BID PACKAGE

PART IV

SPECIFICATIONS

DMH Project#2021-021
Renovation of Lobby & Security Upgrades
Corrigan Mental Health Center
49 Hillside Street
Fall River, Massachusetts 02720

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF HUMAN SERVICES
DEPARTMENT OF MENTAL HEALTH

S P E C I F I C A T I O N S

FOR

RENOVATION & SECURITY UPGRADES OF MAIN LOBBY

AT

CORRIGAN MENTAL HEALTH CENTER
49 HILLSIDE STREET
FALL RIVER, MASSACHUSETTS

ACCOUNT NO. 2021-021

DEPARTMENT OF MENTAL HEALTH
OFFICE OF FACILITIES MANAGEMENT
167 LYMAN STREET
WESTBOROUGH, MA 01581

PREPARED BY: FRED BERGSTROM

REVIEWED BY: JOHN CONNORS
AIMEE SOUSA

DATE: OCTOBER 02, 2020

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DIVISION 26

SECTION 011000
SUMMARY OF THE WORK

PART 1 – GENERAL

1.1 CONTRACT REFERENCES

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within Division 1 – GENERAL REQUIREMENTS that are hereby made a part of this Section of the Specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT and GENERAL CONDITIONS.

1.2 DEFINITIONS

A. The following terms shall be applicable to these Specifications:

1. **DMH Project Manager**: Refers to Fred Bergstrom, Massachusetts Department of Mental Health, Engineering and Facilities Management, 167 Lyman Street, Westborough, MA 01581. (508) 616-2245.
2. **DMH Site Director**: Refers to Frank O'Reilly, Massachusetts Department of Mental Health, 49 Hillside Street, Fall River, MA 02720-5211. (508) 235-7400.
3. **DMH Facility Manager**: Refers to Aimee Sousa, Massachusetts Department of Mental Health, 49 Hillside Street, Fall River, MA 02720-5211. (508) 235-7238.
4. **Fire Alarm Company**: Refers Fire Systems, Inc., 955 Reed Road, North Dartmouth, MA 02747. (508) 999-4444.
5. **Contractor**: Refers to the Contractor who has been awarded the overall contract for the work outlined by the Contract Documents.
6. **Subcontractor**: Refers to any contractor who is working under the direct supervision of the Contractor including but not limited to: steel erector, mason, electrician, carpenter, painter, and trucking/transport companies.
7. **Site**: Refers to Corrigan Mental Health Center, 49 Hillside Street Fall River, MA 02720-5211.

B. The terms are provided to facilitate communication but do not supersede the legal definitions provided in the Contract.

1.3 WORK UNDER THIS CONTRACT

A. The work described under this Contract is for the replacement of the main lobby, construction of interview rooms, and upgrades to the mechanical,

electrical and the security system located at 49 Hillside Street, Fall River, MA. The installation, modernization, replacement and refurbishment shall be in conformity with the International Existing Building Code, (IEBC), 2015 Edition, the International Building Code, (IBC) 2015 Edition, Massachusetts Amendments to the International Building Code 2015, Ninth Edition, and the Commonwealth of Massachusetts Architectural Access Board 521 CMR, including modifications; and to addressing *Americans with Disabilities Act* (ADA) requirements associated with the main entry.

B. Scope of Work - The general scope of work under the bid includes but is not limited to the following:

1. Application of, paying for, and securing any and all permits required from local, state and federal agencies, and other authorities having jurisdiction over construction on the Site, including submitting, revising, and resubmitting all required plans, permits, and notifications.
2. Preparation and submission of project work plan and schedules. The Plan shall include all requirements necessary to keep all facilities open at all times for safe public access and use.
3. Mobilization to the Site including but not limited to establishment of the Contractor's space within the Building.
4. Establish work area perimeter and dust control measures.
5. Perform required selective demolition, including but not limited to, removal of the existing main lobby and all ancillary areas affected by the installation of the new main lobby and surrounding areas as designed and illustrated on the plans, i.e. existing acoustical ceilings, reception desk, doors, existing mechanical, lighting, existing storefront entry.
6. Disconnection of any electrical, alarms, security as required to complete renovation work and to reconnect everything that hasn't been replaced when the project is completed.
7. Furnish and install all finish work as noted within the plans and specifications including but not limited to the following items: electrical, floor repair, carpeting, lobby and security desks as designed, doors, alarm system, painting, ceilings and soffits, lighting, electrical/cabling for security system, etc.
8. Coordination of the mechanical installation with the contractor who will be doing the contracted work.
9. Repair, patch and/or replace any materials damaged by the demolition and installation of the new lobby and surrounding areas.
10. Provide and install specified *Americans with Disabilities Act* (ADA) signage and vestibule modifications as specified herein.

11. Request all required inspections and address any deficiencies identified by the inspectors such that a certification for occupancy is provided.

1.4 CONTRACT INTENT

A. Intent of these specifications is to cover modernization, rehabilitation work, and warranty complete and operable in every respect as well as standby and access for other contractor's completion of their work in proximity to the work specified under this Contract and all related work. It is not intended to give every detail in the specifications. DMH and DMH's Project Manager are not responsible for the absence of unknown existing conditions or any specific details the Contractor may require within the demolition of the existing conditions or the installation of the new construction scope of work. Furnish all material and equipment usually furnished with such an assembly and/or needed to make a complete and code compliant installation, whether specifically mentioned or not, omitting only such parts as is specific exceptions from the specifications.

B. The required materials for the construction will be of non-proprietary design and shall meet all the specific guidelines as described within the supplied specifications and drawings. The scope of work as described within the bid documents shall be considered as an integral part of the construction of the project and changes in the design will be considered unacceptable unless a written submittal has been approved before the actual changes are made to the design. It also must be noted that no substitutions will be allowed where the suggested product is of less quality than what has been specified within the bid documents, only products meeting the base standard as noted will be considered.

1.5 EXISTING CONDITIONS

A. The project site is a four-story structure with street access on the Ground Floor and the Second Floor. The building was constructed in 1965 and the main entry on the Second Floor is original to the Building. The main lobby and entry does meet the current ADA code requirements and upgrades to ADA accessibility but revisions being made in the renovation are of the utmost importance within the new design for continued ADA accessibility requirements. The Building is fully occupied at this time and currently provides a 24-hour seven days per week occupancy within this full occupancy on the Third Floor.

1.6 EXAMINATION OF SITE AND DOCUMENTS

A. A mandatory pre-bid conference will be held at the job site on the date and at the time indicated in the Invitation to Bid.

B The bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which the work is to be carried out. The Commonwealth will not be responsible for errors, omissions, and/or charges for extra work arising from the Contractors or Subcontractors failure to familiarize themselves with the contract documents, that he is familiar with the conditions and requirements of both where they require, in any part of the work a given result to be produced, that the contract documents are adequate and he will produce the required results.

1.7 CONTRACTOR QUALIFICATIONS

A. The Contractor shall be a Division of Capital Asset Management and Maintenance (DCAMM) certified general contractor with a current certification.

B. Within three business days from the bid opening, the apparent low bidder shall submit a certification in writing that it has successfully performed at least three recent (within last three years) projects of similar size, scope, and cost. The apparent low bidder shall submit the following information for each project:

1. Project Description
2. Project Value
3. Date was conducted
4. Reference with contact information for the Owner who was the recipient of the work.

C. The Contractor's Updated Statement is not a public record as defined in M.G.L., Chapter 4, Section 7, and will not be open to public inspection.

1.8 CONTRACT METHOD

A. Work under this Contract shall be lump sum price, for the scope of work included within the base bid and as described in these Specifications.

B. Should additional work be required, the procedures specified in the Contract shall apply.

C. The Massachusetts Standard Labor Wage rates, as included in the Contract exhibits, will be used for base contract work, as well as any change order work.

1.9 SUPERVISION OF THE WORK

A. The Contractor shall be held directly responsible for the correct installation of all work performed under this Contract. The Contractor must make good repair, without expense to the Commonwealth, of any part of the new work, or existing work to remain, which may become inoperative on account of leaving the work unprotected or unsupervised during construction of the system or which may break or give out in any manner by reason of poor workmanship, defective materials or any lack of space to allow for expansion and contraction of the work during the Contractor's warranty period, from the date of final acceptance of the work by DMH.

B. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with his direct work.

1.10 CONTRACTOR'S USE OF THE PREMISES

A. The Contractor can gain access to the premises during the hours specified below. In addition the Contractor and company personnel will limit themselves to only within the working premises during working hours. If work needs to be scheduled during times other than those listed below, Contractor shall inform the DMH Project Manager one week prior to work.

1. Deliveries: 7:00 am to 8:30 am and after 1:00 pm.
2. General Access: 8:00 am to 4:00 pm.

B. Confine operations at the site to areas permitted by:

1. Laws
2. Ordinances
3. Permits
4. Contract Documents
5. DMH Requirements

C. All on-site workers will be required to wear identifying name badges.

D. The Contractor shall supervise the use of the Site related to construction and be responsible for correcting any damage identified by DMH to DMH's satisfaction.

1. An existing conditions survey shall be conducted prior to any work being performed with the DMH Project Manager and the DMH Site Director or their representatives.

E All available existing utilities adjacent to the construction site will be available for use during construction unless indicated otherwise. These utilities would include water, sewer, and electricity. Temporary connections to these utilities, all metering, transformers, removal, usage, and their associated costs will be the responsibility of the Contractor.

F All apparatus, storage, and the operation of workmen in connection with activities under this Section shall be confined to limits of the Contract. Storage will not be permitted on the property without the approval of the DMH Project Manager.

G All parking regulations shall be observed.

H All vehicles carrying loose, dry material, demolition refuse, construction debris, etc., shall be covered by tarpaulins to prevent blowing away or spillage of contents. All spillage of whatever nature shall be promptly taken up and removed.

1.11 COORDINATION

A. The Contractor shall be responsible for the proper fitting of all the work and for the coordination of the operations of all trades, subcontractors or material and men engaged upon the work. The Contractor shall do, or cause his agents to do, all cutting, fitting, adjusting, and repair necessary in order to make the several parts of the work come together properly.

1. Examine Contract Documents in advance of start of construction and identify in writing questions, irregularities or interference to the DMH Project Manager in writing. Failure to identify and address such issues in advance becomes the sole responsibility of the Contractor.

B. Execute the work in an orderly and careful manner with due regard to the occupants of the facility, the public, the employees, and the normal function of the facility.

C. The work sequence shall follow the planning of the schedule established by the Contractor and as approved by the DMH Project Manager. The work upon the site of the project shall commence promptly and be executed with full simultaneous progress. Work operations which require the interruption of utilities, service, and access shall be scheduled so as to involve minimum disruption and inconvenience, and to be expedited so as to insure minimum duration of any periods of disruption or inconvenience.

D. The Contractor shall review the tolerances established in the specifications for each type of work and as established by trade organizations. The Contractor shall coordinate the various trades and resolve any conflicts that may exist between trade tolerances without additional cost to DMH. The Contractor shall provide any chipping, leveling, shoring or surveys to ensure that the various materials align.

E. The Contractor shall coordinate all work that impacts the fire suppression and alarm system with the Fire Alarm Company including preparation, demolition, modernization, and testing. Costs associated with the Fire Alarm Company that are directly related to this Contract are to be included in the Contract price.

F. The Contractor shall coordinate all work that impacts the emergency generator system with the Emergency Generator Company including preparation, demolition, modernization, and testing. Costs associated with the Emergency Generator that are directly related to this Contract are to be included in the Contract price.

1.12 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements for the standard, except where more rigid requirements are specified or are required by codes. Refer to the specific Specification for specific references.

B. Where reference is made in the Contractual Documents to Publications and Standards issued by Associations or Societies, the intent shall be understood to specify the current edition of such Publications or Standards (including tentative revision) in effect on the date of the contract advertisement notwithstanding any reference to a particular date.

1.13 PRECONSTRUCTION CONFERENCE

A. In accordance with Article V of the CONTRACT AND GENERAL CONDITIONS, a pre-construction conference to review the work will be conducted by the DMH Project Manager.

B. Representatives of the following shall be required to attend this conference:

1. DMH Project Manager
2. DMH Site Director
3. Contractor
4. All Subcontractors

C. The Contractor shall have a responsible representative at the pre-construction conference to be called by the DMH Project Manager following the award of the Contract, as well as representatives of field or office forces and major subcontractors. All such representatives shall have authority to act for their respective firms. The pre-construction conference is to be held within five days of Notice to Proceed, or as otherwise determined by DMH.

1.14 WORK BY DMH

A. DMH will provide Site Access

B. DMH will designate parking and staging areas.

C. DMH will provide access to water, electrical, and sanitary facilities. Note that electrical service in the building is National Grid. If the Contractor requires additional power, the Contractor is responsible to provide the additional power under the base contract fee.

1.15 SUBCONTRACTORS

A. After selection, the successful Bidder shall submit a list of subcontractors proposed for the performance of the Work to DMH for approval. The list shall include the name, address, contact person, and MA tax identification number for each subcontractor.

1.16 PROJECT MEETINGS

A. Project meetings shall be held on a weekly basis and as required subject to the discretion of the DMH Project Manager.

B. As a prerequisite for monthly payments, ordering schedules, shop drawing schedules, and coordination meeting schedules shall be prepared and maintained by the Contractor and shall be revised and updated on a monthly basis, and a copy shall be submitted to the DMH Project Manager.

C. In order to expedite construction progress on this project, the Contractor shall order all materials immediately after the approval of shop drawings and shall obtain a fixed date of delivery to the project site for all materials ordered which shall not impede or otherwise interfere with construction progress. The Contractor shall present a list and written proof of all materials and equipment ordered (through purchase orders). Such list shall be presented at the meetings and shall be continuously updated.

D. Scheduling shall be discussed with all concerned parties, and methods shall be presented by the Contractor which shall reflect construction

completion not being deferred or foreshortened. Identify critical long-lead items and other special scheduling requirements. The project schedule is to include time for submission of shop drawing submittals, time for review, and allowance for resubmittal and review.

E. Project meetings shall be chaired by the DMH Project Manager.

F. Minutes of the project meetings shall be prepared by the DMH Project Manager and shall be distributed to all present within 72 hours of the Project Meeting.

1.17 PERMITS, INSPECTION AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having any jurisdiction require any portion of the Work to be inspected, tested, or approved, the Contractor shall give the DMH Project Manager or his/her designated representative, and such Authority timely notice of its readiness so the DMH Project Manager may observe such inspecting, testing, or approval.

B. Prior to the start of construction, the Contractor shall complete application to the applicable Building Code enforcement authority for a Building Permit. Such Permit shall be displayed in a conspicuous location at the project site.

C. Unless otherwise specified under the Sections of the Specifications, the Contractor shall pay such proper and legal fees to public officers and others as may be necessary for the due and faithful performance of the work and which may arise incidental to the fulfilling of this Contract. As such, all fees, charges and assessments in connection with the above shall be paid by the Contractor.

1.18 CUTTING, CORING, AND PATCHING, UNLESS OTHERWISE INDICATED

A. The Contractor shall do all cutting, coring, fitting and patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of the Subcontractors as indicated in the Specifications.

B. The Contractor shall not endanger any work by cutting, coring, excavating or otherwise altering the work and shall not cut or alter the work of any other Subcontractor except with the written consent of the DMH Project Manager.

C. Submit a written request to the DMH Project Manager well in advance of executing any cutting or alteration which affects:

1. Work of DMH or separate contractor.
2. Structural value or integrity of any element of the Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance, or safety of operational elements.
5. Visual qualities of sight-exposed elements.
6. Request shall include:
   a. Identification of the Project.
   b. Description of affected work.
   c. The necessity for cutting, alteration, or excavation.
   d. Effect on work of DMH or any separate contractor, or on structural or weatherproof integrity of Project.
   e. Description of proposed work:
   f. Alternatives to cutting and patching.
   g. Cost proposal, when applicable.
   h. Written permission of any separate contractor whose work will be affected.
7. Should conditions of Work or the schedule indicate a change of products from original installation, Contractor shall submit request for substitution to the DMH Project Manager.
8. Submit written notice to the DMH Project Manager designating date and time the work will be uncovered a minimum of three business days in advance.

D. Performance:

1. Execute cutting and patching by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
   a. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
   b. Prior to cutting and structural steel or concrete work, contact the DMH Project Manager in writing. Do not cut any structural steel and concrete work until approval has been granted by the DMH Project Manager.
2. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

3. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract

Documents.

4. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
5. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
6. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.
    a. Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch.
7. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
    a. For continuous surfaces, refinish to nearest intersection.
    b. For an assembly, refinish entire unit.

E. Existing Utilities Services:

1. Interruptions to critical existing utility services will not be allowed.
2. The Contractor shall locate and record on Drawings all existing utilities along the course of the work by such means as the DMH Project Manager may approve, and shall preserve such marked locations until the work has progressed to the point where the encountered utility is fully exposed and protected as required. It shall be the Contractor's responsibility to notify the proper authorities and/or utility company before interfering therewith.
3. All exposed conduits, wires, and/or cables shall be provided with sufficient protection and support to prevent failure, fraying, or damage due to backfilling or other construction operations.
4. The Contractor shall not obstruct access to existing active utility system manholes and catch basins which continue to serve facilities other than the project construction site. The Contractor shall exercise measures as necessary to prevent the placement of impediments that limit continuous access by authorized utility company or DMH maintenance personnel and shall be required to reimburse the utility company or DMH for any expense incurred as a result of need to remove any such impediments to access.

1.19 PERMITS, INSPECTION AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the contract documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction required any portion of the work to be inspected, tested or approved, the Contractor shall give the DMH Project Manager notice of its readiness so the DMH Project Manager may observe such inspection and testing.

B. Prior to the start of construction, the Contractor shall complete application to the applicable Building Code enforcement authority for a Building Permit. Such Permit shall be displayed in a conspicuous location at the project site. The Contractor shall pay all costs associated with the Building Permit.

1.20 SECURITY REQUIREMENTS

A. The Contractor shall familiarize himself with DMH's security requirements and shall abide by and conform with such established regulations at all times. The Contractor shall submit a list of personnel who will be responsible for the rehabilitation work and the maintenance service. List shall be kept current by Contractor.

B. Proper identification must be worn at all times.

1.21 SAFETY REQUIREMENTS

A. OSHA Safety and Health Course Documentation Records: Chapter 306 of the Massachusetts Acts of 2004 requires that everyone employed at the jobsite must complete a minimum 10-hour long course in construction safety and health approved by the U.S. Occupational Safety and Health Administration (OSHA) prior to working at the jobsite. Compliance is required for the Contractor's and subcontractors' on-site employees at all levels. This requirement does not apply to home-office employees visiting the Site or to suppliers' employees who are making deliveries.

B. Documentation records shall be initially complied by the Contractor and subcontractors as part of certified payrolls, and the Contractor shall create and maintain a copy of the documentation on-site at all times.

C. Building will be occupied during execution of work. Work shall be conducted in a manner to afford maximum protection of building, facilities, employees and the public and to prevent unreasonable delay or interference with normal functioning of the building.

D. Provide fire extinguishers so that they shall be readily available at all times.

E. All accident reports are to be transmitted to the DMH Project Manager within 24 hours of occurrences.

F. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with his direct work.

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

1. All employees on the Work and all other persons who may be affected thereby.
2. All the work and all materials and equipment to be incorporated therein, whether in storage on or off site, under the care, custody or control of the subcontractors.
3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.
4. Contractor to provide full roof protection for his direct work.

H. Provide screens, partitions or other approved barricades to effectively isolate building personnel and public from the work areas that are necessary during the demolition and reconstruction of the main entry and ancillary areas affected by the main entry upgrading during its time of closure. In addition, provide any and all necessary safety barriers within the surrounding area of the main entry due to the demolition and ongoing construction

I. It shall be the obligation of the general contractor to maintain a free and clear passageway within the main lobby connected to the main entry under construction. Parts, tools, etc., shall be kept within the confines of the safety barricades of the construction area.

J. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. He shall erect and maintain, as required by existing conditions and progress of the work, all reasonable safeguards and protection, including barricades, posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

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

L. In any emergency affecting the safety of persons or property, the Contractor shall act to prevent threatened damages, injury or loss.

****** END OF SECTION ******

SECTION 013300
SUBMITTALS

PART 1 – GENERAL

1.1 PROVISIONS INCLUDED

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the specification.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT and GENERAL CONDITIONS.

1.2 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. The Contractor shall review and submit to the DMH Project Manager, shop drawings, product data and samples required by Specification Section.

B. Shop Drawings:

1. Original drawings shall be prepared by Contractor, Subcontractor, supplier or distributors, which illustrate some portion of the work; show fabrication, layout, setting or erection details.
   a. Shop drawings shall be prepared by a qualified detailer.
   b. Details shall be identified by reference to sheet and detail number shown.
   c. Maximum sheet size shall be 30 inch by 42 inch.
   d. Reproductions for submittals shall be reproducible with the required number of opaque prints specified herein.

C. Project Data:

1. Manufacturer's standard schematic drawings:
   a. Modify drawings to delete information which is not applicable to project.
   b. Supplement standard information to provide additional information applicable to project.
2. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:

   a. Clearly mark each copy to identify pertinent materials, products or models.

b. Show dimensions and clearances required.
c. Show performance characteristics and capacities.
d. Show wiring diagrams and controls.

D. Samples: Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.

1. Office Samples: Of sufficient size and quantity to clearly illustrate:
   a. Functional characteristics of product or materials, with integrity related parts and attachment devices.
   b. Full range of color samples.
   c. After review, approved samples may be incorporated into the project construction if not retained for comparison.

1.3 CONTRACTORS RESPONSIBILITIES

A. The Contractor shall coordinate each submittal with requirements of work and contract documents.

B. The Contractor's responsibility for errors and omissions in submittals is not relieved by DMH Project Manager's review of submittals.

C. Notify DMH Project Manager in writing at time of submission, of deviations in submittals from requirements of contract documents or previous submissions.

D. Work that requires submittals shall not commence unless submittals have DMH Project Manager's stamp and initials or signature indicating review and approval.

E. After DMH Project Manager's review, the Contractor shall distribute required copies.

1.4 SUBMISSION REQUIREMENTS:

A. Make submittals promptly and in such sequence as to cause no delay in the work.

B. Submit four (4) opaque copies of shop drawings, and number of copies of product data which the Contractor requires for distribution, plus two (2) copies which will be retained by the DMH Project Manager.

C. Submit number of samples specified in each Specification Section.

D. Forward submittals with transmittal letter.

E. Submittals shall include:

1. Date and revision date.
2. Project title.
3. The names of:
   a. Contractor
   b. Subcontractor
   c. Supplier
   d. Manufacturer
4. Identification of product or material.
5. Relation to adjacent structure of materials.
6. Field dimensions, clearly defined as such.
7. Specification Section number.
8. Applicable standards, such as ASTM number.
9. A blank space 5 inches by 4 inch, for the DMH Project Manager's stamp.
10. Identification of deviations from contract document.
11. Contractors stamp, initialized or signed, certifying review and approval of submittals.

1.5 RESUBMISSION REQUIREMENTS

A. Shop Drawings:

1. Drawings, data or samples shall be designated approved, approved as noted, revise and resubmit or rejected.
2. Revise drawings as required and resubmit as specified for previous submittal.
3. Product Data and Samples: Submit new data and samples as required from previous submittals.

1.6 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute copies of shop drawings and project data which display the DMH Project Manager's written approval to appropriate Subcontractors.

1.7 SCHEDULE OF VALUES

A. Prior to the first request for payment, the Contractor shall submit to the DMH Project Manager, a draft Schedule of Values of the various portions of the work in sufficient detail to reflect various major components of each trade, including quantities when requested, aggregating the total contract sum, and divided so as to facilitate payments for work under each Section.

B. The draft Schedule of Values shall be prepared in such form as specified or as DMH may approve, and it shall include data to substantiate its accuracy.

C. Each item in the Schedule of Values shall include its proper share of overhead and profit. This Schedule including breakdown and values, requires the approval of DMH and shall be used only as a basis for the Contractor's request for payment.

******END OF SECTION******

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT and GENERAL CONDITIONS.

1.2 DESCRIPTION

A. The Contractor shall be responsible for providing and maintaining temporary construction facilities and controls as specified herein.

1.3 HOISTING EQUIPMENT AND MACHINERY

A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in safe condition by the Contractor for the use of all Subcontractor's material and/or equipment delivered to the designated hoisting area except that which is specifically required to be provided by the Subcontractors themselves and is so stated in each appropriately related Section of the Specifications. All costs for hoisting operating services shall be borne by the Contractor.

1.4 STAGING AND TEMPORARY LADDERS, RAMPS, RUNWAYS, ETC.

A. All staging, exterior and interior, required to be over eight feet in height, shall be furnished and erected by the Contractor and maintained in safe condition by him without change to, and for the use of all trades as needed by them for proper execution of their work.

1.5 DUST CONTROL

A. The Contractor shall provide adequate means for the purpose of preventing dust caused by construction operations throughout the period of the construction contract.

B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the contract articles with added regard to performance obligations of the Contractor.

C. The Contractor shall provide and maintain floor mats at access points to prevent the tracking of dust.

1.6 NOISE CONTROL

A. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

B. Execute construction work by methods and by use of equipment which will reduce excess noise.

1. Equip air compressors with silencers and power equipment with mufflers.

1.7 CLEANING DURING CONSTRUCTION

A. The Contractor shall perform clean-up operations during construction as herein specified.

B. The Contractor shall at all times during the progress of the work, keep the work area and other adjacent areas free from accumulation of waste materials or rubbish.

C. Cleaning and removal of waste material and/or rubbish must be performed on a daily basis.

D. Control accumulation of waste materials and rubbish, periodically dispose of off-site. The general contractor shall bear all costs, including fees resulting from such disposal.

E. Store volatile wastes in covered metal containers, and remove from premises.

F. Prevent accumulation of wastes which create hazardous conditions.

G. Provide adequate ventilation during use of volatile or noxious substances.

H. Conduct cleaning and disposal operation to comply with local ordinances and anti-pollution laws.

1. Do not burn rubbish and waste materials on site.

2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

I. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

J. Use only those cleaning materials and methods recommended by manufacturer of surface materials to be cleaned.

K. Provide on-site containers for collection of waste materials, debris and rubbish.

L. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas off the construction site.

****** END OF SECTION ******

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT and GENERAL CONDITIONS.

1.2 PRODUCTS

A. Products include material, equipment and systems. Products shall be new, best of their respective kinds and free from defects.

B. Comply with Specifications and referenced standards as a minimum requirement.

C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.

D. Do not use materials and equipment removed from existing structures, except as specifically required, or allowed, by the contract documents.

E. Materials and equipment of similar application: same manufacturer, except as noted.

F. Secure approval of materials, equipment and installation

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration and racking.

1.4 MANUFACTURER'S INSTRUCTIONS

A. When work is specified to comply with manufacturer's instructions, submit copies as specified in Section 013300 - SUBMITTALS.

B. Perform work in accordance with details of instructions and specified requirements.

1.5 TRANSPORTATION AND HANDLING

A. Refer to CONTRACT and GENERAL CONDITIONS and Specification Sections for requirements pertaining to transportation and handling of materials and equipment.

B. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.

C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct and products are undamaged.

1.6 STORAGE AND PROTECTION

A. Refer to CONTRACT and GENERAL CONDITIONS and Specification Sections for requirements pertaining to storage and protection of materials and equipment.

B. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weathertight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

C. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

D. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged, and are maintained under required conditions.

****** END OF SECTION ******

SECTION 017000
CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT and GENERAL CONDITIONS.

1.2 FINAL CLEANING

A. Upon completion of the work under this Contract, the Contractor shall leave the project site ready for use without the need for further cleaning or directly related painting of any kind and with all work in perfect order. The Contractor shall perform final cleaning operations as herein specified prior to final inspection.

B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

C. Cleaning shall include all surfaces, interior and exterior in which the Contractor has had access whether existing or new.

D. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

E. Use only those cleaning materials and methods that are recommended by the manufacturer of surface material to be cleaned.

F. Employ experienced workmen or professional cleaners for final cleaning operations.

G. Remove grease, mastic, adhesives, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior surfaces.

H. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

I. Polish glossy surfaces to a clear shine.

J. In addition, the Contractor shall remove from the site , all building rubbish, unused materials belonging to him or used under his direction during construction or impairing the use or appearance of the property and shall restore such areas affected by the work to their original condition

K. Prior to final completion or DMH Use and Occupancy, the Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

1.3 PROJECT DOCUMENTS

A. Record Drawings shall consist of **all** the contract drawings. Drawings shall be provided in electronic form and on CD.

B. Project Manuals:

1. Before requesting acceptance of work, furnish as required, three copies of product manuals shall be provided to the DMH Project Manager. The Project Manual shall contain, but not be limited to:
   a. Final detail of all submittals: fixtures, doors, frame, etc.
   b. Product reference including Manufacturer's name and material description detail sheet for all major applicable components and parts.
   c. Supply any and all details pertaining to any installed equipment that may require any specific maintenance or knowledge of where these components have been installed to ease in any future repair or replacement, i.e. complete wiring details corrected to incorporate any field or final changes and/or operation of all other components.
   d. Copy of Certificates of Use.
   e. Product data on all related work.
2. Complete project manual and all detail and documentation to also be electronic and furnished on CD.

C. Operation And Maintenance Manuals: Should include cleaning, replacement parts information, warranties, all contact information of subcontractors and a formal warranty for all work completed.

D. Preventative Maintenance Checklist: Per recommendations of manufacturer's.

E. Door Keys

1. Provide four sets of keys for DMH's use.

1.4 GUARANTEES AND WARRANTIES

A. The Contractor shall submit to the DMH Project Manager all extended guarantees and warranties that have been specified in various, individual Sections of the Specifications.

B. The Contractor shall guarantee to DMH all work installed to be free from any and all defects in workmanship and/or materials and that all apparatus will develop capacities and characteristics specified and that if, during period of one year from date of certificate of completion and acceptance of work, unless a longer period is specified, any such defects in workmanship, material or performance appear, the Contractor will remedy them without cost to DMH.

