchen Range to be Frigidaire FEF365A self-cleaning - white. Handicap units Kitchen Range to be Tappan TEF303B self-cleaning, white.

2.5 Unit Kitchen Range Hoods: Broan 41000 vent-free, 30", white.

3. EXECUTION:

3.1 INSTALLATION

A. All installation shall be done in a quality first-class manner according to Drawings and layouts shown, and shall be according to manufacturer's recommendations.

B. Kitchen cabinets and vanities: shall be installed by experienced cabinet installers in a craftsman like manner, as though this were really "cabinets". Securely screw cabinets to blocking in the walls. Blocking shall be in place at top and bottom of wall and base cabinets, and screws shall be long enough to penetrate blocking 1-1/4" minimum.

Cabinets shall be level and plumb. If leveling cabinets puts them visually out of line with other elements (wall line, window sill, door casing, etc.) Architect shall be notified. Countertops shall be tight to the wall and joints caulked. Cabinets shall be tight to each other and in line. All doors and drawers to open freely. Work shall be left clean and right.

C. Refrigerators and ranges: Shall be set in place properly hooked up and leveled.

D. Range hoods shall be new secured in place by means of screws hidden from view.

E. The contractor shall check and make necessary adjustments to insure that all installed items operate faultlessly.

F. Touch up any dings, scratches or other marks with color matching original.

G. Contractor to coordinate installation of items in this Section with that of related mechanical trades: 15000 Plumbing and HVAC; 16000 Electrical.

H. All work under this SECTION shall be guaranteed to the Owner IN WRITING for a period of at least one (1) year. Appliance Warranty and Operation Manuals to be provided to Owner with typed listing of appliance # correlated to Apt. #.

END OF SECTION

SECTION 13945 – FIRE PROTECTION SYSTEMS-EXTENSION OF EXISTING WET PIPE AND DRY PIPE SPRINKLER SYSTEMS

PART 1: GENERAL

1.01 WORK TO BE PERFORMED

A. Work includes, but is not limited to:

1. Wet Pipe and Dry Pipe Sprinkler Systems – Adjust and extend existing sprinkler systems from existing building and design, fabricate and install a full N.F.P.A.13 sprinkler system for existing Buildings "B" and "D" which are currently protected with an egress sprinkled system only for living areas on the first thru the sixth floors. Areas "A" and "C" are currently protected with a full N.F.P.A.13 System. All rooms, hallways and above ceilings shall be protected. Dry system shall be extended to none heated areas that currently do not have coverage. Adjust existing system in areas of renovations in the existing building. All living areas shall be covered by the wet sprinkler system. ***See drawings for areas affected.**

2. The system is to be designed for light hazard occupancy in living areas and ordinary hazard in the remaining areas.

3. Expand coverage in existing stairwells in accordance with NFPA Standard 13.

4. Expand dry coverage into areas that are not currently covered where no heat currently exists. ***See drawings for areas affected.**

5. Adjust sprinklers as necessary for new work and install new heads in areas of new ceilings as well as protection of enclosed areas.

6. Installation shall be in accordance with NFPA 13 requirements and installed through a Licensed Maine installer. Design generally for residential high-rise for building over four stories.

7. Drawings of the system shall be reviewed by and acceptable to the State of Maine Fire Marshall's Office and the City of Portland Fire Department.

8. The Contractor shall confirm existing pressure and existing fire pump operation prior to designing the sprinkler system. The Contractor shall satisfy himself of an adequate water supply prior to designing the expansion of the existing system and shall confirm this through testing, etc. Provide written verification of adequate water supply, pressure and risers for the installation of the upgraded areas and coordinate with local water district.

1.02 RELATED WORK

A. Section 16721 - Fire Alarm Systems.

B. Section 01045 – Cutting and Patching.

1.03 QUALITY ASSURANCE

A. Qualifications of Installers: The entire fire protection automatic sprinkler system shall be fabricated, installed and tested by a Maine licensed Contractor well qualified to install sprinkler systems. He shall submit evidence of his qualifications upon request.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with:

1. All pertinent requirements of National Fire Codes - National Fire Protection Association (N.F.P.A. 13).

2. All pertinent requirements of the State Fire Marshall's Office and local jurisdiction, including the Portland Fire Department.

1.04 SUBMITTALS

A. Shop Drawings:

1. Before any fire sprinkler system materials are fabricated, submit complete layout and shop drawings to, and obtain approval from, the Architect/Engineer in accordance with the requirements of the General Conditions and Supplementary Conditions of these specifications.

2. Prior to the submittal for Architect/Engineer's review, secure the approval and stamp of review of the Fire Rating Bureau having jurisdiction.

3. Upon request, the Architect/Engineer will furnish without charge to the Contractor one set of reproducible transparencies or CAD. file of those drawings included in the Contract Documents, which may be suitable for use in preparation of layout drawings and only to be used as reference by the Contractor which shall field verify existing conditions.

4. Shop drawings shall include:

a. Layout drawing of the complete overhead sprinkler system indicating relationship of all other overhead items including ducts, ceiling air diffusers, lighting fixtures, beams, piping and all other items.

b. All items and data required to be shown by the Fire Rating Bureau having jurisdiction.

c. Complete details and sections as required to clearly define and clarify the design, including a materials list with catalog cuts describing all proposed materials by manufacturer's name and catalog number.

d. Automatic Sprinkler Systems: Complete piping and sprinkler-head layout for the sprinkled areas, including complete hydraulic computer calculations. These drawings shall indicate accurate locations of all piping, sprinkler heads, drain locations and other apparatus associated with these systems in respect to architectural conditions, structural conditions, lighting layouts, speaker layouts, detector layouts, ducts and diffuser layouts, plumbing, mechanical and electrical layouts. Approval of the same drawings and calculations must first be obtained from the Architect/Engineer.

A. As-Built Drawings: During progress of the work, maintain an accurate record of all changes made in the fire sprinkler system installation from the layout and materials shown on the approved shop drawings.

B. Manual: Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect/Engineer for the Owner two copies of a manual describing the system. Prepare manuals in durable plastic binders approximately 8-1/2" X 11" in size with at least the following:

1. Identification on, or readable through, the front cover stating general nature of manual.

2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the installation.

3. Complete instructions regarding operation and maintenance of all equipment involved.

4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.

5. Copy of all guarantees and warranties issued.

6. Copy of the as-built drawings.

7. Where contents of manuals include manufacturer's catalog pages, clearly indicate the precise items included in this installation and delete, or otherwise clearly indicate, all manufacturer's data with which this installation is not concerned.

1.05 PRODUCT HANDLING

A. Protection: Use all means necessary to protect fire sprinkler system materials before, during, and after installation and to protect the installed work of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

1.06 GUARANTEE

A. This contractor shall guarantee all materials and workmanship furnished by him or his Subcontractors to be free defects for a period of one year from the date of final acceptance of the completed systems and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner.

PART 2: PRODUCTS

2.01 DESIGN

A. General:

1. The design shall be complete in all regards and shall include, but not necessarily be limited to:

a. Connection to existing wet and dry sprinkler risers and modify to meet current need as applicable, including all required valves, fittings and other items for coverage.

2. Sprinkler work shall be laid out to adequately cover the areas of the building in accordance with the requirements of all authorities having jurisdiction over its installation and to afford adequate clearance with the work of the Heating, Ventilating, Plumbing and Electrical Contractors. Piping shall generally be run parallel to walls and girders. Before installing any piping, the Sprinkler Contractor shall consult with the Contractors for the other trades to avoid interfering with their work, and he shall be responsible for any expense involved due to negligence in not so doing.

3. All piping in areas having ceilings shall be concealed including supply mains through finished areas, except where side-wall sprinklers are required. If exposed sprinkler piping becomes necessary, submit prior to any work beginning for approval with all documentations and reasons with solutions to the Architect and Engineer. ***No after-fact approval will be given,** submission and approval will be required before any work begins.

2.02 MATERIALS

A. The quality of materials required for this installation shall be that required by the agencies having jurisdiction.

1. SPRINKLER HEADS:

   a. All sprinkler heads shall be quick response U.L. listed sprinklers and shall be ordinary type tested in accordance with UL-199. Sprinkler heads shall be of the required temperature rating for space usage.

   b. Finished areas: Commercial Quick Response, Recessed, Pendent & Sidewall, Automatic Sprinkler Heads - with recessed escutcheon, support cup and head to be painted white by manufacturer.

   c. Unfinished Areas (closets, etc.): Commercial Quick Response, Pendent, Upright & Sidewall (completely heated areas), with brass finish.

   d. Unfinished & Mechanical Areas: Upright or Pendent, Automatic Sprinkler with brass finish.

   e. In addition to the heads actually required for system, Contractor shall furnish three (3) extra sprinkler heads of each type, finish and temperature rating used and two suitable wrenches, all contained in a metal cabinet. The cabinet shall be installed in the same room as the sprinkler entrance valve.

   f. Sprinkler Guards: Provide and install sprinkler guards in all areas where sprinklers might be subject to mechanical damage. Units to be compatible with sprinkler heads.

2. Pipe:

   a. Sprinkler piping shall be all metal and in accordance with NFPA Pamphlet #13.

3. Valves:

   a. All valves shall be the product of one approved manufacturer and shall be designed for pressures suitable for the duties to be imposed upon them in the system. They must be in accordance with the requirements of authorities having jurisdiction over the work.

   b. All shut-off valves on system shall have supervisory switches furnished and installed.

4. Flow Switches: Furnish and install a water flow detector to indicate system water flow. Flow switches have 0 to 60 second retard devices set at a minimum of 30 seconds.

5. FITTINGS:

   a. All fittings shall be the products of an approved manufacturer's standard weight and shall be designed for pressure suitable for the duties to be imposed upon them in the system.

   b. Screwed fittings shall have clean cut tapered threads.

   c. Fittings shall conform to the requirements of NFPA 2 – Chapter 3.

6. PIPE HANGERS:

a. All horizontal piping shall be supported at intervals required by NFPA # 13. Piping in the computer rooms running perpendicular to the hollow metal framing system shall be supported at the crossing of each channel.

b. All vertical piping shall be securely anchored and provided with alignment guides where necessary.

c. Pipe hangers shall be of the type approved and listed in NFPA Pamphlet # 13.

d. Pipe shall not be supported from piping of other trades.

7. SLEEVES AND ESCUTCHEONS:

a. Contractor shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than the pipe. Piping passing through walls other than masonry shall be provided with # 24 gauge galvanized steel tubes with wired or hemmed edges.

b. Sleeves set in concrete floors shall finish flush with the underside but extend a minimum of one inch above the finish floor. Sleeves set in partitions shall finish flush with each side.

c. Where piping passes through finish walls, floors, ceilings and partitions, provide and set two piece white coated steel floor and ceiling plates.

d. Space between sleeves and pipes shall be caulked with high temperature rope to make smoke and water tight.

8. ELECTRICAL ALARMS:

a. Electrical contacts, supervisory switches on all valves shall be supplied and installed.

b. Connection to the alarm and supervisory contacts and all wiring shall be provided under this section.

2.03 EXPANSION AND CONTRACTION

A. Long runs of pipe shall be provided with suitable means to permit free movement resulting from expansion and contraction of the pipe.

PART 3: EXECUTION

3.01 SCOPE

A. It is the intent of these specifications that the Contractor design and install the various fire protection systems to meet the specifications contained herein, including the various design and performance criteria delineated, and to be responsible for the actual performance of the system according to these criteria.

B. SPRINKLER DESIGN CRITERIA:

1. The automatic sprinkler system shall conform to the requirements of NFPA and BOCA.

2. Penetrations of rated assemblies shall be fire stopped.

3. Installation of the sprinkler systems shall not be started until complete plans and specifications (including water supply information) have been approved.

4. At various stages and upon completion, the system must be tested in the presence of the enforcing agency.

5. The system for all living space coverage shall be a wet pipe system.

6. Occupancy Classification for submission (Note: All data marked with an asterisk (*) shall be filled in and approved by regulating agency).

   a. (*) Hazard, Groups (*) maximum area of (*) square foot area of application.

   b. Minimum discharge density of (*) gpm/sq. ft. over the most hydraulically remote (*) square foot area of application.

   c. Maximum average discharge density of (*) gym/sq. ft. over any (*) square foot area of application.

   d. The hydraulic data used in the hydraulic calculations. Data based on existing building service.

7. The actual layout is the responsibility of the Contractor.

8. The Contractor shall prepare system hydraulic calculations and submit them with the construction shop drawings. The calculations shall be prepared as indicated in NFPA 13. Calculations shall be prepared for as many areas of application as necessary to demonstrate to the satisfaction of the Architect/Engineer that the design meets the criteria as outlined herein.

9. No construction work shall be done without hydraulic calculations and working plans approved by the Architect/Engineer. No materials without the Architect/Engineer's approval submittals shall be installed.

3.02 SURFACE CONDITIONS

A. Inspection:

1. Prior to commencement of each stage of the fire sprinkler system installation, carefully inspect installed work of all other trades and verify that all such work is complete to the point where installation may properly commence.

2. Verify that fire sprinkler system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect/Engineer.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been completely resolved.

3.03 CUTTING AND PATCHING

A. All cutting and patching incidental to the installation of the apparatus and work shall be executed by this Contractor, who shall furnish the Owner with all locations and details as required.

3.04 INSTALLATION

A. Install the complete fire sprinkler system in strict accordance with all pertinent codes and regulations and the requirements of the Fire Rating Bureau having Jurisdiction.

B. No construction work shall be done without hydraulic calculations and working plans approved by the Architect/Engineer. No materials without the Architect/Engineer's approval submittals shall be installed.

C. Sprinkler Systems:

1. Shall include all piping.

2. All exposed and concealed horizontal lines of pipe shall be carried on specified hangers properly spaced and set to allow the pipe to adjust for expansion and contraction. Trapeze hangers shall be used for supporting groups of pipes. Piping in parallel shall be evenly spaced and supported.

3. All piping shall be concealed in ceilings, furred walls and partitions, and pipe spaces, except where specifically noted otherwise. All piping runs shall be checked before hand and with all other trades to ensure clearance. Provide maximum headroom and run piping to maintain proper clearance for maintenance and to clear openings in exposed areas. Piping shall be run in strict coordination with mechanical ducts and equipment, structural, and architectural conditions. When other work prevents installation of the piping, the Contractor shall reroute piping as directed by the Architect/Engineer at no increase in contract price. The Contractor shall verify all inverts and pitched lines of other trades before starting work.

4. Piping shall be installed parallel to or at right angles with the building's walls and shall be tight to walls or columns wherever possible, except where otherwise shown on the drawings. Piping exposed on walls or columns shall be secured with Super Strut, Unistrut, or approved equal.

5. No valve and no piece of equipment or trim shall support the weight of any pipe. All valves and other trim shall be installed in accessible locations.

6. Coordination and Clearances: The installation shall fit into the spaces provided. It is the essence of this contract that all work be completely coordinated with other trades and that all lines, grades, slopes, and vertical and horizontal locations of pipes be exactly determined in the field and cleared with all other trades before installation of these items is begun. Install all piping and equipment allowing for work by other trades.

3.05 FLUSHING

A. Fire Protection Systems: After completions of all work in each section of the water-piping systems and prior to testing, thoroughly flush all piping to remove all foreign materials and to thoroughly clean the piping.

3.06 TESTING

A. Upon completion of the fire sprinkler system installation, furnish all personal equipment required and test and retest the complete system, making all adjustments necessary to secure the approval of the Fire Rating Bureau and Fire Marshal having jurisdiction. Report testing on the forms provided for above ground piping.

B. Testing shall include all new sprinkler piping in the building.

3.07 ACCEPTANCE

A. After the fire sprinkler system has been completely approved, secure a letter of final acceptance from the Fire Rating Bureau having jurisdiction and deliver three copies of the letter to the Architect/Engineer.

****END OF SECTION****

SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1: GENERAL

1.01 WORK INCLUDED

A. Basic Mechanical Materials and Methods for Division 15 includes, but is not limited to, the following:

1. Mechanical Insulation - Section 15250

a. Hot Water Piping - Heating

2. Heating, Ventilating and Air Conditioning - Section 15500

a. Hot Water Heating and Piping - Heating

b. Hot Water Specialties

c. H.V.A.C. Pumps

3. Roof Top Unit – Section 15782

a. Roof Top Gas Fired Air Handling Unit

4. Distribution - Section 15880

a. Ductwork (Low Pressure 2" wg)

b. Ductwork Accessories

5 Controls - Section 15950

a. Digital Control Center

b. Sequence of Operation

aa. Primary Pump Control (Two existing pumps with third new primary pump)

bb. New Master zone valve control

cc. New Roof Top Gas Fired Air Handler

6. Testing, Adjusting and Balancing - Section 15990

a. Air System

b. Piping System

B. Definitions:

1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.

