



SPECIFICATIONS

PROJECT: NAS OPERATIONS & SPACE OPERATIONS Remodeling and Alterations to FAA Command Center Rooms 2242 & 1302

LOCATION: Federal Aviation Administration (FAA)
Air Traffic Control - System Command Center (ATCSCC)
3701 MacIntosh Drive
Warrenton, VA 20187

ISSUE DATE: January 24, 2018
For Construction

ISSUED BY: VOLPE NATIONAL
TRANSPORTATION SYSTEMS CENTER
55 BROADWAY, KENDALL SQUARE
CAMBRIDGE, MA 02142-109

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SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- B. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 CONTRACT CONDITIONS SPECIFICALLY REQUIRED BY LAW

- A. This Contract is subject to and governed by Federal Law and, to the extent otherwise applicable, is subject to State and Local Law, and all amendments thereto, and where any requirements contained herein do not conform to such statutes governing that construction work of this Contract, the statutes shall govern.

1.03 WORK UNDER THIS CONTRACT. The work to be performed under this Contract may be summarized as follows:

- A. This project is the design, fabrication and installation of operations room consoles in the Space Operations Room #2243 and the NAS Operations Room #1302, at the new Air Traffic Control Systems Command Center. The NAS Operations Room is the centerpiece of the new facility with utilizing approximately 9000 SF of floor space. The consoles will be occupied continuously by air traffic control personnel who monitor various air traffic control and communications systems. The consoles will be populated by the FAA with FAA provided PC based equipment including processors, monitors and phone systems.
- B. The project scope for Space Operations Room (Rm #2243) Renovation involves remodeling the existing Doolittle Conference Room #2243:
 - 1. Furniture and carpet removal. Installation of electro-static discharge (ESD) carpeting;
 - 2. Core hole drilling through 2nd floor concrete floor slab and installation of Underwriters Laboratory (UL) listed fire rated cable pass-through assemblies to serve data cable routing;
 - 3. Pullbox and conduit installation for data cabling;
 - 4. Installation and terminating of all data cabling;
 - 5. Relocation of (1) existing audio/visual (A/V) network cabling; Installation of (1) new A/V network switching network,
 - 6. Electrical power circuit installation, receptacle terminations, light switch replacements;
 - 7. Heating, ventilation, and air-conditioning (HVAC) demolition/relocation/installation of one Fan Coil Unit (FCU) including ductwork, thermostat, airflow rebalancing, and associated electric power re-connection;
 - 8. Finished carpentry, electric power, data cabling, power/data terminations for equipment consoles, conference table, credenza, wall mounted flat panel displays, and wall mounted time-clocks;
 - 9. Finished carpentry, light gauge metal framing, and painting for gypsum wall demolition/repair/installation as necessary to accommodate data cabling and power routing;
 - 10. Finished carpentry for furniture relocation, new window shade treatments, white board

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relocation, and replacement of wall-to-wall seamless carpeting with electro-static discharge (ESD) carpeting.

- C. The project scope for Space Operations Room (Rm #2243) Renovation involves furnishing equipment consoles after completion of renovation scope:
 - 1. Furnish and install equipment consoles, seismic bracing, and multi-point grounding connections
 - 2. Installation and terminating of FAA data cabling within console terminal blocks;
 - 3. Installation and terminating of electrical power circuits within console plugmold receptacles;
- D. The project scope for NAS Operations Room (Rm #1302) Renovation involves furnishing equipment consoles in Area-2 after completion of Space Operations room renovations:
 - 1. Remove and relocate select existing consoles as shown on drawings;
 - 2. Furnish and install equipment consoles, seismic bracings, and grounding connections;
 - 3. FAA data cabling and electrical power circuits are not included and will be done by others.
- E. The project scope for NAS Operations Room (Rm #1302) Renovation involves furnishing equipment consoles in Area-3 after completion of Space Operations room renovations:
 - 1. Remove and relocate select existing consoles as shown on drawings;
 - 2. Furnish and install equipment consoles, seismic bracings, and grounding connections;
 - 3. FAA data cabling and electrical power circuits are not included and will be done by others.
- F. The project scope for NAS Operations Room (Rm #1302) Renovation involves furnishing equipment consoles in Area-4 after completion of Space Operations room renovations:
 - 1. Remove and relocate select existing consoles as shown on drawings;
 - 2. Furnish and install equipment consoles, seismic bracings, and grounding connections;
 - 3. FAA data cabling and electrical power circuits are not included and will be done by others.
- G. The project scope for NAS Operations Room (Rm #1302) Renovation involves furnishing equipment consoles in Area-5 after completion of Space Operations room renovations:
 - 1. Remove and relocate select existing consoles as shown on drawings;
 - 2. Furnish and install equipment consoles, seismic bracings, and grounding connections;
 - 3. FAA data cabling and electrical power circuits are not included and will be done by others.
- H. All work shall meet all applicable latest editions of ADA/ABA Accessibility Codes and the latest edition of the Virginia State Building Code.
- I. The construction includes all support structures, modifications, and architectural systems including any obstructions or debris removal required to facilitate the complete installation of new systems and modification to existing ones. The work shall include replacement of anything damaged during the performance of the work. The contractor shall perform all fieldwork and research to document

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- all existing conditions which may affect the construction of the new systems and report any such conditions to the government at the start of work.
- J. Provide new devices, fixtures and equipment in all areas as required to meet the latest codes and as shown on drawings. Refer to Individual sections and drawings for requirements of new systems.
 - K. The Work includes, but is not limited to new finishes and detail-oriented patching and/or firestopping and sealing of holes and penetrations.
 - L. Provide all labor, engineering, tools, transportation, services, supervision, materials and equipment necessary for and incidental to satisfactory completion of required work as indicated in Contract Documents.
 - M. Provide all required staging, hoisting and movement of new equipment, reused equipment or removal of existing equipment.
 - N. Provide Coordination of fire alarm with all interfaces, including, but not limited to mechanical equipment, devices, fixtures, etc.
 - O. Provide temporary structures and protection of pedestrian movement around the spaces affected.
 - P. Provide all caulking, sealants and waterproofing required to protect the existing area structure.
 - Q. The work described by:
 - 1. These specifications as enumerated in the Table of Contents.
 - 2. Contract Drawings as enumerated on the List of Drawings as shown on the drawing cover sheet.
 - 3. Addenda issued during the bidding period, which are hereby made a part of the Specifications.
 - R. The distribution of work in these Specifications:
 - 1. It is intended to be described under the appropriate trade.
 - 2. May be redistributed, except as directed herein, provided no controversy will arise among the trades and progress will not be delayed.
 - S. The committing of nuisances on the land of the Project and adjacent property shall be rigorously prohibited and adequate steps taken to prevent it.
- 1.04 GOVERNMENT'S USE OF PREMISES
- A. The Government will continue full occupancy of the building throughout the Construction Period.
 - B. Special attention and coordination shall be given to the ongoing operations in ATCSCC during the demolition and new construction. Under no circumstances shall any work be conducted in sensitive areas without first informing the Contracting Officer.
- 1.05 PRIME CONTRACTOR'S USE OF PREMISES
- A. Contractor's work that will produce loud and consistent noise, strong smell or fumes that may disturb normal operations in adjacent areas may be performed during close hours of operation by agreement with C.O. Contractor shall include all associated costs, including overtime and premium pay in the Base Bid.
 - B. Limit use of premises of the Work and for construction operations. Coordinate use of premises under direction of Contracting Officer (C.O.).
 - C. Do not unreasonably encumber site with material or equipment. Limit on-site storage to areas designated by the C.O.

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- D. Limit on-site parking to area designated by the C.O.
 - E. Storage of materials and equipment will not be permitted within the buildings without prior consent of the C.O.
 - F. Limit use of site to work and storage.
 - G. Assume full responsibility for protection and safekeeping of products stored on premises.
 - H. The Contractor shall minimize interaction with non-project staff.
 - I. Smoking is not permitted in the building or on the grounds at any time except in designate smoking area.
 - J. Do not load structure with weight that will endanger structure.
- 1.06 COORDINATION, COOPERATION, AND GIVING INFORMATION
- A. Obtain detailed information from the manufacturer of all equipment to be furnished and provided as to method of installing. At the start of construction check all Contract Documents including all Drawings and all sections of the specifications for equipment requiring electrical connections and service and verify electrical characteristics or equipment prior to roughing.
 - B. When additional Work, change to the Work, or a revision or modification of the Work is authorized, provide the additional material, equipment, personnel and workmen to prevent delays in the Work, and to complete the Work within the time limit of the Contract.
- 1.07 CUTTING AND PATCHING
- A. The Prime Contractor shall perform all necessary cutting, drilling, grouting and patching required to properly fit together the several parts of the work.
- 1.08 EXAMINATION OF SITE AND DOCUMENTS
- A. All bidders shall visit the site and examine all Contract Documents before submitting a bid. Inspect and be thoroughly familiar with same and conditions under which work will be carried out. The Government will not be responsible for errors, omissions and/or charges for extra work arising from Prime Contractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the bidder agrees and warrants that he has examined the site and Contract Document, that he is familiar with the conditions and requirements of both and where they require, in any part of the work, a given result to be produced that the Contract Documents are adequate and that he will produce the required result.
- 1.09 EXISTING UTILITIES
- A. Existing active utility lines including without limitation, cables, ducts, conduits, and piping shall, if damaged, be immediately repaired, inspected by the utility company, protected and maintained in use at no additional cost to the Government.
 - B. The Prime Contractor shall notify the C.O. in writing two (2) days in advance of the proposed time for shutting down or interrupting any utilities, services, or facilities of areas occupied by the Government.
- 1.10 TEST AND INSPECTIONS
- A. The Prime Contractor shall make such tests and inspections of his workmanship and materials as may be required by the Building Code, State or municipal laws, or as called for under the various SECTIONS of the Specifications.
 - B. All expense attached to such tests and inspection, unless otherwise specified under the various SECTIONS of the Specifications shall be borne by the Prime Contractor, who shall furnish all labor, tools, instruments, water, temporary power and light, construction and equipment necessary for

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these tests and inspections. Records of all tests and inspections shall be furnished to the C.O. The Prime Contractor shall remove all temporary work, materials and equipment upon completion of test and inspections.

- C. Where in the various SECTIONS of the Specifications, inspection and testing of materials, processes, and the like is called for, the selection of bureaus, laboratories, and/or agencies for such inspection and testing shall be subject to approval of the C.O.
 - D. Should any material or work be found, after testing or inspection, to be defective or inferior, such material and/or work shall be removed and replaced with new sound materials and/or work as approved by the C.O. The removal and replacement herein called for shall be at the Prime contractor's expense.
 - E. The Prime Contractor shall make such tests and inspections of his workmanship and materials as may be required by the Building Code, state or municipal laws, or as called for under the various sections of the Specifications.
 - F. All expense attached to such tests and inspections, unless otherwise specified under the various sections of the Specifications shall be borne by the Prime Contractor, who shall furnish all labor, tools, instruments, water, temporary power and light, construction and equipment necessary for these tests and inspections. Records of all tests and inspections shall be furnished to the C.O. The Prime Contractor shall remove all temporary work, materials and equipment upon completion of tests and inspections.
 - G. The Government shall at any time perform independent testing of construction work the C.O. determines necessary. The cost of the work shall be paid by the Government. The testing performed by the Government shall not relieve the Contractor of its own testing requirements.
- 1.11 MATERIALS AND WORKMANSHIP
- A. All materials required for the performance of this Contract shall be new and of best quality of kinds specified, all subject to the approval of the C.O. Materials shall be used in accordance with the manufacturer's printed instructions unless otherwise specified.
 - B. For the execution of the work to be performed under this Contract and for the manufacturer or transportation of any of the materials or appliances to be used or installed, the Prime Contractor shall employ only such labor throughout as will not interfere with the speedy and uninterrupted completion of the construction. All work shall be done by mechanics skilled in their trade.
 - C. All materials shall be ordered, manufactured, and delivered at such times and in such manner as will insure the speedy and uninterrupted progress of the work, the least obstruction to the premises; and such materials shall be so distributed as to cause no overloading at any point. If any material so stored obstructs the progress of any portion of the various parts of the work, they shall be moved from place to place or from the premises, as the C.O. may direct, at the expense of the Prime Contractor.
 - D. The Prime Contractor shall carry on his work with the greatest reasonable rapidity, consistent with first-class workmanship, and without interfering with or delaying the work of others.
 - E. Any materials delivered, or work performed, contrary to the CONTRACT DOCUMENTS and approved shop drawings, shall be removed by the Prime Contractor at this own expense, and the same shall be replaced with other materials or work satisfactory to the C.O. The Prime Contractor shall also assume the cost of replacing the work which may be disturbed while making good the defective work.
 - F. The C.O., however, reserves the right to allow such defective materials or workmanship to stand, in which case an amount equal to the difference in value between the work and material provided and that specified shall be deducted from the amount due or to become due under the Contract. If a

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suitable mutually agreed credit cannot be worked out defective material or workmanship shall be replaced.

- G. Any materials specified or work shown on the Drawings, which the Prime Contractor cannot guarantee against defects, shall be called to the attention of the C.O. in writing before installation in the building. Installation without such notice shall bind the Prime Contractor to his full guarantee.

1.12 TIMES FOR COMPLETION AND LIQUIDATED DAMAGES

- A. All work of the Contract shall be Substantially Completed no later than the end of the period of performance determined by the CO and stated in the Contract Award to the Prime Contractor.
- B. It is hereby understood and mutually agreed, by and between the Prime Contractor and the Government, that the date of beginning and the times for completion, as specified in the Contract for the work to be done hereunder are ESSENTIAL CONDITIONS of this Contract, and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced by the date specified therein.
- C. The Prime Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Prime Contractor and the Government, that the time for completion of the work described herein are adequate but of limited duration for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality. The Prime Contractor shall be responsible for executing the Work in a manner to meet all requirements of the Contract and completing the Work on time.
- D. It is further agreed that time schedule of each and every portion of the Contract and of the CONTRACT DOCUMENTS wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit is fixed by such extension shall be of the essence for this Contract. Provided, that the Prime Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:
 - 1. To any preference, priority, or allocation order duly issued by the Government;
 - 2. To unforeseeable causes beyond the control and without fault or negligence of the Prime Contractor, including but not restricted to, Acts of God, or of the public enemy, acts of the Government, acts of another Contractor in the performance of a contract with the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusual weather; and
- E. Each and every provision of the laws and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

1.13 WORK SEQUENCE

- A. The Prime Contractor must maintain a sufficient work force at all times to insure satisfactory completion within allotted construction period.
- B. In case of shutting down or interrupting the utilities, the Prime Contractor shall notify the C.O., in writing, 48 hours in advance.
- C. The Work shall be conducted in 5 phases.
- D. Phase 1: Space Operations Room renovation and Console design by vendor.

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- E. Phase 2: Console design and shop drawing approval by FAA.
 - F. Phase 3: Console fabrication, assembly and shipping.
 - G. Phase 4: Console installation in the Space Operations Room.
 - H. Phase 5: Console installation in the NAS Operations Room.
- 1.14 REFERENCE STANDARDS
- A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- 1.15 PRE-CONSTRUCTION CONFERENCE
- A. Within two weeks from the contract award date and prior to the start of construction there will be a pre-construction meeting with the Contractor, the Sub-Contractor and the C.O. to discuss methods of construction, schedule, materials, storage, and contract requirements of the project.
 - B. Representatives of the following shall be required to attend this conference:
 - 1. Government
 - 2. Architect, Engineers and Consultants
 - 3. Prime Contractor
 - 4. Sub-Contractors
 - C. Contractors shall make specified pre-construction submissions including the following, if not already submitted:
 - 1. Typed list of sub-contractors, with addresses and telephone numbers, and name of principal contact.
 - 2. Certificate of Insurance.
 - 3. Performance and Payment Bonds.
 - 4. Construction Schedule.
 - 5. Schedule of Values.
 - D. Agenda will include the following items:
 - 1. Construction schedule.
 - 2. Critical work sequencing.
 - 3. Designation of responsible personnel.
 - 4. Submittal process and schedule of shop drawings, project data and samples.
 - 5. Processing applications for payment.
 - 6. Procedures for maintenance of record documents.
 - 7. Procedures for field changes, change estimates, change orders, etc.
 - 8. Use of premises.
 - 9. Location and maintenance of storage buildings, field offices, etc.
 - 10. Major equipment deliveries and priorities.
 - 11. Site and building security procedures.
- 1.16 PROJECT MEETINGS
- A. Project meeting shall be held on a bi-weekly basis (every two weeks) subject to the discretion of the C.O. Project meeting shall be chaired by the C.O or an authorized representative (COR).
 - B. Minutes of the meeting shall be recorded and distributed in a timely manner to all participants and CO, for comments, review and acceptance at the next meeting.
 - C. Control for completing the project on time, operating schedules and shop drawing schedules shall be prepared and maintained by the Prime contractor and shall be revised and updated (at a minimum) on a monthly basis. A copy shall be submitted to the C.O.

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- D. In order to expedite construction progress on this project, the Prime 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 the construction progress.
 - E. Scheduling shall be submitted, and methods shall be presented by the Prime Contractor which shall reflect construction completion not being deferred, at no additional expense to the Government.
 - F. Project meetings agenda will include the following:
 - 1. Review approved minutes of previous meeting; insert corrections and comments.
 - 2. Review work progress since last meeting.
 - 3. Note field observations, problems, and decisions.
 - 4. Identify problems which impede planned progress.
 - 5. Review off-site fabrication problems.
 - 6. Develop corrective measures and procedures to return to planned schedule.
 - 7. Revise construction schedule as indicated.
 - 8. Plan progress during next work period.
 - 9. Review submittal logs and schedules; expedite as required to maintain schedule.
 - 10. Maintenance of quality and work standards.
- 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 jurisdiction require any portion of the work to be inspected, tested or approved, the Prime Contractor shall give the C.O. and such Authority timely notice of its readiness so the C.O. may observe such inspection and testing.
 - B. Prior to the start of construction, the Prime Contractor shall obtain the applicable Building Code required building Permits. Such Permit shall be displayed in a conspicuous location at the project site.
- 1.18 DEBRIS REMOVAL
- A. Debris shall not be permitted to accumulate and all the work areas shall at all times be kept clean and safe.
 - B. The Prime Contractor shall remove debris from the site of work and dispose of in accordance with all state and local laws and shall bear all costs, including fees resulting from such disposal.
- 1.19 SUPERVISION OF WORK
- A. The Contractor shall be held directly responsible for the correct installation of all work performed under this Contract. He must make good repair, without expense to the Government, of any part of the work which may become inoperative on account of leaving the work unprotected during the construction of the system or which may break or give out in any manner by reason of poor workmanship, defective materials, or lack of space to allow for expansion or contraction of the work during a period of one year from date of final acceptance of the work by the Government.
 - B. Prior to the start up of work, the Prime contractor shall submit the resume of the assigned, competent Virginia licensed superintendent (regularly in his employ) satisfactory to the C.O., who shall supervise all work under this Contract, and who shall remain on duty at the site throughout the Contract period while work is in progress. The resume must list similar projects and locations, Owner's names and telephone numbers, Architects names and telephone numbers and three

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references with telephone numbers.

1.20 WAGE RATES

- A. Refer to Solicitation and Contract Form.

1.21 MANUFACTURER REFERENCES

- A. Attention is directed to the provisions of General Law of Virginia, which states as follows: "A preference in the purchase of supplies and materials, other considerations being equal, in favor, first, of supplies and materials and materials manufactured and sold within the Commonwealth; second, to supplies and materials manufactured and sold elsewhere within the United States."

1.22 SALES TAX EXEMPTION

- A. Refer to Solicitation and Contract Form.

1.23 RECORD DRAWINGS

- A. During the progress of work, the Prime Contractor shall keep on file at all times One (1) complete set of black line prints of Contract Drawings and Specifications, furnished by the Government, on which shall be accurately and promptly noted, as the work progresses, all changes made, whether resulting from addenda; formal Change Order or other instructions issued by the C.O., wherever the work was installed other than as shown on the Contract Drawings, or as described in the Specifications. As applicable show dimensions from building grid lines and elevations related to grade or building structure.
- B. The drawings will be reviewed at regular intervals by the C.O. and the results will be included in the review of the application for payment.
- C. At the completion of the work, the Prime Contractor shall submit to the C.O. for approval, the black line prints mentioned above. Upon receipt of approval, the Prime Contractor shall transfer the as-built information on the before-mentioned prints onto reproducible transparencies furnished by the Government after which the annotated transparencies shall be submitted to the C.O. for review and approval Two (2) copies of the Specifications shall be submitted to the CO after all corrections are included, as above.

1.25 TOWN, STATE AND OTHER FEES

- A. The contractor shall obtain and pay for all fees and permits legally required for the project.

1.26 DEFINITIONS

- A. As used in these Contract Documents; "Furnish" means to purchase and deliver to the project site, complete with every necessary appurtenance, 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. "Provide" means to "furnish and install."
- B. "Architect" means the "Prime Design Consultant".
- C. "RFI" means Contractor's "Request for Information."
- D. "C.O." means "Contracting Officer" warranted by the Government.
- E. "Government" means "Owner".
- F. "GFE" means "Government Furnished Equipment"

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- B. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.
- C. This Section includes requirements for Shop Drawings, Product Data, Samples, Schedule of Values, Coordination of Drawings and Requests for Information.

1.02 SUBMITTAL PROCEDURES

- A. The Contractor, within four weeks after being awarded the Contract, shall prepare, and submit for the C.O.'s approval, a schedule of Shop Drawings, Product Data, and Samples, as required in the Contract Documents. No Submittals will be processed prior to the receipt of such schedule. The schedule shall indicate, by trade, the date by which final approval of each item must be obtained, and shall be revised as required by the conditions of the work, subject to the C.O.'s approval. The C.O.'s review period, will not exceed 30 days from the established date of each submission of Shop Drawings, Product Data, and Samples, plus the additional time, if any, for distribution by the Contractor and receipt of submissions by the C.O. The Contractor shall be required to strictly adhere to the dates established in the schedule.
- B. Notes or other information on the Shop Drawings, labels, transmittals or other items submitted, which are contrary to the provisions of the Contract Documents, shall be deemed to be addressed to the applicable Contractor, material supplier, or other parties involved, and shall have no force or effect with respect to this Contract, even though the shop drawing or sample involved is approved by the C.O. In particular, the terms "By Others", "N.I.C.", or words of similar meaning and import, on submissions, shall not be deemed to imply that the referenced items are to be omitted from this Contract.
- C. Shop Drawings And Product Data:
To receive approval by the C.O., Shop Drawings and Product Data shall be accompanied by a letter of transmittal, and each drawing shall contain the following information on the title block:

Project identification.

C.O.'s name.

Date of preparation of submission, and of revision, if applicable.

Shop drawing number and title of item the drawing refers to.

Contract DRAWING numbers and SPECIFICATIONS SECTION and paragraph number used as a reference in preparing Shop Drawings.

Contractor's name.

Name of person or firm preparing the Shop Drawings.

Statement or stamp of approval by the Contractor, which shall signify that he has seen and examined the drawing, and has complied with the requirements of the contract.

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Shop Drawings and Product Data relating to various units comprising a proposed assembly shall be submitted simultaneously, so that said unit may be checked individually and as an assembly.

All Shop Drawings and Product Data shall be submitted directly to the C.O. Drawings and Product Data submitted to the Contractor directly from the manufacturers will be returned to the Contractor without action.

Submit five (5) copies of each Product Data for standard manufactured items in the form of manufacturer's catalog sheets, showing illustrated cuts of the items to be furnished, scale details, sizes, dimensions, performance characteristics, capacities, and other pertinent information, accompanied by an appropriate transmittal form, with specific reference to the applicable SECTION and paragraph of the SPECIFICATIONS. Such sheets will be marked either "Approved" or "Not Approved" by the C.O., and two (2) copies will be returned to the Contractor. Six copies of each substitute item, for those marked "Not Approved", shall be resubmitted in the same manner until approval is obtained. Indicate clearly on such printed matter, containing multiple items, the specific items that are being submitted for approval.

For each shop drawing, including wiring and control diagrams, submit seven (7) reproducible copies of black-line prints or xerographic copies. The print copies shall be made by the Contractor after his stamp and his comments or corrections, if any, have been affixed to the transparency, and in accordance with the following procedure:

Shop Drawings shall be submitted by the Prime Contractor only, to the C.O. in the form of reproducible copies accompanied by an appropriate transmittal form.