C. Should Contractor fail to remedy such defects within the agreed length of time, to be specified in notice from DMH, DMH may have such work performed by another contractor and charge the entire cost to the Contractor.

****** END OF SECTION ******

SECTION 024119
SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION

A. It is not the intent herein to describe all the items and work required to be removed under this Section. The General Contractor shall assure himself that all of the work to be removed, not otherwise specified herein or described under other Sections, but shown on the Drawings, shall be removed under this Section at no additional cost to the Commonwealth.

B. The General Contractor shall also examine other Sections of these Specifications and familiarize himself with their provisions regarding the removal of existing items and work. He shall understand that all items and work not specifically mentioned to be removed by the requirements of other Sections of these Specifications shall be removed as part of the work under this Section.

C. The scope of work consists of material and services to be furnished under this Section, and without limiting the generality thereof, includes labor, equipment and services required for the removal of existing work, special protection and all work incidental thereto as specified herein and as shown on the Drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. The following work is not included in this Section and is to be performed under the designated Sections:

1. Movable items and items of User Agency's equipment in the areas of the existing building affected by the work under this Contract will be removed by the User Agency.
2. Cutting and core drilling for new electrical or any other work will be performed by these respective trades.
3. The patching and repair of ceilings, floors and walls caused by work performed under this Section is included under Sections of these Specifications describing similar construction. The General Contractor shall do his utmost to keep such necessary patching and

repairing to a minimum.

4. Disconnecting of existing services as required will be done by the respective Mechanical and Electrical trades.

1.4 PERMITS AND CODES

A. Work specified herein shall conform to the Drawings and Specifications and shall comply with all rules, regulations, laws and ordinances of the Commonwealth of Massachusetts.

B. The General Contractor shall procure and pay for all permits and licenses required for the complete work specified or inferred under this Section.

1.5 SCHEDULING

A. Before beginning the removal of work and demolition, the General Contractor shall consult jointly with the Facility and Project Engineer to determine the schedule of work, exact places, times and days during which the removal and demolition work may, or may not be carried on, and to determine further reasonable requirements, particularly in regards to noise prevention, dust prevention, weather protection, and safety precautions.

B. No work shall be started in existing building without prior approval of the Facility. The General Contractor shall give the Facility adequate advance notice of his readiness to start such work in order that they may properly rearrange activities or evacuate the spaces to be affected.

1.6 EXAMINATION OF PREMISES

The Contractor will be held to have examined the premises before submitting proposals for the work and to have satisfied himself as to the existing conditions under which he will be obliged to operate or that will in any way affect the work under this Contract, also the character and amount of materials and debris to be removed. No allowances will be made in this connection for error or negligence of the Demolition Contractor.

1.7 USE OF PREMISES

A. All apparatus, storage, and the operation of workmen in connection with activities under this Section shall be confined to limits of the Contract. Storage will not be permitted on the property without the approval of the Facility.

B. All parking regulations shall be observed.

C. All trucks carrying loose, dry material such as debris, broken concrete block, plaster, etc., shall be covered by tarpaulins to prevent blowing away

or spillage of contents. All spillage of whatever nature shall be promptly taken up and removed.

1.8 PROTECTION

A. The removal of all portions of the structure to be removed shall be done with utmost care, using tools and methods that will not transfer any heavy shocks to the remaining portions of the existing building. All possible care shall be taken to avoid vibration and other disturbances.

B. All existing items directed by the Project Engineer to be retained as the User Agency's property or relocated as shown on the drawings or noted herein, shall be handled and removed with full consideration for their preservation. It is the full responsibility of the General Contractor to replace, without additional charge to the Commonwealth, all such items which are lost or damaged due to the removal operations or handling.

C. When removing materials and making openings in walls, floors, etc., the General Contractor shall take all precautions and use whatever protective devices, shoring, guardrails, and the like as may be required to assure that the remaining and adjacent portions of the existing work which is to remain is substantially supported and/or not loaded beyond safe limits.

D. Consult with the Project Engineer regarding the electrical/mechanical equipment.

PART 2 – MATERIALS

2.2 DISPOSAL OF WORK REMOVED

A. All non-salvageable refuse and debris which accumulate as a result of work under this Section shall be removed. No refuse or debris of any nature shall be allowed to accumulate to the detriment of the work.

B. All existing items removed under this Section shall become the responsibility of the Demolition Contractor, and legally be disposed of off-site at their expense, unless such existing items to be removed are specifically noted on the drawings to be relocated or unless otherwise directed by the Project Engineer to be rendered to and become the property of the Commonwealth.

C. Remove debris in covered containers on a route designated by the Facility.

PART 3 – EXECUTION

3.1 PREPARATION

Before starting the removal of work, the Contractor shall arrange for the disconnection of active utility services in the areas to be worked in. All work on existing utilities shall be accomplished by the respective subtrades or utility companies having jurisdiction.

3.2 REMOVAL OF EXISTING WORK

A. Remove any miscellaneous items left within main lobby in its entirety as noted on plans and any connected electrical, mechanical, plumbing, security, etc.

1. Store any existing devices for reinstallation, as noted on plans or specifications.
2. Properly close off the main lobby from the main entry to ensure only construction staff has the ability to move between the two areas.
3. Please note that the operation of the lobby shall be terminated temporarily and relocated for the duration of the project.
4. Close off and properly secure the main entry as required to prevent any access from non-construction personnel during the renovation process. Coordinate closure with Corrigan staff to ensure no conflicts of function elsewhere within the building.

B. Remove doors, architectural trim, existing partitons and any other finish items as noted in specifications and/or drawings.

C. Provide dust protection to contain dust and debris to the work area.

D. Disconnect all utilities as required.

3.3 CLEAN-UP

At the completion of work, all rubbish, debris, waste, materials, and salvaged materials shall be removed from the site. All tools, scaffolds, apparatus and appliances used in connection with work under this Section shall be removed by the Contractor, and the premises shall be left in clean condition, ready for the alteration work as described under other Sections of these Specifications.

****** END OF SECTION ******

SECTION 061000
ROUGH CARPENTRY

PART 1 – GENERAL

1.1 GENERAL

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Wood blocking and nailers.
2. Plywood backing panels, as required.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 064023 – INTERIOR ARCHITECTURAL WOODWORK for countertops and other miscellaneous items as noted on the plans.

1.3 SUBMITTALS

A. Product Date: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for fire-retardant treatment and chemical treatment manufacturer and certification by treating plant and treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 DELIVERY, STORAGE AND HANDLING

A. Stack lumber, plywood, and any other miscellaneous materials; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 – PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise noted.

B. Plywood Panels:

1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise noted.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Factory mark panels according to indicated standard.

2.2 FIRE RETARDANT-TREATED MATERIALS

A. General: For all interior use materials, provide materials that are fire-retardant treated and comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, US Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.

2.3 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.4 PANEL PRODUCTS

A. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch. Provide fire-retardant treated plywood where indicated.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, or in an area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Wire, Brad, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-Steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.6 MISCELLANEOUS MATERIALS

A. Adhesive, including gluing furring and sleepers to concrete or masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesive that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangements.

B. Set carpentry to required levels and lines, with members p[plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

D. Countersunk fastener heads on exposed carpentry work and fill holes with wood filler.

E. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

******END OF SECTION******

SECTION 064023
INTERIOR ARCHITECTURAL WOODWORK

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Wood Cabinets.
2. Corian countertops and exterior finish of reception and security desk.
3. Shop finishing of interior woodwork

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 024119 – SELECTIVE DEMOLITION and disposal of existing security/reception desk, along with any additional materials that fall within the footprint of the main lobby.
2. Section 061000 – ROUGH CARPENTRY for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
3. Section 088000 – GLAZING for enclosing Security and Reception Desks but will be responsible for coordinating the installation.

1.3 SUBMITTALS

A. Product Date: For each type of product specified, including cabinet hardware and accessories, and finishing materials and processes.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for plumbing fixtures, electrical components and other items installed in architectural woodwork.
3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Verification:

1. Lumber with or for transparent finish, not less than 5 inches wide by 12 inches long for each species and cut, finished on 1 side and 1 edge.
2. Lumber and panel products with shop-applied opaque finish, 5 inches wide by 12 inches long for lumber and by 8 by 10 inches for panels, for each finish system with color, with 1/2 of exposed surface finished.
3. Refer to Corian specifications for requested sample sizes of proposed countertops.

D. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

E. Qualification Data: For installer and fabricator.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work:

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Refer to electrical for the installation of duplex outlets, three light fixtures being installed under the counter of the police desk, along with all other equipment and material being installed at desk.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: Maple, plain sawn or sliced.

C. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
4. Marine-Grade Plywood: DOC PS 1.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening, self-closing.

C. Continuous Hinges for Wardrobes: BHMA A156.9, B01491.

D. Double-Acting Gate Spring Pivot Hinges: McKinney No. 4007RB in brushed nickel, or approved equal.

E. Back-Mounted Pulls: Häfele No. 116.39.651 in brushed nickel, or approved equal.

F. Magnetic Catches for Wardrobes: Heavy-duty magnetic catches, BHMA A156.9, B03171.

G. Vandal-Resistant Clothes Hooks for Wardrobes: Bobrick Model B-983 or approved equal.

H. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

I. Drawer Slides: BHMA A156.9, B05091; side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated-steel with steel ball-bearings; of the following grades:

1. Box Drawer Slides: Grade 1HD-100.
2. File Drawer Slides: Grade 1HD-100.
3. Pencil Drawer Slides: Grade 2.
4. Keyboard Slides: Grade 1.

J. Monitor Suspension Systems for Flat Screen Monitors: Häfele No. 639.91.332 with CPU Holder No. 639.89.391, or approved equal.

K. Door Locks: BHMA A156.11, E07121.

L. Drawer Locks: BHMA A156.11, E07041.

M. Grommets for Cable Passage through Countertops: Molded-plastic grommets and matching plastic caps with slot for wire passage.

N. Countertop Support Brackets: Off-white powder-coat finish.

1. For Countertops up to 18 inches Deep: Rakks Counter Support Brackets Model No. EH-1212 by Rangine Corporation, Millis, MA, or equal.

2. For Countertops up to 25 inches Deep: Rakks counter Support Brackets Model No. EH-1818 by Rangine Corporation, Millis, MA, or equal.

3. For Countertops up to 30 inches Deep: Rakks counter Support Brackets Model No. EH-1818 by Rangine Corporation, Millis, MA, or equal.

O. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

P. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for concrete resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.

2. Contact Adhesive: 250 g/L.

2.4 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.

C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site.

Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.5 WOOD CABINETS FOR PAINTED FINISH

A. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Wood Species and Cut for Exposed Surfaces: Clear Maple

1 Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
2. Matching of Veneer Leaves: Book match.
3. Vertical Matching of Veneer Leaves: End match.
4. Veneer Matching within Panel Face: Center-balance match.

D. Semi exposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
2. Drawer slides and backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
3. Drawer Bottoms: Hardwood plywood.

2.6 CORIAN COUNTERTOPS AND VERTICAL FINISH

A. Countertops and vertical surfaces as illustrated within the architectural drawings shall be Corian® by DuPont™ or approved equal with backsplash and side splashes to be installed as indicated on plans.

1. Color: to be selected from the complete Corian palette, as listed within the Global Corian® Color Portfolio.
2. Front edge: Pencil
3. Finish: Matte.

B. Bidders intending to use an ‘or equal’ shall submit manufacturer’s literature with bid or be rejected.

C. Backsplashes and side splashes shall be 4" in height, unless noted otherwise, and made of the same material and finish as the proposed countertops.

D. Provide cutouts in countertop as required.

E. All dimensions must be field verified before any material goes into fabrication.

F. Fabrication:

1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
2. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat the entire component uniformly prior to forming.
3. Ensure that there is no blistering, whitening and cracking of components during forming.
4. Fabricate backsplashes from solid surfacing material with optional radius cove where counter and backsplashes meet as indicated on Drawings. Backsplashes for most colors may be fabricated by traditional means discussed in the Corian Technical Bulletin K-25294 *Backsplashes*. Colors with metallic/mica particle or veined colors creating directional aesthetics (K-26833 *Directional Aesthetics*) may require the techniques in Technical Bulletin K-28235 *Thermoformed Backsplash*. (Note: Technical Bulletin references can be found on line at the Corian website: www.corian.com/-documentation-#-technical-literature-)
5. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint. Reinforcing strip of solid polymer material is not required when using DuPont™ Joint Adhesive 2.0.
6. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.

7. Finish: Ensure surfaces have uniform finish:
   a. Matte, with a 60^0 gloss rating of 5-20.

8. Fabrication Tolerances:
   a. Variation in Component Size: +/-1/8".
   b. Location of Openings: +/- 1/8" from indicated location.

G. Verification of Conditions:

1. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Verify actual site dimensions and location of adjacent materials prior to commencing work.
3. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10'-0".
4. Notify Project Engineer in writing of any conditions which would be detrimental to installation.

H. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

I. Installation:

1. Install components plumb, level rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.
2. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.
3. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.
4. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.
5. Seal between wall and components with joint sealant as specified herein.
6. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown

on reviewed Shop Drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.

7. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.
8. Coordinate connections of electrical fixtures and outlets with Division 22-Section 260500 Electrical.

J. Repair:

1. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's "Technical Bulletins".

K. Site Quality Control:

1. Non-conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Architect/Project Engineer at no cost to Owner.

L. Cleaning:

1. Remove excess adhesive and sealant from visible surfaces.
2. Clean surfaces in accordance with manufacturer's "Care and Maintenance Instructions".

M. Manufacturer Warranty: Provide manufacturer's standard warranty for material only for period of 10 years against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Project Engineer at no expense to Owner.

2.7 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent finished items specified to be field finished. Refer to referenced quality standard for material and application requirements.

D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing, concealed surfaces, and

similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Back priming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require back priming when surfaced with plastic laminate, backing paper, or thermostat decorative panels.

E. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen measured on 60-degree gloss meter per ASTM D 523.

1. Grade: Premium.
2. AWI Finish System: Conversion varnish.
3. Staining: Match flush wood doors for color.
4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
5. Sheen: Satin, 30-50 gloss units.

PART 3 – EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete as required, including removal of packing and back priming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

G. Countertops: Anchor securely to base cabinets as per specified within Subsection 2-06, CORIAN COUNTERTOPS AND VERTICAL FINISH.

H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork, repair work includes any of the existing woodwork that originally came in contact with the existing desk and from any items removed from the back wall. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi exposed surfaces. Touch up shop-applied finishes restoring damaged or soiled areas.

D. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.

E. Protect surfaces from damage until date of Substantial Completion of the Work.

******END OF SECTION******

SECTION 081213
HOLLOW METAL WORK

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the specification.

1.2 DESCRIPTION

A. Work under this Section consists of furnishing the following items for installation and without limiting the generality thereof includes:

1. Interior shop assembled custom, standard, and fire rated pressed hollow metal steel doorframes.
2. Wiring for magnetic locking system to be included.
3. Frame fabrication for sound attenuated doors to maintain minimum rating of STC 45.

B. Related Work Specified Elsewhere

The following work is not included in this Section and is to be performed under the designated Sections:

1. Section 081416 – Flush Wood Doors.
2. Section 087100, Door Hardware: Templates for door hardware cutouts and reinforcements occurring in doors and frames.
3. Section 099123, Interior Painting: Finish painting of doors and frames as indicated on Architectural Drawings.

1.3 REFERENCES

A. Standards

The following standards and standard specifications referred to thereafter by designation only, form a part of this Section.

1. American Society for Testing and Materials (ASTM).
   a. A366, Specification for Cold-Rolled Carbon Sheet Steel, Commercial Quality.
   b. A526, Specification for Steel Sheet, Zinc-Coated Galvanized, by the Hot-Dip Process.

c. A569, Specification for Steel, Carbon, Hot-Rolled Sheet and Strip, Commercial Quality.

d.

1.4 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies

1. Underwriter's Laboratories, Inc. Labels: Provide labeled doors and frames for openings requiring fire protection ratings as determined and scheduled on the Drawings. Construct such doors and frames as tested and approved by Underwriter's Laboratories,
2. If any door or frame scheduled to be fire-rated does not qualify for appropriate labeling because of its design, hardware or any other reason, notify the Project Engineer before fabricating work.

1.5 SUBMITTALS

A. Shop Drawings

Submit in accordance with provisions of Section 013300, Submittals; include the following:

1. Complete door and frame schedule, large scale details of door and frame construction indicating all gauges, reinforcing, cutouts, anchors, and anchor clips, as well as certification from the manufacturer that all U.L. fire resistive label requirements have been met.
2. Provide details at 3-inch to 1-foot scale and dimensioned elevations at not less than ¼ inch to 1-foot scale.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Frames

1. Ship with separators, banding, spreaders and paper wrapping to protect items.
2. Store in upright position under cover in manner preventing rust and damage.

PART 2 – PRODUCTS

2.1 PRESSED STEEL FRAMES

A. Materials

1. Interior Frames

a. Fabricate from 16-gauge commercial quality, level, cold-rolled carbon steel conforming to ASTM A366.

B. Design and Fabrication

1. General

   a. Provide units of sizes and profiles indicated on Drawings.
   b. Fabricate units that are strong, rigid, neat in appearance, square, true and free of defects, warp or buckle. Provide molded members that are clean cut, straight and of uniform profile throughout their length.

2. Jamb Depths, Trim, Profile and Backbends
   a. To fit existing and/or new walls.
3. Corner Joints
   a. Provide close tight fitting edges with faces mitered.
4. Stops
   a. 5/8-inch minimum depth.
5. Hardware Reinforcements
   a. Hinge and pivot: 7-gauge, 1-1/2 inch x 10-inch minimum size.
   b. Strike: 12-gauge.
   c. Flush Bolts: 12-gauge.
   d. Closer, panic device, hold-open arm, surface mounted hardware: 12-gauge.
6. Floor Anchorage
   a. Countersunk holes to be provided in frame face for attachment to floor track.
7. Jamb Anchors
   a. At stud partitions: steel anchors of suitable design, not less than 18-gauge thickness, securely welded inside each jamb as follows:
      Frames up to 7-feet-6-inches high: 4 anchors
      Frames 7-feet –6-inches to 8-feet-0-inches high: 5 anchors
   b. At previously placed concrete, masonry or structural steel: anchors of suitable design as shown on approved shop drawings. Punch and swage frames in shop for anchors.
8. Glazing Beads
   a. 18-gauge channel sections with mitered corner joints, secured to framed opening with zinc-coated countersunk Philips oval head self-tapping machine screws.
9. Silencers
   a. Punch frames for door silencers; 3 at strike jamb of single door, 2 at head of pairs of doors.
10. Labeling
    a. Labeled frames shall bear required label.

C. Sound Rated Frames

1. Maintain minimum STC rating of 45.
2. Metal frame to be factory assembled mitered corners with fully welded seams ground smooth.
3. Frames to be backfilled with appropriate sound deadening insulation.
4. Install acoustical gasketing seals around the head, jamb and sill complete, uninterrupted and air tight throughout the service life of the door. For uninterrupted contact, the gasketing must be installed on the same side of the door and frame.

2.2 PROVISIONS FOR HARDWARE

A. Prepare hollow metal doors and pressed steel frames at manufacturer's plant for all finish hardware in accordance with templates furnished by the hardware supplier.

B. Mortise, reinforce, drill and tap for mortised and concealed finish hardware. Drilling and tapping for surface applied hardware shall be done in the field by others.

C. Hardware locations on doors and frames, measured from top of finished floor slab unless noted otherwise, shall conform to following:

1. Hinges:
   a. Top - 5 in. from head of frame to top of hinge.
   b. Bottom - 10 in. from top of slab to bottom on hinge.
   c. Intermediate - Centered between top and bottom hinges.
   d. Continuous hinges as noted in door schedule.
2. Unit and Integral Type Locks & Latches - 38 in. to centerline of knob or lever.
3. Deadlocks - 60 in. to centerline of cylinder.
4. Panic Hardware - 38 in. to centerline of cross bar.
5. Door Pulls - 42 in. to centerline of grip.
6. Push-Pull Bars - 42 in. to centerline of bar.
7. Push Plates - 48 in. to centerline of plate.

D. Where dimensions vary from ADA standards, use ADA standards on doors intended to be handicapped accessible.

E. Refer to architectural drawings for information pertaining to the hardware requirements for ligature resistant items. Installation shall be as per manufacturer's specifications and requirements with no substitutions of the listed ligature resistant products.

2-.3 CLEARANCES

A. Provide edge clearance as follows:

1. Between doors and frames, at heads and jambs: 1/8 inch.
2. At doorsills: Where threshold is used, 1/4 in. maximum between door and threshold. Where no threshold is used, 1/4-in. clearance above finish floor material.
3. Between meeting edges of pairs of doors: 1/8 in.
4. For ligature resistant items as per manufacturers recommendations.

2.4 SHOP PAINT AND SOUND DEADENING COATING

A. After fabrication, dress, fill and grind smooth all tool marks and surface imperfections as required to make faces and vertical edges smooth, level and free of irregularities.

B Clean metal surfaces of doors, frames, and glazing beads by a hot-dip phosphate or cold phosphate chromate treatment as a standard with the manufacturer. Follow with a shop coat of rust-inhibitive primer, baked-on, on both exposed surfaces and surfaces inaccessible after erection, including frame interiors and anchors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation of hollow metal and pressed steel frames shall fit into new openings in existing walls.

B. Anchor into existing construction in accordance with manufacturer's recommendations and the best practices of the trade.

3.2 PROTECTION

The Contractor shall be responsible for proper protection of all items furnished. Should prime coat be damaged, or rust or scale appear, he shall, at his expense, have all exposed surfaces cleaned to bright metal and re-primed with an approved prime coat before finish painting.

****** END OF SECTION ******

SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but limited to the following:

1. Install new and replace existing doors in renovated areas with solid-core doors with wood-veneer faces.
2. Install new sound attenuated doors with minimum STC rating of 45 in areas as noted on architectural drawings.
3. Factory fitting flush wood doors to frames and factory machining for hardware.
4. Factory finishing for wood doors to receive transparent finish.
5. Shop-installed glass and glazing for the work of this Section.

B. Alternates: Not Applicable.

C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 081213 – HOLLOW METAL WORK for door frames.
2. Section 087100 – DOOR HARDWARE for hardware for wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

1. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

C. Samples for Verification:

1. Factory finished applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three showing typical range of color and grain to be expected in the finished work.
2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated".

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 or UL 10C.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg. F above ambient after 30 minutes of standard fire-test exposure.

D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84 inch section or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall include hardware installation and replacement of glass and glazing.
3. Warranty shall be in effect during the following period of time from date of Substantial Completion:
    a. Solid-Core Interior Doors: Life of Installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into Work include, but are not limited to, the following:

1. Flush Wood Doors
    a. Algoma Hardwoods, Inc.
    b. Weyerhaeuser Company
    c. Mohawk Flush Doors, Inc.
    d. Eggers Industries; Architectural Door Division.
    e. VT Industries Inc.
    f. Oshkosh Door Company

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. Doors for Transparent Finish:

1. Grade: Premium, with Grade A faces.
2. Species and Cut: Select Veneer to match existing, plain spliced.
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces: Balance match.
5. Pair and Set match: Provide for doors hung in same opening or separated only by mullions.
6. Stiles: Same species as faces or a compatible species.

2.3 SOLID-CORE DOORS

A. Cores: Comply with the following requirements:

1. Particle Core: ANSI A208.1, Grade LD-2, contributes to MR 4 and MR 7.
2. Structural Composite Lumber Core: Timberstrand LSL, contributes to IEQ 4.4 and MR 7.
3. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.
    a. Use particleboard made with binder containing no urea-formaldehyde resin.

B. Interior Veneer-Faced Doors:

1. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer’s standard mineral-core construction as needed to provide fire rating indicated.
    a. Fire Resistant Composite Core, with no added urea formaldehyde crossbands per IEQ 4.4.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.

3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

D. Sound Attenuated Wood Doors:

1. Fabricate doors to ANSI/WDMA IS1A. Provide specified thickness, design, and core to achieved minimum 45 STC rating.
2. Reinforce doors where surface-mounted hardware is required.
3. Drill and tap for mortised, templated hardware.
4. Top and Bottom Rails: Factory sealed with wood sealer.
   a. Stiles shall be same specie lumber as face veneer and rails mill option hardwood or SCL.
5. Provide gasketing and perimeter seal around the head, jamb and sill complete, uninterrupted and air tight to maintain the specified STC rating. Gasketing must be installed all on the same side of the door and frame.
6. Door to be tested as an operable unit in accordance with ASTM E90 and ASTM E 413

2.4 LIGHT FRAMES

A. Wood beads for Light Openings in Wood Doors:

1. Wood Species: Same species as door faces.
2. Profile: Manufacturer's standard shape.
3. At all 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

B. Wood-veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

2.5 GLASS

A. Heat-Treated Float Glass for Non-Rated Doors: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

B. Fire-Protection-Rated Tempered Glass for Rated Doors: 1/4-inch-thick, fire-protection-rated tempered glass, complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Fire-Protection-Rated-Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies.
2. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg. F, and the fire-resistance rating in minutes.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

D. Glazed Openings: Glaze doors at factory with glass type and thickness indicated. Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood stops.

2.7 FACTORY FINISHING

A. General: Comply with AWI/AWMAC/WI'S "Architectural Woodwork Quality Standards" for factory finishing.

B. Finish doors at factory that are indicated to receive transparent finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: Manufacturer's standard UV cured polyurethane finish with performance comparable to AWS System II. Provide two finish coats.
3. Staining: As selected by Designer from manufacturer's full range.
4. Effect: Semi filled finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactorily conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, refer to Section 087100 – DOOR HARDWARE.

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Protection: Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protection and reclean as necessary immediately before final acceptance.

C. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

****** END OF SECTION ******

SECTION 084126
ALL GLASS ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

Work of this Section consists of furnishing all labor, materials, equipment and services necessary to complete the installation of all glazing indicated within the new security desk, and without limiting the generality thereof.

1.2 SUMMARY

A. Section Includes:

1. Interior, manual-swinging all-glass entrance doors.
2. Butt glazed enclosure and sliding doors at security and reception desks.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.

B. Shop Drawings: Show fabrication and installation details, including the following:

1. Plans, elevations, and sections.
2. Details of fittings and glazing, including isometric drawings of patch and rail fitting.
3. Door hardware locations, mounting heights, and installation requirements.

C. Samples for Initial Selection: For each type of exposed finish indicated.

D. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

E. Qualification Data: For qualified installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for all-glass systems.

G. Field quality control reports.

H. Maintenance Date: For all-glass systems to include in maintenance manuals.

I. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain all-glass systems from single source from single manufacturer.

C. Accessible All-Glass Entrance Doors: Comply with applicable provisions in ICC/ANSI A117.1 and the Massachusetts Accessibility Code for Building Construction.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with all-glass systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection.

b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

c. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion, except as follows:
   a. Concealed Floor Closers: 10 years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial completion, provide 12 months' full maintenance by skilled employees of all-glass system installer. Include quarterly preventive maintenance repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper all-glass system operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: subject to compliance with requirements, provide products by one of the following:

1. ACI Distribution; a division of Vitro America, Inc.
2. Alpha Door & Rail, Inc.
3. Arch Aluminum & Glass Co., Inc.
4. Blumcraft of Pittsburgh.
5. Oldcastle Glass, Inc.
6. Virginia Glass Products Corporation; a subsidiary of Virginia Mirror Company.
7. Vistawall Architectural Products; The Vistawall Group; a D Bluescope Steel Company.

2.2 MATERIALS

A. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type 1 (transparent). Tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.

1. Class 1: Clear monolithic.
   a. Thickness: 1 /2 inch.
   b. Locations: As indicated.
2. Exposed Edges: Machine ground and flat polished.
3. Butt Edges: Flat ground.
4. Corner Edges: Lap-joint corners with exposed edges polished.

B. Aluminum Extrusions: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5.

2.3 METAL COMPONENTS

A. Fitting Configuration:

1. Manual-Swinging, All-Glass Entrance Doors: Continuous rail fitting at top and bottom.

B. Rail Fittings:

1. Material: Aluminum.
2. Height:
   a. Top-rail: 2-1 /2 inches.
   b. Bottom-rail: 3-1 /2 inches.
3. Profile: Square.
4. End Caps: Manufacturer’s standard precision-fit end caps for rail fittings.

C. Accessory Fittings: Match rail-fitting metal and finish for the following:

1. Overhead doorstop.
2. Center-housing lock.
3. Glass-support-fin brackets.

D. Anchors and Fastenings: Concealed.

E. Weather Stripping: Pile type; replaceable without removing all-glass entrance doors from pivots.

2.4 ENTRANCE DOOR HARDWARE

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of all rail systems.

B. Concealed Floor Closers and Top Pivots: Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.

1. Swing: Single acting.
   a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.
2. Hold Open: Automatic, at angle selected.
3. Opening-Force Requirements:
   a. Accessible Interior Swinging Doors: Not more than 5 lb to fully open door.

C. Concealed Overhead Holder: BHMA A156.8, Grade 1, with dead-stop setting coordinated with concealed floor closer.

D. Push-Pull Set: As selected from manufacturer's full range of standard and custom products.

E. Magnetic Locks – Model # 1200D as manufactured by Alarm Controls Corp. or equal, double magnetic with minimum1220 lb. force, each lock, UL listed, R16756.

1. Magnet size 21" L X 2-7/8" H X 1-1/2" W.
2. Armature Size 7-1/2" L 2-3/8" W X 5/8" D each.
3. 12 or 24 Volt DC operation, jumper selectable.
4. Current draw 400 mA @ 12 VDC, 200 mA @ 24 VDC each magnet.
5. Bi-colored status LED, door status sensor.
6. Bond sensor with S.P.D.T. 3A relay contacts.
7. Clear anodized US 25 finish.

F. Passive Infrared Sensor - Model #PS-520E(W) single or double door selectable, as manufactured by Takex, Takenaka Engineering Co., Ltd. or equal.