2. Fire and Smoke Barriers require sealing around penetrations with fire rated material in accordance with NFPA-101: Two-hour partitions, one-hour partitions, smoke partitions, and floors. Chase enclosures and partitions above ceilings are included. (Pipe and duct insulation through these penetrations must be a high temperature rated material such as rock wool.)

3. Option or Optional: Contractor's choice of an alternate material or method.

1.02 RELATED WORK

A. Section 16000 - Basic Electrical Requirements

1.03 QUALITY ASSURANCE

A. Objectionable Noise and Vibrations:

1. Mechanical and electrical equipment shall operate without objectionable noise or vibration, as determined by the Engineer.

2. If such objectionable noise and vibration should be produced and transmitted to occupied portions of building by apparatus, piping, ducts, or any other part of mechanical and electrical work, make necessary changes and additions, as approved, without extra cost to Owner.

B. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least two years prior to bid opening. Provide list of users upon request.

2. Equipment Service: Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located, in the opinion of the Architect/Engineer, reasonably close to the site.

3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.

4. Assembled Units: Manufacturer's of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.

5. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

C. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect/Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

D. Installation: Erect equipment in neat and workmanlike manner; align, level and adjust for satisfactory operation; install so that connecting and disconnecting of piping and accessories can be made readily, and so that all parts are easily accessible for inspection, operation and maintenance and repair. Minor deviation for indicated arrangements may be made as approved.

E. Welding: Before any welder performs any welding, submit a copy of the welders certification as a certified welding mechanic. All welding shall be executed using the best practice of the trade.

F. Site Visit: The Contractor estimating and submitting a bid for the work covered by this section of the specifications shall visit the site, and view conditions as they exist prior to submission of a bid. The submission of a bid shall be taken as evidence that the bidder has examined the existing conditions and has satisfied himself as to the various requirements, obstacles and advantages of performing the work. No subsequent allowances will be made in this respect due to failure of the Contractor to meet the full requirements of this specification.

G. Protection of Equipment and Materials: Responsibility for care and protection of all materials and mechanical work rests with the Contractor at all times until the entire project has been completed, tested, and the project is accepted. Damaged equipment shall be placed in first class operating condition or be returned to the source of supply for repair or replacement to the satisfaction of the Architect/Engineer.

H. Guarantee: All work except under this section shall be guaranteed for one year as stated in General Conditions.

1.04 SUBMITTALS

A. In accordance with Section 01340 - Shop Drawings, Product Data and Samples.

1. Submission:

a. Mark the submittals "Submitted Under Division 15 - Mechanical".

b. Submittals shall be marked to show specification reference including the section and paragraph numbers, and identification numbers shown on plans.

2. Manufacturer's Literature and Data shall be submitted under the pertinent section (see individual sections) rather than under this section.

a. Submit belt drive with the driven equipment.

b. Submit electric motor data with the driven equipment.

c. Equipment and materials identification.

d. Firestopping Materials

e. Wall floor and ceiling plates.

3. Maintenance Data and Operating Instructions:

a. Maintenance and operating manuals for systems and equipment.

b. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment.

4. Substitutions:

a. The bid shall be based on the materials or products as specified. Whenever in the specifications a particular article is specified by proprietary name, names, or "approved equal", the bidder shall base his bid on one of the above. The first name listed in the specifications is the name design was based on and scheduled.

b. Any materials or products not herein specified, but worthy of consideration shall be so noted in a separate letter attached to his Proposal Form stating supplier, manufacturer or name and the amount to be added to or deducted from base bid and his reasons for the suggested substitution. He shall also assume the costs necessary for revision in the project due to this substitution.

1.05 PROJECT CONDITIONS

A. Regulatory Requirements:

1. Obtain and pay for all required permits, inspections, licenses, etc.

2. Execute all work to conform to the requirements of all Local, State and Federal laws, regulations, etc., applicable to the work.

B. Drawings:

1. The general location of the apparatus and the details of the work are shown on the drawings, which form a part of this specification. Exact locations are to be determined at the building as the work progresses, and shall be subject to the Architect/Engineer's approval.

2. Anything shown on the drawings and not mentioned in the specifications or vice versa, shall be furnished as if it were both shown and specified.

3. It is not intended that the drawings shall show every pipe, fitting or appliance, but it shall be a requirement to furnish without additional expense, all material and labor necessary to complete the systems in accordance with the best practice of the trade.

1.06 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

1. American National Standards Institute (ANSI) Specifications.

2. Air Moving and Conditioning Association (AMCA).

3. American Society of Mechanical Engineers (ASME).

4. American Society for Testing and Materials (ASTM).

5. National Fire Protection Association (NFPA).

6. American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE).

PART 2: PRODUCTS

2.01 ELECTRIC MOTORS

A. Provide special energy efficient motors as scheduled below. Unless otherwise specified for a particular application, use electric motors with the following requirements.

1. All motors furnished shall meet NEMA requirements and shall have an operating temperature of not to exceed 40 degrees C above ambient temperature and be so marked.

2. All motors shall be of the open drip-proof type, except as noted. Motors may be furnished of fully enclosed type if it is the standard equipment.

3. Energy efficient motors shall be high efficiency design, NEMA design B with NEMA nominal efficiency of the following:

MINIMUM GUARANTEED ELECTRIC MOTOR EFFICIENCIES

HORSEPOWER RATING	PERCENTAGE EFF.- 3600 RPM
1	78
5	86.3
7.5	87.7
10	89.0
20	91

4. Starters: Except where specified otherwise, and where furnished with packaged units, manual or magnetic starters shall be provided under Division 16 - Electrical. It shall be the responsibility of this division for proper overload elements sized for protection of the motor in accordance with manufacturer's recommendations. Provide overload protection for each phase conductor. Provide disconnects for each piece of equipment.

2.02 EQUIPMENT AND MATERIALS IDENTIFICATION

A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings and in the maintenance manuals.

B. Valves:

1. Tags for valves provide 1-1/2" octagonal with 1/2" indented numerals. Engraved black filled numbers and letters or rigid black plastic with white letters equal to Seton Series 2961 not less than 1/4" for service designation

attached with brass "S" hook or brass chain.

2. Valve Lists: Provide three copies of typed or printed plastic coated card(s), sized 8-1/2" by 11" showing tag number, valve function and area of control, for each service or system. Provide one copy of each chart framed and mounted where requested.

2.03 FIRE-STOPPING

A. Rock Wool: Minimum four pound per cubic foot density; flame spread 15, smoke developed 0, fuel contribution 0 by ASTM E84; minimum melting point 2000 degrees F.

B. Wall and Floor Seal for Bare Pipe: Factory assembled unit, constructed of fire resistant silicone rubber seal elements compressed in a sleeve or core drilled hole by steel pressure plates. Seals shall be suitable for normal operating conditions up to 450 degrees F pipe surface temperature and fire tested/rated in accordance with ASTM E119.

C. Concrete and masonry are also approved firestop materials by NFPA 90A.

2.04 FOUNDATIONS

A. Ceiling Mounting: Where ceiling mounting is indicated or specified, use suspended platform or strap hangers, bracket, or shelf, whichever is most suitable for equipment and its location. Construct of structural steel members, steel plates, rods, as required, brace and fasten to building structure or to inserts as approved.

B. Floor Mounting: Where floor mounting is indicated, a 4" raised concrete pad of adequate size shall be provided.

2.05 TOOLS AND LUBRICANTS

A. Furnish and turn over to the Owner special tools not readily available commercially that are required for disassembly or adjustment of equipment and machinery furnished.

B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.

C. Lubricants: A minimum of one quart of oil, and one pound of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

2.06 ASBESTOS

A. Any equipment or material which has asbestos as a component will not be allowed on this job.

B. In accordance with Division 1 - General Requirements, Contractor shall provide certification that all materials and equipment used for construction under this contract are 100% asbestos free.

PART 3: EXECUTION

3.01 INSTALLATION

A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified. All work to abide by all codes and intent of drawings and specifications with the best practices of the trade. See Section 01000 - General Conditions.

B. Protection and Cleaning:

1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations. Damaged or defective items shall be replaced.

2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water chemical, or mechanical injury. At completion of all work, thoroughly clean fixtures, exposed materials and equipment.

3. After satisfactory completion of pressure tests, before permanently connecting equipment, strainers, and the like, clean equipment thoroughly, blow and flush piping for a sufficient length of time as directed, so that interiors will be free of foreign matter.

4. Fill, vent and circulate the system with approved solution in accordance with equipment manufacturer's recommendations, allowing it to reach design or operating temperatures. After circulating a few hours, the system should be drained completely.

3.02 PAINTING

A. All exposed ironwork, including steel supports, hangers, etc., shall be painted two coats of approved machine gray prime.

B. Painting specifically noted on equipment.

3.03 ELECTRICAL WORK

A. Provide and erect all motors, disconnects, pilot lights, controllers, limit switches, etc., as herein specified.

B. Wiring for controls shall be as specified under Automatic Temperature Controls.

C. Except as noted, all other required line switches, starters, fused switches, disconnects, etc., and all necessary wiring to properly connect all equipment to motors and switches will be furnished and installed under Division 16 - Electrical of these specifications.

3.04 OPERATING TEST FOR PIPING SYSTEMS

A. Reports: Perform required tests and submit the test reports and records to the Architect/Engineer.

B. Piping System Testing: All piping shall be tested periodically during the progress of the work. The Contractor's shall provide necessary labor, test pump, gauges, meters, other instruments and materials. All tests shall be made in the presence of the Architect/Engineer's representative. No joint or section of piping shall be left untested.

1. Before testing piping systems, remove, or otherwise protect from damage, control devices, air vents, other parts, which are not designed to stand test pressure.

2. Hydrostatic Pressure: Test hydrostatically, piping to one and one-half times the maximum working pressure, but in no case to less than 75 psig, for at least four consecutive hours, during which time pressure shall remain constant without pumping. Subject welded joints to hammer tests while under hydrostatic pressure.

3. Closing of Work: Do not paint, cover or conceal piping, including radiation and cooling coil branches, swing joints and the like, before testing and obtaining approval.

3.05 INSTRUCTION AND CHARTS

A. After completion of the installation work called for in this specification, the Contractor and his Subcontractor shall furnish necessary mechanics or engineers for the adjustment and operation of the plant, to the end that the plant may be perfectly adjusted and turned over to the Owner in perfect working order. The Contractor shall further instruct the Owner's authorized representative in the care and operation of the installation, providing all required framed instruction charts, directions, etc. The Contractor shall provide a minimum of two (2) days instruction.

3.06 RECORD DRAWINGS

A. The Contractor shall keep on the job, a set of blue-line prints neatly marked in red ink showing any changes to the installation. These shall be given to the Architect/Engineer at the completion of the work.

END OF SECTION

SECTION 15250 - MECHANICAL INSULATION

PART 1: GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, equipment, supplies, and perform all operations necessary to complete the following insulation work, in accordance with the drawings and these specifications which includes but is not limited to:

1. Hot Water Piping - Heating- All new and existing impacted or damaged piping

1.02 RELATED WORK

A. Section 15050 - Basic Mechanical Materials and Methods

B. Section 15500 - Heating, Ventilating and Air Conditioning

1.03 SYSTEM DESCRIPTION

A. Definitions:

1. Air Conditioned Space: Space directly supplied with heated or cooled air.

2. Cold: Equipment, ductwork or piping handling media at design temperature of 60 degrees F or below.

3. Chilled Water: Piping at design temperature of 45 degrees F or below.

4. Exposed: Piping, ductwork and equipment exposed to view in finished areas including mechanical equipment room.

5. Hot: Ductwork handling air at design temperature above 60 degrees F; equipment or piping handling media to 100 degrees F or above.

6. Pcf: Density, pounds per cubic foot.

7. Runout: Branch pipe connection up to one inch nominal size to a terminal unit such as a fan-coil unit.

8. Thermal Conductance: Heat flow rate through materials.

   a. Flat Surface: BTU per hour per square foot.

   b. Pipe or Cylinder: BTU per hour per linear foot.

9. Thermal Conductivity (K): BTU per inch thickness, per hour, per square foot, per degree Fahrenheit temperature difference.

1.04 QUALITY ASSURANCE

A. Criteria:

1. Comply with provisions of NFPA 90A.

2. Specified K factors are at 100 degrees F mean temperature unless stated otherwise.

3. Where optional insulation material is used, select thickness to provide thermal conductance no greater than that for the specified material. For pipe, use insulation manufacturer's published heat flow tables. For a flat surface, thermal conductance equals thermal conductivity (K) divided by the thickness of the insulation.

4. All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surfaces to which applied in either the wet or dry state.

5. Required burning characteristics for insulating materials - (including covering):

a. Flame Spread Rating: Not over 25.

b. Smoke Developed: Not more than 50.

c. Test Methods: ASTM E84, UL 723, or NFPA 255.

d. Underwriters Laboratories, Inc., label or listing, or satisfactory certified test report from an approved testing laboratory will be required to show that surface burning characteristics for materials to be used do not exceed specified ratings.

e. Materials excepted from specified ratings:

1) Factory premolded one-piece PVC fittings and valve corners.

2) Weatherproof coating.

3) A smoke developed rating of 150 is acceptable for flexible unicellular insulation based on test of 1/2" thick material. Material used only where specified hereinafter.

B. Every package or standard container of insulation or accessories delivered at the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.

1.05 SUBMITTALS

A. In accordance with Section 15050 - Basic Mechanical Materials and Methods, furnish the following:

1. Manufacturer's Literature and Data:

a. Insulation Materials: Each type used.

b. Insulation Facings and Jackets: Each type used. Make it clear that white finish will be furnished for exposed equipment.

c. Insulation Accessory Materials: Each type used.

d. Manufacturer's installation and fittings fabrication instructions for flexible unicellular insulation.

e. Make reference: To applicable specification paragraph numbers for coordination.

1.06 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

1. American Society for Testing and Materials (ASTM) (Latest Edition):

C 449-77	Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
C 585-76	Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
D781-68	Puncture and Stiffness of Paperboard, Corrugated and Solid Fiberboard, Test
E84-79b	Surface Burning Characteristics of Building Materials Test
E119-78	Fire Tests of Building Construction and Materials
E136-73	Noncombustibility of Elementary Materials, Test

2. National Fire Protection Association (NFPA) (Latest Edition):

NFPA 255	Surface Burning Characteristics of Building Materials - 1976
NFPA 90A	Air Conditioning and Ventilating Systems - 1978

3. Underwriters Laboratories, Inc. (UL):

UL 723	Tests for Surface Burning Characteristics of Building Materials

PART 2: PRODUCTS

2.01 INSULATION FACINGS AND JACKETS

A. Puncture Resistance: 50 units (ASTM D-781).

B. Noncombustible Vapor Barrier Jacket:

1. All pipe insulation jackets, unless approved otherwise, facings and jackets shall be white all service type (ASJ) suitable for painting without sizing.

2. Fire and smoke treatment of jackets and facings shall be permanent. The use of water-soluble treatments is not acceptable.

3. Pipe insulation jackets shall have a 1-1/2" minimum lap at longitudinal joints and not less than 3" butt strips at end joints. Facing on board, blanket and block insulation shall have 2" laps or 3" minimum butt strips. Butt strip material shall be the same as the jacket or facing. Laps and butt strips may be self-sealing type with factory applied pressure sensitive adhesive.

C. PVC Fitting Cover (Optional): Prefabricated of one piece PVC insulated fitting cover equal to "Zeston" or equal will be acceptable. Provide color match, vapor barrier, pressure sensitive tape, etc.

2.02 FIBER GLASS INSULATION FOR PIPE INSULATION

A. Refer to Part 3 - Execution for items not to be insulated.

B. Glass fiber insulation shall have a minimum density 6 pcf, k = 0.24, for use at temperatures of 0 degrees F to 450 degrees F.

C. Pipe covering, standard thicknesses per ASTM C585 modified by industry standard, in nominal thickness as tabulated below for piping.

PIPE INSULATION TABLE

Pipe Size	**Heating Hot Sup. and Ret.**	
1" and less	1"	
1-1/4" to 2"	1-1/2"	
2-1/2" to 4"	1-1/2"	
5" and larger	2"	

D. Materials shall be as manufactured by Owens-Corning, Gustin-Bacon, CertainTeed, Johns-Manville or approved equal.

2.03 INSULATION ACCESSORY MATERIALS

A. Insulation Inserts at Supports on Outside of Insulation:

1. Material: Hydrous calcium silicate, equal to Manville Thermo-12, of same thickness as adjacent insulation.

2. Provide for all Piping: Install with metal insulation shields furnished with pipe supports. Minimum insert length: 10" for up to 3" pipe; 12" for 3" to 6" pipe; and 16" for 8" to 10" pipe.