The C.O. comments will be returned to the Contractor, if necessary, who shall then make the necessary corrections and resubmit the corrected drawings. The Contractor will make all prints needed for use by him and his Subcontractors.

Submittals returned "REVIEWED", or "FURNISH AS CORRECTED", shall be processed as set forth below: Contractor shall obtain and distribute adequate prints for construction, and return an original submittal to the or supplier for whom he originally received them.

Submittals returned "REVISE AND RESUBMIT" or "REJECTED", shall be processed as set forth below: Contractor shall first obtain a record print and then forward them to source for correction and resubmission of prints as above.

Each drawing shall have a clear space on the right hand side, approximately 80 square inches in size, for review stamps of the C.O. and Contractor. The C.O. stamp shall indicate reviewer's initials and date reviewed, additionally it shall contain indication for the following actions:

REVIEWED

FURNISH AS CORRECTED

REVISE AND RESUBMIT

REJECTED

Shop Drawing Grading:

REVIEWED: No corrections, no marks.

FURNISH AS CORRECTED: Resubmission not required. Minor amount of corrections; all items can be fabricated without further corrections to original drawing; checking is complete and all corrections are deemed obvious without ambiguity.

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REVISE AND RESUBMIT: Resubmission required. Minor amounts of corrections; checking is not complete; details of items noted by checker are to be clarified further before full review can be given. Correct and resubmit, do not fabricate noted items requiring correction.

REJECTED: Drawing is rejected as not in accord with the Contract Documents, too many corrections, or other justifiable reasons. When returning drawings, C.O. will state reasons for rejection. Correct and resubmit, do not fabricate.

The Contractor shall be fully responsible for delay in the delivery of materials or progress of work caused by late review of Shop Drawings due to failure of the Contractor to submit, revise, or resubmit Shop Drawings in and time to allow the C.O. reasonable time (two to three weeks) for normal checking and processing of each submission or resubmission.

If catalog cuts of standard manufactured items show different types, options, finishes, performance requirements, or other variations, such features which the Contractor proposes to furnish shall be clearly circled or otherwise emphasized, and all irrelevant diagrams, notes, or other information deleted or canceled. If any variations from the catalog description are proposed or required, such variations must be clearly noted on the cut, by the Contractor. Catalog cuts of wiring diagrams will not be acceptable.

Shop Drawings shall clearly indicate all details, sectional views, arrangements, working and erection dimensions, kinds and quality of materials and their finishes, and other information necessary for proper checking, fabrication, and installation of the items, and shall include all information required for making connections to other work.

If any information on previously submitted Shop Drawings, except for notations made by the C.O. is revised in any way, such revisions shall be circled or otherwise graphically brought to the C.O.'s attention. If approved Shop Drawings are subsequently revised, they shall be resubmitted to the C.O. with all revisions clearly marked for the C.O.'s attention. Whenever drawings are revised, the latest revisions shall be circled, shaded, or otherwise emphasized to distinguish them from clearly from all previous revisions (and from the information on the original drawing).

Should the C.O. in checking Shop Drawings, make changes which the Contractor deems will increase the Contract Price, the Contractor shall so inform the C.O. in writing within fourteen (14) calendar days following receipt of the checked Shop Drawings and, in any case prior to starting fabrication of the item or items. Failing this, the Contractor shall be deemed to have waived all claims for extra compensation for the work involved.

The Contractor shall be responsible for obtaining and distributing copies of approved Shop Drawings to the applicable material suppliers, and others whose work is affected thereby, at no additional cost to the Government.

The Contractor shall have a complete up-to-date set of all approved Shop Drawings and Product Data, at the site, and maintain same in continuous good order, available for inspection at all times by the C.O.

The Contractor shall assume full liability for delay attributed to insufficient time for delivery and/or installation of material or performance of the work when approval of pertinent Shop Drawings and Product Data is withheld due to failure of the Contractor to submit and revise or resubmit items in adequate time to allow the reasonable time, not to exceed thirty (30) calendar days, for normal checking and processing of each submission or resubmission.

- D. Samples: Before submitting Samples, consult with the C.O. to determine whether Samples are to be submitted to the C.O.'s office, to the project, or to another location.

Samples shall be submitted in duplicate unless otherwise specified or directed by the C.O.

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Samples may be submitted to the C.O. directly from manufacturers, vendors, suppliers, or others, providing as separate transmittal letter is submitted through the Contractor in each such case.

Samples that can be conveniently mailed shall be sent directly to the C.O. accompanied by transmittal notice. On the transmittal notice the Contractor shall stamp his approval of Samples submitted.

All other Samples shall be delivered at the field office of the C.O. with Sample identification tag attached and properly filled in. Transmittal notice of Samples so delivered with Contractor's stamp of approval shall be mailed to the C.O.

Approved Samples of major or expensive items or assemblies, if in good condition and meeting all requirements of the Contract, may be properly marked for identification and used in the work, provided that all shipping and handling charges are paid by the Contractor.

Each sample shall have a label indicating the material represented, its place of origin, and the names of the producer, the C.O. the Contractor, and the building or work for which the material is intended. Samples shall be marked to indicate the DRAWING numbers or SPECIFICATIONS SECTION and paragraph requiring the materials represented.

Approval of Samples for color, texture, and other aesthetic qualities shall not be construed as approval of other characteristics of the item.

Approved Samples, unless specifically designated by the Contractor as items to be incorporated into the work, will be kept on file, accessible for inspection, by the C.O. until final acceptance of the Project. Any sample, not reclaimed by the Contractor within thirty (30) calendar days after final acceptance of the Project, will be considered unclaimed material, and disposed of by the C.O.

- E. Unless such written notice has been given, the C.O.'s approval of a resubmitted shop drawing, Product Data, or sample, shall not constitute approval of any changes requested on the prior submittal.

1.04 SUBSTITUTIONS

- A. The Contract is intended to produce structures of consistent character and quality of design. All components of the structures visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the structures. The C.O. will judge the design, functionality and appearance of proposed substitutes on their basis of their suitability in relation to the overall design of the work, as well as for their intrinsic merits. The C.O. will not approve as equal to materials specified, proposed substitutions that, in his opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Work. With respect to interior and exterior finishes or other materials or products which have been specified to obtain an artistic or aesthetic value or effect, the C.O. may not approve as equal any proposed substitute which, in their sole opinion, would not produce the same artistic or aesthetic value or effect. In order to permit coordinated design or color and finishes the Prime Contractor shall, if required by the C.O., furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer originally at no additional cost to the Government.
- B. Specific reference in the Specifications to any product, material or process by name, make or catalogue number shall be interpreted as establishing a standard of quality. An item will be considered equal to the item so named or described if (1) it is at least equal in quality, durability, appearance, strength and design; (2) it will perform at least equally the function imposed by the general design for the Work; (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the Specification. M.G.L. Chapter 30, Section 39M (b). The C.O. shall be the sole judge of whether any proposed substitute product, material, process or method is equal to that specified according to this standard, and his decision shall be final and binding on the Prime Contractor.

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- C. If the Prime Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, he shall inform the C.O. in writing of the nature of such deviations at the time the material is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents.
- D. In requesting approval of deviations or substitutions, the Prime Contractor shall provide evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality or result at least equal to that otherwise attainable. If in the determination of the C.O., the evidence presented by the Prime Contractor does not provide a sufficient basis for such reasonable certainty, the C.O. may reject such substitution or deviation without further investigation.
- E. Any additional cost, loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Prime Contractor, notwithstanding approval or acceptance of such substitution by the Government or the C.O., unless such substitution was made at the written request or direction of the C.O.

1.05 DOCUMENTS AND SAMPLES AT THE SITE

- A. The Prime Contractor shall maintain at the site for the Government one record copy of all Drawings, Specifications, Addenda, Request for Information, Supplemental Instructions, Proposal Requests, Construction Change Directives, Change Orders and other modifications to the Contract Documents as well as approved Shop Drawings, Product Data and Samples in good order to record all changes made during construction and approvals. These shall be available to the C.O. and shall be delivered to him upon completion of the work.

1.06 OPERATION AND MAINTENANCE MANUALS

- A. Submit Operation and Maintenance Manuals in accordance with this Section and the requirements of SECTION 01700 - PROJECT CLOSEOUT.

1.07 CONSTRUCTION PROGRESS SCHEDULE

- A. Submit Gantt/Bar progress schedule in triplicate within 15 days after date of contract award for C.O.'s review. Revise and resubmit as required.
- B. Schedule shall be of format approved by C.O. showing complete sequence of construction activity, identifying Work of separate stages and specified Construction Phases, and other logically grouped activities. Indicate the early and late start, early and late finish, float dates and duration.
- C. The Schedule shall show the sequence and phasing of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown in the Schedule must be at least equal and related to the number of items listed in the Schedule of Values including back -up detail.

Define portions of work that are dependent on the schedule of other related activities.

Define activities of which the work is dependent, including:

Submittal of Shop Drawings, equipment schedules, Samples, color submission, templates, fabrication, material delivery times, C.O.'s review of Shop Drawings, equipment schedules, Samples and templates.

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Conclude all activities on the contractor's period of performance end date. Show contract completion dates for each specified Construction Phase as a milestone activity on the Schedule.

Update schedule showing actual progress of Work in progress, identify Work started and completed during the previous update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the schedule.

Prepare a Schedule Analysis for submission with revised project schedules. The Schedule Analysis shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action to be taken. All activities that are behind schedule by more than two weeks shall be addressed individually in the Schedule Analysis.

Submit revised schedules with attached Schedule Analysis, with each Application for Payment; clearly identify changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.

1.08 EMERGENCY ADDRESSES

- A. Within 15 days of contract award, the contractor shall submit to the C.O., in writing, the name, addresses and telephone numbers of key members of their organization including Superintendent and personnel at the site, to be contacted in the event of emergencies at the building site, which may occur during non-working hours.

1.09 SCHEDULE OF VALUES

- A. Prior to the first request for payment, the Prime Contractor shall submit to the C.O. a Schedule of Values of the various portion of the work including quantities when requested, aggregating the total contract sum and divided so as to facilitate payments for work under each Section. The Schedule shall be prepared in a form specified and approved by the C.O., and it shall include data to substantiate its accuracy. Each item in the Schedule of Values shall be used as a basis for review and approval of the Contractor's requests for payment.

1.10 REQUEST FOR INFORMATION (RFI'S)

- A. The Contractor may submit Requests for Information to the C.O. to help facilitate the Contractor's performance of the Contract. Prior to submitting each Request for Information, the Contractor shall carefully study and compare the Contract, field condition, other Government provided information, Contractor-prepared Shop Drawings, Coordination Drawings, and prior Project correspondence and documentation to determine that the information to be requested is not reasonably obtainable from such sources.
- B. Each Request for Information shall be submitted to the C.O., in writing, on such form and with such accompanying information as the C.O. may require for such purpose. Each Request for Information shall identify the specific sources that were reviewed by the Contractor in their efforts to determine that information requested, and a statement to the effect that the information being requested could not be determined from such sources.
- C. The Contractor shall submit each Request for Information sufficiently in advance of the date by which such information is required in order to allow the C.O. time, in the C.O.'s professional judgment, to permit adequate review and response and to permit Contractor's compliance with the latest construction schedule.

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- D. The Contractor shall maintain a log at the Project site that sequentially numbers and lists each Request for Information. This log shall also contain the Drawing(s) reference and Specification section to which the request pertains, the date of the request, to whom the request was made, by whom was the request made, the nature of the request, and the C.O.'s resolution thereof. This log shall be reviewed at each Project meeting and the resolution of Requests for Information shall be made a part of the minutes of such meetings.

- E. The C.O. may return to the Contractor any Request for Information that does not meet the above criteria with that request' deficiencies noted instead of providing a detailed response.

END OF SECTION

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- B. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 SCOPE 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. Temporary Facilities and Services.
 - 2. Temporary Water.
 - 3. Weather Protection.
 - 4. Temporary Heating and Ventilation During Construction.
 - 5. Temporary Electricity and Lighting.
 - 6. Temporary Telephone Service.
 - 7. Temporary Sanitary Facilities.
 - 8. Temporary Fire Protection.
 - 9. Temporary Construction.
 - 10. Temporary Enclosures.
 - 11. Hoisting Equipment and Machinery.
 - 12. Staging and Scaffolding.
 - 13. Maintenance of Access.
 - 14. Protection of Work, Property and the Public.
 - 15. Noise Control.
 - 16. Cleaning During Construction.
 - 17. Temporary Offices.
 - 18. Fire Watch
 - 19. Removal of all temporary facilities.

1.03 RELATED SECTIONS

- A. SECTION 01700 - CONTRACT CLOSE-OUT:
 - 1. Final cleaning.

1.04 TEMPORARY FACILITIES AND SERVICES

- A. The Prime Contractor shall be responsible for arranging and providing temporary facilities and general services as specified herein and as otherwise required for proper and expeditious prosecution of Work. Except as otherwise specified in the contract, the Prime Contractor shall pay cost for all temporary facilities and general services until date of Substantial Completion of the Work established by the C.O. and shall remove same at completion of the Work.
- B. Provide and maintain all temporary connections to existing utilities and services in locations acceptable to the C.O. and local authorities having jurisdiction thereof. Make all installations in a manner subject to the acceptance of such authorities and the C.O. Remove temporary installations and connections when no longer required.

1.05 TEMPORARY WATER

- A. The Government will make existing water sources in and around the building available for construction without charge. Any hoses and shall be installed, protected and maintained at the

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expense of the Contractor. Use of the water may be discontinued by the Government if, in the opinion of the Government, it is wastefully used.

1.06 WEATHER PROTECTION

- A. Installation of weather protection shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices.

1.07 TEMPORARY HEATING AND VENTILATION DURING CONSTRUCTION

- A. Provided the Construction is performed within the required schedule and duration Temporary Heating for general construction purposes shall not be required.
- B. Provide temporary ventilation as required for the work and the safety and welfare of the workers.

1.08 TEMPORARY ELECTRICITY AND LIGHTING

- A. The Government will allow use of electrical energy from the existing building required for hand tools and miscellaneous lighting and accessories. If the existing locations and capacity of building sources is not acceptable, the Contractor shall furnish, install and pay for the cost of temporary power sources to the work area. Power sources from the building will not be allowed for trailer power. The Contractor and all Subcontractors, individually, shall furnish all extension cords, sockets, motors, and accessories required for their work.
- B. Electric energy provided by the Government may be discontinued if, in the opinion of the Government is wastefully used.
- C. For the Contractor's use of for Construction trailers, storage or other provisions outside the Building, the Prime contractor shall make arrangements as required with the utilities for temporary electric service, pay expenses in connection with installation, operation, and removal thereof.
- D. Temporary lighting systems, if required, shall be furnished, installed and maintained by the Prime Contractor. Provide sufficient lighting required to satisfy minimum requirements of safety and security.
- E. Temporary electrical work shall meet requirements of Virginia Electrical Code Temporary Wiring, Local Utility Company, and Federal Standards and Laws. Use only copper wires.

1.09 TEMPORARY TELEPHONE SERVICE

- A. Temporary telephone and FAX services: Make all arrangements with the local telephone service company and pay all costs for the installation (and removal when no longer needed) of direct line telephone and FAX services for the use of authorized personnel, including the following:
 - 1. One direct line instrument in the temporary office of the Contractor, with suitable number of outside extensions, and one (1) FAX machine, with a dedicated telephone line thereto; the costs of all calls and transmissions are being borne by the Contractor.
 - 2. Maintain temporary telephone service until date of Substantial Completion of the Contract, at which time have the services removed.

1.10 TEMPORARY SANITARY FACILITIES

- A. The Government will allow use of existing toilet facilities. Contractor shall not locate temporary toilets on the site.

1.11 TEMPORARY FIRE PROTECTION

- A. Provide and maintain adequate temporary fire protection in the form of fire extinguishers, or other effective means of extinguishing fire, ready for instant use, distributed around the project and in and about temporary structures during construction of the Work.

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- B. Torch-cutting and welding operations performed by Subcontractors shall have approval of the Prime Contractor before such work is started and chemical extinguisher shall be available within sight and not over 10 ft. from location where such work is in progress.

1.12 TEMPORARY CONSTRUCTION

- A. The Prime Contractor shall furnish and maintain all temporary stairs, ladders, ramps, scaffolds, runways, chutes, etc. as required for the proper execution of the work, unless specifically noted to be provided for in other Sections. All such apparatus, equipment and construction shall meet all requirements of Federal, State and local laws applicable thereto.

1.13 TEMPORARY ENCLOSURES

- A. Provide temporary weather-tight enclosure of exterior walls for successive areas of the structures as work progresses, as necessary to provide acceptable working conditions, provide weather protection for interior materials, allow for effective temporary heating and to prevent entry of unauthorized persons:
- B. Provide temporary enclosures to separate work areas from areas adjacent to the Work, occupied by parties other than the Government, to prevent penetration of dust or moisture into occupied areas, to prevent damage to existing equipment and to protect personnel and operations from construction work.

1.14 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 Prime Contractor. All cost for hoisting operating services shall be borne by the Prime Contractor unless specifically excluded in the Contract Documents.

1.15 STAGING AND SCAFFOLDING

- A. Unless otherwise specified in the various trade Sections of the Specifications, the Prime Contractor shall furnish, erect and maintain in safe condition staging and scaffolding over eight feet in height for use by his forces. Staging and scaffolding shall be of approved design, erected and removed by experienced stage builders having all accident prevention devices required by Federal, state and local laws.

1.16 TEMPORARY STAIRS, RAMPS AND LADDERS

- A. Furnish and maintain all temporary stairs, ladders, ramps, and runways, as required for the proper execution of the work.

1.17 PROTECTION OF WORK, PROPERTY AND THE PUBLIC

- A. Construction barricades and protective facilities required for the protection of the public in accordance with local and state regulations. The Contractor shall furnish signs, lights, reflectors, and all such protection facilities as may be required.
- B. The Contractor shall keep all access roads and walks clear of debris, materials, and construction equipment during construction operations.
- C. The Contractor shall provide ways and means to control the flow of water from every source that may cause delay or damage during the construction operations.
- D. The Prime Contractor shall maintain all legally required means of egress, and shall not erect barriers that interfere with, or obstruct such means of egress.
- E. Where the new construction coincides with the present traveled way, the Prime Contractor shall

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carry on his work so that travel will not be obstructed.

- F. Whenever gale or high winds are forecast, take proper measures to secure all loose material, equipment or other items that could blow about and be damaged or cause damage to other work. No such loose items shall be left unsecured at end of working day. Particular attention shall be taken with scaffolding and items placed or stored on roofs or within the structure prior to being enclosed.
- 1.18 TEMPORARY CONTROLS
- A. Debris control and rubbish removal: Initiate and maintain, until final completion of the work of the Contract, a specific program to prevent accumulation of rubbish and debris at the construction areas, storage areas, and parking areas.
 - 1. Provide sufficient quantity of dumpsters at strategic on-site locations approved by the Government, for deposit of debris, rubbish, and all other materials, which are to be disposed of, resulting from the work of all trades on the Project. Schedule frequent collection and legal off-site disposal of the contents of such dumpsters.
 - B. Noise control:
 - 1. Develop, and maintain for the duration of the Contract, a noise-abatement program; and enforce strict discipline over all personnel to keep noise to a minimum.
 - 2. Execute the construction work using methods and types of equipment that will reduce excess noise: Equip air compressors with silencers; and power equipment with mufflers.
- 1.19 WORK AREAS, STORAGE, ACCESS, AND PARKING
- A. The limits of storage and parking areas will be designated by the Government. Store all construction materials within the site boundaries, and storage units in site areas approved by the Government, and areas of the work. Assume full responsibility for trespass on, and/or damage to, other property by any employees.
- 1.20 CLEANING DURING CONSTRUCTION
- A. Execute cleaning during process of the Work, as required by the CONDITIONS OF THE CONTRACT and as herein specified.
 - B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations. 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. Safety and Disposal Requirements: Standards: Maintain project in accordance with State Building Code and local ordinances.
- 1.21 PROJECT IDENTIFICATION
- A. No signs or advertisements will displays be allowed on the premises without the approval of the Government.
- 1.22 TEMPORARY OFFICES
- A. Furnish, install, maintain, and pay all costs in conjunction with an adequate weather-tight structure or trailer to serve as a temporary office for the Contractor, located on the site where directed, and remove same when no longer needed.
 - B. Maintain the office adequately lighted, heated, and ventilated, and bear all costs for therefore, except as otherwise specified herein.
- 1.23 FIRE WATCH

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- A. The Contractor shall provide Fire Watch acceptable to the local Fire Department at any time when any portion of the fire alarm system is not active. Coordinate at site and pay all back charges to local Fire Department.
- 1.24 WELDING AND CUTTING
- A. Whenever electric or gas welding or cutting work is done above or within ten (10) feet of combustible material or above spaces that may be occupied by persons, provide shields of incombustible material to protect against fire damage or injury due to sparks and hot metal.
 - B. A qualified electrician shall be in charge of installing and repairing electric or arc welding equipment. No electric welding equipment shall be connected into the Government's electrical system except as approved by the Government.
- 1.25 TEMPORARY AND TRIAL USAGE
- A. Temporary or trial usage by Government of any mechanical device, machinery, apparatus, equipment, or any work or materials supplied under Contract, before final completion and written acceptance by the C.O. shall not be construed as evidence of C.O.'s acceptance of same.
 - B. The Government reserves the right of such temporary or trial usage, for such reasonable time as required to properly test such items. Claims for damage, due to injury to, or breakage of, any parts of such work, when the determined cause is weakness or inaccuracy of structural parts, or by defective material or workmanship, will be denied.
 - C. If the Prime Contractor so elects, he may, without additional cost to the Government, place an approved person, or persons, to instruct and assist in such trial usage. Trials shall be made under the C.O.'s supervision.
- 1.26 WINTER CONSTRUCTION
- A. The Prime Contractor shall be responsible for providing protection against damage to materials and work installed in freezing weather, by providing special heat and coverings to prevent damage from the elements, in a manner approved by the C.O.
- 1.28 REMOVAL
- A. Contractor shall remove temporary materials, equipment, services, and temporary construction prior to Substantial Completion inspection.
 - B. Contractor shall clean and repair damage caused by installation or use of temporary facilities. Restore existing facilities used during construction to its original condition.

END OF SECTION

SECTION 01630

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY: This section covers the requirements for the submission of requests for substitutes in materials and/or construction methods.

1.2 GENERAL REQUIREMENTS: Formal requests for substitution shall be made only when the Contractor has investigated the proposed product and has determined that it will be equal to or superior in all respects to that specified. Warranties or bonds for accepted substitutes shall be provided as they would be for the original product specified. Coordinate installation of accepted substitutes into work complete in all respects; ensure that cost data is complete including all related costs.

1.2.1 Submit each substitution request separately, supported with the following information:

- a) Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents. This shall include: product identification, including manufacturer's name and address; manufacturer's literature identifying product description, reference standards, performance and test data; samples, as applicable; names and addresses of similar projects where product has been used, and dates of installation.
- b) Itemized comparison of proposed substitution with product specified, listing significant variations.
- c) Data relating to changes in construction schedule and Coordination Drawings.
- d) List of changes required in other work or products.
- e) Accurate cost data comparing proposed substitution with product specified including any net change to contract sum.
- f) Designation of required license fees or royalties.
- g) Designation of availability of maintenance services, and sources of replacement materials.

1.2.2 Without a formal request from the Contractor, substitutions will not be considered for acceptance when indicated or implied on shop drawings or product data submittals, or are requested directly by a subcontractor or supplier. Acceptance may require substantial revision of contract stipulations. Do not order or install substitute products without written acceptance from the Contracting Officer's Technical Representative.

PART 2 - PRODUCTS -- NOT USED.

PART 3 - EXECUTION -- NOT USED.

*** END OF SECTION ***

SECTION 01700
PROJECT CLOSE-OUT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. All sections contained in DIVISION 1 are hereby made a part of this SECTION
- B. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 SECTION INCLUDES

- A. Closeout Procedures.
- B. Final Cleaning.
- C. Record Drawings.
- D. Maintenance Manuals and Instructions.
- E. Warranties and Bonds.
- F. Closeout Requirements.
- G. Partial Government Occupancy before acceptance.