1. Power Supply: 12 to 24VDC(Non polarity) or 12 to 24VAC(50Hz/60Hz) (UL listed Class 2).
2. Power Consumption: 40mA or less/DC, 70mA or less/AC.
3. Output:
   a. Dry contact relay 2C.

b. Operation: One shot.
c. Hold time: Adjustable approx.. 0.25 sec. to 60 sec.
d. Contact Capacity: 30V (DC) 1A or less/125V (AC) 0.6A or less.

4. LED: Green, operation: synchronous dry contact relay (LED disabled).
5. Wiring Connection: Terminals.
6. Ambient Temperature Range: +14°F to 122°F (-10°C to +50°C) without condensation.
7. Mounting Position: Ceiling.
8. Accessories: supply as necessary.

2.5 FABRICATION

A. Provide holes and cutouts in glass to receive hardware fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.

1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.

B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611 or thicker.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install all-glass systems and associated components according to manufacturer's written instructions.

B. Set units level, plumb, and true to line, with uniform joints.

C. Maintain uniform clearances between adjacent components.

D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

E. Set, seal, and grout floor closer cases as required suiting hardware and substrate indicated.

F. Install joint sealants as specified by manufacturer.

3.3 ADJUSTING AND CLEANING

A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.

1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

B. Remove excess sealant and glazing compounds and dirt from surfaces.

****** END OF SECTION ******

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION

A. Work Included: Provide labor, materials and equipment to complete the work of this Section including, but not limited to, the following:

1. Furnishing and installing all finish hardware as specified and scheduled. Responsibility for fabrication, delivery, receiving, checking, and storing shipments shall be borne by the General Contractor.
2. Furnish all necessary templates as schedules require fabricating doors, frames, thresholds and all work incidentals thereto.

B. Related Work Specified Elsewhere

The following work is not included in this Section and is to be performed under the designated Sections:

1. Section 081213, HOLLOW METAL WORK: Pressed steel frames.
2. Section 081416, FLUSH WOOD DOORS.

1.3 SUBMITTALS

A. Schedules

Submit three (3) complete Hardware Schedules to Project Engineer for approval within 21 days after written notice of award of contract has been received from the General Contractor, giving the manufacturer's numbers, sizes and installation location for all hardware required to complete the job.

B. Templates

All necessary templates and approved schedules required to fabricate doors, frames and thresholds shall be furnished in sufficient time so as not to impede the progress of work.

1.4 DELIVERY AND STORAGE

Legibly label all packages indicating manufacturer's numbers, types, sizes and hardware schedule reference number. Wrap all hardware in paper and pack in same package with screws, bolts and fastenings necessary for proper installation.

1.5 KEYS AND KEYING

All cylinders shall be compatible with and keyed to the existing facility locking system.

A. 2 keys per lock.

1.6 QUALITY CONTROL

A. All work of this Section shall conform to governing laws and building codes.

B. Lock fronts, flush bolt faces, and strikes shall be beveled, rounded, or rabbeted in accordance with manufacturer's standards.

C. Hardware supplier shall determine conditions and materials for all doors and frames for proper application of hardware.

D. Hardware supplier shall be responsible for the accuracy of the quantities, sizes, finish and proper hardware to be furnished whether specifically mentioned or not, and shall be responsible for determining all details, such as hand of doors, bevel of locks, etc.

1.7 REFERENCES

A. Hardware shall comply with the requirements of the following references. American National Standards Institute (ANSI) numbers are specified for hardware items except when only Builders Hardware Manufacturer's Association (B.H.M.A.) numbers are available.

1.	ANSI 156.1	Butts and Hinges (Grade 1)
2.	ANSI 156.2	Locks and Lock Trim (Grade 1)
3.	ANSI 156.3	Exit Devices (Grade 1)
4.	ANSI 156.4	Door Controls - Closers
5.	ANSI 156.6	Architectural Door Trim
6.	ANSI 156.7	Template Hinge Dimensions
7.	ANSI 156.8	Door Controls - Overhead Holders
8.	BHMA 1301	Materials and Finishes
9.	BHMA 1201	Auxiliary Hardware
10.	BHMA 1101	Spring Hinges

PART 2 - PRODUCTS

2.1 MATERIALS

A. All hardware shall be best grade, entirely free from imperfections in manufacture and finish and shall be equal to the best quality as manufactured by Stanley Works, Corbin Lock Company, Brookline Industries, Ives Division, Glynn Johnson Corporation, Reese Enterprises, Rixson-Firemark, Zero Weather-stripping, Hager and Folger Adam Company, or approved equal. The manufacturer's name and catalog numbers used in this Section are to establish standards only. Similar products by the above manufacturers are to be considered equal.

B. Qualities, weights and sizes specified herein are the minimum that will be accepted. The hardware supplier will be responsible for following the manufacturer's catalog requirements for the proper size and weight of hardware and fastenings, and the proper function of hardware in each case.

2.2 HINGES AND PIVOTS

A. Number of Hinges per Door: Two hinges are to be provided for doors up to and including 5 feet in height, and an additional hinge for each additional 2-1/2 feet, or fraction thereof, in height of the door.

B. Hinges on exterior doors shall be Stanley FBB199, NRP Series.

C. Hinges for interior doors shall be steel and sized as follows:

Door Thickness	Door Width	Hinge Weight	Height
1-3/4 in.	41 in. and under	Regular Weight 2-ball bearing	4-1/2 in.
1-3/4 in.	Over 41 in.	Extra Heavy Wt. 4-ball bearing	4-1/2 in.

Width of hinges shall be determined by trim conditions

D. All hinges shall have flush bearings and hospital tips.

E. Hinges are to be of five-knuckle design, Stanley Series FBB179, FBB168 Series; McKinney Series T4A3386, TB2714, T4B3786; Hager Series BB1199, BB1279, BB1168 are approved equals. All hinges are to have positive non-rising pins.

F. All offset pivots shall be Rixson-Firemark M19 Series.

2.3 CONCEALED GEARED CONTINUOUS HINGE

A. Style SL84 as manufactured by Select Hinges™

B. Material: Extruded 6063 T6 aluminum alloy with self-lubricating polyester thrust bearings.

1. Finish: Clear Anodized aluminum finish, unless noted otherwise.

C. Length: continuous for entire length of door.

D. Heavy Duty-Tested per BHMA standards. Up to 200 lb. doors (high frequency)and up to 400 lb. doors (medium-frequency) without frame or door reinforcement; up to 600 lb. doors (low0frequency)with the use of Rivnuts in the frame and door.

1. BHMA Certification: SL84HD geared continuous hinges to conform to BHMA Standard ANSI/BHMA A156.26-2006 Grade 1.

E. Beveled frame leaf allows for weather-stripping or smoke seal.

F. Hospital tip prep for concealed hinges.

1. Metal TIPIT®CM – angle-cut preparation for concealed hinges, for new construction.

2.3 LOCKSETS, LATCHSETS, MAGNETIC DOOR LOCKS AND SENSORS

A. Unless otherwise noted, locksets and latchsets shall be mortise type, with steel cases and forged brass fronts that are adjustable from flat to beveled. Locks shall have anti-friction (hinge type) latch bolts with a minimum throw of 5/8 inch. Locks shall have balanced hub construction. Locks shall be Corbin series or approved equal.

B. Lock design shall be Corbin or approved equal.

C. Magnetic Locks – Model # 1200L as manufactured by Alarm Controls Corp. or equal, single magnetic with minimum1220 lb. force, each lock, UL listed, R16756.

1. Magnet size 10-1/2” L X 2-7/8” H X 1-1/2” W.
2. Armature Size 7-3/8” L 2-3/8” W X 5/8” D each.
3. 12 or 24 VDC operation, jumper selectable.

4. Current draw 400 mA @ 12 VDC, 200 mA @ 24 VDC each magnet.
5. Bi-colored status LED, door status sensor.
6. Bond sensor with S.P.D.T. 3A relay contacts.
7. Clear anodized US 25 finish.

D. Passive Infrared Sensor - Model #PS-520E(W) single or double door selectable, as manufactured by Takex, Takenaka Engineering Co., Ltd. or equal.

1. Power Supply: 12 to 24VDC(Non polarity) or 12 to 24VAC(50Hz/60Hz) (UL listed Class 2).
2. Power Consumption: 40mA or less/DC, 70mA or less/AC.
3. Output:
   a. Dry contact relay 2C.
   b. Operation: One shot.
   c. Hold time: Adjustable approx.. 0.25 sec. to 60 sec.
   d. Contact Capacity: 30V (DC) 1A or less/125V (AC) 0.6A or less.
4. LED: Green, operation: synchronous dry contact relay (LED disabled).
5. Wiring Connection: Terminals.
6. Ambient Temperature Range: $+14^0$F to 122^0F (-10^0C to $+50^0$C) without condensation.
7. Mounting Position: Ceiling.
8. Accessories: supply as necessary.

2.4 CLOSERS

All overhead closers for interior doors shall be LCN 4110T Series or approved equal. All overhead closers for exterior doors shall be parallel arm closers Russwin 9100 Series or approved equal.

2.5 EXIT DEVICES

A. All exit devices shall be Von Duprin 99 Series or Sargent 60 Series or approved equal.

B. Provide UL approved devices at all labeled doors.

C. Lever trim on exit devices shall match lever trim on locks.

2.6 STOPS AND STAYS

A. Furnish a stop or stay for each door and each leaf of a pair of doors. Wall stops shall be furnished where practical and where conditions allow.

B. Where floor stops are used, their height must be commensurate with special conditions, such as undercut door, threshold, etc. Where carpet occurs, furnish a base riser.

C. Stops shall be as manufactured by Ives Division, Glynn Johnson, Baldwin, Rixson-Firemark, Russwin and Corbin, or approved equal.

2.7 PROTECTION PLATES

Kickplate size shall be 6 inches high. Width of plate shall be determined by the width of the door. Plates shall be 2 inch LWOD on single doors and 1 inch LWOD on pairs of doors.

2.8 SILENCERS

All interior metal frames shall be provided with door silencers, 3 for each single door and 2 for each pair of doors. Silencers shall be equal to Ives #20.

2.9 GASKETING AND THRESHOLDS

A. Gasketing shall be Pemko S88 Series or approved equal and shall be applied at head and jambs.

B. Door sweeps shall be Pemko 315AN Series or approved equal.

C. Products as manufactured by Reese and Zero or approved equal.

2.10 FINISHES

A. Butts, pivots, locksets, latchsets, deadlocks, cylinders, stops, flush bolts, coordinators, etc., shall be dull chrome, US26D, or approved equal.

B. Exit devices shall be US28 housings x US32D, or approved equal.

C. Surface closers shall be sprayed to match the above.

D. Push plates, kickplates, surface pulls, etc., shall be stainless steel, US32D. Plates shall be 18-8 alloy, .050 in. gauge.

E. Thresholds, astragals and door bottoms shall be US28 Satin Aluminum, Clear Anodized, or approved equal.

2.11 HARDWARE SETS

A. It is the responsibility of each bidder to review the contract documents for conformance to all code regulations.

B. Each hardware set listed in door schedule represents the hardware requirements for one opening (pair of doors). Furnish the quantities required of each set for the work.

C. The Contractor shall coordinate keying with the Facility Maintenance Director.

****** END OF SECTION ******

SECTION 088000
GLAZING

PART 1 -GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Glass and glazing for the following Sections:
   a. Section 064023 – INTERIOR ARCHITECTURAL WOODWORK
   b. Section 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
   c. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
    a. Specified Design Wind Loads: As required by Code.
    b. Specified Design Snow Loads for Sloped Glazing: As required by Code.
    c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
        1.) Load Duration: 60 seconds or less/
    d. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
        1.) Load Duration: 30 days.
    e. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
        1) For monolithic-glass lites heat-treated to resist wind loads.
        2) For insulating glass.
        3) For laminated-glass lites.

f. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch-wide interspace.
4. Center-of-Glass Values: Based on using LBNL-35298 WINDOW 5.2 computer program for the following methodologies:
   a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
   b. Solar Heat Gain Coefficient: NFRC 200.
   c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. LEED Submittals:

1. Credit IEQ 4.1: Manufacturers' product data for interior adhesives, sealants and sealant primers, including printed statement of VOC content.

C. Samples: 12-inch- square Samples for each type of glass.

D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

F. Qualification Data: For installers.

G. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance..

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, laminated glass and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

G. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

H. Safety Glazing Products: Comply with testing requirements in 16 CFR 120 and, for wired glass, ANSI Z97.1.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency] acceptable to authorities having jurisdiction.
2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
1. Insulating Glass Certification Council.

K. Mockups: Build mockups to verify selections made under sample sub-mittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup for types of windows indicated, in locations shown on Drawings.

L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

B. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the DMH Project Manager and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: Ten years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to the DMH Project Manager and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATING-GLASS UNITS

A. Insulating-Glass Units for Vertical Glazing: 1 inch thick insulating glass consisting of two lites of 1/4 inch glass, low e coating on the No. 2 surface, 1/2 inch thick argon gas filled space, and mill finish air spacer. Provide one of the following or equal:

   1. VE1-2M by Viracon.
      Visible Light Transmittance: 70 percent.
      Reflectance Visible Light: 11 percent.
      U Value (Winter): 0.25.
      Shading Coefficient: 0.43.
      Solar Heat Gain Coefficient: 0.37.
   2. Solarban 60 by PPG Industries.
      Visible Light Transmittance: 70 percent.
      Reflectance Visible Light: 11 percent.
      U Value (Winter): 0.29.
      Shading Coefficient: 0.44.
      Solar Heat Gain Coefficient: 0.38.
   3. SN-68 by Guardian Industries.
      Visible Light Transmittance: 68 percent.

Reflectance Visible Light: 11 percent.
U Value (Winter): 0.24 with argon gas.
Shading Coefficient: 0.43.
Solar Heat Gain Coefficient: 0.38.

2.2 GLASS

A. Flat Glass:

1. ASTM C1036 Standard Specification for Flat Glass, Type 1, Class 1 (clear) or Class 2 (tinted, heat-absorbing and light reducing) and Quality q3.
2. ASTM C 1048 Heat Treated Flat Glass, Kind HS or FT, Condition A (uncoated), B (spandrel glass, one surface coated), or C (other coated glass).
    a. Heat Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.
    b. Maximum peak to valley rollerwave 0.003 inch in the central area and 0.008 inch within 10.5 inch of the leading and trailing edge.
    c. Maximum bow and warp 1/32 inch per lineal foot.
    d. All tempered architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.
    e. For all fully tempered glass, provide heat soak testing conforming to EN14179 which includes a 2 hour dwell at 554 degrees F plus or minus 8 degrees F.

B. Insulating Glass:

1. ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation. Units shall be certified for compliance by the IGCC in accordance with the above ASTM test method.
2. The unit overall thickness tolerance shall be minus 1/16 inch / plus 1/32 inch. Unit constructed with patterned or laminated glass shall be plus or minus 1/16 inch.
3. ASTM E 546 Standard Test Method for Frost Point of Sealed Insulating Glass Units
4. ASTM E 576 Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position
5. Sealed Insulating Glass Units to be double sealed with a primary seal of poly-isobutylene and a secondary seal of silicone.
    a. The minimum thickness of the secondary seal shall be 1/16 inch.
    b. The target width of the primary seal shall be 5/32 inch.
    c. There shall be no voids or skips in the primary seal.

d. Up to a maximum of 3/32 inch of the airspacer may be visible above the primary polyisobutylene sealant.
e. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16 inch by maximum length of 2 inches with gaps separated by at least 18 inches. Continuous contact between the primary seal and the secondary seal is desired.

6. To provide a hermetically sealed and dehydrated space, lites shall be separated by an aluminum spacer with three bent corners and one keyed-soldered corner or four bent corners and one straight butyl injected zinc plated steel straight key joint.

2.3 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Verify glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Designer from manufacturer's full range.
4. Adhesives and sealants that are used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Structural Glazing Adhesives: 100 g/L.
   b. Architectural Sealants: 250 g/L.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants: For 100/50% movement, typically at exterior locations, as follows:
   a. Dow Corning Corporation; 790.
   b. GE Silicones; SilPruf LM SCS2700.
   c. Tremco Inc.; Spectrem 1.

C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.

1. Basis of Design: Tremco; 440 Tape, preformed butyl type.
2. Basis of Design: Tremco; Polyshim II Vision Strip, preshimmed butyl type.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: 100% silicone material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant

thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

******END OF SECTION******

SECTION 092900
NEW DRYWALL CONSTRUCTION

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION

A. Work of this Section consists of furnishing all labor, materials, equipment and services necessary to complete the rough carpentry work indicated, and without limiting the generality thereof includes:

1. Interior metal screw studs, furring and metal accessories.

2. 1/2" and 5/8" Fire code gypsum wallboard, as noted on drawings.

3. Sealants in conjunction with veneer plaster work and existing construction.

4. Sound insulation in new partitions.

5. Remove security window only where indicated, fill opening with drywall construction.

B. **IN GENERAL**

1. Walls shall be single layer 5/8" gypsum on both sides of 3-5/8" 25 gauge steel studs. Studs and wallboard shall run floor to underside of deck with sound insulation installed between studs.

2. Ceiling soffits as indicated on Architectural Drawings.

1.3 SUBMITTALS

Samples: Submit samples of any items requested by the Project Engineer in accordance with the provisions of Section 01300, Submittals.

1.4 MATERIAL STORAGE AND PROTECTION

Store materials in an area that is sufficiently dry and properly ventilated so that items will not be damaged by excessive changes in moisture content.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Materials, unless otherwise specified, shall be the product of one of the following manufacturers.

1. U.S. Gypsum Company

2. National Gypsum Company

3. Georgia-Pacific Corporation

B. In general, all materials shall be products of one manufacturer.

2.2 METAL STUDS AND FURRING

A. Non-Load Bearing Studs and Runner Tracks:

1. Studs
   a. ASTM C645, cold rolled steel, galvanized, channel shape, with punched webs for utility passage. Provide studs of sizes as indicated on the Drawings, 25-gauge typically, except provide 20-gauge studs at jambs of pressed steel door frames, walls scheduled to receive ceramic tile finish, and partitions exceeding 13-feet-6 inches in height.
2. Runner Tracks
   a. Shall be of same materials and finish as studs with provisions for crimp locking to studs.

B. Wallboard

a. Conforming to ASTM 36 Type "X". Fire rated gypsum base: 5/8-inch thick,1/2"-inch thick, Type "X" blueboard with tapered edges. Veneer plaster shall be USG Diamond Interior finish plaster.

2.3 JOINT MATERIALS

A. Joint Reinforcement Tape: Open weave coated glass fiber tape. "Imperial" type 'S' by U.S. Gypsum Company, "Kal-Mesh" by National Gypsum Company, or equal.

2.4 FASTENERS

A. Screws

1. Power driven bugle head drywall screws. Size as recommended by plaster base manufacturer for the various installation conditions.

B. Staples

1. U.S. Standard galvanized and/or rosin coated staples for securing joint reinforcement tape and metal trim. Size as recommended by manufacturer.

2.5 METAL TRIM AND ACCESSORIES

A. Corner Beads

1. Galvanized steel with 1-1/4-inch wide fine mesh expanded flanges and 3/32-inch ground. U.S. Gypsum Company No. 900 corner bead or approval equal.

B. Casing Beads

1. Galvanized steel, channel type, with 1-1/4-inch wide fine mesh expanded flange and 3/32-inch grounds. U.S. Gypsum Company No. 701-A metal trim or approved equal.

C. Control Joints

1. Roll-formed zinc with ¼-inch wide-open slot protected by plastic tape and 3/32-inch grounds. U.S. Gypsum Company No. 093 or approved equal.

2.6 ACOUSTICAL SEALANT

A. Acoustical Sealant: U.S. Gypsum Acoustical Sealant; Dap Butyl-Flex; Pecora Butyl BC-158; or equal.

2.7 SOUND INSULATION

A. 3-inch Thermofiber SAFB by USG.

PART 3 - EXECUTION

3.1 INSTALLATION OF METAL STUDS

A. Secure floor and ceiling runners at 24 inches on center. Align to configurations required.

B. Install studs vertically at 16 inches on center and not more than 2 inches from abutting construction, each side of openings and at corners. Attach studs with clincher.

C. Fit runners under and above wall openings, secure intermediate studs at spacing of wall studs.

D. Brace stud framing where required making rigid. Cross brace chase partition studs with gypsum wallboard gussets.

E. Coordinate erection of studs with installation of service utilities. Align stud web openings.

F. Coordinate installation of bucks, anchors, and blocking, mechanical and electrical work to be placed in or behind stud framing.

G. Coordinate erection of stud systems with door frame anchors and attachments. Double stud each jamb full height of partition floor to beam or slab. Reinforce frame with wood stud, both sides floor to floor.

H. Stud splicing not permissible.

I. Maintain clearance under structural building members to avoid deflection transfer to non-load bearing studs. At such locations, cut studs 1/2 inch short and provide extended leg ceiling runners.

J. Coordinate installation of supplemental 2 inch by 6 inch wood blocking to studs. Blocking is to be installed for support of finish materials as needed.

K. Miscellaneous Framing: Install for closing existing door opening.

L. Tolerances: Installed framing members shall provide surface plane with maximum variation of 1/8 inch in 10 feet in any direction.

3.2 INSPECTION OF FRAMING

A. Check framing for accurate spacing and alignment.

B. Verify that spacing of installed framing does not exceed maximum allowable for thickness of wallboard to be used.

3.3 WALLBOARD APPLICATION

A. General

1. Use base of maximum lengths to minimize end joints.

2. Stagger end joints when they occur.
3. Locate end joints as far as possible from center of wall or ceiling.
4. Abut ends and edges without forcing.
5. Neatly fit ends and edges of base.
6. Support ends and edges of base panels on framing or furring members.

B. Single Layer Over Framing

1. Partitions

a. Apply wallboard base with long dimension vertical.
b. Position base so abutting edges are located at center of stud flanges.
c. Attach base with screws spaced a maximum of 12 inches o.c. in field of base and along abutting edges.

3.4 ACOUSTIC INSULATION

A. Install acoustic insulation between and tight to studs.

B. Fit around electric boxes and conduit.

3.5 ACOUSTICAL SEALANT

A. Provide acoustical sealant at perimeter of all partitions.

B. Seal all partition cutouts, such as electrical boxes, conduit, pipe, ductwork, and all intersections with adjoining structure.

3.6 VENEER PLASTER

A. Apply 1/16" – 3/32" thick veneer plaster finish to walls in accordance with manufacturer's recommendations.

3.7 INSTALLATION OF METAL ACCESSORIES

A. Joint Reinforcement

1. Apply over full length of all wallboard joints; do not overlap at intersections.
2. Apply reinforcement with spring-driven stapler using 3/8-inch staples. Use two staples at each end of the tape and stagger intermediate staples 24-inches o.c. along length of tape.

3. At wall-ceiling intersections and interior corners, staple tape 24-inches o.c. on both flanges along entire length at bead.

B. Screws

1. Power drive and set so screw heads are flush with surface of gypsum base without tearing through face paper.

3.8 ADJUSTMENTS

A. Upon completion, point up plaster around trim and where it meets other work.

B. Cut out and replace defective and damaged wallboard.

3.9 CLEAN-UP

A. Upon completion of the finish plasterwork, clean all plaster from adjacent surfaces, leaving work ready for finishing by others.

B. Remove any stains from plaster rubbish, excess material, scaffolding, tools, and other equipment from the building, leaving floors broom clean.

C. Remove any stains from plasterwork that would affect finishes.

****** END OF SECTION ******

SECTION 095113
ACOUSTICAL TILE CEILINGS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Acoustical ceiling tiles and panels.
2. Suspension systems, grid systems and ceiling hangers.
3. Acoustical sealant at edge moldings at acoustical ceilings.
4. Mineral fiber insulation where noted to achieve required STC rating.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 260001 - ELECTRICAL WORK:
   a. Access doors in acoustical tile.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 092900 – NEW DRYWALL CONSTRUCTION for gypsum board ceilings and soffits.
2. Section 260001 - ELECTRICAL WORK for light fixture and alarm system components located in ceilings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension members.

2. Method of attaching hangers to building structure. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Minimum Drawing Scale: 1/4 inch = 1 foot.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.

D. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.

E. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.
2. Suspension Systems: Obtain each type through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
    a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
    b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

C. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

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

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 10.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 5.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 5.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Products: Subject to compliance with specified requirements, provide one of the following products for each type indicated.

B. ACT-1: Lobby and as indicated.

1. Manufacturer and Model Number:
   a. Armstrong, Ultima No. 1912.
   b. USG, Mars ClimaPlus No. 86985.
   c. CertainTeed, Symphony M.
2. Panel Size: 24 inches by 24 inches by 3/4 inch.
3. Panel Mounting: Revealed edge.
4. Noise Reduction Coefficient (NRC): Not less than 0.70.
5. Ceiling Attenuation Class (CAC): Not less than 35.
6. Color: White.
7. Grid Material: Painted steel.
8. Grid Face Width: 9/16 inch.

2.2 METAL SUSPENSION SYSTEMS

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

1. Manufacturer: Armstrong, USG, CertainTeed, or Chicago Metallic.
2. Structural Classification: Intermediate-duty system.
3. End Condition of Cross Runners: Override (stepped) or butt-edge type.
4. Face Design: Flat, flush.

5. Cap Material: Steel or aluminum cold-rolled sheet.
6. Color: White, prefinished.
7. Grid Face Width: As specified with ACT type.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Anchors in Concrete: Anchors with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class SC1 service.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 diameter wire.

D. Hold-Down Clips: At vestibules and areas subject to wind uplift, provide manufacturer's standard hold-down clips spaced 24 inches on all cross tees.

2.3 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

2.4 ACOUSTICAL SEALANT & INSULATION

A. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

B. The installation of mineral wool insulation shall be required in rooms C204-A, C204-B, C204 and C212 to achieve a minimum STC of 45.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. The layout and installation of acoustical panel ceilings and suspension systems shall be coordinated with other work penetrating the ceiling. This includes, but is not limited to, light fixtures, HVAC diffusers and equipment, and fire suppression system components.
2. Acoustical panels shall be cut and fit around light fixtures, HVAC diffusers and equipment and fire suppression system components to set flush or recessed as recommended by manufacturer.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. Do not attach hangers to steel deck tabs.
7. Space hangers not more than 48 o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with

ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

****** END OF SECTION *****

SECTION 099123
INTERIOR PAINTING

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

Work of this Section consists of furnishing all labor, materials, equipment and services necessary to complete the painting indicated, and without limiting the generality thereof.

1.2 DESCRIPTION

A. Work of this Section includes complete painting on every surface requiring paint finish, unless specifically excluded, and without limiting the generality thereof includes:

1. Paint walls.
2. Paint ceiling soffits and fascia.
3. Paint existing and new miscellaneous trim.

1.3 SUBMITTALS

A. Manufacturer's Information: Submit manufacturer's literature, specification and full color chips for approval in accordance with the provisions of Section 013300, Submittals.

B. Samples: Submit all paint, varnish and enamel to Project Engineer for approval before proceeding with work.

C. Color: Submit accepted manufacturer's full range of color samples for Project Engineer's color selection.

1.4 PRODUCT DELIVERY AND STORAGE

A. Deliver materials in manufacturer's original unopened containers with labels intact and legible identifying brand names, color designation and instructions for mixing.

1.5 PROTECTION

A. Adequately protect other surfaces from paint and damage. Repair damage caused by inadequate or unsuitable protection.

B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.

C. Place cotton waste, cloths and materials which may constitute a fire hazard in closed metal containers and remove daily from project site.

D. Prior to painting operations, remove electrical device plates, surface hardware, fittings and fastenings. Carefully store, clean and replace items on completion of work in each area. Do not use solvent to clean hardware that has a lacquer finish.

PART 2 – PRODUCTS

2.1 WALL COATING SYSTEM

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, manufacturers and products listed in this Section or approved equal.

A list of approved but not complete manufacturers is listed below:

1. Benjamin Moore
2. Sherwin Williams
3. Duron Genesis
4. Pittsburgh Paints
5. or equal

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates for performance for proposed substitutions.

PART 3 – EXECUTION

3.1 INSPECTION

A. Thoroughly examine surfaces scheduled to receive finishes prior to applying specified finishes.

B. Coordinate painting schedule with other portions of the work.

3.2 PREPARATION

A. Prepare surfaces to receive finishes in accordance with the material manufacturer's recommendations.

B. Wash existing surfaces to be repainted with tri-sodium phosphate and rinse with clean water and allow surface to thoroughly dry.

C. Mask all UL Labels prior to painting.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply paint materials in strict accordance with the manufacturer's recommendations with each coat at proper consistency.

B. Touch up of walls shall mean painting the areas of wall to be touched up between the natural breaks in the surface.

C. Keep finishing materials free from skins, lumps, or foreign matter, and well stirred while being applied.

D. Do not apply finish to surfaces that are not sufficiently dry.

E. Apply each coat of finish evenly and allow drying in accordance with the manufacturer's printed instructions.

F. Lightly sand or steel wool between coats to achieve required finish.

G. Back prime all wood finish immediately following its delivery to job. Back prime painted surfaces with appropriate paint primer. Back prime painted surfaces with appropriate paint primer. Back prime interior woodwork which is to receive stain and/or clear finish, with gloss varnish reduced 25 percent with mineral spirits.

H. Where clear finishes are required, ensure tinted fillers matchwood. Work fillers well into grain before set. Wipe excess filler from surface.

I. Prime top and bottom edges of wood doors with enamel undercoat where they are to be painted, and with gloss varnish where they are to receive a stain or clear finish.

J. Use masking tape where paint color cut lines occur.

3.4 CLEANING

A. Promptly remove spilled, splashed or splattered paint on finish as work proceeds and upon completion.

B. Keep premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris during progress of work.

C. Upon completion of work, leave premises in a neat and clean condition.

D. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials for Project site.

3.5 PAINTING AND FINISH SCHEDULE - INTERIOR

A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.