B. Mechanical Fasteners:

1. Pins, Anchors: Welded pins, or metal or nylon anchors with tin-coated or fiber washer, or clips. Pin diameter shall be as recommended by the insulation manufacturer.

2. Staples: Outward clinching monel or stainless steel.

3. Wire: 18 gauge soft annealed galvanized, or 14 gauge copper clad steel or

nickel copper alloy.

4. Bands: 3/4" nominal width, brass, galvanized steel, aluminum or stainless steel.

C. Reinforcement and Finishes:

1. Glass Fabric - Open Weave: ASTM D1668, Type III (resin treated) and Type I (asphalt treated).

2. Glass Fiber Fitting Tape: Mil. Spec. MIL-C-20079 Type II, Class 1.

3. Tape for Flexible Unicellular Insulation: Scotch No. 472, Nashua PE-12, or approved equal recommended by the insulation manufacturer.

4. Hexagonal Wire Netting: One inch mesh, 22 gauge galvanized steel.

5. Corner Beads: 2" x 2", 26 gauge galvanized steel, or 1" x 1", 28 gauge aluminum angle adhered to 2" x 2" Kraft paper.

D. Firestopping Material: Refer to Section 15050 - Basic Mechanical Materials and Methods.

PART 3: EXECUTION

3.01 GENERAL INSULATION REQUIREMENTS

A. Required pressure tests of joints and connections shall be completed and the work approved, by the Architect/Engineer, for application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale and rust removed.

B. Insulate each pipe individually. Do not use scrap pieces of insulation where a full-length section will fit. Labels and trademarks shall be removed.

C. Insulation materials shall be installed in a first class manner with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Seams shall be concealed where possible. Insulation shall be continuous through all sleeves and openings and run continuously at all pipe hangers. Rigid insulation inserts shall be installed under hangers. Galvanized metal shields shall be applied between hangers and insulation inserts. Shields shall be formed to fit the insulation and shall extend up the center line of the pipe and the length specified for the insulation hanger inserts less 4" to allow for vapor sealing butt joints on each side of shields. Vapor barriers shall be continuous and uninterrupted throughout systems with operating temperature 60 degrees F and below. Lap and seal vapor barrier over ends and edges of insulation. Anchors, supports and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of six inches.

D. Construct insulation on parts of equipment, such as chilled water pumps, that must be opened periodically for maintenance or repair, so insulation can be removed and replaced without damage. Install insulation with bolted 20 gauge galvanized steel or aluminum covers as complete units, or in sections with all necessary supports, and split to coincide with flange/split of the equipment.

E. Items Not To Be Insulated:

1. Vent to atmosphere, discharge from safety and relief valves.

F. Apply insulation materials subject to the manufacturer's recommended temperature limits. Apply adhesives, mastics and coatings at the manufacturers recommended minimum coverage.

3.02 INSULATION INSTALLATION

A. Molded Fiberglass Pipe and Tubing Covering:

1. Fit insulation to pipe aligning longitudinal joints. Seal longitudinal joint laps and circumferential butt strips by rubbing hard with a nylon-sealing tool to assure a positive seal. Staples may be used to assist in securing insulation. Staples shall not penetrate more than one half the insulation thickness. Seal all vapor barrier penetrations with vapor barrier mastic. Provide inserts and install with metal insulation shields at outside pipe supports.

2. Contractor's options for fitting, flange and valve insulation:

a. Insulating and finishing cement for fitting sizes less than 4" operating at surface temperature of 100 degrees F or more.

b. Factory premolded, one piece PVC covers with mineral fiber inserts. Provide two insert layers for pipe temperature below 40 degrees F or above 250 degrees F. Secure first layer of insulation with twine. Seal seam edges with vapor barrier mastic and secure with fitting tape.

c. Factory molded or field mitered sections, joined with adhesive or wired in place. For cold fittings, 60 degrees F or less, vapor seal with a layer of glass fitting tape imbedded between two 1/16" coats of vapor barrier mastic.

d. Fitting tape shall extend over the adjacent pipe insulation and overlap on itself at least two inches.

B. Pipe insulation at penetrations of floors and of fire partitions of walls, including chase walls, fire rated two hours or more:

1. Wrap pipe with rock wool pipe insulation, seal jacket seam and seal end joints to adjacent sections of insulation.

2. Seal opening between insulation and sleeve with firestop material.

C. Firestopping: Fill openings around insulated ducts or piping penetrating floors, or fire rated partitions, including chases, with firestop material.

END OF SECTION

SECTION 15500 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1: GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, equipment, supplies and perform all operations to complete the HVAC work in accordance with the drawings and these specifications which includes, but is not limited to the following:

1. Hot Water Heating Piping System

2. H.V.A.C. Pump

B. Definitions:

1. Low Pressure Piping System: For those referenced in this specification for a hot water heating system of working pressure of 80 psi or less.

1.02 RELATED WORK

A. Section 15050 - Basic Mechanical Materials and Methods

B. Section 15250 - Mechanical Insulation

C. Section 15950 - Controls

D. Section 15990 - Testing, Adjusting and Balancing

1.03 SUBMITTALS

A. In accordance with Section 15050 - Basic Mechanical Materials and Methods, furnish the following:

1. Manufacturer's Literature and Data:

a. All Pumps

b. Hot Water Specialties

2. Manuals - Maintenance and Operating:

a. Pumps

1.04 PROJECT CONDITIONS

A. Regulatory Requirements:

1. Installation shall meet all local, state, etc., codes.

2. All welding shall be executed only by certified welding mechanics in accordance with the best practice of the trade.

PART 2: PRODUCTS

2.01 BASE MOUNTED CENTRIFUGAL PUMP (HOT WATER)

A. General: Furnish and install a base mounted centrifugal pump specifically designed for service as indicated on the drawings. Pumps shall be equal to Armstrong as scheduled, or approved equal by Taco, Bell and Gossett or Thrust.

B. Main Components and Features: Pump shall be constructed for 175 psi working pressure and shall include the following:

1. Seals: Pumps shall be mechanical seals specifically designed for indicated service, rated 212 degrees F at 100 psig continuous operation.

2. Material: Bronze fitting with bronze impeller, hydraulically and dynamically balanced.

3. Motor: Open drip-proof motor of size and with voltage characteristics as scheduled on the drawings, shall not exceed 1,750 rpm.

4. Operating Characteristics: Pumps shall be non-overloading throughout entire operating range.

C. Other Requirements:

1. Supports: Pump mounted on a heavy cast iron base with raised lips for drain collection and with drain tappings.

2. Motors to be compatible with frequency drive, furnished under controls section 15950.

3. Submittals: Provide pump curves for each pump with the shop drawings.

4. Fused Disconnects: Furnish for each pump. (Provide time delayed fuses to match motor loads.)

2.03 PIPING, FITTINGS, VALVES AND MISCELLANEOUS MATERIALS

A. Piping:

1. Seamless scheduled 40 standard weight black steel, ASTM A-120 or ASTM A-53, National Tube Co. or equal from Bethlehem, U.S. Steel Corp. Pipe used for bending shall conform to ASTM A-53.

2. Copper tubing shall be Type "L" copper, ASTM standard specification B88.

B. Fittings:

1. Schedule 40 Pipe:

a. Screwed: 125 lb. best grade cast iron screw pattern with clean-out threads. (150 lb. malleable iron, ASTM B-16.3.)

b. Flanged: 150 lb. forged steel, slip-on or welding neck, raised or flat face as applicable.

c. Welded: Butt welded, wrought carbon steel, schedule not less than adjacent pipe.

d. Unions: Screwed through 2", 125 (250) lb. S.W.P. malleable iron, bronze to bronze (with brass to brass) seat, "Dart" or equal.

2. Copper Type "L" Pipe:

a. Cast bronze solder joint pressure fittings (ANSI B 16.18).

b. Wrought copper and bronze solder joint pressure fittings (ANSI B 16.22).

C. Nipples:

1. Nipples shall conform to requirements of US Department of Commerce Commercial Standard CS-5" pipe nipples: brass, copper, steel and wrought iron".

2. Make nipples of same material and weight as pipe whereon used, except when length of un-threaded part of standard weight nipple is less than 1-1/2", use extra strong pipe nipple.

3. Close nipples shall not be used except where specific approval is obtained.

D. Valves shall be as manufactured by Nibco, Milwaukee or approved equal.

1. Gate Valves:

a. 2" and Smaller: 125 lb. S.W.P., all bronze, non-rising, screwed bonnet, one-piece wedge, designed to permit repacking under pressure. Solder or threaded ends as applicable. Equal to Nibco T-123 or S-123 (Milwaukee 1105 or 1145).

b. 2-1/2" to 3": 125 lb. S.W.P., all bronze, non-rising, screwed bonnet, solid wedge equal to Nibco T-124 or S-124.

c. 3" and Larger: 125 lb. S.W.P., flanged, iron-body, bronze-mounted, designed larger to permit repacking under pressure. Equal to Nibco F-619 (Milwaukee F2882M). Provide chain operators where indicated.

2. Globe and Angle Valves:

a. 2-1/2" and Smaller: 150 lb. S.W.P., all bronze rising stem, union bonnet, renewable composition disk, designed to permit repacking under pressure. Solder or threaded ends as applicable. Equal to Nibco T-235 or S-235 (Milwaukee 590T or 1590T).

b. 3" and Larger: 125 lb. S.W.P., flanged, iron-body, bronze mounted, rising stem, renewable composition disk, designed to permit repacking

under pressure. Equal to Nibco F-718Y (Milwaukee F2981-M).

3. Check Valves:

   a. 2-1/2" and Smaller: 125 lb. S.W.P., all bronze, horizontal swing-type, screwed caps, bronze disk, designed to allow re-grinding of seat without removal of valve body. Solder or threaded ends as applicable. Equal to Nibco T-413B or S-413B (Milwaukee 509 or 1509).

   b. 3" and Larger: 125 lb. S.W.P., flanged, iron-body, bronze mounted, horizontal swing-type, bronze disk or bronze-faced disk. Equal to Nibco F-918B (Milwaukee F-2974-M).

4. Plug Valves:

   a. 2-1/2" and Smaller: 175 lb. wog, cast iron round port openings, lubricated, wrench operated. Equal to Walworth No. 1796.

   b. 3" and Larger: 125 lb. S.W.P., high strength cast iron, round port openings, lubricated, wrench operated. Equal to Walworth No. 1797F.

5. Ball Valves: 125 (150) S.W.P. (600 wog) conventional port, bronze construction, two piece, equal to Nibco #585, Milwaukee BA-100 threaded or BA-150 solder end, Watts B-6000 or Apollo.

E. Strainers shall be 125 lb. cast iron screwed, equipped with stainless steel removable mesh screen and manufactured by Armstrong, Muessco, or Barnes and Jones equal to Muessco No. 11 or No.751. Provide valved drain on strainers serving pumps.

F. Bolts, Gaskets and Stuffing:

1. Bolts shall be of first quality bolt steel with full threads and provided with square heads and hexagon nuts.

2. All valve stems and other stuffing boxes shall be packed with best packing for steam or water as applicable.

G. Sleeves and Plates:

1. Pipes passing through masonry or concrete walls and floors shall be provided with sleeves of steel pipe.

2. Provide steel pipe sleeves or extra heavy cast iron soil pipe sleeves for piping passing through foundations, etc.

3. Pipes passing through partitions and ceiling other than the above shall be provided with minimum 24 gauge galvanized iron tubes with wired or hemmed edges.

4. Sleeves shall be of ample size to provide for renewal of piping and be securely fastened in floors, walls, etc.

5. Where exposed piping passes through walls, floors, partitions, cabinetwork and ceilings, provide and set chrome-plated brass floor and ceiling plates of

approved design with depth to cover sleeve-projection through floor or wall. Ceiling plates are not required on insulated piping.

H. Hangers and Supports:

1. Piping suspended from overhead shall be supported by approved wrought or malleable iron hangers with adjustable solid mild steel rods except as noted.

2. Piping of 6" size or larger shall be supported by approved steel cast iron or malleable iron single rod roll type hangers with pipe covering protection saddles.

3. Piping smaller than 6" size shall be supported by approved clevis type hangers.

4. Piping run on side walls or partitions shall be supported by malleable iron brackets, adjustable swivel rings and rod hangers.

5. Hangers and support shall be as manufactured by Grinnell Co., Inc. or approved equal.

6. Pipe supports on copper tubing shall be all copper.

2.06 WATER SPECIALTIES

A. General: Furnish and install all hot water specialties as indicated and required for a complete installation. Specialties shall be as manufactured by Bell and Gossett, Sarco, Armstrong, Taco, Dole, Amtrol, or Honeywell-Braukmann.

B. Main Components and Features:

1. Drain Valves at all low points complete with hose end and caps.

2. Automatic Air Vents at major high points in system and at all high points serving units with outside air connection. Pipe to floor drain. Provide petcock shut off. Automatic air vents shall be Armstrong 21AR or Honeywell-Braukmann EA122-A.

3. Manual Vents with air chambers at other high points shall be Dole No. 10, or approved equal, with 1/8" IPS connection, key-operated. Furnish ten keys.

4. Angle Flow Combination Valve: On base mounted pump discharge provide combination shut-off balance and check valve, with spring loaded seating, cast iron body, bronze disc and seat, stainless steel stem and spring rated at 175 psig and 300 degrees F equal to Armstrong type "FTA".

5. Suction Strainer: On base mounted pumps furnish and install a combination suction strainer (stainless steel) with guide valves of cast iron body, rated at 175 lb wog at 300 degrees F equal to Armstrong type "SG".

6. Pressure Gauges: Provide and install pressure gauges of the bourdon tube type with phosphor bronze tube, 3-1/2" diameter cast aluminum core with black finish, 0 to 60 psi range dial, and equipped with a shut-off cock. Gauges shall be manufactured by Trerice, Marshaltown, or U.S. Gauge equal to Trerice No. 600 series.

7. Thermometers: Provide and install industrial thermometers with red appearing indicator, 9" aluminum core, union hub and repairable brass wells, and with adjustable angle mounting assembly. Thermometers shall be manufactured by Trerice, Marshaltown or U.S. Gauge, equal to Trerice No. BX91403- 1/2.

8. Thermometer Wells: Thermometer wells shall be installed for thermometers listed above. Thermometer wells shall be made of heavy brass, projecting a minimum of 2" into the pipe with extension to face of insulation. Provide dust excluding caps and chains. Piping 2-1/2" and smaller shall be enlarged where wells are installed, or wells shall be installed on elbow.

PART 3: EXECUTION

3.01 PIPING - GENERAL

A. Provide and erect in a workmanlike manner, all piping shown and required to complete the installation intended. Erect piping to allow sufficient clearance for expansion, application of insulation and finish painting with offsets as required to avoid other work.

B. Sizes and general arrangement, as well as methods of connecting all piping, valves, equipment, etc., shall be as indicated, or so as to meet the requirements of the Architect/Engineer.

C. All pipe used is to be new material, and all threads on piping must be full length and clean-cut with inside edges reamed smooth to full inside bore.

D. Caulking of threads will not be allowed on any piping.

E. Pipe joint compound shall be put on male thread only.

F. In the erection of mains, special care must be used in the support, working into place without springing or forcing.

G. Make such offsets as are shown and required to place the pipes and risers in proper position to avoid other work.

H. Pipes shall be anchored, guided, etc., where necessary, to prevent vibration or to control expansion.

I. Install a sufficient number of flanged fittings or unions to facilitate making possible future alterations or repairs. Unions shall be installed at all equipment, traps, fixtures and risers.

J. Piping shall be erected so as to provide for the easy passage and noiseless circulations of water, steam and condensation under all working conditions.

K. Provide 1/2" minimum size valved draw-offs with hose connection at all low points of the piping systems, apparatus, etc. Steel piping shall be installed by the use of oxyacetylene or electric welding process. Piping 3" and larger, and all expansion loops shall have butt welds and welded fittings, standard factory-fabricated tees, elbows, reducers, caps, etc. Branch outlets, 2-1/2" and smaller shall be made by the use of approved welding type 1/2 couplings, "Weldolet" or "Thredolet" fittings.

1. Piping smaller than 3" except as noted may be installed at the contractor's option with welding type, or threaded type fittings, except all piping regardless of size concealed upon completion of building construction, shall be welded.