1.03 CLOSE-OUT PROCEDURES

- A. Comply with procedures stated in the Contract.
- B. When the Prime Contractor considers the Work has reached final completion, submit written certification that the Contract has been reviewed, the Work has been inspected, and that the Work is complete in accordance with Contract and ready for C.O.'s inspection.
- C. In addition to submittals required by the Solicitation/Contract Form provide submittals required by governing authorities, and submit a final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

1.04 FINAL CLEANING

- A. Execute prior to final inspection or Government occupancy.
- B. Contractor shall clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum floor and wall carpet and other soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean drainage systems.
- C. Contractor shall remove waste and surplus materials, rubbish, and construction facilities from the project and from the site.
- D. Government will assume responsibility for cleaning as of time designated on Certificate of Substantial Completion for Government's acceptance of Project or portion thereof.

1.05 RECORD DRAWINGS

- A. Before work begins, the Prime Contractor shall, from the original Contract Drawings, have a set of reproducible copies of the entire Contract Drawings made durable, reproducible paper.
- B. During construction, the Prime Contractor shall keep accurate daily records of all major deviations from the works as shown on the Contract Drawings, and indicate actual installation with colored inks on a complete set of prints obtained and maintained at the job site for that specific purpose. The Contract shall keep these sets available at all times for use and inspection.

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- C. The Prime Contractor shall transfer all information from the daily record prints to the reproducible tracings at least once every month and submit three prints of each tracing to the Contracting officer. When roughing-in of any particular area is completed, it shall be shown on the tracings and a copy submitted for Contracting officer's review.
- D. Before completion of the Work, and when directed by the Contracting officer, the Prime Contractor shall transcribe all previous information onto a set of reproducible 1/4" prints make all final changes and corrections to same, sign each Drawing as certification that the work was installed as shown, and deliver same to Contracting officer. Acceptance by the Contracting officer of the completed tracings shall be a prerequisite for final payment.
- E. Shop Drawings will not be acceptable as project Record Drawings.

1.06 MAINTENANCE MANUALS AND INSTRUCTIONS

- A. The Prime Contractor shall, upon Substantial Completion of the Work, or any portion thereof, submit drafts of maintenance schedules, maintenance manuals, and all approved Shop Drawings, presenting full details for care and maintenance of visible surfaces and all equipment furnished and installed under the Contract.
- B. Maintenance manuals shall consist of manufacturer's catalogue cuts with descriptive information, lubricating and maintenance instructions, parts list, usage instructions, names, addresses and telephone numbers where replacement parts and services can be quickly obtained, and all other information required for the Government to use, maintain, and service the items properly.
- C. Manuals shall provide information by specification section, or groups of sections in 3 ring binders, labeled on front and side. Provide indexed dividers to indicate individual equipment items included in the binder.
- D. Upon Contracting officer's approval of drafts, submit three (except where additional requirements are indicated in specification Sections) corrected copies properly bound in a logical and well-arranged order, with index, for Government's use. Deliver manuals to the Contracting officer not less than 30 days prior to acceptance of the related installation, to permit Government's personnel to become familiar with equipment and operation prior to acceptance.
- E. The Prime Contractor shall arrange for a reasonable amount of instruction for the Government's employees, to insure proper operation of the equipment furnished. It is the intent of this paragraph to require the Prime Contractor to furnish as much detailed instruction as is necessary to educate reasonably intelligent personnel in the proper use of the equipment. This instruction shall be provided by the manufacturer's representative for each item of equipment. In some cases, this may require several visits to the Project by those responsible for the instruction. Government shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation. Make adjustments under operating conditions.

1.07 WARRANTIES AND BONDS

- A. General: Compile specific warranties and bonds, review to verify compliance with Contract Documents, and submit to Contracting officer for his review and transmittal to the Government.
- B. SUBMITTAL REQUIREMENTS
 - 1. Assemble two original signed copies of warranties, bonds and service and maintenance contracts, executed by Officers of each of the respective manufacturers, and suppliers.
 - 2. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - a) Product or work item.
 - b) Firm, with name of principal, address and telephone No.

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- c) Scope.
 - d) Date of beginning of warranty, bond or service and maintenance contract will commence upon date of Substantial Completion as established by the Contracting officer.
 - e) Duration of warranty, bond or service maintenance contract.
 - f) Provide information for Government's personnel:
 - g) Proper procedure in case of failure.
 - h) Instances that might affect validity of warranty or bond.
 - i) Prime Contractor or Subcontractor, as applicable, name of responsible principal, address and telephone number.
- C. Form of Submittals: Prepare in duplicate packets and in the following format:
- 1. Size 8-1/2 in. by 11 in.; punch sheets for 3-ring binder. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List Title of Project and Name of Prime Contractor or Subcontractor.
 - 3. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.
- D. Time of Submittals:
- 1. For equipment or component parts of equipment put into service during progress of construction, submit documents within ten days after inspection and acceptance. Otherwise, make submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.
 - 2. For items of work where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.
- E. Submittals Required: Submit warranties, bonds, service and maintenance contracts as specified in the respective Sections of the Specifications.
- 1.08 CLOSE-OUT REQUIREMENTS
- A. Punch List: When the C.O. inspects the Work for Substantial Completion, he will prepare and issue to the Prime Contractor a "punch list" of items to be corrected before final payment will be made. Such punch list shall not be construed as all-inclusive of the work which the Prime Contractor will be required to perform before final payment.
- B. Substantial Completion: C.O. will prepare and issue a Certificate of Substantial Completion, complete with signatures of Government and Prime Contractor, accompanied by list of items to be completed or corrected, as verified and amended by the C.O.
- C. Final Inspection:
- 1. The Prime Contractor shall submit written certification that:
 - a) Contract Documents have been reviewed.
 - b) Project has been inspected for compliance with Contract Documents.
 - c) Work has been completed in accordance with Contract Documents.
 - d) Equipment and systems have been tested in presence of C.O. and are operational.
 - e) Project is completed, and ready for final inspection.
 - 2. C.O. will begin final inspection within seven days after receipt of certification.

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3. Should the C.O. consider the Work is finally complete in accordance with requirements of Contract Documents, he shall request the Prime Contractor to make Project Close-out submittals.
4. Should the C.O. consider that the Work is not finally completed:
 - a) He shall notify the Prime Contractor, in writing, stating reasons.
 - b) The Prime Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to the C.O. certifying that the Work is complete.
 - c) C.O. will re-inspect the Work.
- D. Close-out Submittals:
 1. Project Record Documents.
 2. Operating and Maintenance Data.
 3. Extended Guarantees and Warranties.
 4. Keys and Keying Schedule.
 5. Spare Parts and Maintenance Materials.
 6. Deliver evidence of compliance with requirements of governing authorities, including without limitations, the following:
 - a) Certificates of compliance for flame and smoke, and fire rating.
 - b) Certificates of Inspection
 - c) Certificate of Occupancy
- E. Instructions: Instruct Government's personnel in the operation of all systems, mechanical, electrical and other equipment.
- F. Evidence of Payments, and Release of Liens:
 1. The Prime Contractor's Affidavit of Payment of Debt Claims, AIA G706.
 2. The Prime Contractor's Release of Liens, AIA G706A, with:
 - a) Consent of Surety to Final Payment: AIA G707.
 - b) Prime Contractor's release or waiver of liens.
 - c) Separate releases or waivers of liens for Subcontractors, suppliers and others with lien rights against property of the Government, together with list of those parties.
 3. All submittals shall be duly executed before delivery to the C.O.
- G. Final Application and Certificate for Payment:
 1. The Prime Contractor shall submit final application in accordance with requirements of the Contract.
 2. C.O. shall issue final certificate in accordance with provisions of CONDITIONS OF THE CONTRACT.
 3. NOTE: Prior to issuance of the Certificate for Final Payment by the C.O., all requirements contained in this Paragraph entitled "Close-out Requirements" and other requirements of the CONDITIONS OF THE CONTRACT shall be executed, received and approved by the C.O.

END OF SECTION

SECTION 02040
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- B. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 DESCRIPTION OF WORK:

- A. Work included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. The Prime Contractor shall provide all Cutting and Patching required for the work.
 - 2. Dust coverings required to prevent the spread of dust beyond the immediate area where interior demolition and removal work is being performed.
 - 3. Temporary protection items required ensuring safety for persons and property during Cutting and Patching work.
- B. Definition: "Cutting and Patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original conditions.
 - 1. "Cutting and Patching" is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.
 - 2. Cutting and patching performed during the manufacture of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections.
 - 1. Disposal of all debris: SECTION 02050 – SELECTIVE DEMOLITION.
 - 2. Removal, reinstallation and cutting new openings in finished wood panels at locations of new installations: SECTION 06200 - CARPENTRY.

1.03 QUALITY ASSURANCE

- A. Occupancy: The Government will be continuously occupying areas of the building immediately adjacent to areas of cutting and patching work. Conduct cutting and patching work in manner that will minimize disruption of the Government's operations. Provide minimum of 72 hours advance notice to the C.O. about cutting and patching activities that will severely impact Government's operations.
 - 1. Do not perform cutting and patching work that will result in loud, continuous noise, during normal hours of operations. Perform such cutting and patching work during closed hours and include all associated costs (include overtime and premium time) in Base Bid.
- B. Before cutting and patching the following categories of work, obtain the C.O.'s approval:
 - 1. Structural steel, structural concrete and decking,
 - 2. Miscellaneous structural metals, including lintels, equipment supports, stair systems and

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similar categories of work.

3. Foundation construction.
4. Bearing and retaining walls.
5. Exterior curtain wall construction.
6. Piping, ductwork, vessels and equipment.
7. Visual Requirements: Do not cut and patch work exposed on the building's exterior or in its occupied spaces, in a manner that would, in the C.O.'s opinion, result in lessening the building's aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cutting and patching. Remove and replace work judged by the C.O. to be cut and patched in a visually unsatisfactory manner.

1.04 SUBMITTALS

- A. Refer to Division 1 for submittal provisions and procedures.
- B. Procedural Proposal for Cutting and Patching: Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:
 1. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to existing work, including structural, operation and visual changes as well as other significant element.
 2. List products to be used and firms that will perform work.
 3. Give dates when work is to be performed.
 4. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be out-of-service temporarily. Indicate how long utility service will be disrupted.
- C. All services and utilities shall be maintained during normal working hours. Any interruption of services or utilities shall be for periods the Government is not occupying the facility or area.
- D. Approval by the C.O. to proceed with cutting and patching work does not waive the C.O.'s right to later require complete removal and replacement of work cut and patched in an unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 INSPECTION

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

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3.02 PREPARATION

- A. Temporary Support: to prevent failure, provide temporary support of work to be cut.
- B. Protection: protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.
 - 1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas and take steps to insure such access will be maintained.

3.03 PERFORMANCE

- A. Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the C.O. proceed with cutting and patching at the earliest feasible time and complete work without delay.
- B. Cut the work using methods that are least likely to damage work to be retained or adjoining work.
 - 1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporally cover openings when not in use.
- C. Patching: Patch with joints and seams that are durable and as invisible as possible. Comply with specified tolerances for the work.
 - 1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
 - 2. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.

3.04 TRANSITION FROM EXISTING TO NEW WORK

- A. When new work abuts or finishes flush with existing work, make a smooth and workmanlike transition. Patched work shall match existing adjacent work in texture and appearance so that the patch or transition is invisible at a distance of five feet.

3.05 CLEANING

- A. Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.
- B. When cutting and patching is performed in spaces occupied by the Government, and in any finished spaces, clean surfaces immediately at the completion of cutting or patching, and at the end of each day whether or not work is completed. Broom-sweep hard surface floors and vacuum carpets. Brush, or otherwise dust, walls furniture and other surfaces of dust and debris. Remove all debris from the area occupied by the area and place in collection area for Contractor's disposal.

END OF SECTION

SECTION 02050
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- B. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 SCOPE 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. Temporary protection items required ensuring safety for persons and property during the demolition and removal work.
 - 2. Dust coverings as required to prevent the spread of dust beyond the immediate area where interior demolition and removal work is being performed.
 - 3. After all effected services have been disconnected thereto, or otherwise made inactive, perform the demolition work and major cutting, remove all demolished and abandoned materials from the site, and legally dispose of same.
 - 4. Demolition, Removal and disposal of all materials in accordance with federal, state or local requirements.
- B. Related work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Construction and removal of temporary barriers: SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS.

1.03 SUBMITTALS

- A. Refer to SECTION 01300 - SUBMITTALS for submittal provisions and procedures.
- B. A demolition and removal plan shall be submitted to the C.O. for review that describes measures that will be taken to prevent dust from becoming airborne as a result of the demolition and movement of debris, and shall give the ultimate disposal site of all materials.

1.04 PROJECT CONDITIONS

- A. Damages: Promptly repair damages caused to adjacent materials by demolition work.
- B. Flame Cutting is not permitted.
- C. Explosives: Use of explosives will not be permitted.
- D. Utility Services; Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Do not interrupt existing utilities without approval of the Government.

1.05 PERMITS, TAXES AND LICENSES

- A. Obtain and pay for all permits and licenses required by governing authorities to carry out the work of this Section.
- B. Pay all legally imposed fees and taxes on the work of this Section.

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PART 2 - MATERIALS

2.01 MATERIALS

- A. Provide all sheathing, anchors, nails, screws, barricades, electrical items, and other materials as necessary to properly complete the work of this Section.

2.02 SALVAGED MATERIALS

- A. Salvage sufficient quantities of cut or removed materials as indicated on the drawings.
 - 1. Store salvaged items in a dry, secure place on site.
 - 2. Do not incorporate salvaged or used material in new construction except with permission of the C.O..

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate the demolition and removal work with the Prime Contractor and with the work of other Sections.
- B. Carry out demolition and removal work in sequence that accommodates the Government's requirements for access and use of the site during demolition.

3.02 SCHEDULING/PREPARATION WORK

- A. The Contractor shall provide a schedule of his work, carefully planned with the Government to coincide with the time allotted for work. All shutdowns must be as directed and approved by the C.O..

3.03 PROTECTION

- A. Protect, keep clean, as required or directed by the C.O. all entryways, stairs and areas of existing buildings scheduled for modernization work or used in the process of traveling to the work area.
- B. Temporary protection shall be provided for all portions of existing buildings where work is to be done or materials handled. Temporary protection shall be such that the interior of existing structures will, at all times, be protected from dirt and dust, inclement weather, and loss of interior heat. The Contractor will be held responsible for any damage to the existing structure or contents by reason of the insufficiency of such protection.
- C. Provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs and other items as required for the protection of the workmen engaged in demolition operations, public, adjacent construction and occupants of the building.
- D. Provide fire protection in accordance with local fire department requirements.
- E. Protect public and private property adjacent to and on the job site, from demolition activities. Make repairs to the complete satisfaction of the C.O. of the damaged property.
- F. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal work.
- G. Provide and maintain temporary protection of existing structures designated to remain where demolition and removal work is being done, connections made, materials handled or equipment moved.

3.04 DEMOLITION AND REMOVAL

- A. Existing conditions affected by the work under this Contract have been reproduced on the Drawings as accurately as possible, using existing drawings and on-site observation.

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- B. Where drawings showing existing conditions were not available, work indicated as existing and concealed in walls is assumed. All demolition and removal work shall be adjusted in the field as required to meet new and existing conditions however they occur, whether or not shown on the Drawings or specified.
 - C. Do all demolition work in conformance with the applicable requirements of the division on Industrial Safety, Department of Labor and Industries and the Department of Public Safety, Commonwealth of Virginia, OSHA Regulations, U.S. Department of Labor, local and state codes having jurisdiction over this work.
 - D. Remove, support and replace, as necessary any related items which in any way interferes with the new work.
 - E. The Contractor shall perform all necessary removing, cutting, and patching of existing construction required in connection with the project. The Contractor will be held responsible for any damage to part or parts of structure and at the Contractor's expense repair any damage to the satisfaction of the C.O.
 - F. No materials shall be dropped or thrown from any height. Rubbish and debris resulting from renovation work included under this Contract shall be removed from the building as fast as accumulated and disposed of off the premises, in a legal and approved manner.
 - G. Remove all items of existing work which are mentioned or indicated to be removed or are necessary to remove in order to permit proper installation of new work shall, unless otherwise specified or noted, removed.
 - H. All necessary cutting and drilling to fit together properly the several parts of the work shall be done by the Prime Contractor.
- 3.05 CLEAN-UP
- A. Daily, pile debris in a safe manner and place loose debris in containers.
 - B. At the conclusion of the demolition work, remove all debris and the surplus materials and leave work area neat.
 - C. Repair or replace any existing structure, finished material, damaged or marred by the work of this Section.
- 3.06 FINAL CLEAN UP AND RESTORATION OF THE SITE
- A. After all the work is completed, this Contractor shall make satisfactory disposition of all surplus materials, litter, dirt and rubbish from the construction site. He shall remove all temporary barricades, and he shall remove all construction equipment from the work.

END OF SECTION

**SECTION 06200
ROUGH CARPENTRY**

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- B. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 SCOPE 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 framing members, nailers, furring, and blocking where required.
 - 2. Perform all required drilling and cutting in exposed to view wood surfaces, including millwork and other items of finish carpentry, as required for new conduit and electrical items.
 - 3. Removal and reinstallation of finished wood surfaces for the installation of electrical conduits, wiring and other materials.
 - 4. Other items as indicated on the drawings as by "Carpentry" and/or Section "06200"
- B. Related Work: The following items of work are not included in this Section and are specified under the designated Sections:
 - 1. Sealing between finished surfaces and new materials: SECTION 07920 – JOINT SEALANTS.

1.03 WORKMANSHIP QUALITY STANDARDS

- A. Make all cuts smooth and free from all machine and tool marks that will be visible finished installation.
- B. Set all nails with nail set countersink all screw heads, fill all head depressions with wood filler to conceal fasteners.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Lumber: Framing, blocking and other concealed conditions: Construction, or No. 2 and Better, Grade Hem/Fir or Spruce, Grade-stamped S-Dry.
- B. Provide Fire Resistant treated Lumber as indicated or as otherwise required.
- C. Plywood: Plywood sheathing for all locations: APA RATED SHEATHING EXT, 3/4" thickness unless otherwise indicated on the drawings.
- D. Accessories:
 - 1. Nails for trim items: 6d or 8d coated or galvanized finish nails, except as otherwise specified herein.
 - 2. Screws: Flat head hard aluminum or stainless steel screws, of the appropriate sizes; expansion type for attaching wood and plywood to masonry.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

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- A. Ship and handle finish carpentry materials in a manner which will prevent damage thereto, and store all materials at a dry and safe on-site location. Store wood, plywood, and plastic laminate materials at protected interior locations, only.
- 3.02 FILLING
- A. Fill all nail and screw head depressions, and all other gouges, scratches, and minor surface defects in the wood and plywood surfaces with a compatible wood filler, toned to match the color of the specific wood or plywood surface. Leave the surfaces completely smooth and free from tool marks.
- 3.03 FINAL INSPECTION
- A. Immediately prior to the completion of all work under this SECTION 06200, inspect all portions of the work and make any required adjustments or corrections to the work.

END OF SECTION

**SECTION 07270
FIRESTOPPING**

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- a. Part A and DIVISION 1 of PART B are hereby made a part of this SECTION.
- b. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 SCOPE OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, and without limiting the generality thereof includes:
1. Furnish and install Firestopping materials for all new penetrations and all existing penetrations occurring in new and existing walls, partitions, and elevated floor slabs of shafts and other rated rooms, consisting of the following:
 - a) Intumescent firestop sealant, with collars or wrap strips, around PVC piping and conduit.
 - b) Silicone firestop sealant, with collars or wrap strips, around metal piping and conduit.
 2. Firesafing batt insulation for the following conditions:
 - a) Packed into joints at tops of fire-rated interior walls and partitions, keeping the insulation back 3/4-inch back from the exposed to view face of the wall or partition.
 - b) Packed around pipes and similar items at elevator hoistway and machine room.

1.03 SUBMITTALS

- A. General: Refer to SECTION 01300 – SUBMITTALS for submittal provisions and procedures.
1. Test data: Complete test data for the proposed firestopping material, including certified Underwriters Laboratories, Inc., test performance and fire-resistive ratings, applicable to each condition, conforming to the various tests and ratings as specified herein.
 2. Certification: Manufacturer's written certification attesting that the proposed firestopping material is of the formulation and quality tested and classified by Underwriters Laboratories, Inc., in accordance with ASTM Standard E-119, in the test data submitted hereunder.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Intumescent firestop sealant: STI SpecSeal Sealant; Tremco, Inc., Tremstop-WBM; 3M CP25WB+Caulk; or equal.
- B. Silicone firestop sealant: STI SpecSeal Pensil 100 & 300; Tremco, Inc., Fyre Sil Sealant; 3M FB-200 Caulk; or equal.
- C. Firestop collars: STI SpecSeal Firestop Collars; 3M PPD Collars; or equal.
- D. Wrap strips: STI SpecSeal WrapStrip; Tremco, Inc., Tremstop-WS; 3M FS-195 Wrap Strip; or equal.

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- E. Firesafing insulation: Mineral fiber, fire-treated, firesafing insulation, having a minimum density of 4 p.c.f., USG Thermafiber FS-25 Batts, or equal.

PART 3 - EXECUTION

3.01 APPLICATION OF FIRESTOPPING

- A. Apply firestopping materials in strict accordance with the printed instructions of the materials manufacturer, and as required by the specified Underwriters Laboratories Design numbers for 2-hour fire-resistive time ratings.
- B. Thoroughly clean all receiving surfaces free from oil, grease, mill scale, dirt, and other foreign matter which could impair the bond.

3.02 FIRESAFING INSULATION

- A. Pack specified fire-safing insulation around all pipes, ducts, conduits, and similar items, which penetrate new fire-rated masonry walls, masonry partitions, and drywall construction partitions, for the full partition thickness at each such penetration location.
- B. Pack specified fire-safing insulation into joints at tops of non-bearing fire-rated masonry walls, masonry partitions, and drywall construction partitions, keeping the insulation back 3/4-inch back from the exposed to view face of the wall or partition, as applicable.
- C. At all locations where new items penetrate the concrete floors and roof decks, pack the specified insulation around the items, completely filling the voids, and tamp the insulation level with the slab or deck face.

3.03 CLEAN-UP

- A. After completion of the application, remove all equipment, and clean all walls, floors, and other surfaces free from deposits of the firestopping material.

END OF SECTION

SECTION 09100
METAL SUPPORT SYSTEMS

PART 1 - GENERAL

- a. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- b. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest issue of the publications shall be used.

1.1.1 American Society for Testing and Materials (ASTM) Publications:

A 446	Steel Sheet, Zinc Coated (Galvanized) by Hot Dip Process, Structural (Physical) Quality
A 463	Steel Sheet, Cold-Rolled, Aluminum-Coated Type 1
A 525	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
C 754	Installation of Steel Framing Members to Receive Screw-Attached gypsum board

1.1.3 Underwriters Laboratories Inc. (UL) Publication:
Fire Resistance Directory

1.1.4 American Iron and Steel Institute (AISI):
Specifications for the Design of Cold Formed Steel Members

1.1.5 United States Gypsum Company (USG):
Gypsum Construction Handbook

1.1.6 American Welding Society, Inc. (AWS)
D1.3 Structural Welding Code - Sheet Steel

1.2 DESCRIPTION OF WORK: Work includes interior metal framing, furring, and ceiling suspension systems for the attachment of gypsum board.

1.3 SUBMITTALS: Provide submittals in accordance with DIV 01 requirements.

1.3.1 Certificates of Compliance: Manufacturer's certificates attesting that materials meet the requirements specified herein and in referenced publications.

1.3.2 NOT USED

1.3.3 Manufacturer's Erection Instructions: Printed instructions for the erection of metal framing and furring.

1.4 DELIVERY AND STORAGE: Deliver materials to the job site and store in ventilated dry locations. Storage area shall permit easy access for inspection and handling. If it is necessary to store materials outdoors, stack materials off the ground, properly supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items that cannot be restored to like-new condition and provide new items.

PART 2 - PRODUCTS

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2.1 MATERIALS: Provide steel materials for metal support systems with galvanized coating ASTM A 525, G-60; aluminum coating ASTM A 463, T1-25; or a 55 percent aluminum-zinc coating.