B. Interior Paint Schedule for Standard Performance Coatings:

1. Interior Gypsum Wallboard and Plaster for Latex Eggshell Finish:

One Coat	1.	Moore Ecospec Interior Latex Primer Sealer (231)
	2.	Duron Genesis Latex Primer
	3.	S-W Health Spec Latex Wall Primer
	4.	PPG Pure Performance Latex Primer
Two Coats	1.	Moore Pristine Ecospec Interior Latex Eggshell (223)
	2.	Duron Genesis Latex Eggshell
	3.	S-W Health Spec Latex Eggshell
	4.	PPG Pure Performance Latex Eggshell

2. Interior Gypsum Wallboard and Plaster Ceilings for Latex Flat Finish:

One Coat	1.	Moore Ecospec Interior Latex Primer Sealer (231)
	2.	Duron Genesis Latex Primer

3. S-W Health Spec Latex Wall Primer
4. PPG Pure Performance Latex Primer

Two Coats
1. Moore Pristine Ecospec Interior Latex Flat (219)
2. Duron Genesis Flat
3. S-W Health Spec Latex Flat
4. PPG Pure Performance Latex Eggshell

3. Interior Gypsum Wallboard and Plaster For Latex Semi-Gloss Finish:

One Coat
1. Moore Ecospec Interior Latex Primer Sealer (231)
2. Duron Genesis Latex Primer
3. S-W Health Spec Latex Wall Primer
4. PPG Pure Performance Latex Primer

Two Coats
1. Moore Pristine Ecospec Interior Semi-Gloss (224)
2. Duron Genesis Latex Semi-Gloss
3. S-W Health Spec Latex Semi-Gloss
4. PPG Pure Performance Latex Semi-Gloss

4. Interior Architectural Woodwork, Finish Carpentry, and Wood Doors for Latex Semi-Gloss Paint Finish (softwoods, paint grade hardwoods, MDO, and hardwood veneers):

One Coat
1. Moore Ecospec Interior Latex Primer Sealer (231)
2. Duron Genesis Latex Primer
3. S-W Health Spec Latex Wall Primer
4. PPG Pure Performance Latex Primer

Two Coats
1. Moore Pristine Ecospec Interior Semi-Gloss (224)
2. Duron Genesis Latex Semi-Gloss
3. S-W Health Spec Latex Semi-Gloss
4. PPG Pure Performance Latex Semi-Gloss

****** END OF SECTION ******

SECTION 230000
HEATING, VENTILATING AND AIR CONDITIONING

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within Division 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed on the State website COMMBUYS at the day and time stipulated in the ”NOTICE OF CONTRACTORS” .

   The following information shall be included within the electronic submittal:

NAME OF THE SUB-BIDDER:	(Insert name of sub-bidder)
DMH PROJECT:	2020-036
SUB-BID FOR SECTION:	230000 & 230001 – HEATING, VENTILATING AND AIR CONDITIONING

2. Each sub-bid submitted for work under this “Section shall be on forms furnished in Part 1, Attachment C, “Forms for Sub-bid.”
3. Sub-bids filed on the COMMBUYS website shall be accompanied by an electronic copy of a BID BOND issued by a responsible bonding company in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit other than the bond will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: the work of this Filed Sub-Bid is shown on the following Contract Drawings: AD-100, A-100, A-101, A-300, A-400, A-600, A-700, M-1, M-2, M-3, E-1, E-2, E-3, E-4, E-5 & E-6.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. All work of Section 230001 – HEATING, VENTILATING AND AIR CONDITIONING.

******END OF SECTION******

SECTION 230001

HEATING, VENTILATING AND AIR CONDITIONING

TABLE OF CONTENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Tie ins to existing hot water supply and return piping.
2. Relocation of existing systems which interfere with new construction.
3. Coordinate maintenance of existing services during construction with DCAMM's Project Manager.
4. Special coordination of chases and plenums as specified in Part 3 article, Special Responsibilities.
5. Sleeves, inserts and hangers.
6. Flexible connections for vibrating and rotating equipment.
7. Equipment bases and supports.
8. Vibration isolators and inertia blocks.
9. Valves, fittings and other hardware.
10. Pressure gauges and thermometers.
11. Sheet metal work.
12. Complete air distribution system including low and medium

pressure ductwork, diffusers, registers, grilles, splitters, dampers, and similar items.

13. Insulation for duct, piping and equipment.
14. Constant volume air handling units, including fans, coils, filters, motors and mixing boxes.
15. Condensate piping from DX coil drain pans and condensate pumps.
16. Pipe, duct, valve and equipment identification.
17. Instruction manuals and startup instructions.
18. Testing and balancing.
19. Cleaning.
20. Automatic temperature controls, variable air volume controls and other controls.
21. Certified seismic restraints to meet the Commonwealth of Massachusetts Building Code applicable at the time the building permit is issued.
22. Core drilling for the Work of this Section.
23. Coordination drawings and record drawings and similar requirements.
24. Hoisting equipment for the Work of this Section.
25. Coordination with General Contractor for use of staging, planking and scaffolding, interior and exterior, which is the responsibility of the General Contractor as specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

B. Alternates: Not Applicable.

C. Items to Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 260001 – ELECTRICAL WORK
    a. All power wiring required for the automatic temperature control system Electrical Subcontractor at a minimum shall provide a 120-volt power junction box in the boiler room, Custodial Office, and seven other locations as shown on the electrical drawings for the automatic temperature control system. ATC Sub-Contractor to review with the Electrical Contractor if additional required. Automatic temperature control wiring shall be provided by the Control Sub-subcontractor under Division 23.
    b. All electrical power wiring and connections and all disconnect switches not provided with or as integral part of the HVAC equipment shall be provided by the Electrical Subcontractor.
    c. Refer to the Electrical specification for more information.

D. Items to Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. Section 260001 – ELECTRICAL WORK:
   a. Refer to the Electrical specification for more information.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 260001 - ELECTRICAL WORK for electrical power to mechanical equipment as indicated on the Drawings.

F. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

G. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. Shop Drawing: Submittals shall include but not be limited to:

1. DX Split Systems (Indoor Air Handling Unit and Outdoor Air-Cooled Condensing Unit).
2. Indoor air handling unit and Outdoor Air-Cooled Condensing Unit.
3. Fittings, valves and strainers.
4. Diffusers, registers, grilles, splitters, dampers and accessories.
5. Sound attenuators.
6. Automatic controls.
7. Piping, Ductwork and Equipment Insulation.
8. Vibration isolators.
9. Pressure gauges and thermometers.
10. Motor starters.
11. Water treatment equipment.
12. Pipe, pipe hangers, sleeves and inserts.
13. Outdoor air louver.
14. Equipment bases and supports.
15. Identification for pipe, duct, valves and equipment.
16. Complete ductwork shop drawings, construction details and duct construction standards.
17. Access panels.

18. Color selection charts and samples for equipment and systems in finished areas.

1.4 DEFINITIONS

A. As used in this Section, "provide" means "furnish and install" and "HVAC" means "Heating, Ventilating and Air Conditioning" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

B. "Furnish" or "Supply" means to purchase, procure, acquire and deliver.

C. "Install" means to rig, erect, mount and connect, unless specifically noted otherwise.

D. "Furnish and Install" means to supply, deliver, rig, erect, mount and connect in readiness for operation, unless specifically noted otherwise.

E. "Provide" is synonymous with "Furnish and Install".

F. "Piping" means pipe, tubing, fittings, flanges, unions, valves, strainers, traps, hangers and other accessories related to such piping.

G. "Concealed" means hidden in chases, furred spaces and walls, above ceilings or enclosed in construction.

H. "Exposed" means visible or not installed "Concealed" as defined above.

I. "Approved Equal" or "or equal" means any equipment or material which is approved by the Engineer as equal in quality, durability, appearance, strength, design and performance to the equipment or material originally specified.

J. "Underground" means buried exterior to or within the building.

1.5 CONTRACT DOCUMENTS

A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Electrical, and other Drawings and other

Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the Drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the Drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.

E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

F. Data that may be furnished electronically by the Designer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer ’s sealed or stamped construction documents.

1.6 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer’s interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.

B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.

C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.

D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with Paragraph (A) above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

E. In cases covered by Paragraph (D) above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.7 MODIFICATIONS IN LAYOUT

A. HVAC, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.

C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.

D. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate

according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.8 EXISTING CONDITIONS AND PREPARATORY WORK

A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.9 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
2. American Gas Association (AGA).
3. National Fire Protection Association (NFPA).
4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
5. Occupational Safety and Health Act (OSHA).
6. Underwriters' Laboratories (UL).
7. Massachusetts and National Electrical Codes.
8. International Mechanical Code (IMC) 2018.
9. International Energy Conversation Code (IECC) 2018.

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.

C. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:

1. American National Standards Institute (ANSI).
2. American Society of Mechanical Engineers (ASME).
3. National Electric Manufacturers Association (NEMA).
4. American Society for Testing and Materials (ASTM).
5. American Water Works Association (AWWA).
6. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
7. Air Moving and Conditioning Association (AMCA).
8. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
9. American Diffuser Council (ADC).
10. Air Conditioning and Refrigeration Institute (ARI).
11. Thermal Insulation Manufacturers Association (TIMA).
12. Institute of Electrical and Electronics Engineers (IEEE).
13. Insulated Cable Engineers Association (ICEA).
14. Certified Ballast Manufacturers (CMB).
15. Illuminating Engineering Society (IES).

D. Where the contract documents indicate more stringent requirements than the above codes and ordinances, the Contract Documents shall take precedence.

E. All necessary permits, inspections, and approvals are to be obtained and paid for by this Subcontractor.

1.10 GUARANTEE AND 24 HOUR SERVICE

A. Guarantee Work of this Section in writing for one year following the date of Substantial Completion. If the equipment is used for ventilation, temporary heat, etc. prior to Substantial Completion, the bid price shall include an extended period of warranty covering the one year of occupancy, starting from the initial date of Substantial Completion. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer ’s satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in DCAMM’s name.

C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.

D. Provide 24 hour service beginning on the date the project is first

occupied for public use by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to DCAMM. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and DCAMM approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.

E. Submit copies of equipment and material warranties to Designer before final payment.

F. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to DCAMM.

G. This Paragraph shall not be interpreted to limit DCAMM's rights under applicable codes and laws and under this Contract.

H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.

I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use, and shall not institute guarantee period.

J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to The DCAMM Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.11 RECORD DRAWINGS

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. Provide two sets of black line prints to be used as working record drawings during construction. One set of prints shall be maintained at the job site and shall, at all times, be accurate, clear and complete, showing the actual location of all equipment ducts and piping. The working record drawings shall be available for review at the job site by the Architect's/Engineer's field representative. The marked up As Built Drawings required to be maintained under this section are Drawings M-1, M-2 & M-3.

C. Any addenda sketches, supplementary drawings and change orders issued during the course of construction shall be transferred to the working record drawings.

D. At the completion of all work submit an accurate, checked set of working record drawings. Non-availability of these drawings will postpone the final inspection until the record drawings are available.

E. All costs related to these requirements shall be paid for by the HVAC Subcontractor.

1.12 MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field assembled units, including as built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:

1. Directions for and sequence of operation of each item of HVAC system, e.g. air handling units and boilers. Sequence shall list valves, switches, and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions. Include detailed approved flow diagrams of temperature control, heating, condensate, chilled water, condenser water, etc. as appropriate for systems provided. Include approved valve directory showing each valve number, location of each valve, and equipment or fixture controlled by valve.
2. Detailed maintenance and troubleshooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.
3. Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first-class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

B. Furnish three copies of manuals to Designer for approval and distribution. Deliver manuals no less than 30 days prior to acceptance of equipment to permit User Agency’s personnel to become familiar with equipment and operation prior to acceptance.

C. Provide framed and glazed charts as follows: mount as directed by Designer.

1. Flow diagrams from first part of manual as described above.
2. Valve directory.
3. Lubrication chart from third part of manual.

D. Operating instructions: Upon completion of installation or when DCAMM accepts portions of building and equipment for operational use, instruct User Agency's operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. DCAMM shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.

E. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.

F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

1.13 COORDINATION DRAWINGS

A. Refer to Section 013100 – PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements.

B. The work shall be so performed that the progress of the entire building construction including all other trades, shall not be delayed nor interfered with. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as desired.

C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Architect/Engineer for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Architect's/Engineer's satisfaction, at no expense to the Owner.

D. Where work of this section will be installed in close proximity to

work of other sections or where there is evidence that the work of this section will interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8-inch scale or larger working drawings and sections, clearly showing how this work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

E. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work. Furnish and set in place all sleeves, pockets, supports and incidentals.

F. All distribution systems which require pitch or slope such as sanitary drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.

G. Where there is evidence that work of this Subcontractor will interfere with the work of other trades, this Subcontractor shall assist in working out space conditions to make satisfactory adjustments.

H. This Subcontractor shall, with the approval of the Engineer and without extra charge, make reasonable modifications in his work as required by structural interference's, or by interference with work of other trades, or for proper execution of the work.

I. If this Subcontractor installs his work before coordinating with other trades and his work causes interference with the work of such other trades, he shall make all necessary changes in his work to correct the condition without extra charge and as directed by the Engineer.

J. This Subcontractor shall protect all materials and work of other trades from damage that may be caused by his work and shall make good any damages so caused.

1.14 GUARANTEE

A. This Subcontractor shall obtain, in the Owner's name, the standard written manufacturer's guarantee for one year or greater of all materials furnished under this section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which this Subcontractor may have by law or other provisions of the contract documents.

B. This Subcontractor shall warranty workmanship and materials for a period of not less than one year from the date of substantial completion. Should any defects in materials or workmanship appear during this period, they shall be corrected or replaced by the Subcontractor to the satisfaction of the Architect, and at no expense to the Owner.

1.15 CUTTING, CORING AND PATCHING

A. Cutting and patching through new construction using core drill and measuring larger than 4-1/2 inches in diameter, or 4-1/2 inches by 4-1/2 inches, shall be performed by Trades specializing in the specific surfaces affected, e.g., carpentry, masonry, metals, roofing, except where noted otherwise. Notify the specific Trade(s) of exact locations and sizes for openings required. The extent of masonry walls is shown on the architectural drawings. This Section's Contractor is responsible for reviewing and coordinating with other sub-contractors.

1. Exposed concrete coring: Notify Contractor of exact locations and sizes for all openings required in exposed concrete, to be executed under Section 03 30 00 – Cast-in-Place Concrete.
2. Concrete coring less than 4-1/2 inches: Any new penetration cut through concrete less than 4-1/2 inches in width shall be executed by the specific Trade(s) installing the work.
3. Concrete coring 4-1/2 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 4-1/2 inches in diameter required in concrete, to be executed under Section 03 30 00 – Cast-in-Place Concrete.
4. Masonry openings less than 4-1/2 inches: Any new penetration cut through masonry less than 4-1/2 inches in width shall be executed by the specific Trade(s) installing the work.
5. Masonry openings 4-1/2 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 4-1/2 inches in width required in masonry, to be executed under Division 04 - Masonry, utilizing lintels, furnished per Division 05 - Metals.
6. Exposed gypsum board: Notify Contractor of exact locations and sizes for all openings required in exposed gypsum board, to be executed under Division 09 - Finishes.
7. Concealed gypsum board: Any new penetration cut through concealed gypsum board less than 4-1/2 inches in width shall be executed by the specific Trade(s) installing the work. Cutting and patching larger than 4-1/2 inches in diameter, or 4-4/2 inches by 4-1/2 inches to be executed under Division 09 - Finishes.

8. Notify Architect prior to any cutting or coring larger than 2 inches.

1.16 PERMITS

A. This Subcontractor shall be responsible for obtaining and paying for all permits and inspections **required to complete all work described in this section. Refer to Division 1 specifications for more information.**

1.17 STORAGE OF MATERIALS

A. Store materials prior to their installation where designated by the General Contractor. Be responsible for all stored equipment and materials and protect all installed equipment and **materials from damage.**

1.18 INSPECTIONS AND TESTS

A. If inspection of materials installed shows defects, such defective work, materials and/or equipment shall be replaced at no cost to the Owner and the inspection and tests repeated.

B. Make all reasonable tests as required and prove the integrity of all work and leave the entire HVAC installation in correct adjustment and ready to operate.

1.19 ELECTRICAL CHARACTERISTICS

A. In general, and unless specifically indicated otherwise in the specifications or noted on the drawings, all HVAC equipment shall be of the HP, voltage, and phase as indicated on the drawings.

B. Control wiring and conduit for the HVAC systems shall be furnished under this Section. Power wiring, including provisions for disconnect switches not otherwise furnished as an integral part of the mechanical equipment, is under the work of the Electrical Subcontractor.

C. Fractional horsepower motors wired for single phase operation shall have automatic reset overload protection built into the motor.

1.20 SCAFFOLDING AND STAGING

A. All staging, exterior and interior, required to be over eight feet in

height, shall be furnished and erected by this Subcontractor and maintained in safe condition by him without charge to and for the use of all trades as needed by them for proper execution of their work, except where specified to the contrary in any filed sub-bid Section of the Specification.

1. Erection and dismantling of staging shall be performed only by trained, certified, and experienced staging personnel qualified to perform such work.
2. Copies of such certifications, clearly indicating qualifications, shall be provided to the Architect prior to commencement of such erecting and dismantling work.

B. Provide, maintain and remove safe and adequate interior and exterior staging, ladders, scaffolding, hoists, and all other related equipment for proper and complete execution of the work of this section in accordance with requirements of the Contract Documents. Staging, scaffolding, hoists and all other related equipment shall comply with all applicable federal, state and local regulations.

C. Staging, ladders, scaffolding, hoists and all other related equipment shall be provided, maintained and removed when no longer required.

1.21 WORK COORDINATION AND JOB OPERATIONS

A. HVAC equipment shall not be installed in congested and possible problem areas without first coordinating the installation of same with the other trades. Relocate HVAC equipment should it interfere with the proper installation of equipment to be installed by the other trades.

B. Particular attention is directed to the coordination of ductwork with the equipment of other trades being installed in and above the ceiling areas. Conflicts in mounting heights and clearances above hung ceilings shall be brought to the attention of the Architect for a decision before equipment is installed.

C. Furnish to the other trades, all information relative to the portion of the HVAC installation that will affect them, so that they may plan their work and installations accordingly.

1.22 REBATES

A. HVAC Subcontractor shall assist the Owner in obtaining all eligible utility rebates and transferring these rebates to the Owner pertaining to this section.

PART 2 - PRODUCTS

2.1 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT

A. Reference Standards: Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except for more stringent requirements specified or shown on Drawings:

Standard	As Applicable To:
SMACNA HVAC Duct Construction Standards Metal and Flexible	Sheet Metal Ductwork; Duct Liners; Adhesives; Fasteners; Flexible Ductwork.
SMACNA HVAC Air Duct Leakage Test Manual	Duct Leakage Testing
SMACNA Fibrous Glass Duct Construction Standards	Fibrous Glass Ductwork; Tapes
SMACNA Ducted Electric Heat Guide for Air Handling Systems	Electric Duct Heaters
SMACNA Thermoplastic Duct (PVC)	PVC Ductwork Construction Manual
ADC and TIMA Flexible Duct	Flexible Ductwork Performance Standards
NFPA 90A Resistance	Fire Dampers; Fire Standards for Ducts and Liners
NFPA 96 Ductwork	Kitchen Hood Exhaust
NFPA 45 chemicals	Laboratories using
ADC Test Code 1062 R4 Registers Grilles	Ratings of Diffusers,
SMACNA Guidelines for Welding Black Iron	Welded Galvanized,

Sheet Metal and Stainless Steel Ductwork

B. General

1. Provide supporting and hanging devices necessary to attach entire HVAC system including ductwork and equipment, and to prevent vibration.
2. Provide vertical and horizontal supports as required by codes to meet minimum applicable earthquake resistance standards.
3. Ductwork shall be free from vibration under all conditions of operation. Dimensions shown on Drawings for lined ductwork are net inside dimensions. Increase ductwork to accommodate lining requirements.
4. Pipe or conduit crossing duct:
   a. No pipe, conduit, hanger, Architectural element nor structural member shall pass through duct without Designer ’s written approval.
   b. Where it is impossible to re route pipe or conduit and when written approval has been obtained, increase duct size to maintain constant cross sectional area at point of interference. Provide streamlined enclosure for pipe or conduit, as illustrated in SMACNA.
5. When making offsets and transformations necessary to accommodate structural conditions, preserve full cross sectional area of ductwork shown on Drawings.
6. Ductwork shall have pressure velocity classifications as follow:

DUCT CONSTRUCT -ION CLASS	STATIC PRESSURE RATING	PRESSURE	SMACNA SEAL CLASS	SMACNA LEAKAGE CLASS	VELOCITY
10"	10"	Pos.*	A	3	2000 fpm or greater
6"	6"	Pos.*	A	3	2000 fpm or greater
4"	4"	Pos.*	A	3	4000 fpm or less
3"	3"	Pos. or Neg.	A	3	4000 fpm or less
2"	2"	Pos. or Neg.	A	6	2500 fpm or less
1"	1"	Pos. or Neg.	A	6	2500 fpm or less
½"	½"	Pos. or Neg.	A	6	2000 fpm or less

*for negative pressures over 3" w.g., refer to SMACNA Round and Rectangular Indus- trial Duct Construction Standards for joint and intermediate reinforcement require-
ments.

7. Ductwork shall have pressure velocity classifications as follow:

DUCT CONSTRUCT -ION CLASS	STATIC PRESSURE RATING	PRESSURE	SMACNA SEAL CLASS	SMACNA LEAKAGE CLASS	VELOCITY
10"	10"	Pos.*	A	6	2000 fpm or greater
6"	6"	Pos.*	A	6	2000 fpm or greater
4"	4"	Pos.*	A	6	4000 fpm or less
3"	3"	Pos. or Neg.	A	6	4000 fpm or less
2"	2"	Pos. or Neg.	B	12	2500 fpm or less
1"	1"	Pos. or Neg.	B	12	2500 fpm or less
½"	½"	Pos. or Neg.	B	12	2000 fpm or less

*for negative pressures over 3" w.g., refer to SMACNA Round and Rectangular Indus- trial Duct Construction Standards for joint and intermediate reinforcement require-
ments.

   a. Unless otherwise specified or shown on the drawings, the following pressure classifications shall be used for the types of ductwork listed below:
      1) 4" Class: All supply ductwork from discharge of air units to inlets of terminal volume boxes.
      2) 3" Class: All fume hood, kitchen hood and smoke exhaust ductwork.
      3) 2" Class: All other ductwork.

8. Sealing Requirements for Class A, Leakage Class 3, Galvanized, Non-Welded Aluminum or Non-Welded Stainless Steel Ductwork:
   a. Transverse Joints
      1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. 1902-FR. Corners shall be sealed as described by

SMACNA and when applicable per manufacturer's published procedures. After sealant has cured, seal entire joint with Hardcast Inc. RTA-50 adhesive on to Hardcast Inc. DT tape or approved equal.

2) Seal all non-flanged transverse joints with Hardcast Inc. RTA-50 adhesive on to Hardcast Inc. DT tape or approved equal.

b. Longitudinal Seams

1) Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal 1001 or approved equal.

c. Joints and Ductwall Penetrations

1) Seal all duct joints at takeoffs, access doors, damper bearing penetrations, flexible duct connections etc., with Hardcast Inc. Versa Grip 102 or approved equal.

2) Note, access doors and damper rod penetrations shall be equipped with proper hardware for sealing.

9. Sealing Requirements for Class A, Leakage Class 6, Galvanized, Non-Welded Aluminum or Non-Welded Stainless Steel Ductwork.

a. Transverse Joints

1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer's published procedures.

2) Seal all non-flanged transverse joints with Hardcast Inc. Versa Grip 102 or approved equal.

b. Longitudinal Seams

1) Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal 1001 or approved equal.

c. Joints and Ductwall Penetrations

1) Seal all duct joints at takeoffs, access doors, damper bearing penetrations, flexible duct connections etc., with Hardcast Inc. Versa Grip 102 or approved equal.

10. Sealing Requirements for Class B, Leakage Class 12, Galvanized, Non-Welded Aluminum or Non-Welded Stainless Steel, Ductwork.

a. Transverse Joints

1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer's published procedures.

2) Seal all non-flanged transverse joints with Hardcast Inc. Versa Grip 102 or approved equal.

b. Longitudinal Seams

1) Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal 1001 or approved equal.

11. Support
    a. Space hangers as required by SMACNA (8 ft max) for horizontal duct on 8 ft. centers, unless concentrated loadings require closer spacing.
    b. Support vertical duct on each floor or slab it penetrates.
    c. Supports for ductwork and equipment shall be galvanized unless specified otherwise.
12. Connections
    a. Connect inlets and outlets of air handling units and fans to ductwork with flexible connections unless fan has vibration isolator mounts inside unit with flexible connections and no external vibration isolators. Exception: Do not use flex on life safety smoke exhaust fans.
    b. Indoors, flexible connections shall be neoprene coated fibrous glass fire retardant fabric, by Ventfabrics, or Durodyne. Outdoors, flexible connections shall be Dupont hypalon coated fibrous glass fire , weather , and UV resistant by Ventfabrics or Durodyne.
    c. Secure flexible connections tightly to air handlers with metal bands. Bands shall be same material as duct construction.
    d. Connections from trunk to branch ducts shall be as detailed on Drawings.
13. Construction
    a. No sharp metal edges shall extend into air streams.
    b. Install drive slips on air leaving side of duct with sheet metal screws on 6" centers.
    c. Spin in collars shall NOT be used for branch connections in 3" or higher pressure class ductwork.
14. Joints
    a. Longitudinal lock seams shall be double locked and flattened to make tight joints.
    b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheet metal screws or bolts and nuts. Do not use rivets and staples.
15. Prefabricated Transverse Duct Joints
    a. Transverse joints in galvanized sheet metal ductwork may be made with galvanized gasketed frame and angle duct joint system by Ductmate, TDF, TDC or approved

equal. Angles shall be at least 20 gauge. Prefabricated transverse duct joints shall not be used for duct 16 GA. and heavier, nor for duct 23 GA. or lighter.

b. Secure angles to duct with screws (using clutched arbor) or spot welds spaced as recommended by manufacturer for duct pressure class.

16. Elbows and Bends

a. Elbows and bends for rectangular ducts shall have centerline radius of 1 1/2 times duct width wherever possible. Elbows for grease exhaust and fume hood exhaust shall be full radius. Vanes or mitered duct are not allowed.

b. Where centerline radius is less than 1 1/2 times duct width (on supply, return and exhaust ductwork), elbows shall be radius throat (square throat allowed when turning around column or other close objects) with radius heel. For elbows whose width is greater than 48 inches and/or where shown on plans, provide splitter vanes. Install vanes in accordance with SMACNA. Where multiple elbows are separated by less than ten duct diameters use splitter (full length) vanes.

c. For round ductwork provide stamped elbows, with centerline radii equal to 1 1/2 times duct diameter, or gored elbows as follows:

Elbow Angle	No. of Gores
0° - 36°	2
37° - 72°	3
73° - 90°	5

1)

d. Elbows for flat oval ducts shall have centerline radii equal to 1 1/2 times duct diameter in plane of bend, or gored elbows with gores as specified for round ducts.

17. Access Panels/Doors

a. Provide proper pressure and leakage rated, gasketed, duct mounted access panels/doors for the following items with minimum sizes, as indicated. Access doors shall be of double wall construction doors in insulated ducts shall be insulated. Gauges of door materials, no. of hinges, no. and type of door locks shall be as required by the SMACNA Duct Construction Standards. Hinged doors are not acceptable, screwed or bolted access panels are not acceptable. Doors shall be chained to frame with a minimum length of 6" to prevent loss of door. For seal Class A, access doors shall be leakage rated, neoprene gasketed UL 94 HF1 listed, DUCTMATE "sandwich" or

approved equal. Door metal shall be the same as the attached duct material. For grease and high temperature ducts, door assembly shall be rated for 2300°F. The minimum sizes are:

1) Fire dampers 12" x 12", or larger.
2) Combination Fire/Smoke dampers 12" x 12", or larger.
3) Smoke dampers 6" x 6" minimum.
4) Automatic control dampers 6" x 6" minimum.
5) Manual volume dampers 2 sq. ft. and larger 6" x 6" minimum.
6) Inlet side to all coils 12" x 12", or larger.
7) Suction and discharge sides of inline fans 24" x 24" minimum.
8) At additional locations indicated on drawings, or specified elsewhere 12" x 12" minimum.

b. Generally access doors are not shown on the drawings, but shall be provided in accordance with the above.

18. Extractors shall have adjusting rod and locknut on outside of duct.
19. Plenums and connections to louvers:
    a. Shall be 18 ga. minimum cross broken and properly reinforced with galvanized angle irons to SMACNA requirements.
    b. Shall have bottom and corner seams soldered watertight at least 12" up from bottom.
    c. Shall have neoprene gaskets or other non corrosible material to make connections to louvers watertight.
    d. Shall pitch connection back towards the louver. Provide half coupling drain connection at bottom of plenum unless noted otherwise Pipe drain to nearest floor drain.
    e. Shall have unused portions of louvers blocked-off with sheet metal; sealed air and water tight; insulated with 2" thick 6 lb. density rigid or board insulation.
20. Duct Pressure Tests
    a. Pressure test ducts after takeoffs and wall penetrations are in place and before applying exterior insulation. Correct any leaks.
    b. Pressure and leak test 100% of medium and low pressure duct work at 150% of duct construction class pressure. Duct shall be constructed so there is no joint or structural failure at the test pressure.
21. Duct Leakage Tests
    a. Leak testing shall be per SMACNA HVAC Air Duct Leakage Test Manual. Provide orifice assembly including straightening vanes, orifice plate mounted in straight tube with properly located pressure taps, and U tube manometer or other device as specified by SMACNA. Orifice assembly shall be calibrated accurately and shall come with calibration curve.

Leakage classes shall be as previously specified. Submit leak test report (per SMACNA format) for Designer review. Drawings of ductwork tested shall also be submitted with report, indicating presence of takeoffs, wall penetrations, joints, etc.