2. Expansion offset shall be installed with long radius welding elbows.

3. All welding shall be executed only by certified welding mechanics in accordance with the best practice of the trade.

4. Copper piping and fittings shall be installed with soldered joints using the following alloy - per ASTM standard B32.

   a. 95-5 tin-antimony solder (200 degrees F at 200 psi).

L. Grooved Piping System:

1. Piping larger than 2-1/2" except as noted may be installed at the contractor's option with mechanical grooved pipe coupling system by Grinnell or equal by Vicaulic. System shall be rated to operate from -30° F to 230° F at 150 psi. Gaskets to be EPDM with properties meeting ASTM D-2000.

3.02 PIPING INSTALLATION FOR WATER SYSTEM

A. General: Unless otherwise noted, grade supply mains, up in direction of flow, at a minimum uniform slope of 1" in 40', and return mains down in direction of flow, at a minimum uniform slope of 1" in 40'. Take branch lines off bottom of main, either vertically or at a 45 degree angle as space permits.

B. Piping:

1. Steel piping shall be used for the hot water heating system.

2. Copper tubing shall be used for domestic water system.

C. Air Vents: Furnish and install at all high points in piping systems and where indicated and required, manual air vent valves.

1. Manual air vents shall be key operated.

2. Install 6" high air chamber for each vent.

D. Valving: Furnish and install the following:

1. Drain valves at all low points complete with hose end caps.

3.03 MISCELLANEOUS MATERIALS

A. Sleeves and Plates: All sleeves through all floors and through all masonry and all firewalls shall be caulked air tight with high temperature rope and sealed with lead rope (1/2" depth).

B. Hangers and Supports:

1. All hangers shall be supported from steel beams or steel angles installed

between top chord of two bar joists. Provide steel angles as required. No attachments shall be made to the floor construction or the roof deck.

2. All anchors and guide from joist construction shall be supported from steel beams or angle iron and other steelwork provided and installed between three adjoining joists.

3. Support all horizontal piping of steel wrought iron and brass as per following schedule:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1-1/4" (Incl.)	3/8"	8'0"
1-1/2" and 2"	3/8"	10'0"
2-1/2" and 3"	1/2"	10'0"
4" and 5"	5/8"	12'0"
6" and larger	3/4"	12'0"

4. Provide and set all required hangers, clamps, plates, beams, brackets, anchors, guides, expansion bolts, and ironwork required to support all piping and equipment.

*****END OF SECTION*****

SECTION 15782 – ROOFTOP UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Rooftop Gas Fired Air Handling Unit.

2. Roofcurb.

B. Related Sections include the following:

1. Division 15 - Section 15950 for control wiring and control devices.

2. Division 16 - Electrical.

1.03 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other Work. For installed products indicated to comply with design loads, include structural analysis data.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

1.04 QUALITY ASSURANCE

A. Fabricated and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration".

B. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7

C. Comply with AGA Z223.1 for gas-fired and furnace section.

D. Comply with NFPA 70.

E. Power supply to switches, fused switches, outlets, motor starters, to line terminals of equipment, and all related wiring and fuses to properly connect and operate all electrical equipment specified shall be furnished and installed under Division 16, "ELECTRICAL" (Electrical Contractor).

Division 16 shall not mount disconnect switches to indoor mechanical equipment. Coordinate all wiring between Mechanical and Electrical to provide a complete and operating system.

F. Product Options: Drawings indicate size, profiles, and dimensional requirements of air handling units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review

1.05 COORDINATION

A. Coordinate modifications to existing roof curb and installation of equipment supports, and roof penetrations with General Contractor.

1.06 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. Filters: Furnish one installed and one spare set of each type of filter specified.

2. Fan Belts: Furnish one installed and one spare set of belts for each belt-driven fan in energy recovery units.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

a. Trane

b. McQuay

c. Carrier

d. York

2.02 Rooftop Unit: Factory assembled and tested; designed for roof or slab installation; and consisting of gas-fired heating section, supply fan section, temperature controls, filters, and dampers.

A. Casing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, removable panels or access doors with neoprene gaskets for inspection and access to internal parts, minimum 1/2-inch- thick thermal insulation, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs.

B. Evaporator Fans: Forward curved, centrifugal, directly driven with permanently lubricated motor bearings.

C. Heat Exchangers: Manufacturer's standard construction for gas-fired heat exchangers and burners with the following controls:

1. Redundant, dual gas valves for modulating per drawing schedule.

2. Electronic-spark ignition system.

3. High-limit cutout.

4. Forced-draft proving switch

D. Smoke Detectors: Photoelectric detector located in supply-air plenum, to de-energize unit. Detector shall be furnished and installed by Division 16.

E. Operating Controls: Factory-installed microprocessor controls and monitors unit and communicates and is controlled by Control Section of this Division for D.D.C..

1. Control Outputs: stage heating; per drawing schedule and automatic or continuous fan operation 100% outside air make-up unit.

2. Control Sensors: Outside-air-temperature sensor, fan airflow-proving switch, dirty-filter switch, discharge-air-temperature sensor controller.

2.04 Roof Curbs: Modify existing curb to fit new make-up air unit. Duct opening shall be located as shown on the drawings and arranged for flexible type duct connection. Conform with other requirements indicated.

2.05 Motors: Refer to Division 15 Section "Motors" for general requirements for factory-installed motors.

A. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.

B. Enclosure Type: Open, drip proof.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install units according to manufacturer's written instructions.

B. Install unit level and plumb, maintaining manufacturer's recommended clearances.

A. Curb Support: Modify existing roof curb on roof structure, level, etc. Install and secure rooftop unit on curb and coordinate flashing with roof construction. Locate unit for proper discharge of supply air to existing supply ductwork.

B. Install piping to allow service and maintenance.

C. Gas Piping: Conform o applicable requirements of State of Maine "Natural Gas Piping". Connect gas piping to burner, full size of gas train inlet, and provide union with sufficient clearance for burner removal and service. Connect to existing gas supply main on roof.

D. Install ducts to termination in roof mounting frames. Insulate space between roof and bottom of unit.

E. Electrical: Conform to applicable requirements in Division 16 Sections.

F. Ground Equipment:

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

END OF SECTION

SECTION 15880 - AIR DISTRIBUTION

PART 1: GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, equipment, supplies, and perform all operations necessary to complete the air distribution work in accordance with the drawings and these specifications to include, but not be limited to, the following:

1. Ductwork

2. Duct Accessories

1.02 RELATED WORK

A. Section 15050 - Basic Mechanical Materials and Methods

B. Section 15250 - Mechanical Insulation

C. Section 15950 - Controls

D. Section 15990 - Testing, Adjusting and Balancing

1.03 SUBMITTALS

A. In accordance with Section 15050 - Basic Mechanical Materials and Methods, furnish the following:

1. Manufacturer's Literature and Data:

a. Duct Accessories, including Volume Dampers, Lining, etc.

1.04 PROJECT CONDITIONS

A. Regulatory Requirements:

1. Installation shall meet all local, state, etc., codes.

2. Fabricate and install sheet metal in accordance with applicable requirements of the ASHRAE Guide, SMACNA Manuals, and Industrial Ventilation, latest edition.

PART 2: PRODUCTS

2.01 DUCT ACCESSORIES

A. General: Provide and install all ductwork accessories of sizes and design as shown on the drawings or specified.

B. Main Components and Features:

1. Flexible Connections shall be neoprene coated glass fabric with sewed seams

equal to Vent Glass or Duro-Dyne (Metal-Fab).

PART 3: EXECUTION

3.01 SHEET METALWORK AND MATERIALS

A. General: Furnish and install all required sheet metalwork, including: intake ducts, manual dampers, turning vanes, deflectors, manual operators, screens, grilles, registers, diffusers, collars, sleeves, baffles, access doors, flexible connections, supports, etc., for the complete installation in accordance with the intent of the drawings and specifications.

1. Furnish and install supply air connections to supply air fan, etc., and all duct work connected to units, and other equipment furnished under other sections of these specifications.

B. Installation: Fabricate and install in accordance with applicable requirements of the ASHRAE Guide and SMACNA Manual. Ductwork shall conform to 2" SMACNA Pressure Class except where SMACNA requirements are exceeded by these specifications. Ductwork shall be neat, accurate, rigidly constructed and mechanically tight, as well as substantially airtight and shall provide quiet system of air transportation. Offsets of exposed ductwork shall be made on sides opposite to walls and ceilings, unless otherwise shown on the drawings or specified. Sizes, as marked on the drawings, shall be adhered to as closely as possible. The right is reserved to vary the size of ducts and flues to accommodate structural conditions during the progress of the work, without additional cost to the Owner.

C. Materials: Ductwork shall be of galvanized sheet metal or aluminum where indicated. Galvanized sheet metal shall be new copper bearing (or prime grade) galvanized steel sheets of lock-forming quality. Zinc coating that will flake or peel under any forming operation, or laminated sheets will not be allowed.

1. Thickness of metal for rectangular ducts, including elbows and other details, shall be as follows:

Longest Rectangular Dimension of Duct Inches	Thickness of Galvanized Steel USS Gauge	Thickness of Aluminum Alloy Inches
Up thru 30	24	.032
31 thru 42	24	.040
43 thru 48	22	.050
49 thru 60	20	.064
61 thru 84	18	.071
Over 85	16	.090

2. Thickness of metal for round ducts, including elbows and other details, shall be as follows:

Duct Diameter Inches	Galvanized Steel USS Gauge	Thickness of Aluminum Alloy Inches
Up thru 10	26	.040

11 thru 20	24	.050

D. Construction: Seams, joints, bracing angles and stiffeners.

1. Longitudinal Seams: Longitudinal joints in ducts not exceeding 60" in either dimension, and ducts exceeding 60" in the larger dimension but not exceed 18" in the smaller dimension, shall be either Pittsburgh lockseams or grooved seams.

2. Round Ducts: The downstream end of each section of round duct shall be crimped and beaded. Assembly shall be made by inserting the crimped end into the upstream end of the adjoining section. The joints shall be fastened in place by three or more sheet metal screws spaced not over eight inches apart.

3. Transverse Joints and Bracing Angles of Rectangular Duct shall be as follows:

Duct Size Long Side Inches	**Min. Rigidity. Class**	**Transverse Joints**	**Bracing Angles Size- Inches**	**Flat Bar**
18 or less	A	Plain "S" or drive slip	None	----------
19 thru 26	B	Standing dive slip Reinforced Drive Slip Reinforced Hemmed "S" Slip	3/4 x 3/4 x 1/8	1-1/2 x 1/8
27 thru 30	C	Standing Dive Slip Reinforced Drive Slip Reinforced Hemmed "S" Slip	3/4 x 3/4 x 1/8	1-1/2 x 1/8

Alternative joint/reinforcement methods may be used, subject to approval by the Engineer, provided that the rigidity classification is met.

Lock type as described in SMACNA Low Velocity Duct Manual.

a. Transverse Joints: Drive slips shall be used on short sides of transverse duct joints if side is less than 18". Metal and thickness of S slips and drive slips shall be same as duct. Ends of drive slips shall be bent over at least 1/2" at corners. Bar slips shall be fastened with sheet metal screws on 12" centers. Corners of all bar slip joints shall be folded over and riveted. Where intermediate type reinforcements are used as supplements for joints, they shall be attached to duct wall within 3" of the joint.

b. Stiffeners: All ducts over 18" wide shall be provided with stiffeners which may be either transverse joints or angle bracing, as indicated above. The center-to-center spacing of stiffeners shall not be over four feet for ducts not exceeding 60" (long side) and shall not be over two feet for ducts not exceeding eight feet in any case. Flat area of uninsulated ducts over 18" wide shall be stiffened by cross-breaking.

Uninsulated exposed ducts shall have flat bar reinforcement and flush seams in lieu of bracing angles and projecting seams.

c. Bracing Angles shall be of the same metal as the duct. Angles shall be riveted to the ducts on 6" centers, and shall be applied on all four sides. On vertical ducts, set of bracing angles shall be located with heel down at the floor line wherever duct passes through floor. End of two opposite angles shall extend as required to catch floor construction.

E. Duct Turns: Long radius elbows shall be provided, except as indicated hereinafter:

1. Long Radius Elbows shall be constructed with a throat radius equal to not less than the dimension to the duct width in the plane of the duct turn. Where space does not permit the use of a long radius elbow, vaned mitered elbows shall be provided.

2. Mitered Elbows: All mitered elbows shall be constructed with factory-fabricated, turning vanes equal to Barber-Colman "Ducturns."

F. Flexible Connections: Furnish and install flexible connections between all fans and ducts or casings where required to prevent excessive movement of long ducts and wherever ducts cross building expansion joints. Material shall be fabricated with sewed seams. Connections shall be approximately 4" long and installed with sufficient slack to prevent transmission of vibration.

G. Duct Hangers:

1. Ducts up to and including 36" in width shall be hung by 1" x 1/8" flat straps bent under bottom of duct a minimum of 2" q and securely fastened to duct.

2. Ducts larger than 36" in width shall be hung 3/8" steel rods and 2" x 2" x 1/4" angle trapeze hanger. Rods shall be supported by 2-1/2" x 2-1/2" x 1/4" minimum steel angles secured to two or more joist.

H. Access Doors shall be provided and installed in building construction and in casings, plenum chambers and ducts where shown and wherever else required for ready access to operating parts of any kind. Reach-through type access doors, wherever possible, shall be 16" wide by 24" high. Walk-through type access doors shall be 24" wide by 48" high.

1. Door Construction: Access doors and door frames shall be constructed of 24 gauge USS gauge galvanized sheet metal except in medium pressure ductwork construction shall be of 20 gauge. All access doors shall be double-panel construction with 1" rigid fiberglass insulation between the metal panels and equipped with two Camloc winghead studs and receptacles.

2. Door Frames: All access doors shall be mounted on the door frame with minimum of two steel or aluminum butt hinges on maximum spacing of 24".

3. Insulated Duct or Casing: On insulated duct or apparatus casings, an extension collar made of the same material and thickness to which it is attached shall be tack-welded to the door frame. Length of collar shall be determined by the thickness of insulation added to duct or apparatus casing.

I. Joint Sealants:

1. Low Pressure Ductwork: Seal joints in accordance with SMACNA Low Pressure Duct Construction Standards, Seal Class B.

a. Sealant: Resistant to gasoline, oil and water. Thermal range from minus 25 degrees F to plus 200 degrees F, flame spread rating of not more than 25 and smoke developed rating of not more than 50, withstand duct air pressure 25 percent in excess of leakage test pressure. Supplier of sealant shall certify that sealant has been successfully marketed and used for a period of three (3) years without change in formula.

b. Tape: In conformance with Fed. Std. 147, polyethylene coated cloth backing with rubber resin adhesive, four inches wide, not less than 0.0125 inches thick, withstand minimum temperature of 180 degrees F, tensile strength not less than 35 pounds per inch width and water vapor transmission rate not over 1.2 grains per 100 square inches per 24 hours.

J. Duct Leakage Tests and Repair:

1. Low Pressure Ducts: Seal visible openings and seal air leaks audible at operating conditions.

END OF SECTION

SECTION 15950 - CONTROLS

PART 1: GENERAL

1.01 DESCRIPTION

A. General: The control system shall be direct digital control (D.D.C.) with equipment furnished, installed and guaranteed by Honeywell, Maine Controls, or approved equal. Based on Lon Works Technologies open system building automation and BAC NET standard Network.

B. The Temperature Control Contractor shall provide and install a complete system of micro processor based direct digital automatic temperature control as herein specified, including all required micro processors, controllers, monitoring, I/O devices, software, sensors, transducers, wiring, thermostats, valves, relays, switches, etc. as indicated and required.

1. Work includes, but is not limited to, the following:

a. Thermostats and Sensors

b. Control Valves

c. Digital Control Cabinets (DDC)

d. Wiring of Control Devices

e. Control Devices

f. Sequence of Operation

2. Work Related and Specified Elsewhere:

a. Section 15050 - Basic Mechanical Materials and Methods

b. Section 15500 - Heating, Ventilating and Air Conditioning

c. Section 15850 - Air Handling

1.02 QUALITY ASSURANCE

A SPECIFICATION COMPLIANCE REVIEW

1. The temperature control system/BAS contractor shall supply, at the time of bid opening, a paragraph by paragraph specification compliance report. The report shall indicate for each numbered paragraph, how the contractor meets the criteria of the paragraph. The following format must be utilized in completing the compliance report:

Comply - without exception.

Qualify - meet the functional intent. For each paragraph, the contractor shall identify all differences in specific functions stated in the given paragraph and provide a description of what is excluded or how the qualifying system will meet the

function specified.