2.1.1 NOT USED

2.1.2 Materials for Use in Nonload-Bearing Interior Wall Framing and Furring for Attachment of Gypsum board: ASTM C 754.

PART 3 - EXECUTION

3.1 INSTALLATION - Interior cold formed metal framing:

3.1.1 NOT USED.

3.1.2 Nonload-Bearing Wall Framing and Furring for Attachment of Gypsum board: ASTM C 754, except as indicated otherwise.

*** END OF SECTION ***

**SECTION 09250
GYPSUM BOARD**

PART 1 - GENERAL

- a. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- b. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest issue of the publications shall be used.

1.1.1 American Society for Testing and Materials (ASTM) Publications:

C 36	Gypsum board
C 79	Gypsum Sheathing Board
C 442	Gypsum Backing Board and Coreboard
C 475	Joint Treatment Materials for Gypsum board Construction
C 630	Water-Resistant Gypsum Backing Board
C 840	Application and Finishing Gypsum Board
C 1002	Steel Drill Screws for the Application of Gypsum Board
E 84	Surface Burning Characteristics of Building Materials

1.1.2 Underwriters' Laboratories, Inc. (UL) Publication:

Fire Resistance Directory

1.1.3 Gypsum Association (GA) Publications:

GA-600	Fire Resistance Design Manual
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1.2 SUBMITTALS: Provide submittals in accordance with Division One requirements.

1.2.1 Catalog Data: Submit catalog information for each type of gypsum board, fastener, joint treatment material, adhesive, and metal trim. Clearly mark data which describe more than one type or item to indicate which type or item will be provided.

1.2.2 Certificates of Compliance: Submit certificates attesting that the following materials meet the requirements specified:

- a. Each type of gypsum board
- b. Fasteners
- c. Adhesive
- d. Metal or plastic trim
- e. Control joints

1.3 DELIVERY, HANDLING, AND STORAGE:

1.3.1 Delivery: Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.3.2 Handling: Neatly stack gypsum board flat to prevent sagging or damage to the edges, ends, and surfaces.

1.3.3 Storage: Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation.

1.4 ENVIRONMENTAL CONDITIONS:

1.4.1 Temperature: Maintain a uniform temperature of not less than 50 degrees F in the structure for at least 48 hours prior to, during, and following the application of gypsum board and joint treatment materials, or the bonding of adhesives.

1.4.2 Exposure to Weather: Protect gypsum board products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

PART 2 - PRODUCTS

2.1 GENERAL: Materials shall conform to the respective specifications and standards and to the requirements specified herein.

2.2 GYPSUM BOARD - Provide gypsum board manufactured from asbestos-free materials. All gypsum board to be 5/8" thick.

2.2.1 Regular Gypsum Board: ASTM C 36

2.2.2 Fire Rated Gypsum board: ASTM C 36, Type X.

2.2.3 Moisture-Resistant, Fire-Rated Gypsum Board: ASTM C 630, Type X.,

2.2.4 Foil Backed Gypsum Board: ASTM C 36

2.2.5 Exterior Soffit Board, fire-rated: ASTM C931

2.2.6 Tile backer Cement Board

2.3 JOINT TREATMENT MATERIALS: ASTM C 475.

2.3.1 Embedding Compound: Specifically formulated and manufactured for use in embedding tape at gypsum board joints and completely compatible with tape, substrate and fasteners.

2.3.2 Finishing or Topping Compound: Specifically formulated and manufactured for use as a finishing compound.

2.3.3 All-Purpose Compound: Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.3.4 Joint Tape: Cross-laminated, tapered edge, reinforced paper, or special tape recommended by the manufacturer.

2.4 SCREWS: ASTM C 1002. Type "S" steel drill screws. Use specially designed steel screws as recommended by the manufacturer of the gypsum board for the screw application of gypsum board to gypsum board or to steel framing.

2.5 CORNERBEAD AND EDGE TRIM: Fabricate from corrosive protective coated steel designed for its intended use. Flanges shall be free of dirt, grease, and other materials that may adversely affect the bond of joint treatment. Provide corner beads edge trim-beads, and one-piece control joint beads all with bead and face flange to receive joint compound.

2.6 Water: Clean, fresh, and potable.

PART 3 - EXECUTION

3.1 INSPECTION

3.1.1 Framing and Furring: Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board. Verify that all blocking, headers and supports are in place to support plumbing fixtures, handrails, soap dishes, grabbars, towel racks, toilet partitions, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board.

3.2 APPLICATION OF GYPSUM BOARD: Apply gypsum board to framing and furring members in accordance with ASTM C 840 and the requirements specified herein. Apply gypsum board with separate boards in moderate contact; do not force in place. Stagger end joints of adjoining boards. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length. Cut out gypsum board as required to make neat close joints around openings. Surfaces of gypsum board and substrate members may be bonded together with an adhesive, except where prohibited by fire rating(s). Leave a space approximately 1/4-inch at bottom of gypsum board for caulking.

3.2.1 Application of Gypsum Board to Steel Framing and Furring: Apply in accordance with ASTM C 840, System VIII.

3.2.2 NOT USED

3.2.3 Floating Interior Angles for Ceilings and Walls: Locate the attachment of fasteners adjacent to ceiling and wall intersections in accordance with ASTM C 840, System XII, for single-ply applications of gypsum board.

3.2.4 Control Joints: Install expansion and contraction joints in ceilings and walls in accordance with ASTM C 840, System XIII, unless indicated otherwise.

3.2.5 Edge bead to be installed at all locations where gypsum board abuts dissimilar material.

3.2.6 Return-air openings in wall above ceiling: Refer to Mechanical Drawings for locations. Apply gypsum board to sides and bottom of all such openings.

3.3 FINISHING OF GYPSUM BOARD: Tape and finish gypsum board in accordance with ASTM C 840. Provide joint, fastener depression, and corner treatment. Treatment for water-resistant gypsum board shall be as recommended by the gypsum board manufacturer.

3.4 CAULKING: Caulk where gypsum board abuts dissimilar materials, at door and window frames, sills, and at openings around pipes, fixtures, and other items projecting through gypsum board. Apply caulking material with exposed surface flush with gypsum board.

3.5 PATCHING: Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finish as specified.

END OF SECTION

SECTION 09653
RESILIENT WALL BASE AND ACCESSORIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. The extent of the resilient base work is indicated on the Drawings. Provide all resilient base throughout the Project as shown, specified here, or required for a proper job including without limitations:
 - 1. Resilient wall base
 - 2. Resilient accessories.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 5 years experience installing resilient flooring and base.

1. SUBMITTALS

- B. Manufacturer's Data: Submit manufacturer's descriptive brochures and installation instruction for resilient wall base.
- C. Samples: Submit 2 chains or boxes of small color samples illustrating entire line of material proposed for base.
- D. After initial color choice has been made by Contracting Officer's Representative, submit 2 sets of full size samples at least 12 inches long of each type to be used.
- E. Mark samples with name of contractor, project identification and area where materials are to be used. Also include the manufacturer's complete identification of his products.

1.05 PRODUCT DELIVERY AND STORAGE

- A. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand names, colors and pattern and quality designations legible and intact.
- B. Do not open containers or remove markings until materials are inspected and accepted.
- C. Store and protect accepted materials in accordance with manufacturer's directions and recommendations.
- D. Unless otherwise directed, store materials in original containers at not less than 70° F for not less than 24 hours immediately before installation.

1.06 JOB CONDITIONS

- A. Areas to receive base shall be heated to between 65 degrees F. and 90 degrees F. for at least 48 hours prior to installation. Maintain 65 degree F. temperature continuously during and after installation as recommended by manufacturer, but for not less than 48 hours. Thereafter do not allow ambient temperature to fall below 55 degrees F.

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1.07 ADDITIONAL MATERIALS

- A. Base: Provide one full box of 100 linear feet minimum or 1/4 % of total linear footage installed, whichever is greater, in each style and color of resilient base installed. Provide in manufacturer's original unopened boxes plainly labeled with description of contents. Do not furnish scrap.
- B. Accessories: Provide 100 linear feet or 1/6% of total linear footage installed, whichever is greater, of each style and color or resilient accessory installed. Provide in original boxes, plainly labeled, and in original uncut lengths. Do not furnish scrap.

1.8 WARRANTY

- A. Warrant products as given below. Provide manufacturer's standard warranty equal to or better than times given below and/or warrant materials as follows:

Wall base: 2years limited warranty

PART 2 – PRODUCTS

2.01 RESILIENT BASE

- A. Provide resilient .080 gage ASTM F 1861, Type TV, vinyl, Group I solid, homogeneous resilient PVC vinyl compound with color extending throughout thickness of product. Units shall be free of objectional odors, blisters, cracks and imperfections which detract from use or appearance. Comply with Fed Spec RT-T-650B Composition B, and complying with NFPA Class 1 and ADA material requirements.
- B. Provide base of 100 foot roll material in continuous lengths with wrapped, factory-made pre-formed corners. Base shall comply with the following:
 - 1. Typical Color: As selected from standard range, middle price level
 - 2. Height: As shown, if not indicated, 4 inches
 - 3. Typical & Carpet Style: Straight toe
 - 4. Style at VCT: Top-set standard cove toe
 - 5. Manufacturer: Roppe Corp. of Fostoria OH

2.02 ACCESSORIES

- A. Edge strips, guards, and reducers: Provide molded or extruded hard rubber finishing components to match conditions as manufactured by Roppe Corp, Johnsonite Inc., Mercer Plastic or approved equal. Materials shall be 1/8 inch or thicker, tapered or bullnose edge, color as selected by Contracting Officer's Representative, not less than 1" wide; at perimeter of resilient flooring where it abuts concrete floors. Special sizes and shapes as required to meet other adjacent floor materials such as carpet. Provide 1st quality rubber free of imperfections.
- B. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer. Asphalt emulsions and other non-waterproof types not acceptable. Where manufacturer insists on use of their adhesives for warranties to be effective, use only their product.

PART 3 – EXECUTION

3.01 INSPECTION

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- A. Examine the areas and conditions under resilient base and accessories are to be installed. Notify construction manager in writing of any unsatisfactory conditions which are not covered as part of the work of this section.
- B. Verify that walls are dry, clean and smooth, and are free of paint, varnish, excessive adhesive residues, solvents, wax, oil and other foreign matter. Do not proceed with installation of resilient base if conditions exist which would impair the timely completion or satisfactory performance of the completed installation.
- C. Beginning work shall constitute acceptance of substrate surfaces as satisfactory for proper installation of resilient materials.

3.02 PREPARATION

- A. Verify existing wall conditions to receive resilient flooring. As part of the work of this Section correct imperfections.
- B. Walls to receive resilient base shall be finished even. Plane and flatness of wall shall be free of perceptible deflections which in the opinion of the Contracting Officer's Representative adversely affect the appearance or function of the work.
- C. Fill all cracks in sub surfaces with specified crack filler.
- D. Prior to applying base clean surfaces to be covered. Remove dirt, oil, grease, sand, particles, bumps, ridges and surface imperfections or other foreign matter from surfaces to be covered.

3.03 INSTALLATION OF RESILIENT BASE AND ACCESSORIES

- A. Apply resilient base to walls, columns, plasters, casework and other permanent fixtures in rooms or areas where base is required. Install base behind back and sides of equipment not built into place. Install base in as long length as practicable, using rolls. Tightly bond base to backing throughout the length of each piece, with continuous contact at horizontal and vertical surfaces. Install with tight butt joints with no joint widths greater than 1/64 in.
- B. On masonry surfaces, or other similar irregular surfaces, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- C. Top-set base: Apply adhesive and firmly adhere to wall surfaces. Press down so that bottom cove edge follows floor profile. Form corners by heat bending. Scribe base accurately to abutting materials.
- D. Place resilient edge strips tightly butted to flooring and secure with adhesives. Install edging strips at all unprotected edges of flooring unless otherwise shown.
- E. Immediately clean excess adhesive from all wall and floor surfaces.

3.04 CLEAN UP

- A. Remove from the job site and legally dispose of all cartons, cans, and rubbish resulting from the work of this Section.
- B. Restore or replace any finished exposed surfaces soiled by the work of this Section.

END OF SECTION

SECTION 09680
CARPET

PART 1 - GENERAL

- a. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- b. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest issue of the publications shall be used.

- 1.1.1 Consumer Products Safety Commission (CPSC) Publication:
 - FF-1--70 Methenamine Pill Test
 - 16 CFR 1630 Standard for the Surface Flammability of Carpet and Rugs
- 1.1.2 American Association of Textile Chemists and Colorists (AATCC) Test Methods:
 - 8 Colorfastness to Crocking: AATCC Crockmeter Method
 - 16E Colorfastness to Light Using Xenon Arc
 - 134 Electrostatic Propensity of Carpets
- 1.1.3 American Society for Testing and Materials (ASTM) Publications:
 - D 1423 Twist Multiplier
 - D 418 Pile Yarn Floor Covering Construction
 - D 1335 Tuft Bind of Pile Floor Coverings
 - E 648 Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 - E 662 Smoke Density Test
- 1.1.4 National Fire Protection Association (NFPA) Publication:
 - 99-1984 Health Care Facilities
- 1.1.5 The Carpet and Rug Institute standard
 - 104-1994 Installation of Commercial Textile Floor Covering Materials

1.2 SUBMITTALS: Provide submittals in accordance with Section 01330 requirements.

1.2.1 NOT USED

1.2.2 Certified Test Reports: Submit for flammability, electrical resistance, and static propensity. The reports shall be dated within two years of the submittal for approval.

1.2.3 Certificates of Conformance: Certificates attesting that the carpet meets the requirements specified herein.

1.2.4 Evidence of Experience and Qualifications: Before installation of carpet, submit from the installation contractor, certificates attesting that the installation supervisor has had a minimum of five years experience in this type of work and will provide qualified, experienced installers to perform work. Include a list of previous jobs giving name, location, dollar value, and date, setting forth supervisor's experience.

1.2.5 Installation Instructions: Submit the carpet manufacturer's printed installation instructions. Include procedures for installation covering preparation of the substrate, seaming techniques, and recommended adhesives and tapes where applicable.

1.2.6 Samples:

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- a. Carpet: Initial Selection samples: provide samples at least 12 inches by 12 inches of full range of colors and patterns available. Owner may select two colors for final installation.
- b. Carpet: Verification samples: Three samples at least 12 inches by 18 inches of carpet indicated showing quality, pattern, and color specified, or as selected by Owner.

1.2.7 Maintenance Manual: Furnish two copies of the carpet manufacturer's maintenance manual. Include recommended type of cleaning equipment and materials, spotting and cleaning methods, and cleaning cycles.

1.3 DELIVERY AND STORAGE: Deliver carpet to the site in manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, and related information. Attach register number to each roll or stencil on the bale. Store in a safe, dry, clean, and well ventilated area. Store rolls flat, not standing on end and do not stack anything on top of carpet rolls. Do not open containers until needed for installation unless verifying inspection is required. If carpet is to be prefabricated at a carpet workroom, keep receiving records.

1.4 SAFETY: Carpet adhesives may contain toxic volatile components. Follow ventilation, personal protection, and other safety precautions as recommended by the manufacturer of the adhesive.

1.5 EXTRA STOCK:

1.5.1 Replacement Materials: After completion of work, deliver to the project site not less than an extra 5% of carpet, exclusive of material required to properly complete the installation. Furnish replacement materials from same production run as materials installed. Package replacement materials with protective covering or wrapping, clearly identified with appropriate labels as replacement material.

PART 2 - PRODUCTS

2.1 PHYSICAL REQUIREMENTS: Provide carpet of tufted, fusion-bonded, construction; first quality; and free of visual blemishes, streaks, poorly dyed areas, and other physical and manufacturing defects. Use nontoxic carpet materials and treatments, reasonably nonallergenic, and free of other recognized health hazards. Conform to the following:

2.1.1 Color and Patterns: Color and pattern shall be as specified and as indicated in the Drawings.

2.1.2 Physical Requirements

- a. Surface Texture: Performance loop pile
- b. Yarn Content: 100% solution dyed soil-hiding and stain-hiding
nylon; guage: 1/10 inch. Stitch count: 11.2 per inch.
- c. Average Pile Weight: 28 ounces per square yard
- d. Average Pile Height: .090-.125 inches "
- e. Backing Systems: Static dissipative PVC with conductive additive.
- f. Groundable Path: 5mm copper strip with seam stat. Refer to
Division 16450 GROUNDING. Paragraph 3.20
- g. Static Performance: Generation Test AATCC-134:
Prevents static build-up in excess of 3.0 KV

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- At 70 degrees F, 20% relative humidity.
- h. Width: 12 feet
 - j. Flame Resistance: Passes Pill Test (DOC-FF-1-70).
Rated Class I on Flooring Radiant Panel Test
(ASTM-E-648 Glue Down)
 - k. Smoke: NBS Smoke chamber NFPA-258 (450 or less)
 - l. Warranty: 10 year wear limited replacement warranty
Life of carpet static warranty
 - m. Dye System: Solution Dyed
- 2.1.3. Loop Pile: Single-level or textured pile of uncut pile yarns with maximum differential between finished pile heights (high and low pile) of 0.125 inch.
- a. Pile Yarn: Do not use reclaimed yarn fibers from any woven, tufted, knitted, or felted products. Do not use undrawn fiber in spun yarn. Provide spun yarn of at least two ply for loop pile carpets with sufficient twist to develop adequate yarn characteristics to ensure high wearability and to minimize pilling and fuzzing of the finished carpet. Provide plied yarns with a twist in the opposite direction to the singles. Use yarn setting method sufficient to assure permanent texture retention under normal use conditions, cleaning, and shampooing. Fiber denier and staple lengths may be subject to normal manufacturing tolerances with the following limitations:
 - b. Acceptable variance in staple length plus or minus 10 percent.
 - c. Acceptable denier variance, plus or minus 10 percent in individual filament denier and plus or minus 3 percent in average denier.
 - d. Twist and Twist Multiplier: For loop-pile carpet, ASTM D 1423. The minimum twist multiplier for singles is 2.75; minimum twist for a 2-ply yarn is 80 percent of the twist in the singles yarns; for a 3-ply yarn, 70 percent; and for a 4-ply yarn, 60 percent.
 - e. Continuous Filament Nylon: Not less than second generation, continuous high bulk or textured carpet type fiber with average filament size of 15 denier or coarser modified to provide increased translucence or opacity for soil hiding.

2.1.5 Backing Material: Those customarily used and accepted by the trade for carpet. A secondary backing is required for tufted carpet except when an attached cushion is specified or when a special back designed for direct glue-down is provided.

2.2 PERFORMANCE REQUIREMENTS:

2.2.1 Shrinkage: Maximum shrinkage of length and width shall be 3 percent.

2.2.2 Colorfastness to Light: AATCC 16E. Use the Xenon arc as the light source. Consider colors that are deeper or equivalent in hue to Row 2 of the AATCC Color Transference Chart as dark colors; consider those lighter as

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light colors. Colors for synthetic yarns show a gray scale rating of at least 4 for light shades after the equivalent of two L-4 breaks and at least 4 for dark shades after the equivalent of at least three L-4 breaks.

2.2.3 Dry and Wet Crocking: AATCC 8. Minimum rating of step 4 on the AATCC Color Transference Chart for all colors specified.

2.2.4 Pile Coverage: Sufficient to conceal backing.

2.2.5 Tuft Bind: ASTM D 1335. Provide minimum tuft bind in average pounds-force of 20 pounds for loop pile and 20 pounds for cut pile.

2.2.6 Flammability: CPSC 16 CFR 1630, all carpet shall comply. ASTM E 648; all carpet shall comply as follows: ASTM E 648, minimum average critical radiant flux of 0.22 watts per square centimeter. If attached cushion is specified, test carpet and cushion together as they will be installed.

2.2.7 Static Control: AATCC 134. Incorporate a permanent static control system to control static build-up to less than 2.0 KV. Test at 20 percent relative humidity at 70 degrees F.

2.2.8 Electrical Resistance: NFPA-99, (Both Tests). Electrical resistance shall be between 2.5×10^4 ohms and 1.0×10^8 ohms, measured between electrodes and floor to ground averaged from five or more readings. In addition, carpet shall be re-tested after one year of service and shall yield the same test results stated.

2.3 CALCULATION OF PHYSICAL REQUIREMENTS:

2.3.1 Pile Weight: ASTM D 418. Determine the average pile weight in ounces per square yard, except that pile weight of unshaired carpet may be determined by dissecting specimens taken from unfinished carpet before a back coating is applied. Unshaired carpet includes those which are tip sheared or defuzzed in a shearing operation where loss of fiber is negligible. Determination by dissecting specimens is only valid to the extent that it completely represents the pile weight of the fully finished carpet. In determining pile weights, make no allowance for the inclusion of any fibers needled or flocked onto or into the primary backing prior to tufting or weaving, or to any such process which is designed primarily to increase the total yarn weight and which is not integrally a part of the knitting, weaving, or tufting manufacturing process. In the event of variance in results between ASTM D 418 and the dissection method, the former prevails.

2.3.4 Pile Thickness: ASTM D 418. Determine the average pile thickness of the carpet. Make measurements to the nearest 0.01 inch instead of 0.10 inch as stated in ASTM D 418 = .018 - see individual specifications.

2.4 ADHESIVES: Adhesive shall be as recommended by the manufacturer of the carpet product.

PART 3 - EXECUTION

3.1 Shall conform to The Carpet & Rug Institute Standards 104-1994.

3.2 INSTALLATION: Install carpet after the work of other trades, including painting, is substantially done. Installed carpet must be smooth, uniform, and secure with a minimum of seams. Run side seams toward the light where practical and where such layout does not increase the number of seams. Install breadths parallel with carpet pile in the same direction. Match pattern goods according to manufacturer's recommendations. Fit cutouts such as door jambs, columns, and ducts. Locate carpet seams at doorways parallel to and centered directly under doors. Do not seam at

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doorways perpendicular to door or at pivot points. Follow the wall line parallel to the carpet direction for seams at corridor changes of direction.

3.2.1 Carpet Location: Install carpet wall-to-wall in rooms and areas indicated on drawings and located in the Room Finish Schedule except as otherwise indicated. Include all material indicated, specified, or necessary for a completely finished installation by the installation method specified. Contractor is responsible for the required quantities of carpet and must verify all dimensions in the field as well as other conditions affecting the work.

3.2.2 Substrate Preparation: Inspect rooms and areas to be carpeted. Before installation, verify that concrete floors comply with requirements on moisture and alkali content as recommended by adhesive or carpet manufacturer's instructions. Repair holes, cracks, depressions, or rough areas using material recommended by the carpet or adhesive manufacturer. Grind ridges smooth and level. Provide floor free of any foreign materials and swept broom clean. Comply with requirements for conditioning adhesives, towel notching and minimum floor temperature before, during, and after installation as recommended by the carpet and adhesive manufacturers' instructions. However, in no case may floor temperature be less than 65 degrees F for 24 hours prior to, during, and after installation. Carpet shall be installed where the temperature is between 65 degrees F and 95 degrees F, and the relative humidity is between 10% and 65%. Do not permit traffic or movement of furniture or equipment in carpeted areas for at least 48 hours after installation. Carpet installation constitutes validation by the Contractor that the substrate and conditions in the area meet all requirements for satisfactory installation.

3.3 INSTALLATION METHODS:

3.3.1 Direct Glue-down Without Cushion: Use manufacturer's recommended adhesive for each carpet product and install in accordance with the carpet manufacturer's printed instructions. A 100% transfer of the floor adhesive into the carpet backing while maintaining full coverage of the floor must be obtained. Install CPT1 using the manufacturer's recommended foil strips placed in direct contact with the carpet backing and connected to the building ground system.

3.3.2 Carpet Seams: Make uniform, unnoticeable, and permanent seams by any of the methods specified below, except when the carpet manufacturer specifies the seaming method. Treat all joining edges, regardless of seaming method, with a seam adhesive. Seams must have a minimum breaking strength of 100 pounds per inch and must be capable of withstanding all carpet cleaning processes.

3.3.2.1 Taped Seams: Tape with a minimum 4-inch wide carpet seaming tape recommended by the carpet manufacturer. Bond taped seams with seam adhesive.