22. Materials
    a. Sheet metal ducts shall be constructed of hot dipped galvanized sheet metal with G90 Commercial coating according to ASTM 527 unless specified otherwise.
    b. Stainless steel (SS) ductwork shall be 18 gauge for kitchen hoods; and as required by SMACNA for other ducts. Materials shall be 316/No. 4 finish for exposed duct, 304/No. 1 finish for concealed ducts. Joints and seams shall be welded as required by SMACNA Guidelines for Welding Sheetmetal.
    c. Aluminum ductwork shall be Alclad 3003 1414 or alloy 5052 H32, of thickness required by the SMACNA duct construction standards with Alloy 6061 bracing angles, and Pittsburgh lock longitudinal corner and double side seaming.
    d. Flexible Ductwork
        1) Flexible ductwork, connecting to uninsulated or unlined duct, shall be polyester core with corrosion resistant helical wire reinforcing. The polyester core shall be minimum two ply and shall have a minimum thickness of 0.0017". Flex duct shall be U.L. rated for 6" W.C. positive pressure, 2" W.C. negative pressure with a maximum velocity of 4000 FPM. Flexduct must be listed as a Class 1 Connector according to UL 181 and shall meet the requirements of NFPA 90A maximum ASTM E 84 fire hazard rating shall be 25 flame spread, 50 fuel contributed and 50 smoke developed. Uninsulated flexible duct shall be equivalent to Wiremold, Type WB, or Flexmaster Types 2 and 4 (not type 9).
        2) Flexible duct connected to insulated or lined duct shall also be insulated and shall be equivalent to Wiremold Type WK or Flexmaster Types 2 or 4 (not type 9), with 1 1/2", 3/4 lb. density fiberglass insulation and an aluminized reinforced vapor barrier.
        3) Submittals shall include data on no. of polyester plies and minimum thickness of polyester core, in addition to other data listed above required to ensure that submitted product meets the requirements of these specifications.

4) If flexduct other than the model numbers of the vendors listed above is submitted, a sample of the flex shall be submitted to the Designer. The Designer shall have sole discretion in determining whether the submitted flex is equivalent to that of the named vendors above.
5) Unless otherwise indicated, flexible duct shall not exceed 5'-0" long.

e. Rigid PVC ductwork shall be thermally formed ASTM D 1784 69 Class 12454 B with 3/16" thick wall.

C. 2" and Lower Pressure Class Ductwork, Rectangular:

1. Ducts wider than 19" with more than 10 square feet of unbraced panel shall be beaded or cross broken.
2. Internal stiffening struts shall only be used upon prior written approval of the Designer.
3. Make changes in duct size with tapered connections as required by SMACNA. Changes shall NOT exceed 30°from line of air flow. Take off to the diffusers shall be 45° leading edge type or Bellmouth type.
4. Transverse joints shall be TDF/TDC or slip joints; use flat or standing seam according to SMACNA. Where duct size requires standing seam but space restrictions dictate flat seam, notify Designer prior to fabrication.

D. 2" and Lower Pressure Class Ductwork, Round:

1. Joints
   a. Longitudinal joints shall be spiral seam, butt welded, lap and seam welded, or ACME lock grooved seam. Snap lock seams shall be used on ½" w.g. pressure class duct only.
   b. Transverse joints shall be beaded sleeve joint or other approved joints listed in SMACNA. Use three or more sheet metal screws at 15" uniform intervals along circumference of joints.
2. Branch fittings shall be conical tee (Buckley or equal) or combination tee as shown in SMACNA.
   a. 3" and 4" Pressure Class Ductwork Rectangular
3. Joints
   a. Joints shall be prefabricated type by TDC, TDF or Ductmate. See Prefabricated Joints paragraph for specific requirements.
4. Duct reinforcement spacing and type shall comply with SMACNA.
5. Ductwork on both sides of transitions shall be run in same horizontal axis.

6. Diverging section slope shall be 1 1/2" per foot or less if possible.
7. Contraction section slope shall not exceed 7" per foot.
8. Takeoffs shall be 45° leading edge type except that Bellmouths (Buckley or equal) may be used for takeoffs to terminal boxes if the distance between the box and point of takeoff is less than 8 ft.
9. Ducts with an aspect ratio greater than 3:1 shall be minimum of 18 gauge unless a thicker gauge is required by SMACNA.

E. Flexible Rigid Duct

1. Flexible ductwork shall be Flexmaster Triple Lock Buck Duct Flexible Air Duct (insulated or non insulated) as manufactured by Buckley Associates or equal (617 878 5000). Flexible duct, non insulated, shall be Underwriters Laboratory Listed UL 181 Class 0 air duct and constructed in accordance with NFPA Standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.
2. Duct shall be made from a tape of dead soft aluminum sheet, spiral wound into a tube and spiral corrugated to provide strength and stability. The joint shall consist of a triple lock mechanically performed without the use of adhesives to make a durable airtight seam. A double lock is not acceptable.
3. Flexible duct connected to insulated or lined duct shall also be insulated. Flexmaster insulated flex shall have a gray Fire Retardant Polyethylene outer jacket with a ½ lb. density, 1 1/2" thick fiberglass insulation blanket, factory wrapped. Flexible Duct, insulated, shall be Underwriters Laboratory Listed and constructed in accordance with NFPA standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.
4. The flexible duct shall be supported as required.
5. Flexible duct work shall be rated at 12" positive pressure. Duct from 3 to 16" shall have a negative pressure of 12", 8" for duct work 18 and 20.
6. All flexible duct shall be individually cartoned and labeled for delivery to the job site for maximum protection.
7. Submittals shall include data on minimum thickness of aluminum core, in addition to other data listed above, required to ensure that submitted product meets the requirements of these specifications.
8. Provide sealing compound for installation. See further paragraphs in this specification and details for other installation requirements.

F. Volume Dampers

1. Provide Young Regulator manual adjustable rectangular opposed blade dampers for duct heights less than 12" with factory installed locking hand quadrants extended 2" for all dampers installed in externally insulated duct:
   a. On each supply, return and general exhaust duct take off.
   b. At each take off to register, grille or diffuser (not all are shown on Drawing).
2. Dampers are manufactured approximately 5/16" smaller in width and 1/8" smaller in height than size of duct in which they are installed; e.g., nominal damper size is 24" x 10"; actual size is approximately 23 11/16" x 9 7/8".
3. Damper frame shall be constructed of #6063 extruded aluminum reinforced channel with minimum thickness of .050". Opposed damper blades shall be #6063 extruded aluminum with minimum thickness of .050" and shall include reinforcing ribs. Each blade shall be supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8" square steel control shaft.
4. Note: All required volume dampers may not be indicated on drawings but dampers shall be provided as necessary for systems balancing.
5. Dampers 12" and larger in height shall be opposed multi blade equal to Greenheck, Nailor, or Vent Products.
6. Where dampers are inaccessible, use Young Regulator locking type ceiling regulators and miter gear or worm gear for all horizontal dampers. Bearing coupling for bottom duct control may be used for shaft on vertical blade dampers. The 3/8" rod between ceiling regulator and damper shall be provided by contractor.
7. Damper blades shall be two gauges heavier than adjoining ductwork, and shall be riveted to supporting rods. Hem over edges parallel to rods.
8. Brackets shall be galvanized metal, secured to ductwork with sheet metal screw with locking quadrant arms (see seal class section for additional requirements). Provide 2" handle extension for all dampers on externally insulated ductwork.
9. Note: All required volume dampers may not be indicated on Drawings but dampers shall be provided as necessary for system balancing.

G. Branch Duct Take off Fittings

1. Contractor shall provide Buckley Bellmouth Take offs at all branch duct locations.

2. Bellmouth Fitting shall be Model BMD with damper. In areas where sufficient duct height is not available, the contractor shall provide the Buckley Mini mouth fitting, Model M BMD with damper or the flat oval Bellmouth, Model FOBMD with damper.
3. Bellmouths shall be constructed of heavy duty galvanized steel. Bellmouths shall include an air tight Neoprene gasket to ensure a tight fitting with minimal leakage. Pre drilled holes shall be provided for quick mounting. Bellmouth shall be as manufactured by Buckley Associates or equal (617 878 5000).
4. Standard damper hardware to be constructed of 26 gauge galvanized material with a quadrant damper and tight fitting gasketing to ensure minimal leakage at damper pivot points.
5. Optional heavy duty hardware shall be provided at locations of higher static pressure where shown on the drawings.
6. Ninety degree take offs are not permitted on this project.

2.2 PIPING AND FITTINGS

A. Hot Water piping 2" diameter and smaller shall be type "L" hard drawn copper tubing with wrought copper fittings. Hot water piping/ Chilled Water piping 2-1/2" diameter and larger shall be Schedule 40 black steel pipe, ASTM A-53, Grade B, ERW.

B. Condensate drain piping shall be Schedule 40 PVC with solvent joints. Provide P-trap for each condensate drain line connection. Provide clean-outs at each change in direction of piping. Use tees and a 45-degree fitting for a branch line joining a main. Clean-outs shall be made with threaded plug tees. Pitch piping down in direction of flow.

C. Refrigerant Piping:

1. Rigid Copper Refrigerant Pipe: ASTM B819, type #ACR hard drawn or annealed with ASME B16.22 wrought copper fittings. Material shall be Type ACR hard drawn copper tubing with silver solder wrought copper fittings. Tubing shall be specially cleaned and capped for use with refrigerants. Piping shall be sized as recommended by the manufacturer.
2. Pre-insulated line sets: Manufacturer approved Pre-insulated line sets may be used. Lines shall be hung to avoid sagging. Do not allow lines to lay on ceiling system. Pre-Insulated line sets shall be sized and have an insulation thickness as recommended by the manufacturer.

D. Fittings & Couplings:

1. Copper Fittings:
   a. Fittings for copper tubing shall be wrought copper fittings. Provide dielectric fittings for all connections between ferrous and non-ferrous piping.
   b. At the option of the HVAC Subcontractor, copper piping 2" and under shall be joined with ProPress fittings as manufactured by Viega LLC or approved equal. Piping fittings and components shall be capable of withstanding 150 psig. Working pressure at 200 deg F. Piping and fittings shall be installed per manufacturer's installation instructions. Housing shall be copper or bronze. Sealing element shall be EPDM. Pipe and fittings shall be installed using manufacturer's specific tools and using smart connect technology.

2.3 VALVES

A. Furnish and install valves as indicated on the drawings and specified herein. All valves in each class shall be manufactured by the same manufacturer.

B. Isolating valves on piping 2" diameter and smaller shall be ball valves, Apollo Series 70-100 or 70-200 or equal as manufactured by Hammond, Jenkins or Stockham.

C. Check valves on piping 2" diameter and smaller shall be Class 150 bronze, threaded regrinding swing check valves with bronze disc and screw-in cap as manufactured by Hammond, Jenkins or Crane. Valves shall conform to MSS SP-80.

D. Drain valves shall be provided on all low points of water piping. Drain valves shall be 3/4" bronze drain valves with solid bronze cap and chain, Jenkins Fig. No. 314, or equal as manufactured by Apollo, Hammond or Crane.

E. Control valves shall be two position or modulating pressure-independent type as specified under the Controls Specifications.

2.4 INSULATION

A. Provide pipe covering and duct insulation of the type hereinafter specified on the following: hot water piping, cold water make-up piping, refrigerant piping and sheet metal ducts. All sealers, solvents, tapes, adhesives and mastics used in conjunction with this section of

the specifications shall possess the maximum safety quantities available and Standards #90A and #90B. Insulation shall be fiberglass except as specified hereinafter having a minimum density of four pounds per cubic foot. Insulation shall be as manufactured by Armstrong, CertainTeed, Johns-Manville, Knauf, Owens/Corning, or equal and installed in accordance with the manufacturer's recommendations.

B. Piping: All new piping and fittings throughout the building, as shown on the drawings, shall be insulated with Owens/Corning Fiberglass, or equal, 25 ASJ glass fiber insulation in molded sections. Glass fiber insulation shall have a minimum density of 3-1/4 pounds per cubic foot with a thermal conductivity ("K" value) of 0.23 at 75ºF mean temperature. All piping shall have a factory applied all service vapor barrier jacket. The end joints of the insulation shall be sealed with factory furnished end joint sealing tape. Longitudinal seams shall be sealed with Benjamin Foster 85-75 adhesive. The thickness of insulation to be applied to piping shall be as follows:

1. Hot water supply and return piping less than 1.5” in diameter shall be insulated with 1.5" thick insulation and piping 1.5” and greater in diameter shall be insulated with 2” thick insulation. Staples shall not be used in any part of this installation.
2. Chilled water supply and return piping less than 6” in diameter shall be insulated with 1.0" thick insulation and piping 6” and greater in diameter shall be insulated with 1.5” thick insulation. Staples shall not be used in any part of this installation.
3. All cold-water make-up piping shall be covered with 1" fiberglass pipe covering with factory applied flame resistant vapor barrier adhesive. End joints shall be finished with 4" wide matching vapor barrier strips, sealed with adhesive. Staples shall not be used in any part of this installation.
4. All refrigerant suction lines shall be insulated with 1" wall thickness flexible elastomeric closed cell pipe insulation. All insulation exposed to the weather shall be furnished with two coats of Armstrong Armaflex finish or approved equal. Contractor shall provide on both the suction and liquid lines as recommended by the manufacturer. Flexible elastomeric cellular insulation shall be manufactured by Armstrong Armaflex, Aerocel3: K-Flex, or approved equal.
5. The end joints of insulation shall be tightly butted and covered with factory furnished end joint sealing tapes. The jacket overlap shall be sealed with an approved sealer which shall not mar the jacket finish. Staples shall not be used for fastening insulation.

6. All fittings, valves and flanges shall be insulated with the same thickness of fiberglass as on the piping, with mitered segments of pre-molded F/G fittings wired in place after which a one mil aluminum foil vapor barrier shall be wrapped tightly over the insulation with all laps sealed with the manufacturer's vapor seal mastic. Wet coats of vapor seal mastic with imbedded glass fabric shall be applied to fittings, per the manufacturer's recommendations. Staples or tacks shall not be used.
7. Provide PVC plastic pipe jacket over pipe insulation on locations indicated on drawings. Jacket shall be 10 mil thickness, ASTM C921, sheet material, off-white color, ASTM E96; 0.002 perm-inches. Adhesives and mastic shall be compatible with insulation.

C. Ductwork: All plenums behind intake and exhaust louvers shall be insulated with 1" thick 703 Series Fiberglass board insulation, with 0.0025-inch aluminum foil facing that has been tested in accordance with ASTM E-84, having a flame spread rating of 25 maximum and smoke developed rating of 50 maximum. Install per manufacturer's recommendations.

1. All air conditioning supply air ducts and return air ducts above ceilings and outdoor air ducts shall be insulated with 1-1/2" thick fiberglass insulation wrap with 0.0025" aluminum foil facing that has been tested in accordance with ASTM E-84, having a flame spread rating of 25 maximum and smoke developed rating of 50 maximum.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide pipe supports, hangers, and other devices necessary to support firmly and substantially the piping and the apparatus described in the specifications and shown on the drawings. Hangers shall be arranged to maintain the required grading and pitch, to prevent vibration, and to provide for expansion and contraction. All hangers and supports shall be in compliance with seismic requirements of the State Building Code.

B. Where the weight of piping or other apparatus makes it impracticable to support same from the ceiling alone, flange pipe standards shall be installed to support the weight of piping, valves and fittings.

C. Piping shall not be supported from ductwork, breeching, equipment, ceiling suspension systems or other piping.

D. Brackets of approved type may be used along walls.

E. Each vertical line shall be supported at its base using a suitable hanger placed in the horizontal line near the riser.

F. Piping 2-inch diameter and smaller shall be supported by "A" bands with adjustable steel rod with concrete insert or beam clamp. Piping 2-1/2 and above diameter shall be supported by clevis hangers with adjustable steel rod and one concrete insert or beam clamp. Two rod roll hangers shall be used in lieu of the hanger type specified where space limitations necessitate.

G. 1A bands and clevis hangers shall be installed outside the thermal insulation. Provide 18 gauge, 12" long pipe covering protection shields on insulated piping at 1A bands and clevis hangers. Provide galvanized metal shields between pipe hangers and insulation where saddles are not required and where hangers are installed outside of insulation.

H. The maximum spacing between pipe supports shall be in accordance with the latest addition of ANSI/MSS SP-69 & SP-58 Tables 3 & 4. The following excerpts from the tables shall be verified prior to work.

1. Horizonal Copper Pipe:

Nominal Pipe Size (in)	Rod Diameter (in)	Maximum Spacing (ft)
1/4 – 3/4	3/8	5
1	3/8	6
1-1/4	3/8	7
1-1/2	3/8	8
2	3/8	8
2-1/2	1/2	9

I. These spans apply to straight runs of piping without concentrated loads. Spans shall be shorter as required by changes in direction or by concentrated loads such as strainers, valves, or related items. Supplementary steel shall be furnished and installed as required by ANSI/MSS SP-58.

J. The first three hangers on the suction and on the discharge of each pump shall be provided with Type 30N spring hangers as manufactured by Mason Industries or equal as manufactured by Carpenter and Patterson or Grinnell. The HVAC Contractor shall use necessary means to install all piping and equipment with minimal vibration and sound that is normal to the pumps as verified by the pump manufacturer.

2.6 SLEEVES AND PENETRATIONS

A. Pipe Sleeves

1. Sleeves through floors and through exterior, structural and fire rated construction shall be hot dipped galvanized Schedule 40 steel pipe.
2. Sleeves through partitions and non fire rated construction shall be 26 gauge galvanized steel with lock longitudinal seams, or approved plastic pipe.
3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. slip on welding flanges at exterior wall penetrations.

B. Duct Sleeves and Openings

1. Sleeves through floors, through exterior structure, through fire rated construction and through smoke partitions that require smoke dampers shall be Schedule 40 galvanized steel pipe for round duct and shall meet SMACNA Fire Damper and Heat Stop Guide for rectangular and flat oval ducts. Fireproof packing shall be applied to seal any openings between sleeve and wall. Materials shall maintain the fire rating of the wall, and shall be installed in accordance with the SMACNA Fire Damper and Heat Stop Guide.
2. Openings in walls, partitions and other fire rated construction that do not require smoke dampers shall meet NFPA 90A, Section 3 3.8.
3. Materials for prepared openings in partitions shall match construction penetrated.

C. Pipe Sleeve Packing

1. Packing between the pipe and the sleeve (or wall or slab opening) in fire rated walls or slabs shall be a combination of fireproof insulation and fireproof caulk. The combination of materials shall have the same fire rating, in hours, as the wall or slab, as tested in accordance with the latest edition of ASTME 814 (UL 1479). The combination of materials shall be classified by UL, (fill, void or cavity materials) for the fire rating required and shall be listed as a numbered system in the UL Fire Resistance Directory. Fiberglass shall not be used as the insulation material.
2. Acceptable fireproof insulation materials shall be: Kaolin (Kaowool by Babcock and Wilcox); ceramic fiber blanket (Fiberfrax by Standard Oil) or fire rated mineral wool (Thermafiber by USG). Acceptable fireproof caulks shall be:

Silicone (Firestop by Dow Corning, Hilti CS240); ceramic fiber (Fyreputty by Standard Oil) or intumescent synthetic elastomer (Fire Barrier Caulk by 3M, Hilti CS2420).

3. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fibre or mineral fibre with approved sealant. Pack or foam to within 1" of both wall surfaces. Seal penetration packing with approved caulking and paintable water proof mastic surface finish or silicone caulking.
4. All materials must be installed in accordance with manufacturers instructions; all gaps must be sealed. Finish caulk flush with wall or slab surface if piping runs exposed.

D. Other Water proof Pipe Penetrations

1. Modular mechanical penetration seals shall be interlocking synthetic rubber links shaped to fill annular space continuously, with galvanized carbon steel bolts, nuts and pressure plates to expand rubber seal between pipe and sleeve. Sleeve seal shall be water tight.
2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed cell elastomeric seal (non fire rated) or preformed mineral fiber or silicone foam seal (fire rated).
3. Provide water proof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs on grade and existing walls below grade.

2.7 ESCUTCHEONS

A. Provide adjustable escutcheons on exposed piping that passes through finished floors, walls and ceilings. Escutcheons shall be chromium plated cast brass, sized to cover sleeve opening and to accommodate pipe and insulation.

2.8 PRESSURE GAUGES, THERMOMETERS AND TEST PLUGS

A. Provide bronze Bourdon tube pressure gauges where shown on Drawings and where specified, by U.S. Gauge, Trerice, or Weksler, accurate to +1%.

1. Gauges shall have white faces with black filled engraved lettering. Gauge bodies shall be set in phenolic cases. Provide siphons and shut off cocks.
2. Gauges shall be easily accessible and easily read. Gauges

readable from floor at less than five feet shall have 4 1/2" dials. Other gauges shall have 6" dials. Gauges graduations shall meet limit requirements of normal operation. Gauge shall indicate at mid scale.

B. Provide separable well V case thermometers by U.S. Gauge, Trerice, or Weksler where shown on Drawings and where specified. Thermometers shall have 9" scale and white face with black filled engraved letters. Thermometers shall be angular or straight stemmed, as conditions necessitate. Thermometer wells shall be bronze and shall be installed so as to ensure minimum restriction of water flow in pipe.

1. Provide thermometer ahead of and beyond cooling coils, in pump suctions and discharges, and where shown on Drawings. Thermometers shall have scale range of 0° 120°F with 2°scale division.
2. Provide thermometer in condenser water system at each chiller, cooling tower and pump connection. Scale range shall be 20° 180°F with 2°scale division.
3. Provide thermometer in hot water system at each boiler, coil and pump connection, unless specified otherwise. Scale range shall be 30° 300°F with 2°scale division.
4. Provide additional thermometers where shown on Drawings.

C. Combination Pressure/Temperature Test Plugs

1. Provide in the supply and return piping at VAV boxes, duct coils, unit ventilators, and fan coil units, combination pressure temperature test plugs by Peterson Equipment Company "Petes Plug" or Sisco, Inc. "P/T Plugs".
2. Plug shall be 1/4" or 1/2" NPT, constructed of solid brass with a Nordel valve core suitable for temperatures up to 350°F. Plug shall be rated zero leakage from vacuum to 1000 psig.
3. Provide extension fitting for each plug suitable for use with 2" maximum pipe insulation.
4. Provide gauge test kit consisting of the following items:
   a. (2) 3-1/2" dial face gauges 0 100 psi and 0 231 feet.
   b. (2) Gauge adapters with 1/8" O.D. probe.
   c. (2) 5" stem pocket testing thermometers ranges 25 125°F; 0 220°F.
   d. (1) Carrying case.
   e. (2) 4' length of flexible hose with adapters.

2.9 VIBRATION ISOLATION (NON-SEISMIC)

A. General

1. Manufacturer Responsibility
   a. Manufacturer of vibration equipment shall have the following responsibilities:
      1) Guarantee specified isolation system deflections.
      2) Provide installation instructions, drawings and field supervision to insure proper installation and performance of systems.
2. Quality Assurance
   a. All vibration isolators shall have calibration markings or some method to determine adjustment, the actual deflection under the imposed load after installation and adjustment.
   b. All isolators shall operate within the linear position of their load vs. deflection curves. Load vs. deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50% above the design deflection.
   c. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than +10%.
   d. Substitution of internally isolated equipment in lieu of the isolation specified in this section, is acceptable provided all conditions of this section are met. The equipment manufacturer shall provide a letter of guarantee stating that the specified noise and vibration levels will be obtained or the cost of converting to the specified external vibration isolation shall be born by the equipment manufacturer.
   e. The following specifications describe spring hangers with 30 degree misalignment feature. This requirement is mandatory. the Contractor shall replace any hangers without the 30 degree capability discovered on site at no additional cost to DCAMM.

B. Products

1. Description
   a. All vibration isolation devices shall be the product of a single manufacturer. Products of other manufacturers are acceptable provided their systems strictly comply with intent, structural design, performance, and deflections of the base manufacturer.
   b. Acceptable manufacturers of vibration isolation products shall be: Mason Industries, Amber Booth Company, Peabody Noise Control, Korfund Dynamics Corporation,

Vibration Mountings and Equipment, Vibration Eliminator Co., provided they meet the requirements of this specification. Mason Industries model numbers have been used in this specification to establish quality of components, but are in no way to limit competitive bidding by other manufacturers.

c. Refer to Table A at the end of this article for application of the various types listed to appropriate equipment and efficiency level.

2. Vibration Isolation Types
   a. Vibration Isolators
      1) Type A: Spring Isolator
         a) Having a minimum OD to OH of 0.8:1.
         b) Corrosion resistance where exposed to corrosive environment with:
      2) (Springs cadmium plated or electro-galvanized.
      3) (Hardware cadmium plated.
      4) (All other metal parts hot-dip galvanized.
         a) Reserve deflection (from loaded to solid height) of 50% of rated deflection.
         b) Minimum ¼" thick neoprene acoustical base pad on underside.
         c) Designed and installed so that ends of springs remain parallel.
         d) Non-resonant with equipment forcing frequencies or support structure natural frequency.
         e) Mason Ind. Type SLF
      5) Type B: Spring isolator shall be the same as Type A with the following additional features:
         a) Built-in vertical limit stops with minimum ¼" clearance under normal operation.
         b) Tapped holes in top plate for bolting to equipment.
         c) Capable of supporting equipment at fixed elevation during equipment installation. Installed and operating heights shall be identical.
         d) Adjustable and removable spring pack with separate neoprene isolation pad.
      6) Mason Ind. Type SLR
      7) Type C: Spring hanger rod isolator.
         a) Spring element seated on a steel washer within a neoprene cup incorporating a rod isolation bushing.
         b) Steel retainer box encasing the spring and neoprene cup.
         c) When used on ductwork, provide eyebolts for attachment to duct straps.

d) Mason Ind. Type H5, WHS

8) Type D: Double deflection neoprene mountings.
   a) All metal surfaces shall be neoprene covered and have friction pads top and bottom.
   b) Be capable of .035" deflection at rated load.
   c) Steel rails shall be employed to compensate for overhang on units such as small vent sets, close coupled pumps, etc.
   d) Mason Ind. Type ND or Rails Type DNR.
9) Type E: Elastomer hanger rod isolator.
   a) Molded (min. 1-3/4" thick) neoprene element with projecting bushing lining the rod clearance hole. Static deflection at rated load shall be a minimum of 0.35".
   b) Steel retainer box encasing neoprene mounting capable of supporting equipment up to four times the rated capacity of the element.
   c) Mason Ind. Type HD
10) Type F: Combination spring/elastomer hanger rod isolator.
   a) Spring and neoprene elements in a steel retainer box with the features as described for Type A and E isolators.
   b) Mason Ind. Type DNHS
11) Type G: Pad type elastomer isolator.
   a) 0.75" minimum thickness, 50 psi maximum loading, ribbed or waffled design.
   b) Minimum 0.1" deflection.
   c) 1/16" galvanized steel plate between multiple pad layers.
   d) Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area (Type "GM").
   e) Mason Ind. Type Super W pad.
12) Type H: Pad type elastomer isolator.
   a) Laminated canvas duct and neoprene, maximum loading 1,000 psi, minimum ½" thick.
   b) Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area (Type HM).
   c) Mason Ind. Type HL Pad.
   d) NOTE: When bolting is required, neoprene and duck washers and bushings shall be provided to prevent short circuiting.
13) Type I: Thrust restraints.
   a) A spring element similar to Type A isolator

shall be combined with steel angles, backup plates, threaded rod, washers and nuts to produce a pair of devices capable of limiting movement of air handling equipment to ¼".

b) Restraint shall be easily converted in the field from a compression type to tension type.
c) Unit shall be factory precompressed.
d) Thrust restraints shall be installed on all cabinet fan heads, axial or centrifugal fans whose thrust exceeds 10% of unit weight.
e) Mason Ind. Type WB

14) Type J: Steel Rails
a) Steel members of sufficient strength to prevent equipment flexure during operation.
b) Height saving brackets as required to reduce operating height and cradle the unit.
c) Mason Ind. Type ICS

15) Type K: Pipe anchors
a) All directional acoustical pipe anchor, consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum ½" thickness of Type H pad.
b) Vertical restraints shall be provided by a similar material arranged to prevent vertical travel in either direction.
c) Allowable loads on isolation materials shall not exceed 500 psi. And the design shall be balanced for equal resistance in any direction.
d) Mason Ind. Type ADA

16) Type L: Isolated clevis hanger
a) Combination clevis or rod roller hanger and a Type C, (LC), E (LE), or F (LF) isolation hanger.
b) System shall be precompressed to allow for rod insertion and standard leveling.
c) Mason Ind. Type CIH

17) Type M: Flashable restrained isolator
a) Shall have all features of Type B isolator.
b) Shall have waterproof spring covers for adjustment or removal of springs.
c) Unit shall have a structural top plate for welding or bolting of supplementary support steel.
d) Isolator shall accept 2" roofing insulation and be flashed directly into the waterproofing

membrane.
e) To be complete with wood nailer and flashing.
f) Mason Ind. Type REVRS

C. Execution

1. General
   a. Isolation systems must be installed in strict accordance with the manufacturer's written instructions. Vibration isolators shall not cause any change of position of equipment resulting in stress on equipment connections.
2. Equipment Installation
   a. Equipment shall be isolated as per Table A at the end of this section.
   b. Place floor mounted equipment on 4" high concrete housekeeping pads properly doweled or expansion shielded to the deck. Mount vibration isolators and/or bases on housekeeping pads. Concrete work specified in Section 033000 – CAST-IN- PLACE CONCRETE.
   c. Additional Requirements
      1) The minimum operating clearance under inertia bases shall be 2".
      2) The minimum operating clearance under other bases shall be 1".
      3) All bases shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine, isolators.
      4) The isolators shall be installed without raising the equipment.
      5) After the entire installation is complete, and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators are properly adjusted, shall be barely free and shall be removed. Remove all debris from beneath the equipment and verify that there is no short circuits of the isolation. The equipment shall be free in all directions.
      6) Install equipment with flexibility in wiring.
3. Piping and Ductwork Isolation
   a. All piping and ductwork is included in this section.
   b. Installation
      1) Isolate piping and ductwork outside shafts as follows:
         a) All in mechanical rooms.
         b) All exposed on roof.
         c) All within 50 ft. or 100 pipe diameters (whichever is greater) from connected rotating or reciprocating equipment and

pressure reducing stations.

d) Control air piping, from compressor discharge to receiver.