Does not comply – cannot meet specified function

2. The control systems shall be installed under the direct supervision of the control manufacturer. The manufacturer shall provide instruction and direct work in progress and shall assume complete responsibility for the final installation. The control manufacturer shall perform all tests and make the necessary adjustments, and provide free service of the installation for one year from the date of acceptance by the Owner.

1.03 SUBMITTALS

A. In accordance with Section 15050 - Basic Mechanical Materials and Methods, furnish the following:

1. Manufacturer's Literature and Data:

a. All control items, I/O devices, D.C.C., P.C.I., valves, dampers, transformers, etc., associated with the systems.

b. Complete control drawings showing all wiring, controls and written sequence of operation.

c. General application and specific application programs.

2. Manuals: All maintenance and operating equipment associated with controls.

PART 2: PRODUCTS

2.01 DIGITAL CONTROLLERS (D.C.C.)

A. Main Components and Features:

1. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system. The FMCS requires the incorporation of LonWorks Technologies using Free Topology Transceivers (FTT-10), and specific conformance to the LONMARK Interoperability Association's v3.0 Physical and logical Layer guidelines in all unitary, terminal unit and other devices.

2. LonTalk communications protocol will be used on the communication network between FMCS controllers and other LonWorks devices to assure interoperability between all devices within the network.

3. The FMCS shall support the direct integration of standard and non-standard communicating systems. At a minimum, the FMCS shall deliver connectivity at the Lon, IP, and HMI levels through standard offerings. The FMCS shall offer as a standard available solution, a minimum of 300 individual communicating interfaces to 3rd party products.

4. The FMCS shall provide a standard available test kit for development of additional interfaces by others, in addition to the FMCS manufacturer.

5. The FMCS shall provide compliance with the ASHRAE standard 135-P for BACnet

interoperability with all devices within the FMCS.

6. The FMCS shall provide a high speed Network Interface that shall plug directly into the controller node which supports one of the following types of communication standards between controller nodes:

a. Ethernet

The intent for this project is to utilize the facility Ethernet Lan as the FMCS communications backbone between the area controllers and the thin clients.

The Network Interface shall employ Carrier Sense Multiple Access/Collision Detect (CSMA/CD) contention type protocol, which adheres to the industry standard format IEEE 802.3. The content of messages shall be the manufacturer's standard. The Network Interface shall be fully Internet Protocol (IP) compliant allowing connection to currently installed IEEE 802.3 compliant Ethernet Networks.

The Network Interface shall directly support connectivity to a variety of cabling types. As a minimum provide the following connectivity: 10Base2 (ThinNet RG-58 A/U Coaxial cabling with BNC connectors), 10BaseT (Twisted-Pair RJ-45 terminated UTP cabling).

b. Echelon

The FMCS shall employ LonTalk communications utilizing the LonWorks Neuron chip on the device bus, which conforms to the International Standards Organization's (ISO) seven layer Open Systems Interconnect (OSI) network protocol model. The content of messages shall be the manufacturer's standard. The Neuron chip and a transformer-isolated transceiver shall provide for 78.8kbps communications over Category 4 Unshielded Twisted Pair (UTP) cabling.

To facilitate facility expansion or to support large Wide Area Networks (WANs) the Network Interface shall directly support a minimum of 4 logical networks using the same physical network (Ethernet or Echelon). Each logical network shall support a minimum of 126 controller nodes.

The ability to support bi-directional access to remote controller nodes shall be supported by a single point of connection. The ability to monitor

and edit system data shall be provided via the controller node remote communications connection. Connection via the HMI, the GP as well as a standard VT-100 terminal interface shall be provided. Support for solicited as well as unsolicited communications is a requirement.

c. Other Requirements:

Each stand-alone digital control cabinet shall be programmable through the hand held operator terminal or C.P.I. terminal. Software architecture shall allow both standard setups of point types, EMS Programs, loops of related parameters as well as custom program linking with math and logic. In addition, the network shall allow the building operations a means of

interrogating input/output sensor conditions, such as interrogating the values of analog sensor input upon request, or the status of control via the standard keyboard and display unit, or the P.C.I. terminal unit.

All programming shall allow a minimum of three levels of entry with code requirements; level one for general data entry; level two for overall system entry; level three for programming.

B. DDC Sensor (for all DDC controllers)

1. The DDC Sensor shall connect directly to the DDC Controller and shall not utilize any of the I/O points of the controller. The DDC Sensor shall provide a two-wire connection to the controller that is polarity and wire type insensitive. The DDC Sensor shall provide a communications jack for connection to the LON communication trunk to which the DDC controller is connected. The DDC Sensor, the connected controller, and all other devices on the LON bus shall be accessible by the Graphical Programming tool.

   a. The DDC Sensor shall be supplied in the following variations;

      Type 1) Tamper-resistant (no display)

      Type 4) Full user functions (LCD display and network-variable access and tenant override)

2. The DDC Sensor shall be provided in a modular configuration that allows for the rough in of all wiring without the presence of the electronics or aesthetic covering. The DDC Sensor shall allow for the customization of the color on the aesthetic covering as a standard offering. User interface with the DDC Sensor shall be provided as a configurable function by the FMCS, and shall offer password protection for access to network variable editing. Multiple network variables shall be accessible and editable by the DDC Sensor. Icons shall be utilized to represent sensor and controller function status, affording independence from a single language for use interface.

2.02 GRAPHICAL USER INTERFACE SOFTWARE

A. OPEN ARCHITECTURE, BROWSER BASED GUI

1. A graphical user interface shall be included and provided on the Owner's computer system with all software. This user interface shall allow, with proper password access, full interaction with the system including, but not limited to, viewing and modifying data, database administration, configuration of communications parameters, password and security administration, programming and configuration of objects, receipt, routing and acknowledgement of alarms, and development of graphic screens.

B. ALARM CONSOLE

1. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm.

2. A separate alarm notification window will supercede all other windows on the

desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

C. HOST COMPUTER HARDWARE (PERSONAL COMPUTER INTERFACE)

1. The personal computer interface (PCI) shall be by the Owner.

2. The Control installer shall provide all software functions and to tie into Owner's network system. Provide all software including windows based package with mouse driven for all data logging board with "Excel" spread sheet for customizing.

D. NETWORK LINK AND MODEM

1. Networking: provide networking hardware and software to tie P.C.I. into owners network.

2.03 DIRECT DIGITAL CONTROL (D.D.C.) OF OPERATORS

A. General: Direct control capability using a custom control program, manual command, or time program initiated commands shall be provided as a standard features of this system. It shall be possible to input a sensor or group of sensors to the D.C.C. unit, process the data using the features of a Custom Control Program, and output an analog control signal or setpoint directly to a controlled valve or damper. It shall not be necessary to provide intermediate controllers to condition the signal for the valve or damper actuator. The output signal shall be scaled in software to be compatible with industry standard control signal variables, such as three (3) to six (6) volts, six (6) to nine (9) volts.

B. Main Components and Features:

1. Motors: For each automatically-controlled damper or valve, a suitable damper motor or motors shall be provided in accordance with the following specifications:

a. Operator: Motors shall be of the fully proportioning type, non-hydraulic. The motor shall have a rating of not less than twice the thrust needed for actual operation of the damper of valve.

b. Adjustments: Motor shall have adjustable stops to adjust the open and closed positions and adjustable return spring on damper motor.

c. Mounting: Damper motor shall be provided with suitable mounting base and frame. The damper motor and mounting base shall not be mounted directly on cold or insulated ducts and casings, but shall be mounted outside the insulated covering in such a manner as to prevent sweating and interference with the insulation.

2. Sensors: Linear precision resistance elements and resistance averaging elements shall be provided for temperature sensing. Their range shall be –50 to 250 degrees Fahrenheit with an accuracy of +/- 0.5 degrees Fahrenheit.

2.04 AUTOMATIC CONTROL VALVES

A. Automatic control valves shall be furnished as follows:

1. Valves shall have removable composition discs and with monel stem. Bodies 2" or smaller shall be bronze with screwed ends. Bodies 2-1/2" and larger shall be cast iron with flanged ends. If mechanical contractor chooses grooved piping system, grooved valve ends will be acceptable. Valve bodies, trim and stuffing boxes shall be designed for not less than 125 psi working pressure. Valve packing shall be non-lubricated teflon packing.

2. Shall be fully proportioning as herein before described under operators.

3. Water valves shall be sized for approximately 2 psi drop.

2.05 ROOM ELEMENTS

A. Sensors shall be securely attached to a suitable base mounted on the wall or other building surface. Each sensor shall be located where shown or, if not shown, where it will respond to the average temperature in the room. Sensors generally shall be mounted 5 feet above floor and shall not be mounted on outside walls or partitions between offices if other locations are possible. If located on outside wall, it shall have an insulated base.

B. Apartment units shall be Type 4, in public areas Type 1, with Type 4 in maintenance office and mechanical room.

2.06 REMOTE TEMPERATURE SENSORS

A. Remote Temperature Sensors for controlling equipment with remote adjustment shall be adjustable from 45° to 75° Fahrenheit with a minimum sensitivity of not less than one degree plus or minus.

2.07 A.C. DRIVE CONTROLLERS: Furnish and install adjustable frequency A.C. motor controllers for all pumps and fans that are scheduled equal to Toshiba, Square "D", Danfoss Graham, or approved equal.

A. All motors of 3/4 HP or above are, 208 volt, three phase. Coordinate with unit manufacturer to correctly match with furnished motor.

B. Provide NEMA 1 encloser. Provide on all units speed meters in percentage.

C. Units shall interface with network direct through network card and software.

PART 3: EXECUTION

3.01 WIRING

A. Under this section provide and install all wiring associated with the temperature control system. Equipment and wiring not provided under electric sections shall be furnished and mounted under this section.

1. Low voltage control wiring (24V) shall be Type THHN stranded No. 16 or

multiconductor No. 18 or better.

2. Communication wiring shall be Lon compliant Category 4 or 5 twisted unshielded pair or per control manufacturer requirement.

3. Line voltage wiring (120V or higher) shall be No. 12 minimum.

4. All wiring shall be in accordance to Division 16 - Electrical.

5. Exposed wire in mechanical rooms shall be in conduit. Concealed wire shall be plenum grade, run together and supported every 4 feet. All wiring shall be run at right angles to the building.

3.02 DESCRIPTION OF OPERATION

A. Hot Water Pump UFD: Variable Speed Pumps

1. The hot water heating system consists of two existing primary water distribution pumps with individual variable frequency drive. The system will be DDC controlled. Under this phase of work a third primary pump will be installed.

2. Water Pump Control: When the system is on set at 75° O.A. adjustable through DDC System.

3. Pump Control: The variable frequency drive modulates pump speed to maintain system differential pressure as sensed from master differential sensors on the header systems. Provide for sequencing of pumps for equal run time and high demand. Provide alarm on failure of any pumps.

B. Radiation (Fin Tube Radiation): Under base bid sixteen "ADA" apartment units shall have "ACV" with room wall mounted control and under Alternate Price: provide "ACV" with wall sensors for existing 144 apartment units.

1. "ACV" Radiation: The radiation is controlled by an application specific DDC controller utilizing electric actuation. The space served by the radiation is controlled in Occupied and Unoccupied modes as follows:

a. Occupied: The controller monitors the room temperature sensor and modulates the heating valve to maintain the space temperature at set point.

Unoccupied: When heating is required, the control valve is controlled using the Unoccupied space temperature set point. The controller may reset to the Occupied mode for a predetermined time period upon a signal from the control system or manually at the room sensor.

2. Self-Contained Radiation Control: Under base price replace existing "SCV" with new self-contained control valves equal to Honeywell Thermostatic Actuator Valves Model #V5086A1056 with head mounted in radiator cover similar to existing 144 apartment units.

C. ROOF TOP UNIT CONSTANT VOLUME WITH COOLING, GAS HEAT

1. The air handling unit consists of 100% outdoor air, air damper, filter, gas heating section, and supply fan. The unit is DDC controlled using electric actuation.

2. The air-handling unit is scheduled for automatic operation on a time of day basis for Occupied and off during Unoccupied modes.

   The air handling unit operates on a discharge air controller during occupied for outside air and below 65° outside for Heating and Safety modes as follows (All suggested set points and settings are adjustable.):

   a. Occupied: The fans start and the unit is controlled as follows:

      When the outside air dry bulb temperature is below 65°, the heating section, modulates the gas heating section to maintain the supply air temperature set point with a low limit of 65° F at the mixed air sensor.

      The heating section control varies based upon outdoor air temperature. Below an outside air temperature of 45 degrees F, the heating modulates to maintain the supply air temperature set point of 70°. Above an outside air temperature of 45 degrees F (7 degrees C), the heating section modulates to maintain the supply air temperature at 65° set point.

   b. Unoccupied (Normal Off): The supply fan is off, damper closes to the outdoor air.

   c. Safety: Smoke detector in the supply air streams de-energize the supply fan upon activation. A low temperature detector in the mixed air stream de-energizes the supply fan when temperatures below 38 degrees F (3 degrees C) are sensed. All dampers and valves position to their normal position after the fan is de-energized.

      Current switches to be installed in supply fan starter. The DDC system uses the switches to confirm the fans are in the desired state (i.e. on or off) and generates an alarm if status deviates from DDC start/stop control and the system goes to Normal Off mode.

D. Basic and Optimizing Functions: Provide all software on Owner's computer and field programming needed to operate with the following features:

   1. Control of pumps and temperature (time and temperature to be coordinated with Owner). Provide statics of all pumps operation (All supply and return).

   2. Individual room adjusting of temperature with low and high along with alarm and recording.

   3. Design of software to provide Owner specific functions including

      a. Provide graphic interactive system for system input and operating perimeters with adjustable set points.

3.03 COMPLETION

A. Guarantee: The entire system shall be complete in every respect and guaranteed by the Contractor against original defects in workmanship or materials for a period of one year from date of final certificate, to control all valves so as to maintain temperature within

one degree above or below any desired point. The Contractor shall maintain the equipment in perfect working order for the guarantee period without additional charge.

B. Instruction and Adjustment: On completion of the job, the Contractor shall completely adjust, ready for use, all sensors, valves, and relays provided under his contract. The Contractor shall provide a complete instruction manual covering the function and operation of all control components on the job and a schematic control diagram. This manual shall be furnished to the Owner's operating personnel, and a competent technician shall be provided for instruction purposes for two (2) days minimum.

C. Testing: A minimum of two technicians for at least two (2) days minimum for testing procedures. Prior to the final inspection, perform required tests and submit the reports and records along with final readings with technicians signed certification of compliance. The following shall be done as a minimum:

1. Verify every point in the system and record findings with one technician at a D.C.C. panel to operate a point command and the other to observe the point and insure function has been carried out.

2. Confirm and record all temperatures being correctly read within acceptable tolerance.

END OF SECTION

SECTION 15990
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Selection of a TAB Contractor
2. Balancing water flow within boiler room distribution systems, to indicated quantities according to specified tolerances.
3. Adjusting roof top air handling unit to provide indicated quantities.
4. Measuring electrical performance of HVAC equipment.
5. Setting quantitative performance of HVAC equipment.
6. Verifying that automatic control devices are functioning properly.
7. Measuring sound and vibration.
8. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.03 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. AMCA: Air Movement and Control Association.

O. CTI: Cooling Tower Institute.

P. NEBB: National Environmental Balancing Bureau.

Q. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below for review and approval by the Architect.

B. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.

D. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

E. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.

F. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.05 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent who is a bona fide Balancing Contractor and is totally independent of the Mechanical Contractor. TAB Contractor shall have been in the business under the listed name for at least five years.

B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.

b. Contract Documents examination report.

c. Testing, adjusting, and balancing plan.

d. Work schedule and Project site access requirements.

e. Coordination and cooperation of trades and subcontractors.

f. Coordination of documentation and communication flow.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use testing, adjusting, and balancing Agent's standard forms approved by the Architect.

E. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 PROJECT CONDITIONS

A. Owner Occupancy: The Owner will occupy the site and existing building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.07 COORDINATION

1 Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities. In addition to system balance, test complete automatic temperature control system sequence for specified cycles for operation and temperature control.

2 Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

3 Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.08 WARRANTY

A. General Warranty: The performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. The TAB Contractor shall warranty the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

3. Include a warranty period of 90 days after submission of the final TAB report, during which time the Architect/Engineer may request a re-check or re-adjustment of any part of the work at no cost to the Owner.

PART 2 - EXECUTION

2.01 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents described in Division 1 Section "Project Record Documents."

D. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Mechanical contractor shall furnish equipment data for all HVAC equipment to the TAB contractor.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine strainers for clean screens and proper perforations.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature system components to verify the following:

1. Valves, and other controlled devices operate by the intended controller.

2. Valves are in the position indicated by the controller.

3. Integrity of valves for free and full operation and for tightness of fully closed and fully open positions.

4. Automatic modulating and shutoff valves, including 2-way, are properly connected.

5. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.

6. Sensors are located to sense only the intended conditions.

7. Sequence of operation for control modes is according to the Contract Documents.

8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

9. Interlocked systems are operating.

M. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

2.02 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Hydraulic systems are filled, clean, and free of air.

3. Automatic temperature-control systems are operational.

4. Isolating and balancing valves are open and control valves are operational.

2.03 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section. Comply with AABC Manual MN-1 "AABC National Standards" as applicable to mechanical and hydraulic distribution systems and/or Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

2.04 FUNDAMENTAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.

2. Check expansion tank liquid level.

3. Check makeup-water-station pressure gage for adequate pressure for highest vent.

4. Check flow-control valves for specified sequence of operation and set at design flow.

5. Set differential-pressure control valves at the specified differential pressure.

6. Set system controls so automatic valves are wide open to heat exchangers and building loops.

7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.

8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

2.05 HYDRONIC SYSTEMS' BALANCING PROCEDURES

A. Determine water flow at pumps. Use the following procedures:

1. Verify impeller size by operating the pump with the discharge valve closed. Verify with the pump manufacturer that this will not damage pump. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on the manufacturer's pump curve at zero flow and confirm that the pump has the intended impeller size.

2. Check system resistance. With all valves open, read pressure differential across the pump and mark the pump manufacturer's head-capacity curve. Adjust pump discharge valve until design water flow is achieved.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on the pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.

4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, at calculated pre-settings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have CV rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than design flow.

E. Adjust balancing stations to within specified tolerances of design flow rate as follows:

1. Determine the balancing station with the highest percentage over design flow.

2. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design flow.

3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures, including outdoor-air temperature.

G. Measure the differential-pressure control valve settings existing at the conclusions of balancing.

2.06 VARIABLE-FLOW HYDRONIC SYSTEMS' ADDITIONAL PROCEDURES

A. Balance systems with automatic control valves by setting systems at maximum flow and proceed as specified above for hydronic systems.

2.07 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating if high-efficiency motor.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

2.08 BOILERS

A. Measure entering- and leaving-water temperatures and water flow.

2.09 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

2.10 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or non-grounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

2.11 TOLERANCES

A. Set HVAC system water flow rates within the following tolerances:

1. Heating-Water Flow Rate: 0 to minus 10 percent.

2.12 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

2.13 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Pump curves.

2. Manufacturers' test data.

3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.

2. Name and address of testing, adjusting, and balancing Agent.

3. Project name.

4. Project location.

5. Architect's name and address.

6. Engineer's name and address.

7. Contractor's name and address.

8. Report date.

9. Signature of testing, adjusting, and balancing Agent who certifies the report.

10. Summary of contents, including the following:

a. Design versus final performance.

b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.

12. Data for terminal units, including manufacturer, type size, and fittings.

13. Notes to explain why certain final data in the body of reports vary from design values.

14. Test conditions for fans and pump performance forms, including the following:

a. Settings for outside-, return-, and exhaust-air dampers.

b. Fan drive settings, including settings and percentage of maximum pitch diameter.

c. Settings for supply-air, static-pressure controller.

d. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydraulic distribution systems. Present with single-line diagrams and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.

F. Pump Test Reports: For pumps, include the following data. Calculate impeller size by plotting the shutoff head on pump curves.

1. Unit Data: Include the following:

   a. Unit identification.
   b. Location.
   c. Service.
   d. Make and size.
   e. Model and serial numbers.
   f. Water flow rate in gpm.
   g. Water pressure differential in feet of head or psig.
   h. Required net positive suction head in feet of head or psig.
   i. Pump rpm.
   j. Impeller diameter in inches.
   k. Motor make and frame size.
   l. Motor horsepower and rpm.
   m. Voltage at each connection.
   n. Amperage for each phase.
   o. Full-load amperage and service factor.
   p. Seal type.

2. Test Data: Include design and actual values for the following:

   a. Static head in feet of head or psig.
   b. Pump shutoff pressure in feet of head or psig.
   c. Actual impeller size in inches.
   d. Full-open flow rate in gpm.
   e. Full-open pressure in feet of head or psig.
   f. Final discharge pressure in feet of head or psig.
   g. Final suction pressure in feet of head or psig.
   h. Final total pressure in feet of head or psig.
   i. Final water flow rate in gpm.
   j. Voltage at each connection.
   k. Amperage for each phase.

G. Instrument Calibration Reports: For instrument calibration, include the following:

1. Report Data: Include the following:

   a. Instrument type and make.
   b. Serial number.
   c. Application.

d. Dates of use.
e. Dates of calibration.

2.23 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

***END OF SECTION ***

SECTION 16000 - BASIC ELECTRICAL REQUIREMENTS

PART 1: GENERAL

1.01 WORK INCLUDED

A. In general, the work consists of removing and relocating existing equipment and connecting new equipment associated with new pumps, power, and systems all as indicated on the drawings and specifications including the following:

1. Furnish and install wiring and connections for new, relocated and rewired existing electrical panel, lighting fixtures, receptacles, etc. in renovated units.

2. Provide new grounding from apartment panels to existing kitchen and bathrooms with new ground fault receptacles for 160 units including additional receptacles, circuits and breakers in kitchen to meet current code.

3. Provide circuit breakers in existing panels as needed. Reuse existing circuit breakers where possible. Wire new pump, rewire existing supply fan, wire existing pumps new frequency drives and control wiring.

4. Provide new addressable fire alarm system for complete coverage of all areas including interface complete with city and sprinkler fire protection. ***See Section 16721 – Fire Alarm Systems**

1.02 QUALITY ASSURANCE

A. All wiring shall be in accordance with the latest issue of the National Electrical Code.

B. The service equipment is grounded at the service entrance switch enclosure. This shall also be the grounding point for the service conduit, boxes, fittings and metal enclosed equipment used in the building wiring system. Any grounding methods allowed under Article 250 of the National Electrical Code may be used provided the ground resistance is less than 25 ohms.

C. All electrical equipment shall be approved by the Underwriters Laboratories, Inc. Each system shall be products of a single manufacturer of established reputation and experience. The Contractor shall have supplied similar apparatus to comparable installations rendering satisfactory service for at least three years.

D. The Contractor shall guarantee all equipment and wiring free from inherent mechanical or electrical defects for one year from date of acceptance.

1.03 SYSTEM DESCRIPTION:

A. Existing is a 120/208 volt, 3-phase, 4-wire secondary service to the buildings.

1.04 SUBMITTALS

A. Submit four (4) copies of manufacturer's literature.

B. Certification: Prior to final inspection, deliver to the Owner's Representative four (4) copies of the certification that the material is in accordance with the drawings and specifications and has been properly installed.

C. In accordance with Section 01340 - Shop Drawings, Product Data and Samples, furnish

the following:

1. Submit shop drawings which include engineering drawings of the system with specification sheets covering all component parts of the system and interconnection diagrams.

D. Certification: Submit certification of system operating test.

1.05 PROJECT CONDITIONS

A. Regulatory Requirements: Secure and pay for all permits and certificates as required by local and State laws.

1.06 WARRANTY

A. The Contractor shall guarantee all equipment and wiring free from inherent mechanical or electrical defects for one year from date of acceptance.

1.07 RELATED WORK

A. Division 15 - Mechanical

PART 2: PRODUCTS

2.01 MATERIALS

A. Toggle Switches: 20A, 277V, 1-pole, brown specification grade, mount 4' - 0" above finished floor at door entrance.

B. Receptacles: shall be specification grade, mounted 24" above finished floor or above counter unless otherwise noted.

C. Plates: shall be 302 stainless steel with tamper-proof screws.

D. Boxes: shall be steel minimum 2-1/2" deep.

E. Disconnect Switches shall be horsepower rated.

F. Wiring Materials:

1. Wiring exposed shall be enclosed in electrical rigid galvanized steel, aluminum or intermediate metal conduit sized in accordance with code requirements for the conductors. Electrical metallic tubing may be used.

   a. Terminations for all conduit shall have insulated bushings or insulated throat connectors in accordance with code requirements.
   b. All conduits shall be substantially supported with approved clips or hangers spaced not to exceed ten feet on center. Minimum conduit size shall be 1/2".

2. Flexible metal conduit shall be used for all connections to motors and vibrating equipment and shall comply with Fed. Spec. WW-C-566.

3. All wiring shall be type THW, XHHW, or THWN, UL labeled, copper conductors with 600-volt insulation, except as otherwise noted. Minimum size wire shall be No. 12 AWG.

4. Type MC Cable shall have minimum No. 12 AWG type THWN or XHHW insulated copper conductors with an internal bare or insulated copper ground wire.

G. Circuit Breakers: Circuit breakers to be added to existing panelboards shall match existing circuit breakers.

H. Grounding Conductors:

1. Grounding conductors shall be soft-drawn bare copper.

2. Insulated Grounding Wires shall be UL and NEC approved types, copper, with THWN or XHHW insulation color identified green, except where otherwise shown on the drawings or specified.

3. Wire shall not be less than shown on the drawings and not less than required by the NEC.

I. Ground Clamps:

1. Ground clamps shall be cast bronze or cast copper and shall be UL listed for grounding connections.

2. Ground clamps shall be sized for the specific conductor and electrode to be clamped.

J. Equipment Grounding Connections: Connections shall be of the compression type solderless connectors.

PART 3: EXECUTION

3.01 INSTALLATION

A. General:

1. All work shall be in accordance with the National Electrical Code requirements as amended to date, with the local electric utility company's rules, the Fire Underwriter's requirements, and all local, State and Federal laws and regulations.

2. Conduits shall be of sizes required by the National Electrical Code. Exposed conduits shall be installed with runs parallel or perpendicular to walls and ceiling, with right-angle turns consisting of bends, fittings, or outlet boxes. No wire shall be installed until work which might cause damage to wires or conduits has been completed. Conduits shall be thoroughly cleaned of water or other foreign matter before wire is installed.

3. All splices shall be mechanically and electrically perfect, using crimp type wire connectors.

4. Provide all disconnect switches required by the N.E.C.

5. Mount disconnect switches and starters at a height of 60" above finished floor unless otherwise noted.

6. A typewritten schedule of circuits, approved by the Owner's Representative shall be on the panel directory cards. Type the room numbers and items served on the cards. Three-complete separate copies of all directories, neatly bound, shall be delivered to the Owner's Representative.

7. Revise existing panelboard directories. Furnish new cards as needed.

8. Feeder circuit wiring shall be in conduit or EMT.

9. In general, conductors shall be the same size from the last protective device to the load and shall have an ampacity the same as or greater than the ampacity of the protective device where the wire size is not shown on the drawings.

B. Grounding:

1. The entire electrical system shall be permanently and effectively grounded in accordance with Code requirements.

2. Connections to junction boxes, equipment frames, etc. shall be bolted.

3. Conduit Systems:

a. Ground all metallic conduit systems.

b. Conduit systems shall contain a grounding conductor sized per NEC table 250-95 or as shown on the drawings. Increase conduit size where necessary to accommodate the grounding conductor.

4. Feeders and Branch Circuits: Install green grounding conductors with all feeders and branch circuits.

C. Alterations:

1. The Contractor shall study all drawings and specifications and visit the site and acquaint himself with the existing conditions and the requirements of the plans and specifications. No claim will be recognized for extra compensation due to failure of Contractor to familiarize himself with the conditions and extent of the proposed work.

2. The Electrical Contractor shall execute all alterations, additions, removals, relocations or new work, etc., as indicated or required to provide a complete installation in accordance with the intent of the drawing and specifications.

3. Reconnect existing circuits to remain. Remove existing equipment to be discontinued.

4. Any existing work disturbed or damaged by the alterations or new work shall be repaired or replaced to the Engineer's satisfaction.

5. Equipment relocated or removed and reinstalled shall be cleaned and repaired to first class condition before reinstallation.

D. Continuity of Services: The Electrical Contractor shall arrange to execute his work at such times and in such locations to provide uninterrupted service to the building or any of its sections. If necessary, temporary power shall be installed to provide for this condition. Authorization for interrupting service shall be obtained in writing from the

Owner. Any interruption of normal supply shall be performed during an overtime period to be scheduled with the Owner. Cost for overtime work shall be included in the bid.

E. Identification: Provide tags on each end of all pulled wires giving location of other end. Provide phenolic nameplates for all panelboards, motor starters, and disconnect switches (except switches located at motors).

F. Record Drawings: The Contractor shall keep on the job, a set of prints showing any changes to the installation. These shall be given to the Owner at the completion of the work.

G. Testing and Adjusting:

1. The entire installation shall be free from short-circuits and improper grounds. Tests shall be made in the presence of the Engineer or their representatives.
2. Each individual lighting circuit shall be tested at the panel, and in testing for insulation resistance to ground, the lighting equipment shall be connected for proper operation. In no case shall the insulation resistance be less than that required by the National Electrical Code. Failures shall be corrected in a manner satisfactory to the Architects and Engineers.

3. Each system shall be completely tested and shall be adjusted for proper operation as required by the Engineer.

END OF SECTION

SECTION 16721 - FIRE ALARM SYSTEMS

PART 1: GENERAL

1.01 WORK INCLUDED:

A. This specification outlines the requirements for an automatic addressable fire detection and alarm system that expands on an existing addressable fire detection system that currently serves only the existing elevators. The new addressable system shall be expanded to include all existing building areas (high rise residential and commercial mix). Included is the demolition and removal of the existing zoned fire alarm system as the new system is phased in.

B. The work described in this specification consists of all labor, materials, equipment and services necessary and required to complete and test the automatic fire detection and alarm system. Any material not specifically mentioned in this specification or not shown on drawings but required for proper performance and operation shall be furnished and installed.

1.02 RELATED WORK

A. Section 13935 - Wet And Dry Pipe Sprinkler System

B. Section 16000 - Basic Electrical Requirements

1.03 REQUIREMENTS

A. This installation shall be made in accordance with the drawings, specification and the following:

1. National Electrical Code Article 760

2. National Fire Protection Association Standard (NFPA)

No. 72 (Protective Signaling Systems)

No. 72E (Automatic Fire Detectors)

No. 90A Installation of Air Conditioning and Ventilating Systems

3. Local Codes and Authorities Having Jurisdiction

4. Underwriters Laboratories Inc. (UL) publications:

No. 38 Manually Actuated Signaling Boxes

No. 50 Cabinets and Boxes

No. 217 Single and Multiple Station Smoke Detectors

No. 228 Door Closers-Holders for Fire Protective Signaling Systems

No. 268 Smoke Detectors for Fire Protective Signaling Systems

No. 268A Smoke Detectors for Duct Applications

No. 464 Audible Signaling Appliances

No. 521 Heat Detectors for Fire Protective Signaling Systems

No. 864 Control Units for Fire Protective Signaling Systems

No. 1481 Power Supplies for Fire Protective Signaling Systems

No. 1638 Visual Signaling Appliances

5. The Americans with Disabilities Act (ADA) – New 16 "ADA" apartments and public access areas of the complex.

6. American National Standards Institute (ANSI)

No.17.1 Safety Code for Elevators and Escalators

B. Wiring requirements for shielding certain conductors from others or routing in separate raceways shall be as recommended by the manufacturer's documentation.

C. The system including all components shall be listed by Underwriters Laboratories, Inc. for use as a fire protective signaling system.

1.04 GENERAL

A. The Contractor shall furnish and install complete and ready for operation an automatic fire detection and alarm system including control panel, detectors, annunciators, manual stations, alarm devices, wiring, components, appurtenances and accessories, and all wiring and connections to devices furnished by others.

B. The system and components shall be supplied by one manufacturer of established reputation and experience who shall have produced similar apparatus for a period of at least three (3) years and who shall be able to refer to similar installations rendering satisfactory service.

C. All references to model numbers and other pertinent information herein is intended to establish minimum standards of performance, quality and construction, and is based upon equipment designed and manufactured by Pyrotronics, a Division of Cerberus Technologies, Inc. It is not the intent of these specifications to eliminate competitive equipment.