3.3.2.2 Hot-Melt Tape Seam: Use a hot-melt system, compatible with the carpet backing and back coating. Seam in accordance with the tape manufacturer's directions using first quality, minimum 4-inch wide hot melt tape. Control iron temperature to protect carpet and carpet cushion. Pre-stretch the carpet in the seam direction before making the seam.

3.3.3 Molding: Finish carpet edges meeting hard surface flooring with moldings. Install moldings according to manufacturer's instructions. Color as indicated in the Drawings.

3.4 USABLE WASTE PIECES: Leave selected pieces at the site in an orderly manner, as directed by the COR. Remove all other waste pieces.

3.5 CLEANING AND PROTECTION:

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3.5.1 Cleaning: After installation, remove all debris, moldings, scraps, and other foreign matter. Remove any soiled spots or adhesive from the face of the carpet with the appropriate spot remover recommended by the carpet manufacturer. Clip any protruding face yarn with sharp scissors. Vacuum the carpet until it is clean.

3.5.2 Protection: Protect installed carpet with heavy, reinforced, nonstaining kraft building paper. Lap and secure edges of covering widths. Keep covering in repair and replace damaged portions. Remove protective covering or leave in place, as directed by the COR. Protect installation from rolling traffic by using sheets of hardboard or plywood in affected areas.

3.5.3 Curing of Adhesive: Restrict traffic for a minimum of 48 hours to allow proper adhesive cure. Exposure to water from cleaning and other sources should be restricted for a minimum of 30 days.

*** END OF SECTION ***

SECTION 09901
PAINTING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- B Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 SCOPE OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, and without limiting the generality thereof includes:
 - 1. Examine the various trade Sections of the Project Manual and be thoroughly familiar with all provisions regarding painting and finishing work included therein. Refer to Details and other Contract Drawings and Specifications for various surfaces to be painted or finished.
 - 2. Painting of all surface mounted raceway and electrical boxes (including pre-finished items) exposed to view in occupied spaces, corridors and other finished spaces (i.e. painting not required in mechanical and electrical rooms). Color to match color of wall/ceiling.
 - 3. Painting of plaster patching and the surrounding plaster. Painting shall include the plaster patch and surrounding surface to a natural break line to minimize visibility partial painting.
 - 4. Painting of all new interior gypsum drywall and existing gypsum drywall patched in connection with the work. Paint should extend a minimum of 1'-0" beyond new and/or patched area
 - 5. Clean and properly prepare all items designated to be painted.
 - 6. Finishing of all other items indicated on the Drawings as "painted."

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Colors and samples: This Contractor shall provide a color schedule with samples of proposed colors to match existing surfaces. C.O. will use samples in the field to confirm and approve colors.
 - 2. Literature: Manufacturer's complete product data and specifications for each type of coating to be applied hereunder, including material compositions, recommended application procedures, and product limitations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. To establish a standard of Quality and performance, the painting schedule herein is based on the products of the manufacturers listed within. Comparable products as manufactured by Benjamin Moore, Glidden, Pittsburgh, and other manufacturers may be submitted, provided adequate supporting data and samples are approved by the C.O.
- B. Ensure that all paints, enamels, and coatings, proposed to be applied hereunder, are compatible with coatings used for shop-primed items and items which have been prime-coated or pre-finished under the work of other trades. Bring to the C.O.'s attention any condition that may require a

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change in the specifications before proceeding with the work.

2.02 INTERIOR COATING SCHEDULE

- A. Vertical surfaces of gypsum wallboard, and concrete masonry units:
 - 1. First coat: Moore Q.D. Prime Seal, Glidden 3416 Vinyl Primer Tinted, PPG Speed hide Emulsion Sealer, or approved equal.
 - 2. Second coat: Moore Regal Aqua velvet, PPG Satin hide Latex Lo-Lustre, Glidden Spred Ultra Eggshell, or approved equal.
- B. Overhead horizontal surfaces of concrete and exposed to view gypsum wallboard and plaster; and vertical surfaces of previously painted concrete:
 - 1. First coat: Moore Q.D. Prime Seal, Glidden 3416 Vinyl Primer Tinted, PPG Speedhide Emulsion Sealer, or approved equal.
 - 2. Second coat: Moore Regal Wall Satin, Pittsburgh Wallhide Latex Flat, Glidden Spred Satin, or approved equal.
- C. Exposed to view metal raceways, associated boxes and all hangers and supports for such items within finished painted areas:
 - 1. First coat for galvanized metal surfaces, only: Galvanized metal primer, product of the finish coating manufacturer.
 - 2. Two coats: Moore Regal Aquavelvet, PPG Satinhide Latex Lo-Lustre, Glidden Spred Ultra Eggshell, or approved equal.
- D. Exterior metal:
 - 1. First Coat: Benjamin Moore's Iron Clad Retardo Rust Inhibitive Paint, Sherwin Williams Industrial Enamel, Glidden's Glid-Guard Alkyd Industrial Enamel, Porter Super Exterior Paint, or approved equal.
 - 2. Second and Third Coats: Benjamin Moore's Iron Clad Retardo Rust Inhibitive Paint, Sherwin Williams Industrial Enamel, Glidden's Glid-Guard Alkyd Industrial Enamel, Porter Super Exterior Paint, or approved equal.

PART 3 - EXECUTION

3.01 PROTECTION

- A. Furnish and lay suitable drop cloths in all areas where coating work is being done to protect floors and all other surfaces from damage during the work.
- B. At the completion of work in each area, remove all coating spots from all surfaces, including finish hardware. Do not use abrasive paper or abrasive cleaner on hardware.

3.02 STORAGE AND USE OF MATERIALS

- A. Store all materials in designated spaces, in a manner that meets the requirements of applicable codes and fire regulations
- B. Do not use the sanitary system for mixing or disposal of refuse material. Carry water to mixing rooms and dump waste material in a suitable refuse receptacle. Remove oily rags and waste each day.

3.03 WORKMANSHIP

- A. Perform all work with skilled painters under adequate supervision.
- B. Apply all materials under adequate illumination, spreading and smoothly following the materials on,

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without runs or snags.

- C. Perform all preparation work on the various surfaces, as required to properly receive paint and finish materials. Remove all foreign matter that would otherwise prevent proper adhesion of the applied finishes.

3.05 APPLICATION

- A. Apply all materials in strict accordance with the approved manufacturer's printed instruction, and in accordance with the best trade practices, and each coat shall be inspected and approved by the C.O. before succeeding coat is applied.
- B. Do not apply successive coating until the preceding coat is thoroughly dry, and in no case in less than 24 hours after the preceding coat.

3.07 CLEAN-UP

- A. Upon completion of the work of this SECTION 09901, remove all coating splatters from glass, pre-finished surfaces, bright metals, and from other surfaces that have not been painted or finished hereunder.

END OF SECTION

SECTION 10270 - ACCESS FLOORING -

PROVIDED FOR REFERENCE ONLY since the new NAS OPERATIONS ROOM consoles shall be installed on top of this existing raised floor system originally installed as per this specification Section 10270.

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the following:

1. Gravity-held panels on bolted stringer understructure.
2. Refer to drawings for conductive floor finishes.
 - a. Conductive high pressure laminate shall be factory-applied.
 - b. Refer to Section 09681 "Carpet Tile" for loose-lay conductive carpet tile on bare panel in Ops Room Location.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. D2859: Test Method for Flammability of Finished Textile Floor Covering Materials
2. E648: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
3. E699: Standard Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance With Test Methods Promulgated by ASTM Committee.

B. National Electrical Manufacturers Association (NEMA)

1. LD3: High Pressure Decorative Laminates.

C. National Fire Protection Association (NFPA)

1. 75: Standard for the Protection of Electronic Computer/Data Processing Equipment.
2. 99: Health Care Facilities.

1.3 DEFINITIONS

- A. Concentrated Static Load: Concentrated loads are applied on a small area and are typically imposed by stationary furniture and equipment with legs. A concentrated load is applied to the surface of the panel resulting in deflection and permanent set. Deflection and permanent set (rebound) is measured at the top surface after the load is removed.
- B. Uniform Static Load: Uniform loads are applied over the entire area of the panel and are typically imposed by stationary furniture and equipment without legs. The uniform load rating is specified in pounds per square foot.
- C. Ultimate Static Load: The load at which the panel has structurally failed and can no longer accept any loading. This is sometimes expressed as a multiple of concentrated load and referred to as a safety factor.
- D. Rolling Dynamic Load: Rolling loads are typically imposed by equipment on wheels moving across the access floor. They are defined by the number of passes, size and hardness of wheel and the combined weight of the cart and its contents on each wheel. Rolling loads are the most important performance criteria because they have a more damaging effect on the panel than a static load.
- E. Impact: Impact loads are imposed by objects accidentally dropped onto an access floor. These loads are defined by the weight of the load and the height or distance dropped. Impact loads generate severe shocks which can cause structural and panel damage. Impact loads most often occur during construction, move in and equipment/furniture rearrangements.
- F. Non-Combustibility: Non-Combustibility defines the floor system's susceptibility to fire and its capability to generate smoke or toxic vapors.
- G. Static Dissipation: The floor system's capability to create an effective path for static charge dissipation can be critical in areas where sensitive equipment is operated.

1.4 PERFORMANCE REQUIREMENTS

- A. Performance Requirements, General: Provide access-flooring systems to comply with the following:
1. Access flooring systems are proprietary portable systems composed of modular floor panels on elevated supports (understructures) forming accessible underfloor cavities (air spaces) to accommodate electrical and mechanical services.
 2. Installed access flooring system shall comply with performance requirements specified as determined by manufacturers' current standard products representing those indicated for this Project.
 3. System shall be tested as required in Section 15950 "Testing, Adjusting, and Balancing." Tests shall be performed with solid access floor panels with no cutouts. Provide additional panels as required to perform this test.
- B. Structural Performance per CISCA A/F: Install access flooring systems capable of supporting the loads indicated in this Article, within limits and under conditions indicated, as demonstrated by testing according to the referenced procedures in Ceilings and Interior Systems Construction Association's (CISCA) "Recommended Test Procedures for Access Floor." This publication and its procedures are referenced elsewhere in this Section as CISCA A/F.
- C. Floor Panels:
1. Concentrated-Load Performance: Panel shall be capable of supporting a concentrated load of 1250 pounds, placed on a one square inch area (using a round or square indenter) at any location on the panel with a maximum top surface deflection of 0.100 inches. Panel shall not exceed a permanent set of 0.010 inches, after the load is removed. Panel shall demonstrate ductility by being loaded to a deflection of 0.100 inches without incurring damage.
 2. Uniform Load: Panel shall be capable of supporting a uniform load of 300 pounds placed on a one square foot area at any location on the panel with a maximum top surface deflection of 0.060 inches. Panel shall not exceed a permanent set of 0.010 inches after the load is removed. Note: The uniform load rating of an access floor panel as specified herein should not be confused with the uniform live load as specified in seismic zone applications.
 3. Ultimate Load Performance: Panel shall be capable of withstanding a concentrated load of 3,100 pounds applied onto a one square inch area (using a round or square indenter) at any location on the panel without

failure. Failure is defined as the point at which the panel will no longer accept the load. Certified test report shall be provided attesting to this ultimate load.

4. Rolling Load; Panel and supporting understructure shall be able to withstand the following rolling loads at any location on the panel without developing a local and overall surface deformation greater than 0.040 inches. Note: Wheel 1 and wheel 2 tests shall be performed on two separate panels.
 - a. Wheel 1: Size 3-inch dia. By 1-13/16-inch wide: Load: 1000 lbs. Passes:10
 - b. Wheel 2: Size 6-inch dia. By 1-1/2-in wide: Load: 800 lbs. Passes: 10,000.
5. Impact Load: Panel and supporting understructure shall be capable of supporting an impact load of 150 pounds dropped from a height of 36 inches onto a one square inch area (using a round or square indenter) at any location on the panel.
6. Panel Drop Test: Panel shall be capable of being dropped face up onto a concrete slab from a height of 36-inches after which it shall continue to meet all load performance requirements as previously defined.
7. Panel Cutout: Panel with 8-inch diameter cutout shall be capable of withstanding an ultimate load without failure of 1,500 pounds anywhere on the panel.
8. Flammability: System shall meet Class A spread requirements for flame spread and smoke development. Tests shall be performed in accordance with ASTM-E-84-1008, Standard Test Method for Surface Burning Characteristics for Building Materials.

D. Pedestals: Provide pedestals with the following:

1. Axial Load: Pedestal assembly shall provide a minimum 6,000-pound axial load without permanent deformation.
2. Overturning Moment: Pedestal assembly shall provide an average overturning moment of 1,000-in-lbs. when glued to a clean, sound, uncoated concrete surface. ICBO number for the specific system or structural calculations shall be required to the lateral stability of the system under seismic conditions.
3. Concentrated Loads (Static Load): 1,250 pounds.

4. Uniform Loads (Static): 300 pounds.
 5. Ultimate Loads (Static): 3,750 pounds.
 6. Rolling Load: 1,000 pounds at 10 passes. 800 pounds at 10,000 passes.
 7. Impact Load: 100 pounds.
- E. Panel to Understructure Resistance: Not more than 10 ohms.
- F. Electrical Resistance: Not less than 2.5×10^4 ohms, nor more than 1.0×10^8 ohms, as determined by testing identical products according to the method for conductive flooring specified in NFPA 99, RTT, RTG, point-to-point (diagonal corner-to-corner across face of panel), point-to-ground, and tile-to-tile. Tile-to-tile method shall be tested across the seams. Total combined electrical resistance at the floor covering systems shall include carpet tile, conductive adhesive, foil, connectors, clips, access floor panels, and pedestal heads, to groundable point, and shall be less than 1.0×10^8 when tested in accordance with NFPA 99, RTT, RTG. Conduct test measurements at five different locations at installed area.

1.5 SUBMITTALS

- A. Product Data for each type of access flooring component specified. Include Material Safety Data Sheets (MSDS) for adhesives.
1. Submit manufacturer's specifications and installation instructions and independent ESD test data for carpet.
- B. Shop Drawings showing complete layout of access flooring components based on field-verified dimensions; include dimensional relationships to adjoining work and installation tolerances. Include details, with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions and gaskets, accessories, understructure, and other data to permit a full evaluation of entire access flooring system.
- C. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Test reports from a qualified independent testing agency evidencing compliance of installed access flooring system with performance requirements specified based on in-place testing or installed system.

- F. Data on earthquake-load resistance, essential facility, in the form of structural computations that have been signed and sealed by a qualified professional engineer responsible for their preparation. Include structural computations, material properties, and other information needed for structural analysis and for verification that system will withstand earthquake loads indicated. Refer to structural drawings for exact seismic requirements.
- G. Certification: Certify that electrical resistance of the grounded flooring and floor covering system complies with performance requirements specified, when tested in accordance with NFPA 75 test methods.
- H. Provide maintenance information for access floor system. Include instruction for proper removal and re-installation of panels to prevent damage. Refer to Section 01782 "Operation and Maintenance Manual Data."

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is experienced in installing the types of access flooring indicated for this Project.
- B. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to COR's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. NFPA Standard: Provide access flooring system complying with NFPA 75 and install to comply with NFPA 75 requirements for raised flooring.
- D. Single-Source Responsibility: Obtain access flooring from one source and by single manufacturer.
- E. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located, and who is experienced in providing engineering services of the kind indicted. Engineering services are defined as those performed for installations of access flooring systems that are similar to that indicated for this Project in material, design, and extent.

- F. Provide floor panels that are clearly and permanently marked on their underside with the panel type and concentrated load rating.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver access flooring components in original, unopened packages, clearly labeled with manufacturer's name and item description.
- B. Handle and store packages containing access flooring in a manner, which avoids damaging components and overloading building structure.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of access flooring until installation area is enclosed and has an ambient temperature of between 40 and 90 deg F and a relative humidity of not more than 70 percent.
- B. Field Measurements: Check actual locations of walls and other construction to which access flooring must fit by accurate field measurements before preparing Shop Drawings; show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9 COORDINATING AND SCHEDULING

- A. Coordination of Work: Coordinate location of mechanical and electrical work in underfloor cavity to prevent interference with access flooring pedestals.
- B. Mark pedestal locations with a grid of size indicated below on concrete subfloor so that mechanical and electrical work can proceed without interfering with pedestals.
 - 1. 120 by 120 inches.
- C. Do not proceed with installation of access flooring until after Substantial Completion of other construction within affected spaces.

1.10 WARRANTY

- F. Special Perforated Panel Warranty: Written warranty, signed by access flooring manufacturer agreeing to replace perforated panels that fail within the warranty period. Manufacturer warrants full replacement of panels due to breakage, cracking and splitting between the perforations. Warranty does not include breakage due to unusual traffic, failure of substrate, vandalism or abuse.

1. Warranty Period: 10 years from date of Substantial Completion.

1.11 EXTRA MATERIALS

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

1. Field Panels and Understructure: Furnish quantity of standard field panels and understructure components equal to 2 percent of amount installed.

PART 2 - PRODUCTS

2.1 ACCESS FLOOR SYSTEM - GENERAL

- A. Access floor system shall be compatible and inter-changeable with existing access floor system.

2.2 MANUFACTURER

- A. Known Acceptable Sources: Subject to compliance with requirements, manufacturers offering access flooring that may be incorporated in the Work include the following:

1. ConCore 1250 Panel, manufactured by Tate Access Floors, Inc., including accessories as specified in this Section.

2.3 FLOOR PANELS

- A. General: Modular field panels shall be similar to industry standard products. Provide accessible panels that will allow one person, using a portable lifting device, to interchange with field panels without disturbing adjacent panels or understructure. When properly installed, furnished panels will be free of exposed-metal edges with floor covering in place.
 - 1. Nominal Panel Size: 24 by 24 inches.
 - 2. Panel Attachment to Understructure: By gravity.
 - 3. Fabrication Tolerances: Fabricate panels to the following tolerances with squareness tolerances expressed as the difference between diagonal measurements from corner to corner.
 - a. Size and Squareness: Plus or minus 0.015 inch of required size, with a squareness tolerance of plus or minus 0.030 inch, unless tolerances are otherwise indicated for a specific panel type.
 - b. Flatness: Plus or minus 0.030 inch, measured on a diagonal on top of panel.
- B. Panel shall have an electrically conductive epoxy paint finish.
- C. Corner of panel shall have a locating tab and integral shape design to interface with the pedestal head for positive lateral retention and positioning with or without fasteners.
- D. Fit between the pedestal head, panel, and screw shall enable an installation with an average panel-to-panel gap of 0.015-inch.

2.4 FLOOR PANEL COVERING – CARPET

- A. Panel shall have loose-lay conductive carpet tile with conductive adhesive. Refer to Section 09681 “Carpet Tile.”

2.5 FLOOR PANEL COVERING – HIGH PRESSURE CONDUCTIVE LAMINATE

- A. Conductive Properties: Provide floor coverings with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.

1. Electrical Resistance: Test per ASTM F 150 with 500-V applied voltage or NFPA 99, Annex E.
 - a. Average greater than 25,000 ohms and less than 1 megohm when test specimens and installed floor coverings are tested surface to surface (point to point).
 - b. Average no less than 25,000 ohms with no single measurement less than 10,000 ohms when installed floor coverings are tested surface to ground.
2. Static-generation values reported by manufacturers may be limited by sensitivity of testing equipment used; consult manufacturers if static generation is critical.
3. Thickness: In manufacturer's standard thickness, but not less than 0.08 inch (2.0 mm).
4. Size: Sized to fit on panels; 24 by 24 inches (610 by 610 mm).
5. Seaming Method: Installed in factory by access flooring manufacturer.
6. Colors and Patterns: Refer to Interior Materials Finish Schedule.

2.6 UNDERSTRUCTURE

- A. Pedestals: Assembly consisting of base, column with provisions for height adjustment, and head (cap); made of steel.
 1. Base: Square, 5 inch by 5 inch by 1/8 inch thick base plate, Type 1 Pedestal Base, designed for bracing and supporting pedestals, bolted to slab.
 2. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than 2 inches. Include means of locking leveling mechanism at a selected height that requires deliberate action to change height setting and prevents vibratory displacement.
 3. Head: Designed for direct, non-bolted support of panels.
 - a. Provide sound-deadening pads or gaskets at contact points between heads and panels.
 4. Post-installed Expansion Anchors: Where required to comply with performance requirements, provide expansion anchors that have the capability to sustain, without failure, a load equal to 5 times that specified under Part 1 Article "Performance Requirements."
- B. Stringer Systems: Modular steel stringer systems made to interlock with pedestal heads and form a basket weave pattern placing stringers under each edge of each floor panel and a pedestal under each corner of each floor panel. Protect steel components with manufacturer's standard galvanized or corrosion-resistant paint finish.

1. Bolted Stringers: System of main and cross stringers connected to pedestals with threaded fasteners accessible from above.
 - a. Provide continuous gasket at contact surfaces between panel and stringers to deaden sound, to seal off underfloor cavity from above, and to maintain panel alignment, position, and plenum floor air pressure.
 - b. Provide stringers to support each edge of each panel where required to meet design-load criteria.

2.7 ACCESSORIES

- A. Colors and finishes: For exposed accessories available in more than one standard color or finish, provide color or finish complying with Interior Finish Material Schedule.
- B. Cutouts: Contractor shall coordinate with COR quantity and location of floor cutouts. Fabricate cutouts for floor panels for cable penetrations. Comply with requirements indicated for size, shape, number, and location. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with standard performance requirements.
 1. Provide trim edge of cutouts with manufacturer's standard plastic molding or grommets.
 2. Provide airtight installation to maintain integrity of underfloor plenum.
 3. Fit cutouts with manufacturer's standard grommets in sizes indicated or, where size of cutouts exceed maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding having tapered top flange.
 - a. Provide removable covers for grommets.
 4. Seal cutouts to comply with manufacturer's requirements.
 5. Provide foam-rubber pads for sealing annular space formed in cutouts by cables and trim edge of cutout with molding having flange and ledge for capturing and supporting pads.
- D. Panel Lifting Device: Manufacturer's standard portable lifting device of type and number required for lifting panels with floor covering provided.

1. Provide 4 lifting devices of each type required.
- E. Perforated Panels: Provide load bearing perforated panels with 25 percent open area interchangeable with standard field panels and complying with the following requirements:
1. Air-Distribution Characteristics of Units With Dampers: Capable of delivering 390 cfm at 0.05-inch wg static pressure.
 2. Structural Performance: Capable of supporting a 1250-lbf concentrated load.
 3. Number of Grilles: As indicated on Drawings.
 4. Finish: Conductive HPL as indicated on Interior Materials Finish Schedule.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Locate each pedestal, complete subfloor preparation, and vacuum clean the subfloor to remove dust, dirt, and construction debris before beginning installation.
- B. Closures: At column enclosures within access floor area seal penetrations at column bases airtight with neoprene gasketing.

3.2 COORDINATION

- A. Coordinate with carpet installers for installation of loose-lay carpeting on access flooring system. Carpet installation shall be completed prior to testing of access flooring system.

3.3 INSTALLATION

- A. Install access flooring system and accessories to produce a rigid, firm installation that complies with performance requirements and is free of vibration, rocking, rattles, and squeaks.

- B. Bolt base plate holding pedestal to floor.
- C. Lay out floor panel installation to keep the number of cut panels at the floor perimeter to a minimum. Scribe perimeter panels to provide a close fit with adjoining construction with no voids greater than 1/8 inch where panels abut vertical surfaces. Provide neoprene gasketing along perimeter to provide airtight seal.
- D. Secure stringers to pedestal head according to the access flooring manufacturer's instructions.
- E. Scribe underfloor-cavity dividers to closely fit against subfloor surfaces and seal with mastic to maintain plenum effect within underfloor cavity.
- F. Scribe vertical closures to closely fit against subfloor and adjacent finish floor surfaces. Set in mastic and seal to maintain plenum effect within underfloor cavity.
- G. Clean dust, dirt, and construction debris caused by floor installation, including vacuuming the subfloor area, as installation of floor panels proceeds.
- H. Perimeter Support: Provide method for supporting panel edge and form transition between access flooring and adjoining floor covering at same level as access flooring.
- I. Do not cut and trim access flooring components or perform other dirt-or-debris-producing operations in the rooms where the floor is being installed.
- J. Cut and trim access flooring and perform other dirt-or-debris-producing operations as remotely as possible from installation area and to prevent contamination of subfloor under access flooring already installed.
- K. Level installed access flooring to within 0.10 inch of true level over the entire access flooring area and within 0.062 inch in any 10-foot distance.
- L. Carpet Installation: Refer to Section 09681 "Carpet Tile" for locations that will receive loose-lay carpet tiles.
- M. Grounding: Refer to Section 16452, "Grounding."