2) The isolators shall be installed with the hanger box attached to, or hung as closely as possible to the structure.

3) The isolators shall be suspended from substantial structural members sized for 0.08" deflection at center of span, not from slab diaphragm, unless specifically permitted.

4) Hanger rods shall not short circuit the hanger box.

5) Horizontal suspended pipe 1¼" to 2" and all steam piping shall be suspended by Type E isolators with a minimum 3/8" deflection. Water pipe larger than 2" shall be supported by Type F isolators with a minimum 1" deflection or same deflection as equipment for the first 3 locations nearest equipment whichever is greater.

a) Type L hangers may be substituted for the above.

6) Ductwork shall be supported by Type C (WHS) hangers.

7) Horizontal floor and roof supported pipe shall be the same as C.3.b.5 except use isolators Type D and Type A, respectively.

8) Vertical riser pipe supports under 2" diameter shall utilize Type H isolation.

9) Vertical riser guides, if required shall avoid direct contact of piping with the building.

10) Pipe anchors or guides where required, shall utilize Type K isolators.

11) Riser sway supports, where required, shall utilize two (2) neoprene elements (Type G or H) to accommodate tension and compression forces.

12) Pipe extension and alignment connectors: Provide Type FC-2 connectors at riser takeoffs, cooling and heating coils and elsewhere as required to accommodate thermal expansion and misalignment.

13) Install Type FC-1 flexible connectors at all connections of pipe to equipment such as pumps, chillers, cooling towers and as shown on the drawings.

14) Install FC-2 type connectors at all locations which exceed temperature limitations of FC-1.

15) For control air piping, provide two flexible connectors Type FC-2 90° to each other in the compressor discharge piping to the receiver. When the receiver is remote from the compressor, isolate

the piping between the compressor and receiver with Type C isolators having 3/8" deflection. The receiver shall be isolated with Type D isolators having 3/8" deflection.

4. Inspection
   a. Upon completion of installation of all vibration isolation devices, the local representative shall inspect the complete project and certify in writing to the Contractor that all systems are installed properly, or require correction. The Contractor shall submit a report to DCAMM's Project Manager, including the representative's report. Certifying correctness of the installation or detailing corrective work to be done.

TABLE A

			NON-CRITICAL			CRITICAL		
EQUIPMENT	HP	MTNG	ISOL	DEFL	BASE	ISOL	DEFL	BASE
Absorption Mach.		Flr	GM	.10	--	B	.75	J*
AC Units (Dx)		Flr Clg	D - 	.30 -- 	-- -- 	A F 	.75 .75 	J* --
Air Compressors Tank or Unitary	to 10 > 10	Flr Flr	D A 	.30 .75 	-- -- 	A A 	.75 1.50 	-- B-2
Air Cooled Cond. or Chillers		Fir	-	--	--	A	2.50	B-4
Axial Fans		Flr Clg	D - 	.30 -- 	-- -- 	A** F 	See Guide 	-- --
Base Mounted Pumps	to 15 > 15	Flr Flr	D D 	.30 .30 	B-2 B-2 	A A 	.75 1.50 	B-2 B-2
Boilers		Flr	GM	.10	--	B	.75	--
Centrif. Chillers		Flr	D	.30	J*	B	1.50	J*
Centrif. Fans Arr. 1 & 3		Flr Clg	D - 	.30 -- 	B-1 -- 	A** F 	See Guide 	B-1 ***
Arr. 9 & 10		Flr Clg	D - 	.30 -- 	J -- 	A** F 	See Guide 	J J
Computer Rm Units		Flr Clg	D - 	.30 -- 	B-7 -- 	A F 	.75 .75 	B-7 --
Condensate Pumps		Flr	D	.30	J	D	.30	J

Cooling Towers		Flr	B	.75	--	M	2.50	--
Fan Coil Units		Flr Clg	D -	.30 --	-- --	A C	.75 .75	-- --
Unit/Cab. Heaters		Clg	-	--	--	E	.30	--

*Used on vertically arranged units. Rails to be 1½ times the unit height.

** Substitute TYPE B isolator for roof installations.

***Substitute TYPE B-2 base for Class 2 & 3 fans.

DEFL. GUIDE	
RPM	DEFL
< 400	3.5"
< 600	2.5
> 600	1.5

5. Notes:
   a. "ISOL" and "BASE" column indicates letter type as appears in the specs.
   b. "MTNG" refers to method of support of equipment from the structure.
   c. "SEE GUIDE" indicates isolator deflection selection to be taken from RPM/DEFLECTION Guide at bottom of table.

2.10 DIFFUSERS, REGISTERS AND GRILLES

A. Provide all diffusers, registers and grilles as scheduled on the drawings. The units shall be of the size, type and direction of flow noted on the drawings. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70. All registers and diffusers shall be furnished with individually adjustable volume control dampers. Diffusers, registers and grilles shall be as manufactured by Tuttle & Bailey, Krueger, Metal- Aire, Nailor, Price, Titus or approved equal and shall be complete with the finishes and accessories specified on drawings

B. Coordinate the location of ceiling supply, return and exhaust outlets with architectural ceiling plans.

C. All diffusers, registers and grilles shall have custom color selected by Architect. Contractor shall coordinate the color with the Architect prior to order. The units shall be factory painted the Architects selected color.

D. Ceiling diffusers shall be of the restricted multi-orifice jet induction and air mixing type consisting of louver sections with built-in diffusing vanes. The vanes shall be arranged to discharge air from adjacent louvers at an angel of 45 degrees in opposite directions to insure rapid mixing of primary and room air. Diffusing vanes shall be welded and mechanically fastened to the adjacent louver sections to make a rigid unit. The vanes shall extend to the discharge edges of the louvers. Where louver sections join the core frame, the louver ends shall be welded to the core frame. The leaving edge of each louver shall be hemmed and the louver end shall be rounded and hemmed before welding to the core frames. Diffuser shall be provided

with a connection. The diffusers shall extend no less than 1" to prevent leakage into the ceiling space. Diffusers shall be of steel construction with extended pan to accommodate 2' x 2' lay-in ceiling or gyp-board ceiling configuration as scheduled. Diffusers shall have baked enamel finish.

E. Return registers shall be of steel construction with opposed blade dampers as scheduled on drawings (no damper for transfer grilles), 35-degree horizontal fixed bars maintaining an effective area capacity of greater than 75% and baked enamel finish.

2.11 AIR CONDITIONING SPLIT SYSTEM

A. Furnish and install a ductless split air conditioning system as indicated on the drawing.

B. The air conditioning system shall be manufactured by Mitsubishi, Daikin, Fujitsu, LG, Panasonic, or approved equal.

C. Quality Assurance:

1. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
2. All wiring shall be in accordance with the National Electrical Code (N.E.C.)
3. The units shall be rated in accordance with ARI Standard 210 and bear the ARI label.
4. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. A full charge of refrigerant shall be provided in the condensing unit.

E. A dry air holding charge shall be provided in the evaporator.

F. System efficiency shall meet or exceed the SEER rating in the equipment schedule.

G. The units shall have a manufacturer's warranty for a period of not less than one year from the date of substantial completion. The compressor shall have a warranty of six (6) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

H. The outdoor unit shall be capable of operating at 5° ambient temperature without additional low ambient controls (Optional wind baffle may be required).

I. Provide a wired wall mounted thermostat, for the indoor air conditioning (AC) units. Locate the thermostats adjacent to the entry door to the space. Provide adaptors, for each indoor unit to interface the wired thermostat with the indoor units.

J. Provide a plug-in type condensate pump.

2.12 CONDENSATE PUMPS

A. Where called for on the design drawings, furnish and install condensate pumps as indicated. The pumps shall be manufactured by Little Giant, Blue Diamond, Liberty Pumps, or approved equal.

1. Standard Pumps: Provide pump equal to Little Giant VCMA Series. Pump shall have automatic start/stop, built in check valve, three prong cord, and be capable of pumping 25 GPH at 10' of head.
2. Pumps in Ceiling Plenums: Provide pump equal to Little Giant VCC-20-P Series. Pump shall meet the requirements of UL 2043, be labeled for use in a ceiling plenum, be hard wired, have automatic start/stop, built in check valve, and be capable of pumping 45 GPH at 10' of head.

2.13 AIR HANDLING UNIT (AHU)

A. Furnish and install a hot water/DX cooling coil furnace with performance characteristics as scheduled on the design drawings. Units shall be complete with condensing gas furnace, fan, motor and

controls. Units shall be Trane, Model BCVD or equal as manufactured by Trane, Carrier, Lenox or approved equal.

B. Unit cabinet shall be constructed heavy gauge steel and "wraparound" cabinet construction with baked-on enamel finish. Casing panels shall be removable for easy access to the unit. The heat exchanger section of the cabinet shall be completely lined with foil faced fiberglass insulation resulting in quiet and efficient operation.

C. All heating hot water coil sections shall be provided as specified and shall be sized in accordance with the schedule on the drawings.

D. The fan motor shall be equipped with integral, automatic reset thermal overload motor protection. The variable speed blower motor shall switch from heating to cooling speeds on demand from existing room thermostat.

E. The heating capacities shall be as scheduled. The blower shall be variable speed.

F. Unit shall be floor mounted on 4" housekeeping blocks. Provide vibration isolators and a secondary drain pan. Provide a water-level detection device in the secondary drain pan that shall shut-off the furnace & condensing unit prior to overflow of the pan.

G. The electrical characteristics of the unit shall be as noted on the design drawings.

H. Provide a 3/4" condensate drain pipe for the new furnace. Provide a condensate pump.

I. All cooling coil sections shall be provided with an insulated, double-wall, galvanized or stainless steel auxiliary drain pan. To address indoor air quality (IAQ), the drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes promoting positive drainage to eliminate stagnant water conditions. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition. All drain pan threaded connections shall be visible external to the unit. Drain

connections shall be of the same material as the primary drain pan and shall extend a minimum of 2-1/2" beyond the base to ensure adequate room for field piping of condensate drain traps.

2.14 AIR COOLED CONDENSING UNIT (ACCU)

A. Furnish and install outdoor air cooled condensing unit as manufactured by Trane, Carrier or Lenox. The unit shall be fully charged from the factory and shall be designed to operate at outdoor ambient temperatures as high as 95º. Cooling capacities shall be A.R.I. certified. The unit shall be U.L. listed. Exterior must be designed for outdoor application. Condensing units shall be compatible with the indoor DX cooling coil. Condensing unit shall have R-410A refrigerant. Condensing unit shall be Trane, Model #4TTR7 and shall have a cooling capacities as scheduled in the design drawings.

B. Unit casing shall be constructed of heavy gauge, galvanized steel and painted with a silver gray weather resistant powder paint finish.

C. Refrigerant system controls shall include condenser fan and compressor contactor. High and low pressure controls are inherent to the compressor. A factory installed liquid line dryer shall be furnished by the manufacturer.

D. The compressor features internal over temperature and pressure protection, total epoxy dipped hermetic motor windings and thermostatically controlled sump heater. Other features included roto lock suction and discharge refrigerant connections, centrifugal oil pump, special steel alloy valves in valve plate assembly and internal spring mounts to reduce vibration and noise. Units shall be furnished with a solid state timing cycle protector to prevent rapid recycling. Condensing unit shall be provided with 5 year compressor warranties.

E. The coil shall be continuously wrapped, corrosion resistant all aluminum with minimum brazed joints. The coil shall be 5/16" O.D. seamless aluminum glued to a continuous aluminum fin. The coil shall be protected on all four sides by louvered panels. Coil shall be factory tested to 2000 lbs.

F. Contractor shall provide interconnecting refrigerant piping between indoor and outdoor unit sized per manufacturer's recommendations. Provide a new, full charge of refrigerant for the system.

G. Unit selection and refrigerant line sizing shall be coordinated with the manufacturer.

H. The electrical characteristics of the unit shall be as noted on the design drawings.

2.15 AUTOMATIC TEMPERATURE CONTROL SYSTEM ELECTRIC/ELECTRONIC - NOT DIRECT DIGITAL

A. General:

1. Provide complete electric/electronic temperature control system by Johnson Controls, Inc., Landis & Staefa, Honeywell or Barber Coleman.
2. All systems shall be provided directly by the manufacturers listed above. DEALERS OR REPRESENTATIVES ARE NOT ACCEPTABLE. The manufacturer must provide full support during the guarantee.

B. Scope

1. Control system shall consist of thermostats, humidistats, temperature transmitters, controllers, automatic valves and dampers, damper operators, control panels, electrical wiring and other components required to fill intent of Specifications and provide for complete and operable system. Control equipment shall be fully proportioning, except as noted otherwise. Sequence of operation shall be as indicated on Drawings.
2. In general this Specification morning warm up is intended to cover following: occupied unoccupied control, summer/winter changeover controls, central station air handling unit controls, hot water controls and interlocking of fans and equipment.

C. Provide services of control manufacturer to supervise related work done under other Paragraphs of this Section.

1. Installation of automatic valves, separable wells and duct humidifiers furnished under this Paragraph.
2. Provision of auxiliary contacts with buttons, switches and indicator lights in required configurations, on magnetic starters.
3. Provision of blank off plates (safing) for dampers that are smaller than duct size.
4. Provision of access doors for service to control equipment.

D. Electric Wiring:

1. Electric wiring and wiring connections required for installation of temperature control system, as herein specified, shall be provided by temperature control manufacturer, unless otherwise indicated on Drawings.
2. Wiring shall comply with requirements of Electrical Section.

3. If a fireman's override panel (FOP) is provided with the fire alarm system provided under the electrical section, all control wiring between FOP, motor starters and controlled devices shall be under the work of this section. This includes wiring of the pilot lights at the FOP.
4. Provide all control wiring between float switches, provided under Section 260001 ELECTRICAL WORK, in the emergency generators day tank, and the fuel oil pump set.

E. Instruction and Adjustment: Upon completion of project, temperature control manufacturer shall:

1. Completely adjust and ready for use: thermostats, controllers, valves, damper operators, relays, and other components and equipment provided under this paragraph.
2. Furnish three instruction manuals covering function and operation of control systems on project for use by User Agency's operating personnel. Competent technician shall be provided for instruction purposes.

F. Programmed Maintenance:

1. Upon completion of installation, temperature control manufacturer shall submit to DCAMM a proposal to provide necessary programmed maintenance and to keep various control systems in proper working condition after the guarantee period.
2. Programmed maintenance agreement shall fully describe maintenance work to be performed and shall advise cost of work for subsequent years after guarantee period. This programmed maintenance proposal shall be provided free of charge at the completion of the guarantee period.

G. Room Type Instruments:

1. Modulating room thermostats shall be tamper proof. Thermostats shall have concealed adjustable setpoints. Thermostat shall be solid state with nominal 1000 ohm linear nickel wire sensing element. Element shall have positive temperature coefficient. Temperature limits shall be 0 to 125°F with operating range of 55 to 85°F. Accuracy shall be +1%.
2. Two position room thermostats shall be tamper proof without thermometers. Thermostat shall have concealed adjustable setpoints. Sensing elements shall be liquid charged.
3. Thermostats in public and multi occupancy areas shall have metal cover with tamper proof screws and satin chrome finish, with concealed adjustment without thermometer.

H. Automatic Control Valves:

1. Automatic control valves shall be fully proportioning with modulating plug or V port inner guides, unless otherwise specified. Fin tube radiation control valves shall be non-modulating, 2-position type. Valves shall be quiet in operation and fail safe in either normally open or normally closed position in event of control failure. Valves shall be capable of operating in sequence when required by operation.
2. Control valves shall be sized by temperature control manufacturer and shall be guaranteed to meet heating and cooling loads as specified. Control valves shall be suitable for pressure conditions and shall close against differential pressure involved.
3. Valve actuators shall be modulating sealed electro hydraulic type with spring return. Actuators shall incorporate solid state electronic internal controller circuitry. Ambient temperature range shall be 40°F to 150°F. Body pressure rating and connection type (screwed or flanged) shall conform to pipe schedule specified elsewhere.

I. Miscellaneous Devices: Provide relays, positioners, electric switches, clocks, transformers, etc. necessary to make complete and operable system. Locate these devices on local panel unless specified otherwise. Time clocks shall be seven day program type with ten hour spring reserve and manual override.

2.16 SEQUENCE OF OPERATION

A. Rooms with IUs and OU/ACCUs: The IU unit shall be controlled by on board controls and shall modulate as required to satisfy the set-point of the wall mounted cooling thermostat. 75^0F (adj.). Provide all interconnecting wiring between the indoor and outdoor units.

PART 3 - EXECUTION

3.1 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Designer will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Designer.

B. Prior to the Designer's checking a part of the installation or the entire installation, this contractor shall submit a letter signed by an officer

of this contracting company or an officer of the Construction Manager stating that:

1. he is an officer of the company,
2. he has personally inspected the installation to be checked,
3. the date of his inspection,
4. the installation is complete and tested and ready to be inspected by the Designer, and that all required test reports have been submitted.

C. This contractor shall arrange that an officer of this contracting company or of the Construction Manager, as well as DCAMM's Project Manager, in addition to other test witnesses that may be specified, shall witness the below listed tests. At the conclusion of each such test this contractor shall submit a letter signed by the officer stating that:

1. he is an officer of the company,
2. he has personally witnessed the test (give the name of the test),
3. the date of testing,
4. the results of testing, as compared to specified performance,
5. listing the name, title, and company affiliation of all those witnessing the test.

D. Tests Requiring Letters:

Electrical:	Fire alarm Emergency Lighting and Power Distribution Fire Department Control Center
HVAC:	Air handler operation and controls

3.2 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this Section.

4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections.
5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Designer.
6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted vibrating and rotating equipment provided under this Section.
7. Notify Designer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Designer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non functioning and abandoned piping, ductwork and equipment as directed by Designer. Dispose of or store items as requested by Designer.

B. Installation Only Items

1. Where this contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:
   a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
   b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
2. This contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted

this contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

C. Maintenance of equipment and systems: Maintain HVAC equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.

D. Use of premises: Use of premises shall be restricted as directed by Designer and as required below.

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Designer and as specified under CLEANING paragraph.
2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on site in open or unprotected areas, all equipment

   and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.
3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Designer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Designer to provide minimal interference with normal operation. Obtain Designer ’s approval of the method proposed for minimizing service interruption.

E. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify Designer in writing and do not proceed with work until written instructions have been issued by Designer.

F. Fireproofing:

1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible, prior to start of spray fiber work.
2. Ducts, piping and other items which would interfere with proper application of fireproofing shall be installed after completion of spray fiber work.
3. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to DCAMM.

G. Airbound Coils

1. If, after plant is in operation, any coils or other apparatus are stratified or air bound (by vacuum or pressure), they shall be repiped with new approved and necessary fittings, air vents, or vacuum breakers at no extra cost. If connections are concealed in furring, floors, or ceilings, this trade shall bear all expenses of tearing up and refinishing construction and finish, leaving same in as good condition as before it was disturbed.

3.3 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Ductwork and piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe and duct openings shall be temporarily closed to prevent obstruction and damage before completion.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.

C. to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.

D. Finish of materials, components and equipment shall be as approved by Designer and shall be resistant to corrosion and weather as

necessary.

E. DCAMM will not be responsible for material and equipment before testing and acceptance.

3.4 CONTINUITY OF SERVICES

A. Do not interrupt existing services without the DCAMM Project Manager's approval.

B. Schedule interruptions in advance, according to the DCAMM Project Manager's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on the User Agency's operations.

3.5 TAGS

A. Upon completion of work, attach engraved laminated tags to all valves (listed in the valve directory called for in the "Bulletins, Manuals and Instructions" paragraph of these specifications) and all pieces of HVAC equipment (including but not limited to pumps, fans, air handlers, coils and all other equipment listed in the HVAC schedules). Valve tags shall have black characters on white face, consecutively numbered and prefixed by letter "V". Equipment tags shall have black characters on white face, with labels corresponding to drawing schedule numbers.

B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.

C. Valve tags shall be at least 1" in diameter with numerals at least 3/8" high and attached by "S" hooks or chains. Equipment tags shall be at least 2" diameter securely attached to apparatus.

D. Provide manufacturers equipment nameplates, catalog numbers and rating identification securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

3.6 PIPE AND DUCT IDENTIFICATION

A. Ductwork shall be stenciled at each junction or branch takeoff, at

least once in each room, and at intervals not longer than 20 ft. Stencil shall clearly identify duct service (S for supply, R for return, X for exhaust), area served by branch, and arrow indicating direction of flow.

B. Provide color coded pipe identification markers on piping installed under this Section. Pipe markers shall be snap on laminated plastic protected by clear acrylic coating. Pipe markers shall be applied after architectural painting where such is required.

C. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double headed arrow marker.

D. Mains shall be labeled at points of entrance and exit from mechanical room, adjacent to each valve, on each riser, at each tee fitting, at points of entrance and exit from building, at least once in each room, and at intervals no longer than 20 ft.

E. Size of legend letters on markers and length of color field shall be per the latest edition of ANSI A13.1.

F. Markers shall be "Setmark" by Seton Name Plate Corp. or approved equal.

G. Following color coding shall be used with names in black letters on background and white letters on green background.

Service	Legend	
	Background Color	
Hot water supply	HWS	Yellow
Hot water return	HWR	Yellow
Cold water	CW	Green

H. Color banding shall meet latest edition of ANSI A13.1 and OSHA.

3.7 PENETRATIONS AND SLEEVES

A. General

1. Provide pipe and duct sleeves and packing materials as specified and as shown on Drawings at penetrations of foundations, walls, slabs (except on grade), partitions and floors. Sleeves shall meet NFPA 101 requirements and materials requirements of Part 2 of this Section.
2. Coordinate work carefully with architectural and structural work. Set sleeves in forms before concrete is poured. Provide

core drilling as necessary if walls are poured, or otherwise constructed, without sleeves and a wall penetration is required. Provide core drilling as required for penetrations of existing construction. Do not penetrate structural members without Designer ’s approval.

3. Sleeves for insulated pipe and duct in non fire rated construction shall accommodate continuous insulation without compression. Sleeves and/or penetrations in fire rated construction shall be packed with fire rated material which shall maintain the fire rating of the wall. Seal ends of penetrations to provide continuous vapor barrier where insulation is interrupted. See Part Two of these specifications for requirements for packing materials.
4. Sleeves through floors shall be water tight and shall extend 2" above floor surface.

B. Pipe Sleeves

1. Annular space between pipe and sleeve shall be at least 1/4".
2. Sleeves are not required for slabs on grade unless specified otherwise.
3. Sleeves and packing materials, through rated fire walls and smoke partitions shall maintain fire rating of construction penetrated.
4. Do not support piping risers on sleeves.

C. Duct Sleeves and Prepared Openings

1. Provide duct sleeves for round ducts 15" and smaller; provide prepared, framed openings for round ducts larger than 15" and for square, rectangular and flat oval ducts, except as specified otherwise. Sleeves shall meet SMACNA requirements.
2. Provide sleeves for ducts through 1 , 2 or 3 hour fire rated construction and smoke partitions, regardless of size and shape of ducts. Sleeves shall maintain fire rating of construction penetrated. Sleeve and seal materials, construction and clearances shall meet requirements of SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems.
3. Prepared openings shall be framed to provide 1" clearance between framing and duct or duct insulation.

D. Installation Testing, Listings and Approvals

1. Installation shall meet material manufacturer's recommendations exactly, particularly as regards safety, ventilation, removal of foreign materials and other details of installation. Dam openings as recommended. Remove

flammable materials used for damming and forming seals in fire rated construction.

2. Sleeve penetration methods shall be water and gas tight and shall meet requirements of ASTM E 119 Standard Methods of Fire Tests of Building Construction and Materials.
3. Fire stop penetration seal methods and materials shall be FM approved and UL listed as applicable.
4. Inspect foamed sealants to ensure manufacturer's optimum cell structure and color ranges.

3.8 ANCHORS AND INSERTS

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment supports and hangars.

3.9 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Designer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard

Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Designer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.10 PAINTING

A. Equipment installed under this Section shall have shop coat of non lead gray paint. Hangers and supports shall have one coat of non lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6" high for large equipment, 2" high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.

B. Note requirement for Designer ’s approval invoked under Part 3 article, MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.

3.11 CLEANING

A. Ductwork

1. Ducts shall be thoroughly cleaned so that no dirt or dust shall be discharged from diffusers, registers or grilles, when system is operated.
2. Provide temporary connections required for cleaning. Provide cheesecloth for openings during cleaning.
3. Replace filters prior to final inspection and testing.

B. Piping

1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
2. Permanently install necessary chemical injection fittings complete with stop valves.
3. After chilled water, heating hot water, condenser water, steam and condensate piping have been pressure tested and approved for tightness, clean and flush piping specified under WATER

TREATMENT Paragraph.

4. Maintain continuous blowdown and make up, as required during flushing operation.

C. Equipment

1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.12 STARTUP, TESTING AND BALANCING

A. General

1. Provide qualified personnel, equipment, apparatus and services for start up, testing and balancing of mechanical systems, to performance data shown in schedules, as specified, and as required by codes, standards, regulations and authorities having jurisdiction including City Inspectors, DCAMM's Project Manager and Designer. Note that some ATC start up procedures listed below require the cooperation of the balancing contractor and the rooftop unit manufacturer's representative (if rooftop units are involved) and some balancing procedures require the cooperation of the ATC contractor and the rooftop units manufacturer representative (if appropriate). Ensure that all contractors are present on site during the entire time that these procedures take place. Note that some procedures listed below have a distinct order of precedence, e.g., the testing of the temperature control system shall not occur until major pieces of mechanical equipment have been started up and testing is complete. Ensure that any listed orders of precedence for procedures are followed.
2. Startup, testing and balancing shall not diminish guarantee requirements.
3. Notify Designer and authorities involved at least two weeks before startup testing and balancing begins.
4. Before temperature control testing begins a meeting shall be held between the HVAC engineer, the balancing contractor, the automatic temperature control contractor and the mechanical contractor. The mechanical contractor shall present the HVAC engineer with the completed checklists (contained in this specification) certifying that equipment startup and testing has been completed. The temperature control contractor shall then present his procedures for testing the ATC system to the HVAC engineer for review and approval. Allow one full day for this meeting.
5. When the temperature control testing has been completed a second meeting shall be held. At this time the temperature

control contractor shall present the HVAC engineer with the completed controls startup checklist (contained in this specification). The balancing contractor shall present HVAC engineer with certificates of calibration for balancing instruments, proposed balancing forms and proposed balancing procedures to the HVAC engineer, for review and approval. Allow one full day for this meeting.

6. If, through no fault of the Designer, the above two meetings do not take place and the temperature control startup and balancing proceeds the following shall occur.
   a. All balancing reports shall be rejected.
   b. The contractors requisition for monies covering the ENTIRE portion of the testing and balancing work will be rejected. Others will be hired to complete the work. These requirements shall be strictly enforced.
7. Do not cover or conceal work before testing and inspection and obtaining approval.
8. Instruments for testing and balancing shall have been calibrated within one month prior to testing and balancing. Calibration shall be traceable to NBS Standards. Provide

   Photostat of certificate of calibration to Designer 's representative at meeting demonstrating balancing procedures mentioned in Paragraph 4 above.
9. Leaks, damage and defects discovered or resulting from startup, testing and balancing shall be repaired or replaced to like new condition with acceptable materials. Tests shall be continued until system operates without adjustments or repairs.
10. Report on reporting forms, submitted to Designer for approval in advance, and on forms provided by Designer.
11. For each piece of equipment, copy nameplate data and include in report.
12. Submit six copies of testing and balancing reports to Designer for approval.
13. Provide capacity and performance of equipment by field testing. Install equipment and instruments required for testing, thermo wells and gauge connections at no additional cost to DCAMM.
14. Qualified representative of equipment manufacturer shall be present at test.
15. Startup, testing and balancing procedures outlined below are the minimum effort required for the project. Contractor shall use any additional procedures he feels will be necessary to properly startup, test and balance the job.

B. Equipment Startup

1. Start up the following pieces of equipment in strict accordance

with manufacturer's instructions and with manufacturer's representative present:

a. Air handlers
b. Ductless Split Systems
c. Complete the following checklist to certify to the Designer that startup of the above pieces of equipment has successfully been accomplished. Copy multiple checklists as required. Edit inappropriate items as required.

EQUIPMENT LIST	DATE CONFIRMED	MANUFACTURERS REPRESENTATIVE NAME AND SIGNATURE	CONSTRUCTION MANAGER REPRESENTATIVE NAME AND SIGNATURE
AIR HANDLERS (LIST NOS. BELOW)			
DUCTLESS SPLIT SYSTEMS (LIST NOS. BELOW)			

C. Automatic Temperature Controls Testing

1. Temperature Control Testing General Requirements
   a. Startup temperature control system so that all sequences of operation called for in Designer's drawings and specifications operate properly. Ensure that all control components are properly calibrated in accordance with manufacturer's instructions. See that all software, included with control system, is fully debugged. For further requirements see automatic temperature control paragraph of these specifications. For requirements requiring letters certifying ATC startup see paragraph 3.1 of these specifications.
2. Temperature Control Testing General Requirements
   a. Test Temperature Control System after all major pieces of mechanical equipment have been started up, as described above, have been completed and after all tests described in the EQUIPMENT TESTING Paragraph (and elsewhere in Part 2) have been completed. Note portions of ATC test procedures below which require cooperation of balancing contractor. Ensure that balancing contractor is present during entire time when

these test procedures take place.

b. Where it is said below to confirm or ensure the operation of a particular piece of control equipment, this means to confirm that operation is as called for in the Control Sequence of Operation which are shown on the HVAC drawings or listed in the HVAC specifications. If operation is not as called for by sequences, make any necessary corrective actions so that controls perform as required on Contract Documents. On completion of ATC testing, fill out, sign and return to Designer, the checklist included in this Specification.

c. Perform any additional checkout test required by manufacturer for proper system operation whether or not listed below. If any checkout test below conflicts with a particular manufacturer's recommendation bring matter to the attention of Designer immediately.

d. Where reference is made below to confirming or ensuring operation of a particular item, it shall mean all items of that type, not a representative sample.