D. Any equipment proposed as equal to that specified herein shall conform to the standards herein, and the manufacturer must supply proof of having produced similar equipment, now giving satisfactory service. In addition, the Contractor must obtain the Architect/Engineer's or Owner's approval in writing ten (10) working days prior to bidding equipment other than as specified. The manufacturer's name, model numbers, and three copies of working drawings and engineering data sheets shall be submitted for approval. Included in the submittal shall be a written statement from the manufacturer of the substituted equipment that it does in fact equal the features, functions, and performance of the specified equipment.

1.05 SPECIAL CONDITIONS

A. The manufacturer or his authorized distributor shall confirm that within reasonable distance of the job site there is an established agency which stocks a full complement of parts and offers service during normal working hours on all equipment to be furnished, and that the agency will supply parts without delay and at reasonable cost.

B. All material and equipment shall be new and unused.

C. All individual components and composite systems shall be designed for continuous operation without undue heating or change in rated values, and shall be properly fused.

1.06 SYSTEM DESCRIPTION AND FUNCTION

A. The automatic fire detection and alarm system shall consist of main control panel, printer, firemens' communication system, remote annunciators, detection devices and manual stations wired in accordance with the schedule on the drawings and shall function as specified herein.

B. The system shall be capable of being expanded at any time up to the predetermined maximum capacity of the system.

C. The system shall be capable of being programmed in the field, by a non-computer trained person, via the optional system printer. All programmed information shall be stored in non-volatile memory.

D. The system shall be capable of operating both addressable and non- addressable ionization, thermal and photoelectric detecting devices, manual stations and water-flow switches.

E. The control panel shall provide power, annunciation, supervision and control for the fire detection and alarm system. The control panel shall be modular in construction, and contain equipment meeting the requirements of Part 2 of this specification as necessary to operate according to the schedule in this specification and applicable drawings. The system shall be designed such that alarm indications override trouble condition. The panel shall be capable of measuring the sensitivity of the addressable ionization and photoelectric detectors connected to it.

F. External circuit supervision shall not require additional wires other than the pair used for detection or alarm (only two wires shall be used from the control panel to each loop of initiating devices and two wires for the audible devices). These two wires shall provide both supervision and alarm signals. There shall be no loss of supervision for Class "B" wired addressable devices. Class "A" supervision shall be provided by adding an additional pair of wires.

G. The system shall be a coded, zoned, electrically supervised, low-voltage fire alarm system.

H. The system shall function as follows when any public or non-residential area or duct detector, manual station or water-flow switch operates:

1. Sound required audible devices as shown on the schedule.

2. Light required visual devices as shown on the schedule.

3. Automatically notify fire department or central station.

4. Display individual detector and/or zone number on alpha-numeric display with optional user defined message.

5. Light an indicating lamp on the device initiating the alarm.

6. Shut down the HVAC system and operate dampers as shown on the schedule.

7. Activate the elevator return sequence and shut down the elevator in accordance with ANSI 17.1.

8. Close all magnetically held fire doors as shown on the schedule.

9. There shall be no limit, other than maximum system capacity, as to the number of addressable devices which may be in alarm simultaneously.

I. The System Shall Function as follows: When an apartment unit (residential) shall have sounder bases and to be monitored by the fire control panel. This residential monitoring shall be a separate channel than other system initiating devices. In the event of smoke detection in unit all devices in the unit will sound together and send a problem sign to the main panels.

J. Firemens' Communication System – Furnish where indicated a communication system for use by the fire department that will tie to Fire Command Center.

1.07 SUBMITTALS

A. In accordance with Section 01340 - Shop Drawings, Product Data and Samples, furnish the following:

1. Shop Drawings:

a. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

b. Include ratings, power requirements, battery calculations, dimensions, mounting, equipment, device arrangement, complete wiring diagrams, connection diagrams with terminal identification, material and description of operation.

c. Show main graphic annunciator layout, riser diagram and auxiliary functions.

2. Manuals:

a. Submit simultaneously with the shop drawings, companion copies of complete operating and maintenance manuals including technical data sheets, wiring diagrams, and information for ordering replacement parts.

b. Two weeks prior to final inspection, deliver four copies of final updated operating and maintenance manuals to the Owner. Each

manual shall contain, but not be limited to the following:

1) A statement of guarantee including date of termination and name and phone number of the person to be called in the event of equipment failure.

2) Complete, simple, comprehensive, step-by-step, testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment and a complete trouble shooting manual explaining what might be wrong if a certain malfunction occurs and explaining how to test the primary internal parts of each piece of equipment, shall be delivered to the Owner upon completion of the system.

3) Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

   a) Instruction on replacing any components of the system, including internal parts.

   b) Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.

   c) A complete list of all equipment and components with information as to the address and phone number of both the manufacture and local supplier of each item.

4) A complete set of reproducible as-builts, showing installed wiring and color coding and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment and internal wiring of the equipment shall be delivered to the Owner upon completion of the system. A copy of the as-built print shall be submitted to the fire department prior to final acceptance.

c. Individual factory issued manuals shall contain all technical information on each piece of equipment installed. In the event such manuals are not obtainable from the factory, it shall be the responsibility of the Contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.

3. Certifications: Submit certification of fire alarm operator tests.

1.08 WARRANTY

A. All equipment and systems shall be warrantied by the Contractor for a period of one year following acceptance. The warranty shall include parts, labor, prompt field services, pick-up and delivery.

B. Provide one year testing and maintenance, (minimum of two inspections) which shall consist of:

1. Regularly and systematically examining all detectors, manual stations, panels, relays, pressure switches and accessories pertaining to the system.

2. Regularly and systematically examine, adjust and clear all the electrical and mechanical components of water flow switches.

3. Tests and written reports which certify that all initiating devices have been tested and which indicate the result of the inspection test as required by the authority having jurisdiction.

C. The system supplier shall offer, complete with cost, a test and maintenance agreement providing the same service as described in para. B. to commence after expiration of test and maintenance included in this contract.

1.09 Instruction:

A. Furnish the services of a competent instructor for not less than two (2) four-hour periods for instructing personnel in the operation and maintenance of the system.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All units of equipment shall be manufactured by Pyrotronics, or approved equal.

2.02 MATERIALS AND EQUIPMENT

A. All materials, equipment, accessories, devices and other facilities and appurtenances covered by these specifications or noted on the contract drawings and on the Contractor's approved working drawings and installation specifications shall be new, best suited for its intended use and shall conform to applicable and recognized standards for their use. All equipment shall be the standard cataloged products of a single manufacturer.

B. Control Equipment

1. The control panel shall provide power, annunciation, supervision and control for the detection and alarm system. The control panel shall be modular in construction, and contain all modules necessary to operate according with this section and applicable drawings. The system shall be capable of reading and displaying at the control panel, the sensitivity of remote addressable ionization and photoelectric detection devices. Individual addressable detection device alarm threshold shall be adjustable from the control panel. The detection system shall remain 100% operational and capable of responding to an alarm condition while in the routine maintenance mode. Addressable detection devices shall be individually identified by the system, and any quantity of addressable detection devices shall be in alarm at any time up to the total number connected to the system.

2. The control panel shall be capable of supporting non-addressable as well as addressable detection devices.

3. The panel annunciator shall be a 32 character alpha-numeric display, which

shall provide an optional user definable message associated with each detection device or zone.

4. Dynamic supervision of system electronics, wiring, detection devices and software shall be provided by the control system. Failure of system hardware or wiring shall be indicated by type and location on the alpha-numeric annunciator. Software and processor operation shall be monitored by an independent hardware watchdog, which will indicate their failure. The system shall provide fail safe operation, i.e., incoming alarms shall automatically override all other modes of operation, and the panel shall automatically return to normal operating mode from any operator initiated mode.

5. Ground-fault detection shall be provided for all initiating and audible circuits. All system modules shall be capable of operation in any unused panel location. Lamp test capability shall be provided to test all visual panel indicators and associated software. Provisions shall be made for remote trouble and remote alarm silencing switches. The control panel shall be equipped with a silence before reset feature, designed to prevent accidental system reset during an alarm condition.

6. The system alarm lamp shall flash upon receipt of any alarm condition. Acknowledgement of the alarm by operation of the silence switch shall silence the audible alarm and cause the alarm lamp to light steadily. Receipt of subsequent alarms shall cause the audible devices to resound and the alarm lamp to flash.

7. The system trouble lamp shall flash and an integral trouble buzzer hall sound upon the occurrence of any trouble condition. Acknowledgement of the trouble condition by operation of the silence switch shall silence the audible alarm and cause the trouble lamp to light steadily. Receipt of subsequent troubles shall cause the trouble buzzer to resound and the trouble lamp to flash.

8. Individual input and output device addressability as well as remote sensitivity measurement shall all be performed on the same pair of wires. Wiring may be Class "A" or "B". When Class "B" wiring is used, no special wiring sequence shall be required on addressable device circuits, an unlimited number of wiring branches shall be permitted with no loss of supervision. The system shall be capable of having all addressable devices in alarm simultaneously.

9. The service mode shall permit the arming and disarming of individual detection or output devices as well as manually operating output devices. Status of these devices shall be displayed upon command from the control panel. The panel shall automatically return to normal mode in the event the panel remains unattended in the service mode.

10. The panel shall be capable of receiving and processing alarms even when in the service mode.

11. The control shall operate from a three wire 120 VAC supply, or when so configured 120 VAC and internal 24V back-up battery. All power connections whether AC or DC shall be separately fused within the control. Light emitting diodes (LED's) shall be included to indicate (green) system power, (yellow) trouble, and (red) alarm; trouble and alarm shall also be annunciated on an alpha-numeric display which will give device number and location plus

diagnosis of trouble. Momentary contact switches shall provide for Locate, Next Alarm, Next Trouble, Acknowledge/Silence and Reset. An audible device shall sound within the control for alarm or trouble. This device shall have two (2) distinct sounds, and shall be silenceable by the acknowledge/silence switch. Alarms shall override any trouble condition.

12. The control power supply shall be capable of powering up to 960 addressable early warning detectors and at least four (4) audible signal circuits. All system expansion modules shall interconnect through a card edge connector and shall require no inter-module wiring.

13. The control shall be capable of measuring and adjusting the sensitivity of detectors. An alpha-numeric display shall be provided to display custom messages and give readings of detector sensitivity, detector by detector. Each device on an addressable initiating circuit shall be checked continuously to include the following: sensitivity, response, opens, shorts, ground faults, functionality and status.

14. The control shall report the failure of a device's transmitting component(s), open or shorted, on an addressable initiating circuit. The device shall be recognized and identified by location within the circuit to the specific device, and all other devices on the circuit shall continue to function properly.

15. The control shall report, by specific device number, any device removed from an addressable initiating circuit and all other devices shall continue to function.

16. The control shall allow changing the status of configured circuits (arming or disarming and changing status of relays). If any change in status degrades system operation as configured, a trouble condition shall be reported and remain until system operation again meets configured status.

17. The control shall perform multiple operations at the same time. These operations shall include but not be limited to timed functions and multiple configured sequences.

18. The control shall support a printer terminal. This terminal shall be used for permanent records of the XL3 Control's status and detector chamber voltages, and shall also be capable of system control as configured.

19. The control shall allow for expansion and shall also be configurable without system interwiring.

20. The control shall allow for up to two hundred field programmable changes by non-computer trained personnel.

21. The system shall provide a hard copy written record of all alarms, troubles, and system activity by means of full carriage width terminal to print detection device designations and location messages on a single line of up to 128 characters wherein 32 are reserved for device or zone custom identification.

22. New unacknowledged alarms and troubles shall be distinctively displayed on both the visual display and the printer and differentiated from previous alarm and troubles.

23. The system shall automatically indicate the total quantity of alarms and of troubleswhich have occurred prior to reset at the control unit.

24. No alarm or trouble indication shall be resettable until it has been acknowledged. It shall not be possible to reset the system until all alarms have been acknowledged.

25. It shall be possible to display up to 127 alarms and up to 127 trouble indications, one at a time, on the digital annunciator and as a list on a printer.

26. The printer or digital annunciator shall be capable of listing, upon request:

a. Alarms with time, date and location.

b. Troubles with time, date and location.

c. Status of output functions, "on" or "off".

d. Sensitivity of addressable smoke detectors.

e. Detection device number, type and location.

f. Status of remote relays, "on" or "off".

g. Acknowledgement time and date.

h. Signal silence time and date.

i. Reset time and date.

27. The system shall be capable of:

a. Counting the number of addressable detectors within a "zone" which are in alarm.

b. Counting "zones" which are in alarm.

c. Counting the number of addressable detectors which are in alarm on the system.

d. Differentiating among types of addressable detectors such as smoke detectors, manual stations, water-flow switches, thermal detectors.

e. Assigning priorities to types of detectors, zones or groups of detectors.

f. Cross-zonings.

28. Control functions shall be assigned on the basis of system initiation patterns of detection devices such as "anding" zones, counting zones, counting devices, "anding" groups, and "anding" types of detection devices.

29. Control functions shall be assigned on the basis of time of day, day of week, and with a holiday schedule of up to thirty (30) holidays per year. Each addressable detection device shall report its condition to the system control unit

every four (4) seconds in a manner such that failure of the connections to or internal electronics of the device will result in a trouble signal which identifies the specific device involved.

30. Addressable dual chamber ionization and photoelectric type smoke detector sensitivity shall be reported at the control panel when requested. The electronic readout of detector sensitivity shall be equivalent to sensitivity readings made with a meter for a non- addressable detector, but shall be read at the control panel digital annunciator.

31. It shall be possible to change the detector sensitivity from the control panel within maximum and minimum values as defined by the UL listing of the detectors.

32. The system shall be capable of listing detector chamber voltage settings on the printer for permanent record.

33. Water-flow switches, air duct smoke detectors, tamper switches, OS and Y valves, manual stations, and thermal detectors shall be equipped with an electronic address device which shall be supervised identically as addressable detectors.

34. Water-flow switch alarm operation and automatic sprinkler system supervisory switches shall be wired and annunciated in conformance with the National Fire Code.

35. A trouble signal shall be initiated for each addressable device for which the automatic sensitivity measurement is too insensitive.

36. The system shall be capable of operating conventional two-wire, Class "B" detector circuits terminated on end-of-line devices or Class "A", field selectable, detector circuits and connected in series/parallel per the manufacturer's recommendations. These non-addressable detector circuits shall be capable of operating interchangeable, plug-in detectors of the following types: dual chamber ionizations, photoelectric, flame, and rate anticipation thermal as well as manual stations and non-plug-in thermals of any type.

37. Alarm and troubles from non-addressable detector circuits (zones) shall be annunciated and cause output functions in the same manner as addressable detection devices including a location message for each zone.

38. The supervised and powered parallel output circuits shall be capable of use as audible signal circuits, fire extinguishing release circuits, municipal tie, remote station connection or general alarm release service. They shall be capable of providing 1.5 amp at 24 VDC.

39. Provide control relays in the fire alarm control unit having dry contacts rated 120 VAC 5 amp inductive as required.

40. Remote relays located on detector bases or double gang outlets throughout the building shall be controlled in the same manner as panel mounted relays.

41. The system power supply shall be provided with an integral uninterruptable power source or UPS. This UPS shall provide continuous power to the system

in the event of a commercial power failure. Transfer from commercial to standby power shall be instantaneous to insure proper processor operation, and indicated by flashing the system power LED. Batteries shall be sized to provide 60 hours of standby operation followed by 10 minutes of alarm. A dual rate battery charger shall be provided which is capable of recharging the batteries to 80% capacity in 12 hours. Loss of commercial power shall be annunciated as a system trouble. System trouble shall be indicated for over or under voltage conditions, blown fuse or disconnected batteries. The system shall visually and audibly indicate operation from standby power. The system shall automatically restart upon the return of power. No operator intervention shall be required.

42. The control panel enclosure shall be earth tones in color, suitable for surface or semi-flush mounting. A locked door shall be provided to limit access to individuals authorized access to the panel.

43. All modules shall be plug-in, dynamically supervised and easily replaceable. Field wiring shall be connected to the panel with removable multi-conductor connectors to facilitate rapid removal and replacement of both the module and wiring for ease of servicing the panel.

44. Visual indicators shall be long life LED's. Modules capable of initiating a system trouble shall display individual trouble indications on the alpha-numeric annunciator.