3.3 TESTING

- A. Testing Electrical Resistance: Testing shall be in accordance with NFPA 99 modified by placing one electrode on the center of panel surface and connecting the other electrode to the metal flooring support. Measurements shall be made at five or more locations. Each measurement shall be the average of five readings of 15 seconds duration at each location. Relative humidity and temperature during tests shall be 45 to 55 percent and 69 degrees F to 75 degrees F, respectively. The panels used in the testing shall be selected at random and shall include two panels most distant from the ground connection. Electrical resistance shall be measured with instruments, which are accurate within two percent and have been calibrated within 60 calendar days prior to the performance of the resistance tests.
- B. Coordinate with mechanical testing and balancing technician for testing as specified in Section 15950 "Testing, Adjusting and Balancing."

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjusting: Re-level and re-adjust floor prior to substantial completion and to satisfaction of COR.
- B. After completing installation, vacuum clean access flooring and cover with continuous sheets of reinforced paper or plastic. Maintain protective covering until the time of Substantial Completion.
- C. Replace access flooring panels that are stained, scratched, otherwise damaged, or not complying with specified requirements.

END OF SECTION 10270

SECTION 12361 – OPERATIONS CONSOLES

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and other specification sections, including Division 1 Specifications, apply to this Section.

2.2 SUMMARY

- A. This Section includes but is not limited to the following console requirements:

1. Framing
2. Cladding
3. Work surfaces
4. Shelves
5. Lighting Locations
6. Internal Cable Management
7. File and storage units
8. Console Hardware
9. Slat-wall
10. Articulating Arms
11. Console Ventilation
12. Electrical Distribution (including dedicated space)
13. Data and Phone Distribution (including dedicated space)

- B. Related Sections include the following:

1. Access Flooring System 10270 (for reference only).

2.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide consoles and support framing capable of withstanding the effects of the following gravity loads and stresses, per support framing module, without permanent deformation excessive deflection, or binding of drawers and doors.

1. Fixed Shelves: 200 lbs concentrated
2. Slide Out Shelves: 100 lbs concentrated
3. Work Surface: 150 lbs/lf
4. Top of Support Framing System: 500 lbs concentrated
5. Top of Base Cabinet: 350 lbs concentrated
6. Doors: 250 lbs vertically concentrated

7. Point of connection to Slatwall: 100lb.vertical load applied at the end of full extension of articulating arm.
- B. Seismic Performance: Provide console casework and support framing capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures".
 1. Seismic Design Criteria:
 - a. Seismic Design Category A
 - b. Seismic Importance Factor 1.5
- C. Functional Flexibility: Console Design shall be a modular component system which will allow the owner complete flexibility for the entire reconfiguration of the consoles for any future functional needs. The system will be comprised of a multitude of variable sized components, which will enable the user to reconfigure the console arrangement into a variety of shapes and sizes, while minimizing the need for additional parts.
- D. Functional Accessibility: System shall be accessible from all sides of the consoles, including top and bottom, with minimal impact to the user or service technician. Consoles shall provide ample cavity space to house CPU's as indicated on drawings. CPU's shall be accessible and removable from both the front and rear without tilting, turning, or twisting the CPU.
- E. Ergonomics: In addition to meeting UFAS and ABA requirements, design of consoles will enable the users to perform their job function at the console positions through ergonomically enhanced features that will provide ample ergonomic leg room free of any intermediate supports clear span from edge to edge as shown on drawings. At positions that are eight (8), nine (9), and 10' (ten) foot wide countertops will be continuous and seamless, and any support systems used will not interfere with the users transition across the span. Ergonomic design shall be compliant with ANSI, ISO and BIFMA standards.
- F. Aesthetics: The console Vendor shall be responsible for all finishes and components of consoles to insure a consistent product conducive to a Control Room Environment.
- G. Environmental: During the design process, consideration should be made regarding sustainability of materials, employing recycled materials, energy efficient characteristics, employing a green organic approach consistent with the LEEDS process. In addition all components, binders, bonders, adhesives, paints and finishes shall contain low or no volatile organic compounds (VOC's).
- H. Fire Retardant and Smoke: Console components shall meet the minimum requirements for fire retardant requirements. Surface burning characteristics of finishes in accordance with ASTM E84 or UL723.
- I. Mechanical: Provide the capability for sufficient air circulation within the console. The expected sensible mechanical load for the Operations Room is 320 MBH.

2.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
1. Manuals
 2. Installation instructions for reconfigurations
 3. Warranties
 4. Vendor supplied final installation inspection checklist.
 5. List of proprietary products
 6. Spare parts
- B. Design and Shop Drawings: For consoles. Submit for approval, 8 hard copies and one electronic copy of scaled CAD drawings, elevations, sections, isometrics, details, list of components and attachments for each numbered console. COR will require approval of design drawings submittal and approval of shop drawing submittal prior to fabrication.
1. Indicate locations of blocking and reinforcements required for installing console components.
 2. Include details of utility spaces showing supports for cable management systems.
 3. Include details of support framing system.
 4. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other console or miscellaneous equipment.
 5. Indicate available clear space provided in console cavity housing equipment (by others) to adjacent structural frame, cladding, cable management trough etc.
 6. Indicate slat-wall configurations and height.
 7. Indicate number, type and location of articulating arms for monitors including size of monitor being supported, including size and weight carrying capabilities.
 8. Indicate space for all electrical and communications outlets for each individual console.
 9. Indicate location of lighting fixture supports for each console (fixtures to be supplied by others).
 10. Include all ergonomic clearances (eg. knee space) as well as sightline obstruction to large screen monitors.
 11. Indicate exhaust fans and louvers in console panels, if required.
 12. Indicate areas restricting access to raised floor system below.
 13. All components shall contain a parts number for ordering parts for future reconfigurations.
- C. Samples for Initial Selection.
- Submit samples and finishes available for the following components:
1. Countertop material
 2. Cladding
 3. Frame
 4. Hardware
 5. Shelves
 6. Lighting supports
 7. Articulating arms with cable management
 8. Electrical outlets/power strips
 9. Data and phone jacks

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10. Audio interface jacks
 11. Grounding connections
 12. Seismic restraints
 13. Slat wall configuration
 14. Adjustable legs
- D. First Article: Provide a first article unit for inspection by COR. The first article shall be a complete unit to include a sample of every detail and appurtenance expected throughout project. Unless otherwise directed, approved unit will become part of the completed work if unit remains in the post production condition. The first article unit shall include the following:
1. One complete 10' console to include cladding, doors and countertop with proposed finishes.
 2. One full-size, finished storage drawer assembly complete with hardware, 1 small drawer, 2 storage drawers.
 3. All internal equipment supports and cable management.
 4. Power and communications outlets.
 5. One of each type of articulating arm with cable management assembly and accessory item specified.
 6. Seismic restraints.
 7. Stackable slat wall with internal cable management.
 8. Grounding connections.
 9. Full size template.
 10. Required hardware for adjacent console attachment.
- E. Templates: One month prior to shipping of approved consoles assembled at manufactures location, console manufacturer will provide full size templates per each console.
1. One full size floor template for each console shall be installed at the Command Center one month prior to the arrival of consoles.
 2. Prior to shipping of consoles COR will approve templates and their installed locations at the Command Center Control Room.
 3. Template will indicate all structural and seismic support locations.
 4. Template will indicate all areas of obstructions preventing location of console conduit feeds from raised floor below.
 5. Templates will indicate areas restricting access to raised floor system below.
- F. Submit Sample of installation inspection checklist for approval.
- 2.5 QUALITY ASSURANCE
- A. The manufacturer shall have a minimum of 7 years experience in console design, production and installation.
 - B. All console components shall be manufactured or compatible with the console manufacturer.

- C. The applicable standards of the following organizations shall be enforced:
 - 1. ANSI and ABA for human factors design
 - 2. BIFMA for furniture systems design guidelines
 - 3. UL for electrical systems listings
 - 4. ASME for material characteristics
 - 5. AWS for welding of materials
 - 6. NFPA for life safety and fire protection requirements
 - 7. OSHA for occupational safety requirements
 - 8. IBC for general building code compliance
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Vendor shall formulate and utilize an installation inspection checklist. Checklist shall be submitted to COR for approval prior to installation.

2.6 DELIVERY, STORAGE, AND HANDLING

- A. All deliveries shall be coordinated through the COR.
- B. Contractor shall assume all costs related to delivery, storage and handling.
- C. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.
- D. Console manufacturer shall store consoles until facility under construction is ready for acceptance. Closely coordinate this scheduled event with the COR.
- E. On site storage for delivery vehicles will be available at the facility, but no staging inside the building will be available. Coordinate with COR.
- F. Vendor will be responsible for accepting all quantities of delivered materials and will coordinate with COR.
- G. Vendor will need to make provisions for delivery. There will be not be 4' high truck dock or lift devices. Fork trucks/lifts will not be available.
- H. In the event of an unforeseen delay the vendor shall immediately notify the Contracting Officer of the anticipated impact.
- I. All dumpster and disposal costs will be the responsibility of the contractor.

2.7 PROJECT CONDITIONS

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- A. This facility operates twenty-four (24) hours per day, seven (7) days per week, as such the COR will not tolerate any outages, interruptions or delays. The COR reserves the right to cancel or suspend delivery, and/or installation of work during the duration of the project.
- B. Operations Room can receive consoles once partial beneficial occupancy of new facility has been established. Remainder of facility will still be under construction.
- C. Contractor will be made aware of other ongoing modernization and construction contracts at this facility. Contractor must cooperate fully with separate contractors so work on all contracts may run properly, and not interfere with or delay work under this contract.
- D. Environmental Limitations: The COR will advise the contractor when the Operations Room consoles can be delivered and installed.
- E. Consoles will be installed on raised access floor having a concentrated load value of 1250 lbs and a uniform load rating of 300 pounds per square feet.
- F. Prior to submitting bid, vendor shall visit site to verify delivery, on site storage and access to building constraints.

2.8 COORDINATION

- A. Contractor will coordinate with the COR, the layout and installation of framing and reinforcements for support of consoles.
- B. Contractor will coordinate installation of consoles with installation of access floor system panels and support grid, under floor electrical cable trays, junction boxes, panels and other adjacent equipment.
- C. Contractor will supply the COR with templates four (4) weeks prior to delivery of consoles to insure work required for console installation is complete prior to installation.
- D. The facility is under construction, and as such, the contractor must interface with the COR to ensure proper coordination with other contractors on site for the duration of the project.
- E. Contractor shall be responsible for all installation and delivery personnel while on site. See section 01593.
- F. Weekly progress updates will be required to be submitted to COR during design and fabrication phases.
- G. Weekly progress meetings will be conducted by the installer during delivery and installation phases.
- H. Contractor will provide training and familiarization of console composition, layout and operation for COR maintenance technicians. Provide (3) 2 hours sessions to be scheduled with the FAA COR.

2.9 EXTRA MATERIALS

- A. Furnish complete touchup kit for each type and color of exposed console components provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to any console damaged finish that may occur after the final acceptance by the COR. Any damage to the consoles incurred prior to acceptance shall be replaced and will not be repaired in the field.
- B. Furnish extra materials, as described below, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Connecting Hardware and Fasteners: Quantity equal to 10 percent of amount installed, but no fewer than 20 of each type.
 - 2. Articulating Arms: 2 of each type supplied.
 - 3. Castered Storage drawer cabinets- 2 required.

PART 3 - PRODUCTS

2.1 CONSOLE FEATURES

- A. Console Metal Frame: Cold-rolled commercial steel sheet, complying with ASTM A1008/A1008M, powder coated finish or series 6063 aluminum.
 - 1. Sizes and shapes as required to support console structural loads with a factor of safety of 30%.
- B. Work surface: Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1".
 - 1. Seamless Plastic-Laminate
 - a. Work surfaces: Plastic-laminate sheet, complying with NEMA LD 3, shop bonded with waterproof adhesive to both sides of 1" thick core.
 - b. Plastic-Laminate for flat countertops: HGS or HGL
 - c. Plastic-Laminate Type for Side or End Panels: HGP.
 - d. Plastic-Laminate Type for Doors: HGP.
 - e. Countertop Core: Hardwood-faced plywood, medium-density-fiberboard, or .45 lb industrial grade particleboard complying with ANSI A208.1, Grade M-2, Exterior Glue.
 - f. Colors, Textures, and Patterns: As selected by COR from plastic-laminate manufacturer's full range
- C. Work Surface Nosing: Impact absorbing nosing on all exposed edges of work surfaces.
- D. Cladding: 1" thick particleboard with thermo-fused melamine laminate. Provide panels with flame-spread and smoke-developed indices of not more than 25 and 50, respectively, as determined by testing identical products per ASTM E 84.

- E. Access Panels: Shall be finished on all faces and edges and z-clipped fastened to frame or hinged. Panels shall be removable by simply lifting panel vertically off z-clip and removing horizontally or opening door. Align clips to insure snug fit that is properly aligned with adjacent panels and frame for removable panels. For hinged doors, secure hinge to frame.
- F. Storage drawer assembly (movable): with lockable caster, capable of storing under console with face of cabinet to be flush with edge of work surface in stored position. (Approximately 44).
- G. Support arms: Fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Weld drawer front to sides and bottom to form a single, integral unit. Provide drawers with rubber bumpers, ball-bearing slides, and positive stops to prevent metal-to-metal contact or accidental removal.
- H. Fixed Shelves: Shelves shall be perforated for air flow. Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels. Arrange for vertical CPU with approximate dimensions of: width 8", length 19.5", height 19", weight 50 lbs. Orientation of CPU shall be front to back, vertical as shown on dwgs.. CPU's shall be removable both front and back of the console.
- I. Utilities: Provide space, cutouts, and holes for cable management systems, conduits, and fittings in console bodies to accommodate utility services and their support-strut assemblies.
- J. Doors: Mortise for hinges and reinforce with angles welded inside inner pans at hinge edge. Hinge from frame.

3.2 CONSOLE SYSTEM

- A. General: Provide console manufacturer's standard integrated system that includes support framing, suspended modular cabinets, filler and closure panels, countertops, and fittings needed to assemble system. System includes hardware and fasteners for securing support framing to permanent construction.
 - 1. Console components can be removed and reinstalled without use of special tools for relocation within system.
 - 2. Storage drawer assembly with one small drawer and two storage drawers can be removed without providing temporary support for countertops.
 - 3. System consists of filler and closure panels to close spaces between support framing, cabinets, shelves, countertops, floors, and walls, unless otherwise indicated. Fabricate panels from same material and with same finish as cabinets and with hemmed or flanged edges.
 - 4. Console cavity space shall provide clearance from any support member, cladding, cable trough for the following minimum dimensions:
 - a. Front to back depth of 24.5 inches
 - b. Vertical height of 20"

- B. Support Framing: Console manufacturer's standard system consisting of vertical supports and connecting braces and rails as follows:
 - 1. Slatwalls, shelves and countertops are supported from vertical supports. Vertical positioning of supported cabinets, shelves, and countertops can be varied in 1-inch increments through full height of supports.
 - 2. Vertical supports with adjustable leveling bases are installed with braces and rails connecting them to each other and to concrete slab below access floor system to create a stable, rigid structure with framed utility spaces where indicated.
 - 3. Vertical supports are braced at floor with cantilevered horizontal leg members where indicated.
- C. Countertops: Provide in modular lengths without seams, secured to frame with concealed fasteners.
- D. Cladding: Rigidly connect to frame.
- E. Access Panels and Doors: Zee clipped access panels for easy removal and replacement. Hinged doors where required. Access panels when removed without tools shall provide a vertical clearance of 20".

3.3 CONSOLE HARDWARE

- A. General: Provide console manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges: Stainless-steel, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 36 inches (1200 mm) or less in height and 3 for doors more than 36 inches (1200 mm) in height.
- C. Pulls: Stainless steel fastened from back with two screws, complying with BHMA A156.9.
- D. Door Catches: Nylon-roller spring catch or dual, self-aligning, permanent magnet catch complying with BHMA A156.9. Provide 2 catches on doors more than 36 inches in height.
- E. Drawer Slides: Powder-coated, full-extension, self-closing, heavy-duty drawer slides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; complying with BHMA A156.9, Type B05091, and rated for 150 lbf (670 N).
- F. Locks: standard cabinet locks complying with BHMA A156.11. Provide two keys per lock.

3.4 COUNTERTOPS

- A. Countertops, General: Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch.
- B. Provide integral audio interface (jack) in exposed edge of console. Rear of audio interface shall be accessible to and protected by cable management system.
- C. Seamless Plastic-Laminate:
 - 1. Countertops: Plastic-laminate sheet, complying with NEMA LD 3, shop bonded with waterproof adhesive to both sides of 1 inch thick core.
 - 2. Plastic-Laminate Type for Flat Countertops: HGS or HGL.
 - 3. Plastic-Laminate Type for Side or End Panels: HGP.
 - 4. Plastic-Laminate Type for Doors: HGP.
 - 5. Countertop Core: Hardwood-faced plywood, medium-density-fiberboard, or particleboard complying with ANSI A208.1, Grade M-2, Exterior Glue.
 - 6. Colors, Textures, and Patterns: As selected by COR from plastic-laminate manufacturer's full range.

3.5 ACCESSORIES

- A. Slat walls
 - 1. Low Profile 18" maximum height from top of countertop.
 - 2. Stackable not to exceed an overall height of 18" above countertop work surface.
 - 3. Capable of supporting a multitude of device such as light fixtures, shelves, articulating arms for monitors, phones, receptacle/power strips, etc.
 - 4. Horizontal supports slats spaced per console manufacturer's standard while meeting industry standards for utilizing maximum flexibility and infinite number of possibilities when locating the aforementioned devices of the user.
 - 5. Colors, Textures, and Patterns: As selected by COR from manufacturer's full range.
 - 6. Capable of managing all cabling and wires originating from monitors, phones, articulating arms, desktop printers, etc and feeding below to inside of consoles which houses processors on shelving. Provide access to raised floor below consoles.
- B. Articulating Arms: Shall be compatible with slat wall system and capable of supporting the following components:
 - 1. Approximately 275 monitors of varying sizes and weights.
 - 2. Multiple monitors per arm - 24" diagonal (in widescreen aspect ratio) LCD flat screen Monitors weighing approximately 25 lbs.
 - 3. Light fixture weighing approximately 5 lbs.
 - 4. Phone system weighing approximately 5 lbs.
 - 5. Fully adjustable 360 degrees yet fully lockable in the desired position.
 - 6. Provide cable management integral with arm and slatwall.
 - 7. CCS-W Touch Entry Display- approximate weight-35 lbs-Unit will be mounted on an articulating arm attached to slat wall. One per console typical.

- C. Audio Interface shall be integral with edge of countertop. Device and housing shall type shall be coordinated with requirements of phone system.

3.6 CABLE MANAGEMENT

- A. Wireway shall be listed and labeled as defined by NFPA 70, article 100 by a testing agency acceptable to the authority having jurisdiction and marked for it's intended use.
- B. Wireway shall be located in the console in such a manner as to not impede full use and function of the all systems to reside in the console. They will not restrict access or removal of the CPU's from the console.
- C. Adaptability: wireway shall be adaptable to wireway in adjacent consoles.
- D. Separate wireway shall be provided for power and for data/phone systems.
- E. Cable management for accessories shall be such that wires and cables serving accessories are not excessively exposed on articulating arms or slat walls.

3.7 ELECTRICAL DEVICES

- A. Electrical Devices, General: Provide units complete with metal enclosures, receptacles, terminals, switches, dimmers, device plates, accessories and gaskets required for mounting on consoles.
- B. Receptacles:
 - 1. Essential Type: 125V, 20 A Specification Grade. Comply with NEMA WD1, NEMA WD6 and UL 498. Configuration 5-20R. .
 - 2. Critical Type: 125V, 20A, Spec Grade. Comply with NEMA WD1 and NEMA WD6 and UL498. Configuration L5-20R.
- C. Switches: Comply with FS W-C-896, UL 20 and NEMA WD1. Provide single-pole, double-pole, or 3-way switches as required, rated 120 to 277-V ac and in amperage capacities to suit units served.
- D. Cover Plates: Type 304 stainless-steel cover plates with formed beveled edges.
- E. Cover-Plate Identification: Use 1/4-inch high letters unless otherwise indicated.
- F. Ventilation: As required to meet cooling requirements.
- G. Provide capability for each console section to be grounded/bonded to existing ground counterpoise (located on concrete sub-floor, 18" below finished floor). Each console section shall be predrilled in preparation of being bonded to the existing ground counterpoise using a two hole bonding strap (provided and installed by others).

PART 4 - EXECUTION

4.1 GENERAL

- A. Production shall begin after the following requirements have been satisfied:
 - 1. Design drawings have been approved by COR.
 - 2. Shop drawings have been approved by COR.
 - 3. All catalogue cuts, samples and submittals have been approved by the COR
 - 4. Mock-up Console has been approved.
 - 5. All finishes have been approved.
 - 6. Template drawings have been approved.
 - 7. Individual consoles inspected and approved at manufacturers site prior to shipping.
 - 8. Approved shipping schedule.
 - 9. Approved installation checklist.
 - 10. Proceed with production only after unsatisfactory conditions have been corrected.

4.2 INSTALLATION OF CONSOLES

- A. Prior to installation, contractor shall visit site and notify COR of any condition or deficiency that would prevent proper installation of the consoles.
- B. Contractor will be responsible for supervision of all on site personnel
- C. Installation of the consoles must be performed by fully trained, and qualified, personnel, who are certified by the contractor to install their product.
- D. Consoles will be installed on raised access floor having a concentrated load value of 1250 lbs and a uniform load rating of 300 pounds per square feet.
- E. Install level, plumb, and true.
- F. No cutting or drilling of console components on site will be tolerated unless approved by the COR.
- G. Contractor will supply all necessary tools required for installation.

- H. Future reconfigurations by the COR must not require special tools.
- I. Utility-Space Framing: Secure to floor with two fasteners at each frame.
- J. Bolt adjacent consoles together with joints that are flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
- K. Install all hardware uniformly and precisely. Set hinges snug and flat in mortises.
- L. Adjust console panels and hardware so that doors and drawers align and operate properly, without warp or bind, and that all contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

4.3 INSTALLATION OF COUNTERTOPS

- A. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
- B. Fastening:
 - 1. Secure countertops, to cabinets with Z-type fasteners or equivalent, using four or more fasteners at each cabinet front and back, and two or more at each side and end.

4.4 INSTALLATION OF ACCESSORIES

- A. Install accessories according to Shop Drawings and manufacturer's written instructions.

4.5 INSTALLATION OF ELECTRICAL DEVICES

- A. Install devices in accordance with approved Shop Drawings and manufacturer's written instructions.

4.6 CLEANING AND PROTECTING

- A. Protect consoles surfaces during shipping, delivery and installation to prevent any damage.
- B. Clean finished surfaces to match original factory approved console finish.
- C. All shipping containers, pallets, packaging, excess material, damaged parts etc. shall be properly removed from the site.

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4.7 SCHEDULE

A. The contractor will submit a schedule which will validate the following proposed schedule dates:

- | | |
|--|--------------------|
| 1. COR receives design dwgs and finishes | May1, 2018 |
| 2. COR signs off on design dwgs and finishes | May 15, 2018 |
| 3. COR receives shop drawings | May 29, 2018 |
| 4. COR signs off approved shop drawings and finishes | June 12, 2018 |
| 5. COR approves "First Article" and templates | June 26, 2018 |
| 6. Approved Templates received by COR on site | July 10, 2018 |
| 7. Manufacturing of consoles complete | July 25, 2018 |
| 8. Ship and receive Consoles | August 1, 2018 |
| 9. Space Operations Room Installation Complete | August 31, 2018 |
| 10. NAS Operations Room Installation Complete | September 29, 2018 |
| 10. Punchlist and Acceptance | September 30, 2018 |

B. The schedule dates are tentative and are dependant upon other contracts, completion dates etc. These dates could vary but the durations will remain the same. Contractor must notify the Contracting Officer immediately of any potential impact to the schedule.