3. Temperature Control Start Up Tests

a. With the air handlers supply fan turned off at the motor starter, perform the following tests: (Contractor shall ENSURE that electric power to air handler is OFF).

1) Visually inspect all fans interlocked with the supply fan to ensure that they are off.

2) Visually inspect all control dampers and ensure that they are in positions that the control sequences call for them to be when the fan is off. Particularly ensure that the outdoor air damper is fully closed.

b. Ensure that all personnel and tools are out of air handler casing, ensure that casing is closed and locked; put any disconnect other than those at starter to the on position. Then have fan started at motor starter and perform the following procedures.

1) Ensure that fans interlocked to air handler supply fan run after AHU fan starts. Visually observe each fan.

System No.

ATC Cycle	Date Confirmed	ATC Representative Name and Signature	Construction Manager Representative Name and Signature

Freezestats

Occupied Cycle

Unoccupied Cycle

D. Equipment and Piping Testing

1. Tests: No tests shall be started until systems have been cleaned as described under CLEANING Paragraph. Provide temporary piping and connections for testing, flushing or draining systems to be tested. If leaks develop, repairs shall be made and tests repeated. Tests shall be continued until systems operate without adjustments and repair to equipment or piping. Tests are further specified under other paragraphs of this Section. Test requirement specifically includes, but is not limited to the following:
   a. Air handling units
2. When testing is complete fill in the following checklist certifying satisfactory completion of testing. Make multiple copies of checklist as required, edit out items which are not appropriate.

EQUIPMENT AND PIPING TESTING CHECKLIST

TEST ITEM	DATE CONFIRMED	MANUFACTURERS REPRESENTATIVE NAME AND SIGNATURE	CONSTRUCTION MANAGERS REPRESENTATIVE NAME AND SIGNATURE
FANS			
REFRIGERATION SYSTEM LEAK TESTS			

HYDROSTATIC TESTS OF PIPING

E. Air and Water Balancing

1. General
    a. Provide qualified personnel, equipment and services for balancing and adjusting of mechanical systems. Submit resumes at demonstration of balancing meeting.
    b. Personnel shall be experienced and qualified to perform, record, and evaluate all procedures contained here and/or as outlined on drawings.
    c. For each air handler on job, provide, under the work of the mechanical section, one spare sheave of size to be determined after traverses are complete.
    d. Submit procedures, recording forms, and test equipment for review prior to balancing, as described in Paragraph A.4 above.
        1) Balancing procedure or sequence is contained herein.
        2) Recording forms used for balancing must be submitted to Designer for approval before balancing is started.
            a) Failure to submit forms will result in rejection of entire submittal.
            b) Submit description of balancing equipment being used.
        3) Balancing shall not begin until system has been installed complete and capable of normal operation.
            a) All grilles, dampers, fans, coils, pumps, valves and linkages shall be installed and operating prior to balancing.
            b) System shall be capable of operating under control as specified on drawings and/or contained herein.
            c)
2. Air System Balancing
    a. Testing agency shall balance, adjust and test motors,

systems, air moving equipment and distribution, supply, return and exhaust systems, as follows:

1) Adjust blower rpm to design requirements and record. Test and record motor full load amperes.
2) Make pitot tube traverse of main supply, return and exhaust and obtain design cfm at fans.
3) Test and record system static pressure, suction and discharge.
4) Test and record entering air temperatures.
5) Balance and adjust supply air systems in finished areas of building:
    a) Balance and adjust as required to deliver volume of air at each air outlet within 10% of design flow shown on Drawings.
    b) Readjust air volumes after occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.
6) Balance supply air systems in unfinished areas:
    a) Supply air systems shall be balanced after installation of items related to same systems with exception of duct taps to air diffusers in interior zones.
    b) Balance as required to deliver air volume at outlets within 10% of design flow shown on Drawings.
    c) Provide sufficient temporary openings in interior zone duct systems to adjust interior zone air volumes.
    d) Readjust air volumes after completion and occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.

b. Compile test data and submit to Designer for approval.
c. If questions arise, tests or portions of tests shall be repeated in presence of Designer.

3. Air System Balancing:
    a. Visually inspect all fire, smoke and volume dampers on branch take offs to each floor to ensure that they are fully open.
    b. Verify with straight edge that fan and motor shafts are parallel and that sheaves are in proper alignment. Use Browning belt tensioner to confirm belts are at proper tension. Refer to deflection tables appropriate for installed belts.
    c. Start fans, verify that fan rotation is correct. If not, coordinate with electrical contractor to switch power leads such that the fan rotates correctly.

d. Verify that fan belts are tight on one side and have slight bow on other side when fan is operating with no excessive squeal at startup. If not correct, adjust sheaves or motor base accordingly.

e. Check nameplate voltage on motor, compare to scheduled voltage. Notify Designer immediately of any discrepancies. Measure and record actual voltage across all power leads. Notify Designer of discrepancies immediately.

f. Check motor nameplates full load amps, measure and record amperage across all power leads. If there are marked discrepancies in amperage draws between legs, notify Designer immediately.

g. Measure and record fan and motor rpm. Check that motor rpm agrees with nameplate and scheduled rpm.

h. Perform static pressure profile as follows: Record all results and submit to Designer.

1) Determine static pressure across supply and return fans as follows:
   a) Measure static or total pressure at fan suction.
   b) Measure static pressure at fan discharge.
   c) Differential is total static pressure developed by fan.

2) Determine static pressure:
   a) In discharge ductwork after AHU smoke damper.
   b) Across each filter section.
   c) Across each coil.
   d) Across fire and volume dampers at branch take offs to each floor.
   e) At up to 25 points, in system shown on drawings or to be selected by Designer to be determined when ductwork shop drawings are approved.

3) Determine the correct causes of any excessively high readings, i.e. open throttled dampers, clean dirty coils, etc. Cover all holes when measurements are complete.

i. Add 1/2" of static pressure to the system, to simulate the effect of dirty filters. Static may be added by throttling branch volume dampers, blanking off portions of the filter section, covering filter section with cheesecloth or other suitable means. Confirm 1/2" static has been added with new static pressure reading across fan. Open dampers, remove cheesecloth, etc. after traverses are complete.

j. Perform pitot tube traverse of supply ducts downstream from AHU discharges and return ducts. Summing CFM totals from diffusers is not an acceptable method of

determining total airflow from AHU's. At Designer's request, show Designer holes where traverses were taken. Perform traverses in accordance with procedures outlined in latest edition of the SMACNA HVAC Testing. Adjusting and Balancing Manual, except that if recommended lengths of straight duct before and after traverse points are not available, increase number of measuring points by 50%. If a 24 point traverse would be called for given the duct cross section area measure 36 points, for example.

k. Measure amperage at each power leg after traverse is complete. If an overload condition exists with measured CFM equal to scheduled CFM, notify Designer immediately.

l. Balance each diffuser on each floor to within 10% of scheduled values. Follow procedures in SMACNA manual referenced above.

m. For constant volume systems, perform pitot tube traverses for branch ducts on each floor. Adjust volume dampers to produce design CFM for each branch.

n. Balance supply air systems in unfinished areas:
   1) Supply air systems shall be balanced after installation of items related to same systems with exception of duct taps to air diffusers in interior zones.
   2) Balance as required to deliver air volume at outlets within 10% of design flow shown on Drawings.
   3) Provide sufficient temporary openings in interior zone duct systems to adjust interior zone air volumes.
   4) Readjust air volumes after completion and occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.

4. Water Balancing and Adjusting
   a. Balancing shall not begin until systems have been installed complete, including pumps, piping, valves and coils.
   b. Make adjustments as required to deliver water volumes at coils and equipment within 5% of design flow, or as required to properly balance cooling and heating loads throughout conditioned areas.
   c. Adjustments in water volumes shall be made in manner satisfactory to Designer.
   d. Report on system performance shall include:
      1) Manufacturer, size, type, location including room number, and zone of each coil and piece of equipment.

2) Design and actual water flow.
3) Complete nameplate data for each piece of equipment reported.
4) Complete identification of data.

*******END OF SECTION******

SECTION 260000
ELECTRICAL

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within Division 1 – GENERAL REQUIREMENTS which are hereby made a part of this Section of Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed on the State website COMMBUYS at the day and time stipulated in the ”NOTICE OF CONTRACTORS” .

   The following information shall be included within the electronic submittal:

NAME OF THE SUB-BIDDER:	(Insert name of sub-bidder)
DMH PROJECT:	2021-021
SUB-BID FOR SECTION:	260000 & 260500 – ELECTRICAL

2. Each sub-bid submitted for work under this “Section shall be on forms furnished in Part 1, Attachment C, “Forms for Sub-bid.”

3. Sub-bids filed on the COMMBUYS website shall be accompanied by an electronic copy of a BID BOND issued by a responsible bonding company in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit other than the bond will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: the work of this Filed Sub-Bid is shown on the following Contract Drawings: AD-100, A-100, A-101, A-300, A-400, A-600, A-700, M-1, M-2, M-3, E-1, E-2, E-3, E-4, E-5 & E-6..

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. All work of Section 260500 – ELECTRICAL.
2. All necessary cabling for the proposed updated security system and wiring for all door openers, ADA equipment, etc.

******END OF SECTION******

SECTION 260500
ELECTRICAL WORK

PART 1 – GENERAL

1.1 GENERAL

A. The Conditions of the Contract and other sections of Division 1, General Requirements, apply to work of this Section.

1.2 WORK TO BE PERFORMED

A. The scope of work under this Section, without limiting the generality thereof, includes the furnishing of all labor, materials, equipment, services and incidentals necessary to complete all of the Work in accordance with the Contract Documents which are intended to describe and provide for a finished piece of Work, and are to be cooperative; what is called for by either shall be complete in every detail, notwithstanding whether or not every item necessarily involved is particularly mentioned.

B. Electrical Work shall generally consist of, but not be limited to:

1. Obtain all permits and inspections and pay all fees;
2. Selective demolition of items as noted or shown;
3. Provide all wire and cable, connectors and connections;
4. Provide all raceways, fittings and supports;
5. Provide all device, pull, outlet and junction boxes;
6. Provide all wiring devices and plates;
7. Provide all safety disconnect switches as shown;
8. Provide all panelboards and circuit breakers as scheduled;
9. Provide all nameplates and signage as shown or specified;
10. Provide all lighting fixtures and lamps as scheduled or specified;
11. Provide all fire detection and alarm equipment, devices and ancillary devices as required;
12. Provide all audio equipment as specified;
13. Provide intrusion detection and access control pathway system for new devices as shown, (wiring, connections, testing, equipment and devices to be provided by the User Agency);
14. Relocate existing intrusion and access control equipment and devices as shown, extend/cut back/replace existing wiring as required. Verify operation with User Agency;
15. Provide voice/data wiring pathway system for new devices as shown, (wiring, connections, testing, instruments and hardware to be provided by the User Agency);
16. Testing, training, commissioning and demonstration of all systems;
17. Record Drawings;
18. Operation and Maintenance Instruction and Manuals;
19. Warranties.

C. All permit and inspection fees for the work of this section shall be paid for by this Contractor.

D. Restore to match surrounding surfaces any area disturbed or exposed by the Work of this contract. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of others and provide a complete and fully functional installation. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation. Remove all debris caused by the Contractors' work.

E. Wiring shall be routed as required to minimize cutting and patching required. Devices shall be located to comply with code required locations, and to avoid field obstructions, and to comply generally with locations as shown on the drawings. The location of new and relocated devices and related work within 10 feet of location shown on plans shall be included in the contract price.

F. Drawings are diagrammatic and indicate general arrangement of systems and work included in Contract. It is not intended to specify or to show every offset, fitting or component; however, Contract Documents require components and materials whether or not indicated or specified as necessary to make the installation complete and operational.

G. As work progresses and for duration of Contract, maintain complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately, including work installed as a modification or addition to the original design. Indicate actual circuiting, light fixture locations, device outlet locations, switch assignments, load center schedule, etc.

1.3 RELATED WORK SPECIFIED UNDER OTHER SECTIONS

A. The following items of work are specified and included under other sections of the specifications:

1. Section 230000 Heating and Ventilating

B. Painting of electrical conduits, pull boxes, hangers, panelboard doors and trim, and all other electrical equipment, to match the surrounding finish as directed by the Architect, shall be done by the Painting Subcontractor.

C. All electric motors shall be furnished and set in place by the trade requiring same and shall be wired by this Contractor.

D. All control devices including starters, thermostats, pneumatic-electric switches, electric- pneumatic switches, aqua stats and alternators required for the automatic temperature control system shall be furnished and installed under the Heating, Ventilating and Air Conditioning Section of the Specifications unless otherwise indicated on the electrical drawings.

E. All automatic temperature control wiring and raceways, including wiring all control devices shall be provided under the Heating, Ventilating and Air Conditioning Section of the Specifications unless otherwise indicated on the electrical drawings.

F. All temporary power shall be provided by the General Contractor.

G. All removal and disposal of demolished electrical items shall be provided by the General Contractor.

H. All cutting and patching, including floor cutting for floor boxes and conduits, required for the electrical work shall be provided by the General Contractor.

1.4 SUBMITTALS

A. Submit shop drawings and manufacturer's product data in accordance with the provisions of the General Conditions. Submit quantity of copies as requested.

B. List of material and equipment requiring shop drawings shall include, but is not limited to:

1. Wire and Cable
2. Wire and Cable Connectors and Devices
3. Raceways and Fittings
4. Boxes
5. Wiring Devices and Plates
6. Panelboards and Circuit breakers
7. Disconnect Switches
8. Lighting Fixtures & Controls
9. Fire Alarm System Devices
10. Systems Equipment

C. Submittals shall be indexed from list above. Add additional items to end of list. Check, stamp and mark with project name shop drawings and product data before submitting for approval. Specifically indicate on shop drawing transmittal form or by separate letter any deviations from Contract Documents because of standard shop practice or other reason. Cross out, but do not obliterate, material not intended for inclusion in the Work. Clearly indicate material to be included in the Work.

D. Submit for approval all materials incorporated in the Work. Installation of material which is not approved shall be at the risk of this Contractor, and the Owner may order that it be removed and/or replaced.

E. Submit samples of any material or equipment requested, prior to approval.

F. The Engineer will review one initial submittal, and one re-submittal of any item. If review, of re- submittals beyond the first re-submittal are required; this Contractor shall bear the Engineer's cost to review the re-submittal. If materials which have previously been approved or approved-as- noted are re-submitted, this Contractor shall bear the Engineer's cost to review the re-submittal.

1.5 CODES, ORDINANCES AND PERMITS

A. All Work shall be done in strict accordance with the Codes, rules and regulations governing electrical work in the City of Fall River, and the Commonwealth of Massachusetts, and the Massachusetts Electrical Code. If there is any conflict between plans or specifications and such rules and regulations, the rules and regulations shall take precedence.

B. The publications and/or standards listed below form a part of this specification. The publications are referenced in text by the basic designation only.

1. National Fire Protection Association (NFPA) - USA:
    a. No. 70National Electrical Code (NEC)
    b. No. 72National Fire Alarm and Signaling Code
    c. No. 241Standard for Safeguarding Construction, Alteration, and Demolition Operations
2. Commonwealth of Massachusetts
    a. 527 CMR 12.00 Massachusetts Electrical Code
    b. 780 CMR Massachusetts State Building Code, 9th Edition and it's reference standards
    c. 521 CMR Massachusetts Regulations of the Architectural Access Board

C. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and federal government, and other authorities that have lawful jurisdiction.

D. Give notices, file plans, obtain permits and licenses, pay all fees and obtain all necessary approvals from authorities that have jurisdiction. Coordinate with General Contractor for submission of, and/or prepare and submit, an NFPA 241 plan as required by the AHJ. Deliver all certificates of inspection to the Architect. No work shall be covered before examination and approval by the authority having jurisdiction. Replace any imperfect or condemned work with materials conforming to the requirements, and satisfactory to the Architect, without extra cost to the Owner. This Contractor is responsible to obtain all permits and pay all fees.

E. Where the Engineer is to witness testing or perform inspections of work, provide not less than seven (7) calendar days' notice to the Engineer of such inspections or testing. At or before request for completion inspection, provide completed as-built plans for review by the Engineer at the final inspection.

F. Where the local Authority Having Jurisdiction (AHJ) requires work which is not included in the Contract, and where such work will result in an added cost to the Owner, this Contractor shall obtain such requirement from the AHJ in writing. Such requirements shall be supported by applicable code, ordinance or law citation(s), or other justification, to the full satisfaction of the Owner.

1.6 INSPECTION OF SITE

A. Prior to submitting a bid, the bidder is advised to with prior arrangement with the Owner, visit the site (See Advertisement for site date) and shall at that time, inspect all existing conditions to ascertain the exact scope and nature of the work that is required under this Contract, how it relates to existing work to remain and all job conditions and restrictions.

B. Bidders are advised to visit the site and inform themselves as to conditions under which this work will be performed, prior to submitting prices. Failure to do so will, in no way relieve the successful bidder from the responsibility of furnishing any materials or performing any work in accordance with the true intent of the Drawings and Specifications.

C. No claim for extra compensation will be recognized if difficulties are encountered which an examination of the site conditions, Drawings and Specifications prior to executing the Contract would have revealed.

1.7 STORAGE AND REMOVAL OF MATERIALS

A. Provide suitable containers on-site for storage of materials, or store material off-site. Type and location of containers shall be subject to the approval of the Engineer.

B. The General Contractor shall provide suitable containers for all demolition and waste materials generated by this work.

1.8 CHANGES IN THE WORK

A. Any addition, deletion or change in the work which affects the contract sum will be addressed via a change order. This Contractor may be noticed to proceed with the work while the change order paperwork is being processed via a bulletin, construction change directive, or other document.

B. In addition to any requirements listed in other sections of the contract, any proposals shall be fully supported by documentation of costs, including material quantities and unit costs, labor units, labor rates and any mark-ups in accordance with the contract. Any sub-contractor proposals shall be similarly detailed. Material unit costs shall be based on the proposer's actual costs, which shall be documented by vendor quotes, invoices or other upon request. Material prices from estimating or pricing guides will

not be accepted. Material prices which are in excess of the retail costs of materials in the area will not be accepted.

C. Any change order proposal shall also state the impact, if any, on the contract duration. If no such statement is made, the contract duration will remain unchanged.

D. The proposer shall bear the costs associated with reviewing, documenting and processing any change orders which are the result of a failure to properly carry out the work, or other proposals which are 1) not requested by the Owner, Architect or Engineer, or 2) are not the result of differing conditions.

E. Where the work is under construction control, any change to the work deviating from the approved construction documents must be submitted to and approved by the registered design professional in advance via an RFI. The reason(s) for the change must be clearly stated, such as field interference, AHJ request, convenience, etc. Unapproved changes will prevent the issuance of a Final Construction Control Document, acceptance of the work, and payment for unapproved work. The Engineer's costs for addressing RFIs as a result of proposed changes which are for the convenience of the Contractor shall be paid for by the Contractor.

1.9 SAFETY

A. The General Contractor and this Contractor shall be jointly responsible for all safety on the Project. This shall include safety to the workers, Occupants, the Engineer and Owner and their respective employees. The General Contractor shall develop and implement all safety programs required by mandated and industry standard regulations.

PART 2 – PRODUCTS

2.1 GENERAL

A. Products furnished shall be designed and approved for the intended use, shall meet all requirements of the Massachusetts Electrical Code (MEC), and local codes, shall be manufactured in accordance with the standard indicated, and shall meet the requirements specified in the Contract Documents. Materials and equipment shall be listed by a nationally recognized testing laboratory.

B. All material incorporated in the Work shall be new and unused. Samples of any material or item shall be furnished upon request of the Engineer, prior to approval.

C. All products shall be rated for and approved for use in the application shown, regardless of any notations on the plans. Equipment located outdoors or in wet locations shall be weatherproof, and/or enclosed in suitably rated enclosures. All equipment shall be rated for the current, voltage and phases at which they are applied.

D. All workmanship shall be of the highest quality, as determined by the Engineer. This

Contractor will be required to repair or replace all Work which is not of the highest quality and workmanship.

E. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

F. It is the intent of the Specifications that one manufacturer be selected, not a combination, for any particular classification of material. For example, all wire of one manufacturer, all switches of one manufacturer, etc.

G. Where materials, equipment, apparatus, or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards of performance, quality, type and style.

H. This Contractor shall be responsible for ordering and furnishing the correct quantity of material required. Routing and equipment arrangements shown on the drawings are approximate only and are not warranted to be accurate.

I. Devices and equipment shall not require batteries to operate, unless expressly specified.

2.2 WIRE AND CABLE

A. General

1. Minimum wire size shall be No.14 AWG.
2. All conductors shall be annealed copper, 98% conductivity, Class B stranding, except No.10 AWG and smaller diameter may be solid.
3. Aluminum conductors are not allowed.
4. Minimum sizes shall be No. 12 AWG for power and lighting and No. 14 AWG for control.
5. Conductors shall be identified (colored) as required by the MEC.
6. Wire and cable in underground ducts shall be approved for use in wet locations.
7. Wire and cable shall be manufactured by General Cable Co., American Wire, Okonite, or approved equal.

B. NEC Type THWN/THHN: UL 83

1. Conductors for power, lighting, grounding and control; above grade; No. 14 AWG through No. 8 AWG; shall be NEC type THWN/THHN.

C. NEC Type MC: UL 1569, with full size grounding conductor, and steel or aluminum interlocked armor sheath

.

1. Metal-Clad cable shall have full size green grounding conductors.
2. Metal-Clad cable shall be used in concealed locations only. Concealed locations include above ceilings and within dry wall partitions.

3. Metal-Clad cable shall be used in dry locations only.
4. Metal-Clad cable shall be used in all areas of assembly and immediately adjacent areas.

D. Type NM-B Cable shall not be used.

E. NEC Type FPL: UL listed, 14 gauge, 2 conductor, solid with overall red jacket.
1. Provide riser rated cable (FPLR) where cable leaves the floor.
2. Provide plenum rated cable (FPLP) where cable is installed in a plenum.

2.3 WIRE AND CABLE CONNECTORS AND DEVICES

A. Wire and Cable Connectors and Devices: UL 486.

B. Ground conductors of # 14, 12 and 10 AWG shall be made up using only green wire nuts with grounding pigtail provisions.

2.4 RACEWAYS

A. Surface Raceways: UL 5. Including a system of interlocking, two piece metal raceways, fittings and outlet boxes designed for surface mounting, as manufactured by Wiremold, Hubbell, MonoSystems, T&B or approved equal. Color as selected by architect. Use surface raceway only where explicitly shown or concealed wiring methods or alternate routing of raceway/wiring is not possible, and only with the e xpress permission of the Engineer.

B. Rigid Galvanized Steel (RGS): UL 6. Fittings – threaded.

C. Electrical Metallic Tubing (EMT): UL 797. Fittings – compression one inch and below, set screw over one inch. Pre-painted raceways are not acceptable.

D. Flexible Metallic Conduit (FMC): UL 1.

E. Liquid-tight Flexible Metallic Conduit (LFMC): UL 360. Use for connections at exterior mounted equipment, or other location exposed to weather or wet conditions.

F. Fittings for metallic raceway shall be steel. Connectors for EMT, FMC, LFMC shall have insulated throat.

G. Steel supports or racks shall be galvanized steel channel and fittings. Supports shall be manufactured by Unistrut, Kindorf, Husky Products Company, or approved equal. Steel support rods or support bolts for conduits shall be 1/8" diameter for each inch or fraction thereof of diameter of conduit size, but no rod or bolt shall be less than 1/4" in diameter.

H. All required fittings, offsets and bends required shall be provided to route the conduits from source to destination, whether these are shown on the plans or not. Contractor

shall/may arrange conduits as required to avoid obstructions, and account for field conditions. Provide all supports as required by the National Electrical Code.

I. Wireways shall be painted steel trough with screw mounted covers fabricated from a minimum of 14 gauge steel with ANSI grey polyester coating over phosphatized surfaces, inside and outside. Wireways shall be sized as required. Wireways shall be furnished without knockouts.

2.5 BOXES

A. Outlet Boxes: UL listed, NEMA OS 1, with marked volume. Size boxes in accordance with volume requirements of MEC.

B. Outlet boxes shall be specifically designed for the construction encountered, with suitable supports and attachments.

1. Outlet boxes shall be metallic, in gangs and configurations to suit the application, with suitable wire/cable clamps as required. Outlet boxes shall be flush mounted in all finished areas. Ceiling outlet boxes shall be listed and rated for support of light fixtures up to 50 pounds.
2. Surface mounted outlet boxes shall be specifically designed for the construction encountered, with suitable supports and attachments. Outlet boxes shall be metallic, in gangs and configurations to suit the application. Outlet boxes may be surface mounted in unfinished areas.

C. Outlet boxes for fire alarm devices shall be as follows, per the installed device, and device location:

1. Detector, all finished areas – 4” round, flush mounted old work type, with swing-out \or spring type mounting ears, suitable for termination of Type NM cable. Material: plastic.
2. Detector, basement, crawlspace & mechanical/electrical areas – 4” square or round, surface mounted junction box, suitable for use with ¾” raceways, with device mounting adapter or “plaster ring” as required. Material: pressed steel, painted red.
3. Audible/visible device, and visible device, dwelling unit, common areas – single or double gang, flush mounted, deep old work box with swing out or spring type mounting ears, suitable for termination of Type NM cable. Material: plastic.
4. Audible/Visible device, basement, crawlspace & mechanical/electrical areas – 4” square junction box, surface mounted, suitable for use with ¾” raceways, with device mounting adapter or “plaster ring” as required. Material: pressed steel, painted red.
5. Manual Pull Stations, common areas - single gang, flush mounted, deep old work box with swing out or spring type mounting ears, suitable for termination of Type NM cable. Material: plastic.
6. Manual Pull Stations, basement, crawlspace & mechanical/electrical areas - 4” square junction box, surface mounted, suitable for use with ¾”

raceways, with device mounting adapter or "plaster ring" as required. Material: pressed steel, painted red.

7. Where devices weigh in excess of 6 pounds, provide outlet box rated for support of devices of at least 50 pounds.

D. Pull boxes shall be code gauge sheet steel, painted, with screw covers. In wet, exterior or basement areas, provide galvanized sheet steel boxes, with gasketed cover. Where dimensions are shown, these are based on no splices. Increase dimensions as required if splices are provided in pullboxes

E. Where required or shown, locate outlet boxes flush within casework. Provide blank plate to finish opening. General Contractor shall make cutout in casework as required for outlet box.

F. Where required, provide outlet box extensions to bring front of outlet box flush with mounting surface, per MEC 314.22.

G. Existing device outlet boxes may be reused only where 1) boxes are securely mounted, 2) boxes meet volume requirements of the MEC, 3) the box is in usable, good overall condition and 4) the box can be used with the wiring method employed. Otherwise, new devices shown at the location of an existing device to be removed shall be provided with a new outlet box suitable for the device.

H. Where existing device outlet boxes are re-used or connected to, provide box extensions suitable for the installed area, to comply with MEC 314.16. Also provide all adapters, rings, etc, for mounting new devices on existing outlet boxes as required. In finished spaces, rings, extensions and adapters shall be finish appearance type approved by the Architect.

I. Junction boxes shall be of size and type to accommodate (1) structural conditions, (2) size and number of raceways, conductors or cables entering, splices, and (3) devices or fixtures for which required.

J. Special care shall be taken to set all boxes correctly square and true with the building finish. Junction boxes and accessories shall be as manufactured by Steel City, Appleton, Raco, or approved equal.

K. Exterior receptacles shall be installed in surface mounted boxes with weatherproof device covers as listed below

L. Floor Boxes: UL listed, cast iron, water tight construction for any grade application, with screw anchorage flanges at each corner.

1. Two Gang: 3 3/4inch (93 mm) high, 3/8 inch (9 mm) adjustment after placement, partitioned, 26 cu. In. interior capacity.
2. Provide each floor box with cover plate.

M. Floor Box Cover Plate: Flip lid, Pin hinged, cover plates ¼ inch (6 mm) thick, fabricated for seamless attachment to floor box with screws of same material as cover plate. Material: Brass

2.6 WIRING DEVICES

A. Switches:

1. Single pole, three way or 4 way as required, 20A, 120/277 volt, heavy duty, quiet commercial specification grade, self-grounding with green ground screw. Provide lock \switch with removable key where indicated on plans.
2. 120/277 volt 1200 watt 0-10 volt dimmable wall mounted switch shall be provided with all required wiring between switch(es) and light fixtures served.
3. Line voltage wall mounted occupancy sensor switch shall be dimmable and provided with manual override switch and user adjustable timeout from 1 to 20 minutes.
4. Switches shall be colored as selected by the Architect.

B. Receptacles:

1. Specification grade NEMA 5-20R 20A for 20 ampere protected branch circuits, NEMA 5- 15R for 15 ampere protected circuits, 125V, side-wired, self-grounding.
2. Receptacles shall be colored as selected by the Architect, with matching color device plate.
3. Ground Fault Circuit Interrupter (GFCI, GFI) duplex, 20 amp, 120 volt, specification grade, 5 mA sensitivity/trip, Class A, with pilot light. GFCI receptacles shall include self-test feature, and comply with UL 943 edition in effect at time of permitting. Where non-GFI receptacles are mounted in common view with GFI receptacles, provide “designer” type receptacle to match appearance of GFI receptacle.
4. Receptacles located in exterior, damp or wet locations shall be listed as weather resistant.
5. Receptacles located in exterior locations shall be GFI type.
6. All 125 volt 15 ampere and 20 ampere receptacles shall be listed as tamper resistant.

C. Device Plates:

1. Device plates shall be brushed stainless steel, one piece, single or multi-gang type selected to match the device or combination of devices. So-called “goof” plates are not allowed.
2. Weatherproof receptacle plates/covers shall be metallic, pad-lockable rated ‘weatherproof while in use’.

D. Locations of all receptacles and switches to be reviewed with Architect prior to rough-in. Coordinate light switch locations with doors as installed, and install switches on latch side of door. Adjust locations as required, without cost. Provide three way switching for lighting at rooms with multiple entries, and at top and bottom of all stairs. Layout and locations of all switching must be confirmed with Architect and Owner prior to rough-in.