45. <u>Addressable Input Module:</u>

    a. Addressable/programmable initiating circuits shall be provided by a Pyrotronics Addressable Input Module, Model INX. The module shall be system interconnected by a card edge connector, and shall be operable by the control unit.

    b. Each initiating circuit shall consist of a two (2) wire circuit, allowing multiple T-taps, and not requiring any end of line device for supervision. Each initiating circuit shall accommodate up to thirty (30) addressable/programmable initiating devices. Each circuit shall be capable of Class "A" or Class "B" wiring.

    c. Upon activation of any addressable/programmable device installed in the circuit, the system shall automatically report the status of the device and initiate the sequence of operations specified for that device, i.e., alarm, local, general, reporting, trouble reporting only, etc. Alarm shall have priority over trouble. Trouble conditions shall be reported to include the device number, location and type of trouble.

    d. All addressing initiating devices on all circuits may be in alarm at the same time and perform the sequences of operation prescribed by the system configuration. If there are more than 127 alarms the message "more than 127 alarms" will appear and any alarms after 127 will still have all of their required functions performed.

    e. The initiating circuits shall maintain complete reporting of device status while in trouble, due to any addressable device having its active transmitting component fail, open or shorted.

f. The initiating circuits shall detect a line break and provide information to the control panel allowing the user to determine between which two (2) devices the break has occurred.

g. The Model INX module shall be Underwriters Laboratories, Inc. listed.

46. Zone input Module:

a. Detection line circuit monitoring shall be provided by a Pyrotronics Zone Input Module, Model ZNX. This module shall be system interconnected by a card edge connector and shall be operable by the XL3 control unit. Connection of field wiring shall be by screw terminals on a card edge connector.

b. Each circuit shall be capable of Class "A" or "B" wiring. Class "B" a 50ufd 50V capacitor end-of-line device shall be required. Each zone shall accommodate up to thirty (30) Pyrotronics ionization or photoelectric detectors, or five (5) Pyrotronics flame detectors as well as any quantity of shorting type contact devices.

c. Upon actuation of any detector or device installed in a zone circuit, that particular zone shall lock into alarm and the zone identification and location shall be annunciated at the XL3 control unit. Zone troubles such as opens shall be annunciated at the XL3 control unit, giving zone identification and trouble description. Alarm information and transmission shall have priority over trouble.

d. The Model ZNX module shall be Underwriters Laboratories, Inc. listed.

47. Programmable Signal Module:

a. An output circuit for operation of DC audible devices, leased line or city tie, or halon release shall be provided by Programmable Signal Module, Model SPX. This module shall be system interconnected by a card edge connector, and shall be operable by the XL3 control unit.

b. Upon command by the XL3 control unit, the output circuits will respond as configured. Leased line or city tie circuits shall be limited energy outputs. All signal circuits shall require and be fitted with an end-of-line device. The output current shall be at least 1.5 amps per circuit and each circuit shall be fused separately.

c. The module shall be supervised by the XL3 control unit for open and shorted circuits. Open circuits shall report trouble only and respond with circuit identification. A shorted circuit shall respond in a similar manner. Each output circuit shall be individually fused with replaceable fuses.

d. Output circuits may be user controlled. If such control degrades system configuration, a trouble condition shall be reported.

e. The Model SPX module shall be Underwriters Laboratories, Inc.

listed.

48. Programmable Supplementary Relay Module:

a. For control of air handling units and elevators there shall be provided a Pyrotronics Programmable Supplementary Relay Module, Model POX. It shall contain four independent relays, fitted with form "C" contacts, rated at 120 VAC, 5 amps inductive, Pyrotronics Model POX.

C. Alarm Initiating Devices:

1. General:

a. All addressable and non-addressable ionization, photoelectric and thermal detectors shall be capable of being intermixed on the same control panel. All detection devices shall contain an integral alarm LED. All addressable detectors shall be individually identifiable by zone.

2. Addressable Ionization Smoke Detector:

a. The addressable ionization type product of combustion detector shall be listed by Underwriters Laboratories, Inc. The detector shall be a plug-in, twist/lock unit. The detector shall contain two ionization chambers and solid state indicator lamp. The reference chamber shall compensate against sensitivity changes due to changes in environmental temperature, humidity and barometric pressure. The sensing chamber shall be open to the outside elements through a protective cover which will permit products of combustion to enter, while preventing foreign matter from entering and causing unwanted alarms.

b. The addressable detector sensitivity shall be individually adjustable from the control panel. It shall also be possible to accurately measure the addressable detector's sensitivity from the control panel. Relative sensitivity measurements providing no readout of discrete sensitivity will not be considered as being equivalent.

c. The addressable ionization detector shall be dynamically supervised, indicating a trouble condition at the control panel when the detector is unable to sense a fire condition due to both internal and external operating conditions or malfunctions.

d. The detector mounting base shall be of the twist/lock type with screw terminals for field wiring. Pigtails or in-line connectors shall not be permitted. It shall be possible to secure the detector in the base with a concealed locking mechanism to prevent unauthorized removal. When locked in its base, detector removal shall require a special unlocking tool. The addressable ionization products of combustion detector shall be a Pyrotronics Model DI-X3.

3. Addressable Photoelectric Smoke Detector:

a. The addressable photoelectric smoke detector shall be listed by Underwriters Laboratories, Inc. The detector shall contain a long life light emitting diode (LED) as its light source, and photo diode as a light receiver. An automatic gain control circuit shall be provided to maintain correct sensitivity by compensating for detector aging and dirt accumulation. The detector shall be a plug-in twist/lock unit which allows for easy connection to its mounting base.

b. It shall be possible to adjust and/or electronically measure the sensitivity of each individual addressable detector from the control panel. Relative sensitivity or manual test methods which check the detector at the maximum allowable obscuration will not be considered as being equivalent.

c. The addressable photoelectric detector shall provide complete supervision of the detector optics. The detector shall be supervised for complete failure of the LED light source or a critical reduction in the light output of the LED caused by excessive dirt which could not normally be compensated for by the automatic gain control circuit. The detector mounting base shall be of the twist/lock type with screw terminals. Pigtails or in- line connectors shall not be permitted. It shall be possible to secure the detector in the base with a concealed locking mechanism to prevent unauthorized removal. Detector removal shall require a special unlocking tool. The addressable photoelectric smoke detector shall be a Pyrotronics Model PEX-3000.

4. The addressable thermal detectors shall be of the rate compensated fixed temperature type and shall be listed by Underwriters Laboratories, Inc. The addressable thermal detectors shall be individually annunciated on the control panel. The addressable thermal detectors shall contain an integral alarm lamp. The addressable thermal detector shall be Pyrotronics DT-X3-135.

5. The intelligent interface module shall be listed by Underwriters Laboratories, Inc. This unit is designed to provide an interface for direct shorting contact devices to the XL3's Addressable Input Model INX. This unit is used with water flow switch, tamper switch and OS and Y valves. The addressable/programmable interface module shall be a Pyrotronics Model TRI-2, TRI-2R, or TRI-2D as required.

6. The addressable manual fire pull station shall be listed by Underwriters Laboratories, Inc. The addressable manual fire station shall be non-coded and shall operate on any addressable detection circuit. The addressable manual fire station shall be individually annunciated on the control panel. The addressable manual station shall be a Pyrotronics Model MSX-2.

7. Non-Addressable Ionization Smoke Detectors:

a. The non-addressable ionization type products of combustion detector shall be listed by Underwriters Laboratories, Inc. The detector shall be a plug-in twist/lock unit which shall be capable of removal from or installation into its base with one hand.

b. The detector shall contain two ionization chambers and solid state indicator lamp. The reference chamber shall compensate against

sensitivity changes due to changes in environmental temperature, humidity and barometric pressure. The sensing chamber shall be open to the outside elements through a protective cover which will permit products of combustion to enter, while preventing foreign matter from entering and causing unwanted alarms.

c. The detector shall provide provision for field adjustment and measurement of sensitivity using an appropriate test instrument and change the detector's sensitivity as required without removing the detector from its mounting base. Relative sensitivity measurements providing no readout of discrete sensitivity will not be considered as being equivalent. The detector mounting base shall be of a twist/lock type with screw terminals for field wiring. Pigtails or in-line connectors shall not be permitted. It shall be possible to secure the detector in the base with a concealed locking mechanism to prevent unauthorized removal when locked in its base. Detector removal shall require a special unlocking tool. The non-addressable ionization products of combustion detector shall be a Pyrotronics Model DI-3.

8. Non-Addressable Photoelectric Smoke Detectors:

a. The non-addressable smoke detectors shall be listed by Underwriters Laboratories, Inc. The detector shall contain a long life light emitting diode as its light source, and a photo diode as a light receiver. It shall be a plug-in, twist/lock unit which allows for easy connection to its mounting base.

b. The detector shall provide provision for field measurement of sensitivity. It shall be possible to electrically check the detector's sensitivity using an appropriate test instrument. Relative sensitivity measurements providing no readout of discrete sensitivity or manual test methods which check the detector at the maximum allowable obscuration will not be considered as being equivalent.

c. The detector mounting base shall be of the twist/lock type with screw terminals. Pigtails or in-line connectors shall not be permitted. It shall be possible to secure the detector in the base with a concealed locking mechanism to prevent unauthorized removal. Detector removal shall require a special unlocking tool. The photoelectric smoke detector shall be a Pyrotronics Model PEC-3.

9. The non-addressable thermal detectors shall be listed by Underwriters Laboratories, Inc. The non-addressable thermal detectors shall be either fixed temperature or rate compensated rating and type as indicated on the drawings. Non-addressable thermal detectors shall contain an integral alarm lamp. The non-addressable thermal detectors shall be of the Pyrotronics DT series.

a. Rate-of-rise Type: Pyrotronic # DT-135R

b. Fixed Temperature Type: Pyrotronic # DT-200F

c. Fixed Temperature Type: Pyrotronic #DT-135F

10. The non-addressable manual fire pull station shall be listed by Underwriters

Laboratories, Inc. Non-addressable manual fire stations shall be non-coded, double action and shall operate on any non-addressable detection circuit. The non-addressable manual fire station shall be the Pyrotronics MS-501.

11. The air duct smoke detector shall be listed by Underwriters Laboratories, Inc. The air duct detector shall operate on a cross- sectional air sampling principle to overcome stratification and the skin effect. The air duct detector shall consist of a standard addressable/non-addressable ionization/photoelectric detector mounted in an air duct sampling assembly and sampling tube that protrudes across the duct of the ventilating system. The air duct detector shall retain the features of the addressable/non-addressable ionization/photoelectric detector, and be installed in the ventilating duct as indicated in the manufacturer's instructions. The air duct detector shall be a Pyrotronics AD-3 with the appropriate non-addressable or addressable detector.

D. Alarm Indicating Devices

1. Visual Unit: Pyrotronics Model SVMT-F (Flush) strobe.

2. Alarm Strobe/Horns shall be of the polarized 24 VDC type. The mechanisms shall contain an aerospace grade aluminum diaphragm, blued, tempered and polished armature, and tungsten contact points, all housed in a die-cast frame and grill assembly. The alarm horn shall be UL listed. The alarm horn shall be a Pyrotronics Model EHM-D (Flush), EHM-E (Surface).

3. Audio/Visual Unit shall consist of a 10" single stroke bell (Faraday #4070 and #3010) mounted on a semi-flush visual unit with back box (space age #A32-BL-SFFR-S524D and GM-001).

4. Remote Annunciator shall be self-contained, flush mounted, 30 point, supervised, Pyrotronics Model SAX-3.

E. Pull Station Enclosure shall be 8" x 6" x 6", NEMA 1, with mounting plate, hinged cover and lock (lock to be furnished by Owner, to be installed by the Contractor, shall be suitable for flush or semi-flush mounting, painted red with 5/8" high white letters reading "Fire Alarm Pull Station".

F. Furnish a battery backed area for firemen call/voice intercom system from the fire alarm remote annunciator location to all places required. Each area location shall be indicated at the remote annunciator location. If the annunciator is used to indicate the location of a call, the number of annunciator points shall be increased by the number of area locations. Furnish all required amplifiers, speakers, phones, batteries, battery chargers, etc., for a complete and operational system. At each area, there shall be audio and visual indications that a call has been placed and that the call has been answered.

PART 3: EXECUTION

3.01 INSTALLATION

A. Control and other panels shall be mounted with sufficient clearance for observation and testing. All fire alarm junction boxes must be clearly marked for easy identification. All wiring shall be in conduit, EMT thin-wall or other approved methods. Flexible connectors shall be used for all devices mounted in suspended lay-in ceiling panels. All conduit, mounting boxes, junction boxes and panels shall be securely hung and fastened

with appropriate fittings to insure positive grounding throughout the entire system.

B. No wiring other than that directly associated with fire alarm detection, alarm or auxiliary fire protection functions shall be permitted in fire alarm conduits. Wiring splices are to be avoided to the extent possible, and if needed they must be made only in junction boxes and shall be crimp connected. Transposing or changing color coding of wires shall not be permitted. Wire nut-type connections are not acceptable. All conductors in conduit containing more than one wire shall be labeled on each end with "E-Z markers" or equivalent. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal. Cabinet terminals shall be numbered and coded. All controls, function switches, etc., shall be clearly labeled on all equipment panels.

C. All wiring shall be checked and tested to insure that there are no grounds, opens or shorts.

D. Check to see that the duct smoke detectors shut down the ventilation equipment.

E. Installation shall be in accordance with the NEC Article 760, and as shown on the drawings.

F. Installation shall be as shown on the drawings and on the manufacturer's wiring diagrams, and shall be performed under the supervision of a factory-trained representative.

G. All pull boxes, junction boxes, etc., shall be painted red. Conduit shall be painted with a 2" wide red stripe at 5'-0" intervals.

H. Wire the roof top unit starter coils in series with the duct detector relay contacts (one contact for the supply fan) to shut down the unit if duct detector alarms.

I. All wiring shall be color-coded and tagged and shall be checked for continuity, short circuiting, and resistance to ground.

J. Provide all necessary mounting brackets or duct modifications required for mounting the duct smoke detectors.

K. A factory-trained technician shall be present during final inspection and shall instruct the Owner in system operation.

L. The Contractor shall coordinate the programming of the system with the Owner. Room designations shall be as shown on the drawings or as furnished by the Owner.

M. Furnish fire alarm code cards. Cards shall be red with white letters. The card stock shall be approximately 1/32" thick, smooth bright white finish on one side, matte finish on the other side, accept printing ink.

N. Pull stations shall be mounted in pull station enclosures. If semi-flush enclosures are used, the space between the enclosure and wall shall be sealed with grout or other approved methods.

3.02 TESTS AND REPORTS

A. Provide the service of a competent, factory-trained engineer or technician authorized by

the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. Make all adjustments and tests in the presence of the Owner's Representative.

B. When the systems have been completed and prior to the final inspection, furnish testing equipment and perform the following tests in the presence of the Owner's Representative.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity and insulation.

2. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.

3. Open fire alarm detector circuits to see if trouble signal actuates.

4. Ground fire alarm station detector and verify response of trouble signals.

5. Test the remote annunciator to see if it functions properly.

6. Check code transmission of all fire detection devices.

7. Check installation, supervision, operation and sensitivity of smoke detectors as recommended by the manufacturer to ascertain that they will avoid false alarm signals and will function as specified.

8. Check to see that the duct smoke detectors shut down the ventilation equipment.

9. Perform any other tests recommended by the equipment manufacturer.

10. Connections to Fire Department Master Box.

C. The Contractor shall perform all electrical and mechanical tests required by the equipment manufacturer's certification form. In addition, he shall measure and adjust each of the smoke detectors to the maximum stable sensitivity setting. This must be performed with the detector at its operational location and under normal operational environmental conditions in the area. Bench settings are not acceptable. All test and report costs shall be in the Contract price. A check-out report shall be prepared by the installation technicians and submitted in triplicate, one copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.

2. Indication that all equipment is properly installed and functions and conforms with these specifications.

3. Test of individual zones as applicable.

4. Serial numbers, locations by zone and model number for each installed detector.

5. Voltage (sensitivity) settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.

6. Response time on thermostats and flame detectors (if used).

7. Technician's name, certificate number and date.

D. After completion of all the tests and adjustments listed above, the Contractor shall submit the following information to the Architect/Engineer:

1. "As-built" conduit layout diagrams including wire color code and/or tag number.

2. Complete "as-built" wiring diagrams.

3. Detailed catalog data on all installed system components.

4. Copy of the test report described in Para. C above.

E. Final tests and inspection shall be held in the presence of Architect/Engineer's representatives and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost.

F. The completed smoke detection system shall be tested to ensure that it is operating properly. This test will consist of exposing the installed units to a standard fire test. Failure of the devices to detect the smoke within required time shall be considered a failure of the system and all detectors in that system shall be readjusted or replaced. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) and begin another ninety (90) day test period. As required by the Architect/Engineer, the Contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the Owner has obtained beneficial use of the building under test.

G. If the requirements provided in the paragraph above are not completed within one (1) year after beginning the test described therein, the Contractor shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Owner's Representative.

END OF SECTION