4.8 WARRANTY

- A. One year parts and labor for full replacement.
- B. Warranty to commence at completion of installation and COR acceptance.

END OF SECTION 12361

SECTION 12525

SOLAR CONTROL WINDOW SHADES

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS: The publication listed below forms a part of this specification to the extent referenced. The publication is referred to in the text by the basic designation only. The latest issue of the publication shall be used.

1.1.1 Federal Specification (Fed. Spec.):

L-P-3776 Plastic Sheet and Strip Polyester

1.1.2 Association of Industrial Metalizers, Coaters and Laminators (AIMCAL)

Standard Methods

1.1.3 Federal Standard (Fed. Std.)

FED-STD-102 Preservation, Packaging and Packing Level

1.2 SUBMITTALS: Provide submittals in accordance with Division One requirements.

1.2.1 Shop Drawings and Literature: Submit in sufficient detail to verify installation method and compliance with requirements.

1.2.2 Samples: Submit two 12-inch square samples showing color and thickness of material.

1.3 DELIVERY AND STORAGE: Deliver the shades to the site in the manufacturers original containers meeting FED-STD-102 with manufacturer's name and container contents clearly labeled. Store in a safe, dry, clean and well ventilated area. Do not open containers until needed for installation unless verification inspection is required.

PART 2 - PRODUCTS

2.1 TRANSLUCENT PLASTIC WINDOW SHADES: Manufacturers listed are for color and material reference and are not intended to limit selection of other manufacturers products with similar colors and materials.

2.1.1 Plastic Film Construction: Shall consist of four-ply laminated polyester film. The two laminated center sheets shall each be 1.5 mil thick polyester vat dyed gray in color. A clear 1 mil thick polyester film shall be laminated to each side of the gray film laminate. Coat one side with a scratch resistant coating. The final film construction will be 5 mils thick, optically clear and totally transparent. Surface tinting and/or color adhesives will not be accepted as equal without independent reports qualifying the color stability in comparison with the vat dyed process.

2.1.2 Shade Material: Shade film shall be manufactured from a polyester type polymer in accordance with Federal Specification L-P-3776 for Type V.

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2.1.3 Ultraviolet Transmission: The shade shall transmit no more than 4% of the ultraviolet solar energy (from 300 to 380 nanometers) when measured by AIMCAL standard methods.

2.1.4 Visible Light Transmission: The shade shall transmit no more than 6% of the visible solar energy (from 380 to 780 nanometers) when measured by AIMCAL standard methods.

2.1.5 Total Solar Energy Rejected: The shade shall reject 48% of the total solar energy transmitted from 360 to 2100 nanometers when measured by AIMCAL standard methods.

2.1.6 Bottom Bar: Shades shall have a flat one-inch by one-half inch, dull black, full width metal hemline bar, (minimum of 26 gage) at bottom onto which the pull cord and shade are attached. Black plastic caps shall be provided on each end of hemline bar to cover any sharp exposed edges.

2.1.7 Shade Cords: Shall be color black and of sufficient length to route around stairwell and equipment to cord lock positions whenever required. The cords shall be 9/64" diameter rope made of 4.5 Duro Nylon and shall be attached underneath the center of the bottom of the hemline bar.

2.1.8 Shade Rollers: Shades shall be mounted on 1-3/4-inch diameter metal wrapped rollers. The rollers shall be spring loaded, single piece barrel, with a reusable safety cotter key type retainer installed through both end pins and washers to prevent roller from falling out of mounting brackets. Constant tension in shades is required. Mounting brackets shall come with a 2-1/4-inch resting ledge. Regular "industry norm" ceiling brackets are not acceptable. A label stating "THIS END DOWN" with an arrow pointing to the proper installation direction of the roller into the mounting brackets shall be placed on the spring motor end of each shade roller. The shade film laminate material shall be mounted on rollers so as to minimize ridgings. Roll-off direction of material from roller shall be as directed by the shade manufacturer for use in the specific tower cab under consideration. Each shade shall have a label or whatever suitable means required to specify and identify the proper roll-off direction.

2.1.9 Shade Labels: Each shade shall have a manufacturer's label attached to the metal bar hemline giving cleaning instructions and the telephone number for emergency service.

2.1.10 Lock Pulley and Cord Direction Change Pulley: Lock pulleys shall consist of a roller and a spring return side action cam cord grip. Cord direction change pulleys shall be used to route shade cord around obstructions where they exist. Pulleys shall be positioned in direct line with cord outlet on metal hemline. Color to be black.

2.1.11 Shade Size: Shade roller width shall be to within 1/2 inch of maximum possible width as determined by physical limitations. Shade material width with shade fully drawn shall be to within 1 inch of columns on bias cut sides and to within 1-3/4 inch of columns on vertical cut sides. Horizontal seam shall be located a minimum of 55 inches from the bottom of the shade. Shades in ATCT cabs shall be bias cut when required. To ensure a safe roll-up, a minimum of 15 inches of shade material shall remain on the roller when the shade is fully extended.

2.1.12 Measuring for Shades: Measuring for shades and positioning shall be strictly in accordance with the shade manufacturer's instructions. Marks showing the precise position of all brackets, pulleys, and metal hemline positions as related to the factory measuring instructions shall be provided. All measurements shall be taken per instructions from shade manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION: Shades shall be installed in shade housings as shown in Drawings. Shades shall follow the slope of the cab glass. No drilling is to be done in the cab window mullions, as some mullions contain electrical cables. Spring tension in roller shall be manually adjusted so that shades roll up comfortably. In order to safely control

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and limit the shade travel, the installer shall make two knots in the shade cord. One knot is to be placed before the lock pulley to prevent the metal hemline bar from hitting the window sill. The second knot is to be placed after the lock pulley to prevent the metal hemline bar from hitting and overrunning the shade roller. Adhere to the "THIS END DOWN" label on the shade roller when installing the shade. Install the lock pulley on the window sill, position to be chosen by the COR.

3.2 LOCATION: Install shades on all windows. Carefully check the dimensions of all finished openings for exact sizing of the shades.

*** END OF SECTION ***

SECTION 15250
INSULATION OF MECHANICAL SYSTEMS

PART 1 - GENERAL

- a. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- b. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of the publications shall be used.

1.1.1 Federal Specifications (Fed. Spec.):

HH-B-100B	Barrier Material Vapor (For Pipe, Duct and Equipment Thermal, Insulation)
L-P-535E	Plastic Sheet (Sheeting); Plastic Strip: Poly (Vinyl Chloride) and Poly (Vinyl Chloride-Vinyl Acetate), Rigid

1.1.2 American Society for Testing and Materials (ASTM) Publications:

A 167	Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
C 177	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus, Test Method
C 195	Mineral Fiber Thermal Insulating Cement
C 533	Calcium Silicate Block and Pipe Thermal Insulation
C 534	Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
C 547	Mineral Fiber Preformed Pipe Insulation
C 552	Cellular Glass Block and Pipe Thermal Insulation
C 553	Mineral Fiber Blanket and Felt Insulation (Industrial Type)
C 592	Mineral Fiber Blanket Insulation and Blanket Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
C 612	Mineral Fiber Block and Board Thermal Insulation
C 916	Adhesives for Duct Thermal Insulation
C 921	Properties of Jacketing Materials for Thermal Insulation
D 227	Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing
E 84	Surface Burning Characteristics of Building Materials
E 96	Water Vapor Transmission of Materials

1.1.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS) Publication:

SP 58	Pipe Hangers and Supports - Materials, Design, and Manufacture
SP 69	Pipe Hangers and Supports - Selection and Application

1.1.4 National Fire Protection Association (NFPA) Publication:

255	Surface Burning Characteristics of Building Materials, Method of Test of
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1.1.5 Underwriters Laboratories, Inc. (UL) Publication:

723	Tests for Surface Burning Characteristics of Building Materials
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1.2 GENERAL REQUIREMENTS: Section 15011, "Mechanical General Requirements," with the additions and modifications specified herein applies to this specification.

1.3 SUBMITTALS: Provide submittals in accordance with Division One requirements.

1.3.1 Manufacturer's Data:

- a. Insulation
- b. Jackets
- c. Casings
- d. Vapor-barrier materials
- e. Accessory materials

1.3.2 Standards Compliance: Standards compliance labels are required on each container or package:

- a. Insulation
- b. Jackets
- c. Casings
- d. Vapor-barrier materials
- e. Accessory materials

1.4 DEFINITIONS:

1.4.1 Finished Spaces: Spaces used for habitation or occupancy where rough surfaces are plastered, paneled, or otherwise treated to provide a pleasing appearance.

1.4.2 Unfinished Spaces: Spaces used for storage or work areas where appearance is not a factor.

1.4.3 Concealed Spaces: Spaces out of sight. For example, above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

1.4.4 Exposed: Open to view. For example, pipe running through a room and not covered by other construction.

1.4.5 Fugitive Treatments: Treatments subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, and heat. Fugitive materials are entrapped materials that can cause deterioration, such as solvents and water vapor.

1.5 MANUFACTURER'S STAMP OR LABEL: Every package or standard container of insulation, jackets, cements, adhesives, and coatings delivered to the project site for use must have the manufacturer's stamp or label attached giving name of manufacturer, brand, and description of material. Insulation packages and containers shall be asbestos-free.

1.6 FLAME SPREAD AND SMOKE DEVELOPED RATINGS: In accordance with NFPA 255, ASTM E 84 or UL 723, the materials shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.

1.6.1 Materials Tests: Test factory-applied materials as assembled. Field-applied materials may be tested individually. Use no fugitive or corrosive treatments to impart flame resistance. UL label or satisfactory certified test report from a testing laboratory will be required to indicate that fire hazard ratings for materials proposed for use do not exceed those specified. Flame-proofing treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

1.6.2 Materials Exempt From Fire-Resistant Rating: Nylon anchors.

1.6.3 Materials Exempt from Fire-Resistant Rating When Installed In Outside Locations, Buried, or Encased In Concrete: PVC casing and glass-fiber-reinforced plastic casing.

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1.7 WARRANTY: Contractor shall warranty all material equipment and installation for a period of two years from final acceptance.

PART 2 - PRODUCTS

2.1 NOT USED

2.2 DUCTS, PLENUMS, MIXING BOXES, FILTER BOXES AND CASINGS (HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS (HVAC)) INSULATION:

2.2.1 Duct Insulation in Concealed Spaces: Two-inch thick mineral fiber flexible resilient blanket insulation with a maximum conductivity of 0.31 btu-in/per hr-sq. ft.-degree F at 75 degrees F mean temperature as tested in accordance with ASTM C 177.

2.2.2 Duct Insulation Not in Concealed Spaces: Mineral fiber per ASTM C 612, Class 2 (maximum surface temperature 400 degrees F), 3 pcf (pounds per cubic foot) average, 1 1/2-inch thick, inside the building; and 6 pcf average, 2 1/2-inch thickness double layer construction outside the building.

2.2.3 Acoustically Lined Ducts: Interior lined ductwork is not allowed.

2.2.4 Duct Insulation Finishes:

2.2.4.1 All-Purpose Jacket: Provide a factory applied all-purpose jacket with or without integral vapor barrier as required by the service. Provide jackets in exposed locations with a white surface suitable for field painting. All-purpose jacket shall have a maximum water vapor permeance of 0.05 perm per ASTM E 96; a puncture resistance of not less than 50 Beach units; and a tensile strength of not less than 35 pounds-force per inch of width.

2.2.4.2 Vapor-Barrier Material: Fed. Spec. HH-B-100, Type I for duct in equipment room and exposed areas and Type I or II in all other areas. Material shall be resistant to flame, moisture penetration, and shall not support mold growth. Provide vapor barrier on all HVAC duct insulation, on except insulation for heating only.

2.3 EQUIPMENT: Insulate all equipment and accessories as specified in Table III. In outside locations, provide insulation one inch thicker than specified. Increase the specified insulation thickness for equipment only where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Additional insulation is not required for factory-insulated equipment.

2.4 ADHESIVES, SEALANTS, AND COATING COMPOUNDS:

2.4.1 Adhesive for Securing Insulation to Metal Surfaces and Vapor Barrier Lap Adhesive (For Use in Building Interior Only): ASTM C 916, Type I (an adhesive in which the vehicle is nonflammable in liquid (wet) state and which will pass the edge-burning test), or Type II (An adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will not pass the edge-burning test).

2.4.2 Lagging Adhesive: For bonding fibrous glass cloth to unfaced fibrous glass insulation; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing the edges of and bonding fibrous glass tape to the joints of, fibrous glass board; or for bonding lagging cloth to thermal insulation or for attaching fibrous glass insulation to metal surfaces.

2.4.3 Mineral Fiber Insulation Cement: ASTM C 195, thermal conductivity 0.85 maximum at 200 degrees F mean when tested per ASTM C 177.

2.4.4 Vapor Barrier Coating: Indoor only above surface temperature 60 degrees F, color white.

2.5 ACCESSORIES:

2.5.1 Staples: ASTM A 167, Type 304 or 316 stainless steel outside-clinch type.

2.5.2 Insulation Bands: 3/4-inch wide; 0.021-inch galvanized steel or 0.20-inch aluminum.

2.5.3 Anchor Pins: Provide anchor pins and speed washers recommended by the insulation manufacturer.

2.5.4 Glass Cloth and Tape: Tape shall be 4-inch wide rolls. Tape shall be 4.5 ounces per square yard. In lieu of glass cloth and tape, open weave glass membrane may be used.

2.5.5 Coal-Tar-Saturated Organic Felt: ASTM D 227, minimum weight of 13 pounds per 100 square feet.

2.5.6 Wire: Soft annealed stainless steel, 0.047-inch nominal diameter.

2.5.7 Bands for Metal Jackets: 3/8-inch minimum width; .020-inch aluminum.

PART 3 - EXECUTION

3.1 PREPARATION: Provide external insulation on all supply and return air ductwork in air conditioned (cooled) spaces. Do not insulate materials until all system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and dried. Insulate return ducts, outside air intakes and supply ducts to the room outlets, flexible runouts, plenums, casings, mixing boxes, filter boxes, coils, fans, and the portion of air terminals not in the conditioned spaces. Ensure full range of motion of equipment actuators. Modify insulation to avoid obstruction with valve handle, safety relief, etc. Allow adequate space for pipe expansion. Conditioned space shall be defined as an area, room or space normally occupied and being heated or cooled for human habitation by any equipment. Install insulation with jackets drawn tight and cement down on longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems. Extend all surface finishes to protect all surfaces, ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Provide a moisture and vapor seal where insulation terminates against metal hangers, anchors and other projections through the insulation on surfaces for which a vapor seal is specified. Keep insulation dry during the application of any finish. Bevel and seal the edges of exposed insulation. Unless otherwise indicated, do not insulate the following:

- a. Heating supply and return ducts in spaces that are heated 24 hours each day of the heating season.
- b. Fibrous glass ductwork.
- c. Factory preinsulated flexible ductwork.
- d. Factory insulated ductwork, plenums, casings, mixing boxes, filter boxes.
- e. Vertical portion of interior roof drain pipelines, chrome plated pipes, and fire protection pipes.
- f. Vibration isolating connections
- g. Adjacent insulation
- h. ASME stamps
- i. Equipment name plates
- j. Access plates in fan housings

3.2 NOT USED

3.3 DUCTS AND PLENUMS (HVAC) INSULATION:

3.3.1 NOT USED.

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3.3.2 Flexible Blanket Insulation: Apply insulation with all joints tightly butted. Secure insulation to ductwork with adhesive in 6-inch wide strips on 12 inch centers. Staple laps of jacket with outward clinching staples and seal with foil scrim kraft (FSK) tape. For ductwork over 24-inches on horizontal duct runs, provide pins, washers and clips. Use pins on sides of vertical ductwork being insulated. Space pins and clips on 18 inch centers and not more than 18 inches from duct corners. Carry insulation over standing seams and trapeze-type hangers. Install speed washers with pins and pin trimmed to washer. Sagging of flexible duct insulation will not be permitted. Cut off protruding ends of pins after clips are secured and sealed with coating compound for inside work. For warm air ducts, overlap insulation not less than 2 inches at joints and secure the laps with outward clinch staples on 4-inch centers. In cold air ducts, vapor seal all joints and staple as specified.

3.3.3 Insulation Finishes and Joint Sealing: Fill all breaks, punctures, and voids with vapor barrier coating compound conforming to for inside work or manufacturers recommended weatherproof coating for outside service. Vapor seal all joints by embedding a single layer of 3-inch wide open weave glass membrane, 20 by 20 mesh maximum size between two 1/16-inch wet film thickness coats of vapor barrier coating compound. Draw glass fabric smooth and tight with a 1 1/2-inch overlap. At jacket penetrations such as hangers, thermometers, and damper operating rods, fill voids in the insulation with vapor barrier coating. Brush a coat of vapor barrier coating where required on HVAC ducts. Provide vapor barrier jacket continuous across seams, reinforcing, and projections. Where height of projections is greater than insulation thickness, carry insulation and jacket over the projection. For joints for heating only systems, provide insulation with two coats of fire resistant adhesive with glass fabric 20 by 20 maximum size mesh embedded between coats.

3.4 NOT USED

3.5 NOT USED.

3.6 FIELD INSPECTION: Visually inspect to ensure that materials used conform to specifications. Inspect installations progressively for compliance with requirements.

TABLE I - NOT USED

TABLE II – NOT USED

TABLE III
INSULATION FOR EQUIPMENT

<u>BARRIER MATERIAL</u>	<u>SPEC</u>	<u>TYPE</u>	<u>CLASS</u>	<u>REQUIRED</u>	VAPOR
Flexible Mineral Fiber	ASTM C 553	I	B-3	Yes*/No	
Rigid Mineral Fiber,	ASTM C 612		2	Yes*/No	
or Cellular Glass	ASTM C 552	I		No	

*Yes for chilled water and no for other services.

*** END OF SECTION ***

SECTION 15895
DUCTWORK AND DUCTWORK ACCESSORIES

PART 1 - GENERAL

- a. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- b. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of the publications shall be used.

1.1.1 Federal Specifications (Fed. Spec.):

- | | |
|-------------|--|
| HH-I-545B | Insulation, Thermal and Acoustical |
| & Int. Am-2 | (Mineral Fiber, Duct Lining Material) |
| HH-I-1030B | Insulation, Thermal (Mineral Fiber, for Pneumatic or Poured Application) |

1.1.2 Air Diffusion Council (ADC) Publications:

- | | |
|---------|--|
| I062 R4 | Certification, Rating, and Test Manual 2 |
|---------|--|

1.1.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Publication:

- | | |
|----|--|
| 52 | Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter |
|----|--|

1.1.4 American Society for Testing and Materials (ASTM) Publications:

- | | |
|--------|---|
| A 123 | Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| A 167 | Stainless and Heat-Resisting Chromium- Nickel Steel Plate, Sheet, and Strip |
| A 527 | Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process Lock-Forming Quality |
| B 152 | Copper Sheet, Strip, Plate, and Rolled Bar |
| C 423 | Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method |
| C 553 | Mineral Fiber Blanket and Felt Insulation (Industrial Type) |
| D 1654 | Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments |
| E 90 | Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions |
| E 437 | Industrial Wire Cloth and Screens (Square Opening Series) |

1.1.5 Air Movement and Control Association (AMCA), Inc. Publication:

- | | |
|-----|--|
| 500 | Test Methods for Louvers, Dampers and Shutters |
|-----|--|

1.1.6 National Fire Protection Association (NFPA) Publication:

- | | |
|-----|--|
| 90A | Installation of Air Conditioning and Ventilating Systems |
|-----|--|

1.1.7 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA) Publications:

- | | |
|----------|---|
| HVACTAB | HVAC Systems - Testing, Adjusting and Balancing (HVACTAB) |
| FGDCS | Fibrous Glass Duct Construction Standards (FGDCS) |
| HVACDCS | HVAC Duct Construction Standards - Metal and Flexible (HVACDCS) |
| HVACALTM | HVAC Air Duct Leakage Test Manual (HVACALTM) |

1.1.8 Underwriters Laboratories Inc. (UL) Publications:

- | | |
|------|--|
| 555 | Fire Dampers and Ceiling Dampers |
| 555S | Leakage Rated Dampers for Use in Smoke Control Systems |
| 998 | Humidifiers |

1.2 GENERAL REQUIREMENTS: Section 150II, "Mechanical General Requirements," applies to this section with the additions and modifications specified herein.

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1.3 SUBMITTALS: Provide submittals in accordance with Division One requirements.

1.3.1 Shop Drawings: Location of test holes.

1.3.2 Manufacturer's Data:

- a. Dampers
- b. Flexible Ducts and Connectors
- c. Insulation and Vapor Barrier
- d. Diffusers, Registers and Grilles Submit a schedule of all inlets and outlets indicating location, catalogue model number, manufacturer, dimensional information, sound pressure level rating, nominal rated volumetric flow rate (cfm), neck or face velocity at specified cfm, pressure drop at specified cfm, throw and drop for outlets, range for diffusers, and maximum and minimum cfm modulation.
- e. Sheet Metals

1.3.3 NOT USED

1.3.4 NOT USED

1.3.5 Field Test Reports:

- a. Air Duct Leakage Tests
- b. Balancing and Testing of Air Systems

1.3.6 SMACNA Duct Construction Manuals: The SMACNA recommendations shall be considered as mandatory requirements. Substitute the word "shall" for the word "should" in these manuals. No negative pressure construction for 4-inch, 6-inch, or 10-inch water gauge is provided herein.

1.4 NOT USED

1.5 PRESSURE-VELOCITY CLASSIFICATION: SMACNA HVACDCS, Section 1, and as indicated.

1.6 WARRANTY: Contractor shall warranty all material equipment and installation for a period of two years from final acceptance.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS:

- 2.1.1 Galvanized Steel Sheets: ASTM A 527; coating designation G90.
- 2.1.2 Galvanized Steel Hot Dipped After Fabrication: ASTM A 123.
- 2.1.3 Copper Sheets: ASTM B 152, light cold rolled temper.
- 2.1.4 Corrosion Resisting (Stainless) Steel Sheets: ASTM A 167.

2.2 DUCTWORK: Construction, metal gauge, hangers and supports, and reinforcements shall conform with SMACNA HVACDCS. Ductwork shall be airtight and shall not vibrate or pulsate when system is in operation. Air leakage shall be less than 5 percent of the system capacity.

1. 3" Pressure Class (Medium) – All AHU ductwork upstream of VAV boxes.
2. 2" Pressure Class (Low) – All other ductwork.

2.2.1 Joints: All joints shall be sealed to meet SMACNA Class A requirements and leakage testing shall be provided as specified herein. Duct components shall fit so that joints are not mismatched. Do not use duct sealant and tape to compensate for mismatched connections. Longitudinal locks or seams known as "button-punch snap-lock" will not be permitted. Apply fire-resistant sealing compound to exposed male part of fittings collars to that sealer will be on inside of joint and fully protected by the metal of the duct and fitting. Apply one brush coat of sealing compound over outside of joint to at least 2 inch band width covering screw heads and joint gap. When tape is used, apply a

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single wrap of a duct tape over the wet sealer. Tape provided shall be as recommended by the sealer manufacturer to permit proper curing of the sealer. Dents in the male portion of the slip fitting collar will not be acceptable.

2.2.2 Fittings: Square elbows, round elbows, fittings, branch take-offs, transitions, splitters, duct volume dampers, fire dampers, flexible connections, and access doors shall conform with the SMACNA DCS, Section 2.

2.2.2.1 Test Holes: Provide factory fabricated, airtight, and noncorrosive test holes with screw cap and gasket. Provide extended neck fittings to clear insulation.

2.2.2.2 Round Elbows: Provide 45 degree and 90 degree elbows of 2 piece die stamped construction for ducts, 8 inches or less in diameter. For ducts over 8 inches in diameter, provide 5 mitered pieces for 90 degrees and 3 mitered pieces for 45 degrees.

2.2.3 Round and Oval Ducts: SMACNA DCS, Section 3.

2.2.4 Rectangular Ducts: make joints between sections of duct and between ducts and fittings with either gasketed flanged connection, welded flange joints, or other joints recommended in SMACNA DCS Section 1, and reinforce at the joints and between the joints as recommended.