E. Wiring devices shall be manufactured by Pass & Seymour/Legrand, Hubbell or Leviton.

2.7 PANELBOARDS AND CIRCUIT BREAKERS

A. Provide retrofit panelboard interior, cover and trim as indicated at the end of this specification. Panelboard interiors shall be provided with copper buss, and bolt-on circuit breakers. Provide copper neutral and ground buss. Panelboard cover shall have locking door, and circuit directory pocket with accurate, updated directory.

B. Panelboard retrofit interior, cover and trim kits shall be listed or component recognized and shall be specifically designed and approved for retrofit use, and shall comply with NEC wire bend space requirements. Installation of a panelboard interior which is not specifically designed for retrofit use will not be accepted. Cover or trim kit shall have clearly legible circuit breaker numbering, corresponding to the directory. Stamped numbers will not be accepted.

C. Prior to ordering the panelboard retrofit kits, the Contractor shall have the manufacturer certify that the retrofit kit is appropriate for the existing enclosures. This shall include having the manufacturer's representative measure the existing enclosures and verify that the proposed kit will meet applicable codes and standards and is appropriate in all respects for the installation. Also verify panelboard voltage, phases, current and main (lugs or circuit breaker and amperes) and all branch circuit breaker quantities, ampere ratings, poles, and any handle ties or locks.

D. Panelboards shall have an arc flash warning label applied, complying with the MEC.

E. Circuit breakers shall be compatible with and UL listed for use in the panelboard provided. Circuit breakers shall be quick-make, quick-break molded case type in amperes and poles to suit, or as called for on the Drawings. Where serving lighting circuits, provide switch duty (SWD) rated circuit breakers. Where serving heating, air conditioning or refrigeration loads, provide HACR rated circuit breakers. AFCI circuit breakers are not required.

F. Circuit breakers shall be toggle type, manually operated, trip free with simultaneous opening/closing of all common poles. Trip units shall be thermal-magnetic type. Tandem or duplex breakers shall not be used.

G. Panelboards shall be fully rated. Series rating shall not be acceptable. Panelboards shall be rated minimum 22,000 amperes interrupting capacity.

H. Provide typed updated schedule at each panelboard. Mark any spares in pencil only.

I. Permanent signage with not less than 1" text letters shall be placed on and near panelboards indicating "code required clear space – no storage or obstruction allowed". If in a utility space, the floor shall be marked with yellow paint stripes, minimum 3" wide to indicate the code required clear space. If the equipment is located in a room, a sign shall also be attached to the outside of the door to the room.

J. Retrofit kits shall be as manufactured by Square D, Eaton or A&M Associates.

2.8 DISCONNECT SWITCHES

A. Disconnect switches shall be NEMA Heavy Duty Type HD, three pole disconnects with ampere rating as shown on the plans.

B. Disconnect switches located indoors shall be furnished in NEMA 1 general purpose enclosures, and NEMA 3R for outdoor areas or wet locations. Enclosures shall be of code gauge (UL 98) sheet steel (NEMA 1) or code gauge phosphate treatment with gray baked enamel finish.

C. Disconnects shall be padlockable in the off position, and include a cover interlock to prevent opening while the disconnect is in the 'ON' position. Interlock shall have a defeat feature.

D. Disconnects shall be horsepower rated for 600 volts AC. Where required or shown switches shall be fused type with dual element fuses, rated as indicated on the plans, or as required by equipment manufacturer.

E. Switch blades shall be fully visible in the OFF position with the door open. All current-carrying parts shall be copper and plated through electrolytic processes to resist corrosion and promote cool operation. The handle and mechanism shall be an integral part of the box, not the cover.

F. Where required for proper motor/drive protection, provide an auxiliary switch in each motor disconnect for disconnects serving motors fed by variable frequency drives. Provide (2) #12 AWG conductors from each auxiliary contact to the respective drive for proper signal to the drive of the disconnect status. Where required by the drive system, provide separate conduit for these conductors.

G. Manual starter shall be a toggle type switch with overload protection, designed for use on motor circuit. Provide enclosure suitable for area installed.

H. Safety switches shall be manufactured by Square D, General Electric or Eaton.

2.9 EXISTING DISTRIBUTION EQUIPMENT

A. Where connections are made in existing panelboards or other distribution equipment, the panel index shall be revised to indicate the new loads served. All existing panelboards that do not have a circuit directory card mounted in a frame with

noncombustible plastic cover shall have one installed on the inside of the door. All directory cards shall be properly filled in, using a typewriter, and indicate areas and devices served by each unit. Where spares or spaces are provided, mark these designations in pencil by hand.

B. New circuit breakers, disconnects, starters, etc. added to existing equipment shall be the same frame size and interrupting capacity as existing panelboards and circuit breakers. New circuit breakers installed in existing panelboards shall be listed as fully compatible with the panelboard.

2.10 NAMEPLATES

A. Black phenolic nameplates, screw-on type, with ¼" minimum white engraving shall be furnished for all equipment and properly fastened with brass screws. Lettering shall be minimum 1" high where label is above eye level. Nameplates shall be provided for the following equipment:

1. Panelboards
2. Disconnect Switches
3. Junction boxes larger than 4-11/16"

2.11 LIGHTING FIXTURES AND CONTROLS

A. Provide lighting fixtures, equipment and components where shown on Drawings, and as specified, wired and assembled. Provide approved connectors, fittings, and other appurtenances as required.

B. Provide all fixtures with light source as scheduled. Scheduled fixtures indicate the type, finish and quality required. Lamps shall be as scheduled, and manufactured by Philips, Osram, or GE.

C. LED lighting shall be Energy Star compliant designed in accordance with ANSI C78.377. Provide UL recognized LED drivers designed to UL8750 standard.

D. Electronic ballasts, LED lamps, modules and drivers shall be designed to NEMA 410 standard.

E. Fixtures shall be complete with light source of the type noted in schedules and shall have metal parts, glassware, plastic diffusers, etc., free from scratches, cracks, and other defects. Any items damaged during shipment, handling, or installation shall be replaced without expense to the Owner.

F. Provide exit signs and emergency battery unit equipment as shown and scheduled. Circuit remote heads to battery units shown. Maintain separation of all emergency system wiring. All wiring from remote heads to be #10 AWG. Balance remote heads on battery units shown. Circuit exit signs and unit equipment to lighting branch

circuits serving the space.

G. Fluorescent lamps and ballasts which may contain PCBs shall be picked up by a certified recycling/waste disposal firm from the site. The recycling/waste disposal firm shall provide to this Contractor a certificate of recycling or disposal as appropriate for all materials, which shall be turned over to the Owner. The certificate shall show 1) the date of pick-up, 2) the location of the pick-up, and 3) a detailed quantity and detailed description of the material picked up.

H. Lighting Controls

1. Lighting controls shall be by Lutron, WattStopper, or SensorSwitch. Controls shall be hard wired. Battery operated devices are not acceptable.
2. Power Packs
   a. Power pack shall be a self-contained transformer and relay module with dry contacts capable of switching 20 amp ballast load, 13 amp incandescent, 1 hp @ 120 VAC, 60Hz; 20 amp ballast @ 277 VAC, 60 Hz.
   b. Power packs shall provide a 24 VDC, 150 mA output and 0-10VDC output.
3. Occupancy sensor shall be provided with user adjustable timeout from 1 to 30 minutes. Sensors shall be 24V type sensors in a configuration based on the application encountered.
   a. Wall mounted sensors shall have a full 180° field of view with up to 1000SF coverage.
   b. Ceiling mounted sensors shall have either full 180° or 360° field of view with a minimum of 1200SF coverage.
   c. Sensors shall be dual technology.
4. Switching controls, 24 volt 0-10 volt dimmable. Wall mounted switch shall be provided with all required wiring between switch(es) and lighting controls.
5. LED drivers, and lighting controls shall be compatible.

2.12 FIRE ALARM SYSTEM DEVICES

A. The existing building FACP is a Notifier 640 FACP. New devices interfacing with this panel shall be UL listed compatible with the existing FACP.

B. Pre-inspection: Prior to ANY work on the existing fire detection and alarm systems, this Contractor shall perform a 100% test/inspection of the existing system. This test shall document the condition of the existing system. The test shall be witnessed by the Owner's representative, and a complete pre-inspection report prepared and submitted within 24 hours of the pre- inspection. Any defective devices or other system anomalies shall be brought to the attention of the Owner's representative at that time, and noted on the pre-inspection test report. This Contractor shall be responsible for the proper operation throughout the construction period for all devices which are operational at the time of the pre-inspection.

1. Verify the devices on each existing notification appliance circuit (NAC)

in the areas of work, in order to prepare battery calculations for modified NAC(s).

C. Provide all wiring, peripheral devices and programming, as required to connect new devices to existing notification appliance circuits (NAC), initiating device circuits (IDC), signal line circuits (SLC) and to shut down the equipment associated with the devices.

D. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on Signaling Line Circuits (SLC).
2. Initiation Device Circuits (IDC) shall be wired Class A as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class B.

E. System Programming

1. Re-program the existing FACP to accept the added peripheral devices.

F. Submittals

1. Pre-construction submittals:
   a. Pre-inspection report.
   b. Shop Drawings: Include manufacturer's name(s), model numbers, listing information, ratings, power requirements, equipment layout, device arrangement, and complete wiring point-to-point diagrams. Provide circuitry layout, conductor types and sizes on wiring diagrams.
   c. Provide battery calculations for each existing power supply to be connected to, showing all system connected devices, in alarm and non-alarm mode, indicating not less than 60 hours non-alarm operation with 15 minutes of alarm capacity at the end of the 60 hour period.
   d. Provide voltage drop calculations for all NAC circuits.
   e. Provide the name(s), license number(s) and license expiration date(s) of the contractor(s) installing the system.

G. All equipment and components shall be new, and the manufacturer's current model.

H. System Peripheral Components:

1. Audible appliances, common areas: Electronic sounders shall operate on 24 VDC nominal. Electronic sounders shall have a three pulse temporal pattern, with an output sound level of at least 90 dBA measured at 10 feet from the device. This Contractor shall measure and set the sound pressure level (SPL) in db, A weighted, to meet the code requirement for the area(s) served, and as required by the local AHJ.

a. Provide System Sensor Model MHR or equal.

2. Strobe Unit: shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:

   a. The maximum pulse duration shall be 2/10 of one second.
   b. Strobe intensity shall meet the requirements of UL 1971.
   c. The flash rate shall meet the requirements of UL 1971.
   d. Strobes shall be multi-candela rating.
   e. Strobes shall be synchronized where required.
   f. Strobes for carbon monoxide warning shall be white, and labeled 'alert', 'evac', or other label as required by the AHJ.
   g. Where located in straight corridors, strobes may be set at 15 candela setting. Where located at corridor intersections and all other areas not otherwise noted, strobes shall be set at 75 candela or greater.

3. Provide combination horn/strobe units, meeting the requirements above, where indicated on the plans.
4. Manual Pull Stations: existing to be relocated.
5. Smoke Detector, Addressable: existing to be relocated
6. Monitor Module: Notifier FMM-1.
7. Control/Relay Module: Notifier FCM/FRM-1.

I. Carbon Monoxide Detectors

1. Carbon Monoxide (CO) Detectors shall be 24 volt DC with SPDT alarm relay. Unit shall have interconnected integral piezoelectric sounders, rated not less than 85 dB at 10 feet with four pulse temporal output. Device shall be self-diagnostic, include integral gasket to prevent the intrusion of outside air, and fully functional test provision.
2. CO detectors shall have multiple levels of exposure to CO based on time-weighted averages of the gas present per the requirements of UL 2034. Unit shall be listed to UL Standard 2075 for CO Detectors.
3. CO detectors shall be by Macurco, Pama, or approved equal.
4. CO Detector shall be monitored by the FACP via monitor module. CO incidents shall be reported distinctively as a "supervisory signal carbon monoxide".

J. Plan Box.

1. Provide a locking plan box, with USB flash drive at the FACP. At completion, copy the local program to the plan box flash drive.

K. Signage

1. Provide all signage as required by the Local Fire Department.

2.13 INTERIOR PAGING SYSTEM SPEAKERS

A. Provide system including:

1. Recessed amplified speakers, Bogen ASWG1, each with remote volume control mounted in the same room or area as the speaker,
2. Interconnecting cabling, 16 AWG 2 conductor type CMP, homerun from each speaker to the nearest existing speaker or speaker circuit.

PART 3 – EXECUTION

3.1 MATERIALS AND WORKMANSHIP

A. Work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Maintain maximum headroom at all times. Do not run raceway exposed unless shown exposed on drawings. Material and equipment shall be new and installed according to manufacturer's recommended best practice so that completed installation shall operate safely and efficiently.

B. This Contractor shall review installation details of all electrical equipment in public areas with the Architect and cooperate fully with the Architect in this regard. Any work installed which is not reviewed with and approved by the Architect is subject to re-work at no increase in contract price.

C. All workmanship shall be of the highest quality, as determined by the Engineer. This Contractor will be required to repair or replace all Work which is not of the highest quality and workmanship.

D. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

E. Conductor fasteners shall be tightened with a torque tool in good condition to factory specifications. At time of inspection, torque tool(s) shall be available to demonstrate proper torque.

3.2 DEMOLITION

A. Demolish the existing systems to allow installation of the new systems. No components, items or materials are to be re-used, unless specifically noted herein. All demolition material shall become the property of the General Contractor, for his lawful disposal, except any material which the Owner may salvage. Equipment to be turned over to the Owner as salvaged shall be moved to on-site storage as directed by the Owner.

3.3 CONTINUITY OF SERVICES

A. Do not interrupt existing services without Owner's and Architect's approvals.

3.4 TESTING, INSPECTION AND CLEANING

A. Test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required. Insulation resistance between conductors and grounds for secondary distributions systems shall meet NEC requirements.

B. Verify and correct as necessary: voltages, tap settings, trip settings and phasing on equipment from secondary distribution system to points of use. Test secondary voltages at loadcenters, and at other locations on distribution systems as necessary. Test secondary voltages under no-load and full-load conditions.

C. Test lighting fixtures with specified lamps in place for 10 hours. Do not operate lamps other than for testing before final inspection by Architect. Replace lamps that fail within 90 days after acceptance by Engineer within Contract Price.

D. Provide necessary testing equipment and testing.

E. Failure or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested until satisfactory results are achieved. Replace defective material.

F. Final Inspection

1. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

G. Clean panels and other equipment. Panelboard interiors shall be cleaned and vacuumed. Equipment with damage to painted finish shall be repaired to Architect's satisfaction.

H. After completion of project, clean the exterior surface of equipment included in this section.

3.5 TRAINING

A. Provide a training session for the Owner and his representative(s) for minimum 4 hours at the jobsite or other location chosen by the Owner. The training session shall be conducted by a manufacturer's qualified representative.

B. Submit training materials for approval prior to conducting training. Satisfactory completion of training shall be a prerequisite to substantial completion.

C. The training program shall consist of the following:

1. Review of the one-line drawings and schedules.
2. Review of the factory record shop drawings and placement of the various

components.

3. Review of each piece of equipment, components within, control and power wiring.
4. Discuss the maintenance timetable and procedures to be followed in an ongoing maintenance program.
5. Full operation of the unit, under any and all operating conditions.

3.6 WARRANTY

A. Materials provided under this section shall be warranted against defects in materials and workmanship by this Contractor for not less than one (1) year from the date of substantial completion.

B. This Contractor shall respond to the site to address any warranty contact from the Owner within 48 hours. If the defective item can be repaired, it shall be repaired within 48 hours. Repairs shall be to the full satisfaction of the Owner, and repairs which render an item in a condition less than new will not be accepted. If the item cannot be repaired within 48 hours, it shall be replaced within 48 hours. If the item cannot be repaired or replaced within 48 hours, the contractor shall provide such temporary work as directed by the Owner to address the issue until such time as the issue is permanently addressed. If the issue appears to be across all same or similar products, the contractor shall be prepared to address (repair or replace) the remaining items.

3.7 SYSTEM START-UP AND OPERATION

A. Provide all labor and materials and service necessary for the initial start-up and operation of all systems and equipment furnished and installed under this Section of the Specifications. This shall include all programming, data entry, testing and the like to demonstrate a completely functional system.

B. Request, schedule and attend meetings with the Authorities having jurisdiction as required to resolve all device, room and area labeling, sequence of operation, recorded messages, etc. Program the system based on the requirements of the Authorities having jurisdiction, based on the meetings held.

C. Provide the services of a qualified representative for all major equipment pre-start set-up, start- up and initial operation. Such periods shall be sufficient to insure proper operation of systems and equipment.

3.8 OPERATION AND MAINTENANCE MANUALS

A. The following information shall be submitted for record purposes at project closeout:
   1. Final as-built drawings and information for items listed in this paragraph
   2. Wiring diagrams
   3. Installation information
   4. Signed Permits/Certificate of Inspection
   5. Warranties.

B. Two (2) Operation and Maintenance Manuals shall include the following information: one copy of all approved submittals, Instruction books and/or leaflet, recommended renewal parts list and list of local distributors who service installed system. O&M manuals shall be bound in properly sized, indexed and tabbed 3-ring binders, with front and edge labeling.

C. INSTRUCTION: Provide instruction as required to the building personnel and fire and safety personnel. "Hands-on" demonstrations of the operation of the system shall be provided.

3.9 ACCESS AND ACCESS PANELS

A. Provide proper access to material or equipment that require access, inspection, replacement, repair or service. If proper access cannot be provided, confer with Architect as to best method of approach to minimize effects of reduced access.

3.10 FIRE BLOCKING AND STOPPING

A. Provide all materials and labor to penetrate or remove and re-install existing fire blocking, or re- route wiring to avoid fire blocking.

B. Provide fire stopping for all electrical conduits which enter or pass through fire rated walls or floors. Materials and methods of fire stopping shall be approved by UL. Fire seal fittings shall be used around cable, in sleeves, or in core drilled holes passing through fire rated walls and floors. Fire stopping shall be T&B Fire-Seal, O.Z. Gedney, Minnesota Mining and Manufacturing Company or approved equal.

3.11 WIRING METHODS

A. Install wire and cable in approved raceways as specified and as approved by authorities that have jurisdiction.

B. Surface metal raceways shall not be used unless explicitly specified and shown on Drawings, or approved in advance by the Engineer. Do not use surface raceways on floor. Surface raceways shall be secured to the mounting surface using concealed means. Use only fittings provided by the manufacturer of the raceway system provided. Use of surface metal raceways, where approved, in lieu of cutting, fishing wiring, patching and painting, shall not be the basis of any claim for additional compensation.

C. Wiring methods shall be as follows:

1. Interior, finished, dry locations, concealed – EMT or Type MC Cable.
2. Interior, finished, dry locations, exposed – None (conceal wiring methods).
3. Interior, mechanical, electrical or other utility spaces, exposed – EMT or RGS.
4. Interior, wet locations – RGS.

5. Exterior – RGS.

D. Where ferrous metal conduit exits concrete, into soil, the first 12" of raceway from the concrete shall be continuously wrapped with an anti-corrosion barrier, 20 mill PVC tape or approved equal.

E. Only the best possible workmanship for type MC cable installation shall be accepted. Type MC cable which is not properly supported, neatly installed, or bundled shall be removed and replaced at no additional cost. The acceptability of Type MC cable installation shall be solely the determination of the Engineer.

F. Install wiring methods in accordance with requirements for an assembly use group for such areas.

G. Provide flexible conduits for connections to electrical equipment and to appliances and equipment that are subject to movement, vibration or misalignment; where equipment connections dictate; and where noise transmission must be eliminated or reduced.

H. All conductors shall be installed in raceways, or fished in, or run in attic spaces, as required by the NEC. Wiring shall be concealed in finished spaces.

I. All wiring in finished spaces shall be run concealed, except where surface metal raceway systems are specifically noted on the plans or otherwise approved. Provide chases, soffets and boxouts, finished to match surrounding areas, as required.

J. Splices shall be made only at device outlet boxes. Addition or re-use of boxes in finished areas solely for the purpose of splicing will not be accepted.

K. All device outlet boxes shall be set flush to the final finish surface. All openings in the surface finish around the box shall be filled in accordance with the MEC. Where device outlet boxes are located in an area with existing device outlet boxes, match mounting heights, but not less than 18" above finish floor. Mount all boxes true and plumb. Patch and paint as needed.

L Provide all traveler wiring required for three and four way switching shown.

M. All wiring shall be new. Remove all existing wiring and raceways to the maximum extent possible. Cut back and abandon concealed wiring and raceways.

N. All conductors shall be neatly arranged and bundled, without excess cable at any point, but with reasonable slack to allow installation and removal of the device.

O. Emergency circuit wiring shall be kept entirely independent of all other wiring.

3.12 GROUNDING

A. Bond and ground equipment and systems connected under this Section in accordance with standards of MEC and other applicable regulations. Provide approved means for terminating and connecting grounding conductors, such as lugs, crimp-on terminals, green ground screws, grounding wirenuts, etc.

B. Conduit system shall be electrically continuous throughout. Equipment frames, enclosures, boxes, etc. shall be grounded by use of green colored equipment ground conductor sized as per Table 250.122 of MEC. Raceway ground alone will not be accepted.

C. Green bonding jumper shall be installed in flexible conduits.

3.13 MOTORS AND CONNECTIONS

A. Motors will be provided under other Sections.

B. Check electrical connections and sizing of motor circuit protection and prevent damage to motors and equipment from incorrect direction of rotation.

C. Review existing conditions prior to disassembly/disconnection for verification of size, speed, and operation of existing motors.

D. Consult drawings and specifications and shop drawings for verifications of size, speed, and operation of motors furnished under other Sections.

E. Final connection to appliances and motors shall be made with flexible conduit (at least 16" long) with green ground wire installed.

F. Motors, control panels and variable frequency drives (VFDs) will be furnished under other Sections. Equipment disconnects shall be mounted, with load conductors to equipment. Make all line connections at the mounted disconnects. Provide all line and load conductors and conduits, and make all line and load terminations at VFDs. Provide 120 volt single phase branch circuits at control panels.

G. Obtain necessary control wiring and interlocking diagrams from equipment suppliers for installation under this Section and connect equipment circuits for proper sequence of operation. Refer to sequence of operations provided under other Sections, and circuit equipment via control devices such as thermostats, relays, aquastats, contactors, etc.

3.14 WIRING DEVICES

A. Mount all wiring devices plumb in device outlet boxes. Center devices on boxes, and set true within the device plate. Set device plates so all edges contact surface, and conceal box edge.

B. Side wire devices only. Back wiring will not be accepted.

C. Provide neutral conductor to each switch location in accordance with MEC.

D. Provide GFCI protection for all 15A and 20A, 125V receptacles located in the following locations:

1. Outdoors

E. Where outlet boxes are not used, remove same.

3.15 LIGHTING FIXTURES

A. Verify mounting construction, and provide fixtures, ballasts, frames, rings, mounting boards and other accessories suitable for construction encountered.

B. Coordinate installation of fixtures with installation of casework materials and mounting system. Coordinate wiring stub out location, so as to maintain wiring to light fixtures effectively concealed.

C. Investigate lighting fixture locations and supports to ensure that no interference exists between lighting fixture, supports and other equipment. Correct interference as directed by Engineer.

D. Lighting System Controls Requirements: Controls for automatic lighting system for the following areas shall be as follows:

1. Conference room, meeting room, multipurpose room, storage room, private office: local switching, occupancy sensor automatic on (100%), automatic off after vacancy of 30 minutes, manual multilevel lighting control, manual automatic daylight controls;
2. Corridor: occupancy sensor automatic on (100%), automatic partial on (50%) after vacancy of 15 minutes;

E. Lighting System Controls Functional Testing. Controls for automatic lighting systems shall be tested as follows:

1. Testing shall ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's requirements.
2. The functional testing shall be performed by this Contractor, for witness by the Owner or his agent.
3. The following procedures shall be performed:
   a. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance
   b. Confirm that time switches and programmable schedule controls are programmed to turn lights off at the appropriate times

c. Confirm that the placement and sensitivity adjustments for photosensor controls reduce electric light based on the amount of usable daylight in the space as specified.

3.16 CIRCUIT BREAKERS

A. Install circuit breakers in panelboards. Mark panel schedule accordingly. Panel markings shall be printed by typewriter, printer or other suitable means. Handwriting will not be acceptable. Utilized circuits shall be marked in ink. Spare or spaces shall be so marked in pencil, and may be marked by hand. No circuit shall be described in a manner that depends on transient conditions of occupancy.

3.17 FIRE ALARM

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. Permitting

1. It is recognized that various jurisdictions may have varying requirements for issuance of permits for work related to fire protection systems. Be responsible for determining the local authority(ies) having jurisdiction, what their requirements are, and providing all documents required for permitting. The Engineer will provide the contract document plans, specifications, and where requested by the AHJ, a fire protection construction documents narrative.

C. Comply completely with 780 CMR 33, Safeguards During Construction. Comply with NFPA 241 as listed in 780 CMR 35.

D. Wiring Methods

1. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. All junction boxes shall be spray painted red and labeled “Fire Alarm”, exposed conduit shall be EMT with minimum 2” wide red band maximum spacing every 5’, no less than one 2” per conduit between devices. Pre-painted raceways are not acceptable. System smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
2. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760.
3. Conduit shall be 3/4 inch (19.1mm) minimum.
4. Conduit shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where specified by the factory.
5. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating

device circuits and signaling line circuits, and 14 AWG for notification device circuits.

6. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR). Where located in ducts, provide suitably approved cable.
7. All field wiring shall be completely supervised.

E. All fire detection and alarm system devices shall be flush mounted or surface mounted where indicated on the plans when located in finished areas and may be surface mounted when located in unfinished areas.

F. Manual pull stations shall be installed not less than 42 inches or more than 48 inches above the finished floor.

G. Test: 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.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Open initiating device circuits and verify that the trouble signal actuates.
3. Open and short Notification appliance circuits and verify that the trouble signal actuates.
4. Ground device circuits and verify response of trouble signals.
5. Check proper operation of all alarm notification devices.
6. Check installation, supervision, and operation of smoke detectors.
7. Verify that each initiating device alarm signal is properly received and processed by the fire alarm control panel.
8. Conduct tests to verify trouble indications for common mode failures, such as alternating current power failure, low battery, etc.

H. System Acceptance

1. Provide notice as required by applicable codes to the Owner, occupants, engineer, general contractor, authorities having jurisdiction of scheduled testing. Make all necessary temporary provisions for reporting of fire while the system is being tested.

2. Retain the required licensed professionals as required to test the related interfaced systems where included in the project (including, but not limited to elevator systems,fire pump systems, fire sprinkler systems, HVAC systems, etc.) for all testing and any re-testing.

3. Pre-test. Perform a 100% test of the new or relocated system devices, plus 10% of the remaining existing initiating devices (smoke detectors, manual stations, monitor modules) in the building, and correct any deviations or deficiencies. Measure and set the sound pressure level (SPL) in db, A weighted, to meet the code requirement for the area(s) served, and as required by the local AHJ. The pre-test shall include all related interfaced systems.

4. Contractor's Certification. Following the pre-test, certify to the Engineer in

writing a 100% pre-test has been completed, and that the system is installed and operates in accordance with the approved fire protection construction documents and applicable codes, identifying any deviations, or so stating if there are no deviations. The certification shall be notarized.

5. Engineer's test. Request and attend a functional test of the system in the presence of the Engineer, including 100% of the new or relocated system devices, plus 10% of the remaining existing initiating devices. Include all required material and equipment for complete testing including ladders, test smoke, carbon monoxide gas, test magnets, etc., and access to all areas and devices.

6. Provide not less than seven (7) days advance notice to the Engineer of the requested test date. On the test date, provide not less than two (2) employees, for activation of devices and relaying of events received from the control panel/remote annunciator. Each employee shall have a 2 way radio (not a cell phone) with full batteries.

7. Have in hand the acceptance submittals listed below for review by the Engineer.

8. Engineer's certification. Following the observation of an acceptable 100% test of the fire protection system(s) and any related interfaced system(s), and an acceptable visual observation of the installed system, and approval of the acceptance submittals listed below, the Engineer will provide a certification that the fire protection systems have been installed in accordance with the approved fire protection construction documents, including any deviations.

9. Fire Department Test. Following issuance of the certification noted above, arrange for and attend a 100% test for witness by the local AHJ(s). Advise the Engineer of the time and date of the test. Immediately advise the Owner and Engineer of the results of the test, such as acceptance, failure and why, etc.

10. This Contractor shall be responsible for all costs associated with the failure to comply with this procedure explicitly. This Contractor shall be responsible for all costs associated with re-testing due to issues with the installed systems, failure to properly pre-test the system, failure to have the proper staff and test equipment on hand for testing. Costs include, but are not limited to, the Owner's, AHJs and Engineer's travel and labor costs at current hourly rates. Any costs shall be paid prior to the issuance of the Engineer's certification.

11. Acceptance Submittals:
    a. Submit the following hard copy documents for review by the Engineer and acceptance by the local AHJ prior to requesting final acceptance testing. It is recommended that the acceptance submittals be submitted well before the acceptance testing. Allow 30 days for review and approval of acceptance submittals. The submittals shall be hard copies.
        i. Provide an input/output matrix for the system.
        ii. Provide a completed record of completion, including all original ink signatures (i.e. not word-processor printed).
        iii. Provide material, test, performance, and completion certificates, properly executed by the parties in accordance

with applicable NFPA standards.

iv. Provide final as-built plans.

v. Where the system uses site specific software, provide a copy of the site specific software on a flash drive factory mounted in the plan box. The software shall not require a password to access from the flash drive.

b. A copy (or originals as may be required by the AHJ) of items above shall be placed in the fire alarm plan box.

c. Provide a list of all system passwords (all access levels). The password list shall be typed, on an adhesive label applied to the inside of the front cover of the plan box. The label shall have a title in 1" red color letters "SYSTEM PASSWORDS".

d. Once the as-built plans have been certified, turn a copy over to the Owner, and obtain a certification from the Owner that they have received the as-built fire protection system as-built plans, shop drawings, and O&M manuals.

******END OF SECTION******