2.3 FLEXIBLE DUCTS AND CONNECTORS: UL 181, Class I, UL listed, SMACNA HVACDCS, and additional requirements herein specified. Use to connect between rigid ducts and outlets or terminals. Flexible ducts shall be maximum 3 feet in length. Minimum bend radius shall be twice of the duct diameter.

2.3.1 Flexible Duct shall be Flexmaster Triple Lock Buck Duct Flexible Air Duct (Insulated or Non-Insulated) as manufactured by Buckley Associates. Flexible Duct Insulated and Non-Insulated shall be Underwriters Laboratory Listed and constructed in accordance with N.F.P.A. Standards 90A and 90B. It shall have a smoke/flame spread rating 50/25.

2.3.2 Triple Lock 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 an air-tight seam. A double lock is *not* acceptable.

2.3.3 Insulated Flex shall have a gray Fire Retardant Polyethylene outer jacket with a ½ lb. density 1½" thick Fiberglass Insulation blanket, factory wrapped.

2.3.4 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".

2.4 NOT USED

2.5 NOT USED

2.6 NOT USED.

2.7 NOT USED

2.8 DEFLECTORS: Factory-fabricated and factory-or-field-assembled units consisting of curved turning vanes or scoop type extractors for uniform air distribution and change of direction with minimum turbulence and pressure loss. Provide curved vanes for square elbows. For round ducts taking off from rectangular ducts, provide factory fabricated, galvanized sheet metal, spin-in fittings. These fitting shall have scoop extractors, butterfly dampers, and locking quadrant operators.

2.9 NOT USED

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2.10 DAMPERS AND LOUVERS: Construct dampers and louvers with two gauges heavier than ducts in which installed. Except as modified herein, the construction shall be of aluminum or galvanized steel with interlocking edges and maximum 10-inch blade width. Conform with SMACNA HVACDCS. Dampers shall be opposed-blade type where indicated.

2.10.1 NOT USED

2.10.2 Manual Volume Dampers: Balancing, factory-fabricated type. Equip dampers with accessible mechanism such as quadrant operators or 3/16-inch rods brought through the side of ducts with locking setscrew and bushing. Where quadrant operators are used, they shall be chrome-plated or enamel painted with all exposed edges rounded. Operators for concealed dampers shall utilize rods and/or mitered gear assemblies. Flexible shafts are not allowable.

2.11 NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION: Installation shall conform to NFPA 90A, SMACNA HVACDCS and SMACNA FGDCS. Provide mounting and supporting of ductwork and accessories including, but not limited to, structural supports, hangers, vibration isolators, stands, clamps and brackets, access doors, and dampers. Use electrical isolation between dissimilar metals. Electrical isolation may be fluorinated elastomers or sponge-rubber gaskets. Install ductwork accessories as indicated in accordance with the manufacturer's printed instruction. Allow clearance for inspection, repair, replacement, and service.

3.1.1 Ductwork: When air distribution systems are operated, there shall be no chatter, vibration, or dust marks. After ducts are thermally or acoustically insulated, ensure air flow area equal to duct cross section dimensions indicated.

3.1.1.1 Field Changes to Ductwork: Those required to suit the sizes of factory-fabricated equipment actually furnished, shall be designed to minimize expansion and contraction. Use gradual transitions in field changes as well as modifications to connecting ducts.

3.1.1.2 Dampers: When installed on ducts to be thermally insulated, equip each damper-operator with stand-off mounting brackets, bases, or adapters to provide clearance between the duct and operator not less than the thickness of insulation. Stand-off mounting items shall be integral with the operator or standard accessory of damper manufacturer.

3.1.1.3 Deflectors: Provide in square elbows, duct-mounted supply outlets, take-off or extension collars to supply outlets, and tap-in branch-off connections. Adjust supply outlets to provide air volume and distribution as indicated or specified.

3.1.1.4 NOT USED

3.1.1.5 NOT USED.

3.1.1.6 NOT USED

3.1.1.7 Packing: Fed. Spec. HH-I-1030. Pack with mineral fiber in spaces between sleeve or opening and duct or duct insulation.

3.1.1.8 Ductwork at Diffusers and Grilles: Paint interior of ductwork at diffusers and grilles flat black for a distance of two feet away from supply and return diffusers and grilles.

3.1.2 Duct Hangers and Supports: All project ductwork shall be supported from trapeze type hangers as detailed in SMACNA HVACDCS, Section 4. Anchor risers in the center of the vertical run to allow ends of riser free vertical movements. Attach supports only to structural framing members and concrete slabs. Do not anchor supports to metal

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decking. Where supports are required between structural framing member, provide suitable intermediate metal framing. Where C clamps are used, use retainer clips.

3.1.2.1 Flexible Ducts: Support ducts by hangers every 2 feet, unless supported by ceiling construction. Use stretch flexible air ducts to smooth out corrugations, and long radius elbows, where possible, using a minimum length to make connections.

3.1.2.2 Flexible Connectors: Provide flexible connectors between fans and ducts or casings and where ducts are of dissimilar metals. For round ducts, securely fasten flexible connectors by zinc-coated steel clinch-type draw-bands. For rectangular ducts, lock flexible connectors to metal collars.

3.1.3 Inspection Plates and Test Holes: Provide, where required, in ductwork or casings for all balance measurements. Test holes shall be factory fabricated, airtight, and noncorrosive with screw cap and gasket. Extend cap through insulation.

3.1.4 Not Used

3.1.5 NOT USED

3.1.6 Cleaning of Ducts: Remove all debris and dirt from ducts and wipe clean. Before installing air outlets, use air handler to blow dry air through entire system at maximum attainable velocity. Provide temporary air filters for this operation.

3.2 FIELD TESTS AND INSPECTIONS: The Contractor is responsible for the administration and direction of tests. Furnish instruments, equipment, connecting devices, and personnel for the tests. Notify COR in accordance with Division One before inspection or testing is scheduled. Correct all defects in the work. Repeat tests until the work is in compliance.

3.2.1 Air Duct Leakage Tests: All ductwork, plenums, and casings for the project shall be leak tested. Prior to application of insulation, subject new ductwork to static pressure equivalent to that indicated. Before installing supply outlets, apply temporary caps where outlets will be connected. Connect a test blower temporarily to inlet end of duct and, by throttling its intake, adjust static pressure in duct to required value. Read voltage and current to blower motor and total static pressure across blower wheel. Apply these data to AMCA certified performance table for the test blower to derive volumetric flow rate (cfm) of air injected into duct. Remove temporary caps and test blower. Verify the maximum allowable air leakage of the total air that the duct is required to deliver. Perform the measurement of leakage using a calibrated orifice tube with its individual calibration curve. Ductwork testing is allowed in sections. Allowable leakage is as follows:

- | | | |
|----|----------------------------|----------------|
| 1. | 3" Pressure Class (Medium) | _____CFM/100SF |
| 2. | 2" Pressure Class (Low) | _____CFM/100SF |

3.2.2 Performance Testing and Balancing:

3.2.2.1 Balancing and Testing of Air Systems: Comply with SMACNA HVACTAB to achieve and confirm compliance with drawings and specifications, prepare complete report of final test results and submit in quadruplicate.

*** END OF SECTION ***

**SECTION 15907
TESTING AND BALANCING AIR AND WATER SYSTEMS**

PART 1 - GENERAL

- a. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- b. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.1 WORK INCLUDED:

Furnish all labor, equipment and incidentals necessary to coordinate with a Testing and Balancing Agency contracted separate from this scope of work **and shall be Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) certified.** This outside Agency will perform the test, adjust and balance (TAB) work of the entire heating, ventilating, and air conditioning (HVAC) system as specified herein.

1.2 RELATED WORK COVERED ELSEWHERE:

All other sections of Division 15.

1.3 SUBMITTALS:

All SUBMITTALS required for the Test and Balance Agency will be provided directly to the COR.

1.4 QUALITY ASSURANCE:

- A. When any component is found missing or installed improperly to inhibit the TAB work, the Contractor shall make the correction promptly.
- B. After correcting component and system deficiencies, the system shall be retested or rebalanced as directed by the COR.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 PREPARATION:

- A. Before any TAB work, verify that systems are complete and operable. Ensure the following:
 1. Equipment is operable and in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Correct fan rotation.
 7. Fire and volume dampers are in place and open.
 8. Coils have been vented and fins have been cleaned.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system air leakage has been measured, recorded, and minimized.
 12. Hydronic systems have been filled and all air has been vented.
 12. Hydronic systems have been pressure tested and flushed of all debris.

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13. Correct pump rotation.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

3.02 SCHEDULE:

At least two (2) weeks prior to the HVAC system being complete and ready for the TAB work, the Contractor shall inform the COR in writing.

3.03 ADDITIONAL REQUIREMENTS:

- A. During the balancing process, all abnormalities or malfunctions of equipment or components discovered by the Testing and Balancing Agency, shall be reported to the COR for prompt correction by the Contractor.
- B. The temperature controls shall be verified for calibration and proper relationship between control devices before testing. The Contractor will be advised of any instruments out of calibration for prompt correction.
- C. The Contractor shall provide technical support to the Testing and Balancing Agency for a complete check of the HVAC system including the temperature controls. The Contractor shall assist the Testing and Balancing Agency as needed by the Testing and Balancing Agency.
- D. After the TAB work is complete and accepted, the Contractor shall run the entire HVAC system for two consecutive 8-hour days minimum under normal operating conditions. This shall be done in the presence of the COR. Advise the COR five days in advance of the time the test run is to take place. During this period, instruct the owner's operating personnel in the operation of the system.

*** END OF SECTION ***

SECTION 16050
ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- B. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.
- C. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Conduit and power wiring/circuit installation where required.

1.2 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification. The publications are referred to in the text by the basic designation only. The latest issue of the publications shall be used.

- 1.2.1 American National Standards Institute (ANSI) Publications:
 - C2 National Electric Safety Code, 1993
 - C37.20 Switchgear Assemblies, Including Metal-Enclosed Bus
- 1.2.2 American Society for Testing and Materials (ASTM):
 - A36 Structural Steel
 - A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- 1.2.3 Institute of Electrical and Electronics Engineers (IEEE) Publication:
 - 100 Standard Dictionary of Electrical and Electronics Terms
- 1.2.4 National Electrical Manufacturers Association (NEMA) Publication:
 - ICS 6 Enclosures for Industrial Controls and Systems
- 1.2.5 National Fire Protection Association (NFPA) Publication:
 - 70B Electrical Equipment Maintenance
 - 70 National Electric Code (NEC), 2002

1.3 APPLICATION: This section applies to all sections of Division 16, "Electrical," of this project except as specified otherwise in each individual section.

1.4 DEFINITION OF ELECTRICAL TERMS: Electrical terms used in these specifications, and on the drawings, shall be as defined in IEEE Standard No. 100 or as below:

"Furnish" or "Provide": To supply, install, and make complete, safe, and operable, the particular work referred to.

"Install": to erect, mount, and make complete with all related accessories.

"Work": labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.

"Piping": pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation and all related accessories.

"Wiring": raceway, fittings, wire, boxes, and all related accessories.

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"Concealed": not in view, installed in masonry or other construction, within furred spaces, double partitions, hung ceilings, trenches, crawl spaces, or enclosures.

"Exposed": in view, not installed underground or "concealed" as defined above.

"Indicated", "shown", or "noted": as indicated, shown, or noted on drawings or specifications.

"Similar" or "equal": of base bid manufacturer, equal in quality materials, weight, size, performance, design, and efficiency of specified product.

"Reviewed", "satisfactory", "accepted", or "directed": as reviewed, satisfactory, accepted, or directed by Contracting Officer.

"Motor Controllers": manual or magnetic starters with or without switches, individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.

"Control or Actuating Devices": automatic sensing and switching devices such as thermostats, pressure, float, flow, electro-pneumatic switches and electrodes controlling operation of equipment.

1.5 INTENT: The work described in this Division of the Specifications and the accompanying drawings describe the electrical systems for the ATCSCC. The Contractor shall furnish, install, test and place into operation all equipment, materials, devices and necessary means to provide a complete electrical system. The work shall include integrating the electrical work with other Divisions to obtain a functioning, integrated operable system.

1.6 CODE REQUIREMENTS AND UTILITIES: Perform work to meet or exceed the requirements of the National Electrical Code and other applicable statutes, ordinances and codes. Make all arrangements with the utility companies for proper coordination.

1.7 TEMPORARY POWER: See Division 1.

1.8 COORDINATION: The contract drawing are diagrammatic in showing certain physical relationships which must be established and do not give fully dimensioned requirements. The Contractor shall not use dimensions scaled from the drawings. It is the responsibility of the Contractor to determine exact locations from field measurements. The Contractor shall coordinate and sequence work with other Divisions to prevent interferences, conflicts and sequence of construction. Any discrepancies between the drawings and specifications and the existing conditions shall be referred to the Contracting Officer's Representative (COR) before any work affected is performed. All wiring, circuit breakers, and motor starters shall be of the sizes and capacities to suit the electrical requirements of the motors and equipment actually furnished under various sections of the specifications.

1.8.1 The Contractor shall study the building plans and details and shall cooperate with all other trades to prevent conflict and interference as to space requirements. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire electrical work with adequate access for operation and maintenance. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical work (equipment).

a. NOT USED

b. Coordination of Options and Substitutions: Where the contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, do not proceed with purchasing until coordination of interface requirements has been checked and satisfactorily established.

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- c. Special attention is called to the following items and all conflicts shall be reported to the COR before installation for decision and correction:
 - (1) Door swings to the end that switches will be located on the "strike" side of the door.
 - (2) Location of grilles, pipes, sprinkler heads, ducts and other mechanical equipment so that all electrical outlets, lighting fixtures and other electrical outlets and equipment are clear from and in proper relation to these items.
 - (3) Locations of cabinets, counters and doors so that electrical outlets, lighting fixtures and equipment are clear from and in proper relation to these items.
 - (4) Lighting fixtures, equipment and outlets shall be located to avoid interference with mechanical or structural features. Lighting fixtures shall be symmetrically located according to the room arrangement. Raceways, junction and outlet boxes and lighting fixtures shall be properly supported to comply with applicable codes and good work practice.
 - (5) Coordinate mounting heights of wiring devices with surrounding architectural finishes.
 - (6) Depth of flush installed cabinets, enclosures and panelboards.
- d. The Contractor will not be paid for cutting, patching and finishing required for relocation of work installed due to interference between the work of different divisions.
- e. Equipment shall be delivered in shipping sections, which will fit through the access ways provided.
- f. The scale of drawings cannot show all necessary transitions, offsets, changes in direction, etc. It shall be the responsibility of the Contractor to provide all pull boxes, etc. necessary to install his work to conform to the structure, to preserve headroom and to keep openings, required work clearances, and passageways clear.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT: All materials, equipment, and devices shall, as a minimum, meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70. All items shall be new, the standard products of manufacturers regularly engaged in the production of such materials, and of the manufacturer's latest designs that comply with the specification requirements.

PART 3 - EXECUTION

3.1 GENERAL: The rules, regulations and reference specifications enumerated herein shall be considered as minimum requirements and shall not relieve the Contractor from furnishing and installing higher grades of materials and workmanship than are specified herein or when so required by the Contract Drawings. This specification shall govern when conflicts occur between reference documents and this specification. Conform to the requirements of ANSI C2 National Electrical Safety Code.

3.2 WORK RESPONSIBILITIES

3.2.1 Drawings indicate diagrammatically desired locations or arrangement of conduit runs and outlets equipment. Proper judgment shall be exercised in executing work so as to secure best possible installation in available space and to overcome local difficulties due to space limitations or interference with structural conditions. Contractor shall be responsible for correct placing of Work and proper location and connection of work in relation to work of other trades. Advise appropriate trades as to locations of access panels.

3.2.2 Locations shown on architectural plans or on wall elevations shall take precedence over electrical plan locations, but where a conflict is evident, contractor shall notify the COR in writing.

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3.2.3 For all equipment furnished, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

3.2.4 Lighting fixtures are shown in their approximate locations only. Do not install light outlets or fixtures until mechanical equipment, piping and ductwork, are installed. Lights shall be then installed in locations best suited for equipment arrangement or as directed by the COR.

3.2.5 Scaled and figure dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, check and verify dimensions and sizes with Drawings to see that equipment will fit into spaces provided without violation of applicable codes.

3.2.6 Contractor shall be responsible for any cooperative work, which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such change shall be made to the COR's satisfaction.

3.3 MATERIALS

3.3.1 Material and equipment shall conform to respective publications and other requirements specified. Materials and equipment to be acceptable must comply with all contract requirements. Materials to be furnished by the Contractor under this specification shall be of manufacturers regularly engaged in the production of such materials that comply with the specification requirements.

3.3.2 Galvanizing – NOT USED.

3.3.3 Finish - Exposed parts of electrical equipment and the interior of panelboards, panels, cabinets, switchboards and wireways shall be thoroughly cleaned of dirt, cement, plaster and other materials. All scratched or damaged materials shall be replaced or refinished to the satisfaction of the COR.

3.3.4 Tools - Provide all special servicing tools required for equipment provided under this section.

3.4 OUTLET LOCATION: Position of outlets. Center all outlets with regard to paneling, furring and trim. Symmetrically arrange outlets in the room. Satisfactorily correct outlets improperly located or installed. Repair or replace damaged finishes. Set outlets plumb and extend to the finished surface of the wall, ceiling or floor without projecting beyond it.

3.4.1 Install symmetrically all receptacles, switches, and outlets. Mounting heights, to center of box above finished floor, shall be as follows. Other mounting heights are indicated on the drawings by detail or by a plus dimension shown adjacent to the symbol.

Lighting Switches	48 inches
Convenience Outlets and Similar Devices	15 inches
Telephone/Data Outlets	15 inches

3.5 NOT USED

3.6 NOT USED

3.7 SEISMIC REQUIREMENTS: Light fixtures, conduits, cable trays, cable racks and electrical equipment shall be provided with earthquake restraints in accordance with the requirements of IBC.

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3.7.1 Suspended fluorescent fixture, individual or continuous, shall be provided with seismic wire supports attached to the building structural members, using two wires for individual fixtures and one wire per unit for continuous row fixtures. These support wires shall be number 19 gauge minimum and shall be capable of supporting four times the supported load.

3.7.3 All cable trays and groups of conduits shall be supported by trapeze hangers with support rods and horizontal steel members at spacing of 10 feet maximum, on center. These trapezes shall also be supported laterally by steel angles or steel members.

3.8 WORKMANSHIP: All materials and equipment shall be installed in accordance with the contract drawings and the recommendations of the manufacturer as approved by the COR. The installation shall be accomplished by skilled licensed workmen regularly engaged in this type of work. Raceways, electrical equipment, and electrical equipment supports shall not be installed until fire protection materials have been applied and approval has been obtained.

3.9 CONTRACT DRAWINGS: Where the electrical drawings indicate (diagrammatically or otherwise), the work intended and the functions to be performed, even though some details are not shown, the Contractor shall furnish all equipment and labor to complete the installation work, and accomplish all the indicated functions of the electrical installation. Further, the Contractor shall be responsible for taking the necessary actions to ensure that all electrical work is coordinated and compatible with architectural, landscape, civil, mechanical, plumbing, and structural drawings.

3.10 ELECTRICAL CONNECTIONS TO EQUIPMENT

3.10.1 Contractor shall provide all connections to mechanical, architectural, and plumbing equipment supplied under various sections of these Specifications.

3.10.2 All equipment shall be wired complete in each detail including all interlocks, safety switches, control devices, starters, and disconnects.

3.10.3 All connections and wiring diagrams, where shown on the drawings, are for bidding purposes only and the Contractor shall obtain final wiring diagrams from equipment vendors. Diagrams, as supplied, shall be specifically for this Project.

3.10.4 Conduits and wires where shown on the Contract Documents are for bidding purposes. Contractor shall verify all wire sizes, number of wires required and supply the proper number to each piece of equipment before installation.

3.11 NOT USED

3.12 QUALITY ASSURANCE

3.12.1 Testing: Provide the tests as outlined hereinafter and other tests necessary to establish the adequacy, quality, safety, completed status and suitable operation of each system. Tests are to be conducted in the presence of the COR.

3.12.2 NOT USED

3.12.3 NOT USED.

3.12.4 Final tests: The COR shall witness tests, to be performed by the Contractor after complete preliminary tests have been made which indicate adequacy, quality, completion and satisfactory operation. These final tests are comprised of the following.

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3.12.4.1 Operating test: After the interior wiring system installation is completed, and at such time as the COR may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the COR or an authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power.

3.12.4.2 Insulation and loop testing: Shall be completed by the Contractor with a 500-volt D.C. resistance measuring instrument.

3.13 WARRANTY: The Contractor shall be responsible for all work installed under this Specification. He shall make good, repair, or replace at his own expense as may be necessary, any defective work, materials or parts. The Contractor shall warrant his work for two (2) years after final acceptance.

*** END OF SECTION ***

SECTION 16400
SERVICE AND DISTRIBUTION

PART 1 – GENERAL

- a. All sections contained in DIVISION 1 are hereby made a part of this SECTION.
- b. Examine all conditions, as they exist at the project prior to submitting a bid for the work of this SECTION.

1.1 APPLICABLE PUBLICATIONS: To the extent referenced herein the publications listed below form a part of this specification. The publications are referred to in the text by the basic designation only. The latest issue of the publications shall be used.

1.1.1 American National Standards Institute (ANSI) Publications:

- | | |
|-------|---|
| C80.1 | Specification for Rigid Steel Conduit, Zinc-Coated |
| C80.3 | Specification for Electrical Metallic Tubing, Zinc-Coated |

1.1.2 American Society for Testing and Materials (ASTM) Publications:

- | | |
|-------|---|
| A 123 | Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| B 1 | Hard-Drawn Copper Wire |
| B 8 | Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft |

1.1.3 National Electrical Manufacturers Association (NEMA) Publications:

- | | |
|--------|---|
| AB-1 | Molded Case Circuit breakers |
| ICS1 | General Standards for Industrial Control and Systems |
| ICS2 | Industrial Control Devices, Controllers and Assemblies |
| ICS4 | Terminal Blocks for Industrial Control Equipment and Systems |
| ICS6 | Enclosures for Industrial Controls and Systems |
| KS1 | Enclosed Switches |
| MG1 | Motors and Generators |
| OS1 | Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports |
| PB-1 | Panelboards |
| PB-1.1 | Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less. |
| ST20 | Dry-Type Transformers for General Application |
| VE1 | Metallic Cable Tray Systems |
| WC5 | Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy |
| WD1 | General Requirements for Wiring Devices |

1.1.4 National Fire Protection Association (NFPA) Publication:

- | | |
|----|--------------------------------------|
| 70 | National Electrical Code (NEC), 1999 |
|----|--------------------------------------|

1.1.5 Underwriters' Laboratories, Inc. (UL) Publications:

- | | |
|------|--|
| 1 | Flexible Metal Conduit |
| 50 | Cabinets and Boxes |
| 67 | Panelboards |
| 83 | Thermoplastic-Insulated Wires and Cables |
| 98 | Enclosed and Dead-front Switches |
| 198C | High-Interrupting Capacity Fuses, Current-Limiting Types |
| 198E | Class R Fuses |
| 360 | Liquid-Tight Flexible Steel Conduit |
| 467 | Grounding and Bonding Equipment |
| 486A | Wire Connectors and Soldering Lugs for Use with Copper Conductors |
| 486C | Splicing Wire Connectors |
| 489 | Molded-Case Circuit Breakers and Circuit Breaker Enclosures |
| 493 | Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables |
| 498 | Attachment Plugs and Receptacles |

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506	Specialty Transformers
510	Insulating Tape
514A	Metallic Outlet Boxes
514B	Fitting for Conduit and Outlet Boxes
869	Service Equipment
870	Electrical Wireways Auxiliary Gutters, and Associated Fittings.
943	Ground-Fault Circuit Interrupters
984	Hermetic Refrigerant Motor-Compressors
1053	Ground-Fault Sensing and Relaying Equipment
1561	
1.1.6 FAA Specification:	
C-1217f	Electrical Work, Interior
1.1.7 Federal Specifications:	
W-P-115C	Type I, Class 1
W-P-115C	Type II, Class 1
W-C-375B/Gen	Circuit Breakers, Molded Case, Branch Circuit And Service.
W-C-865C	Fusible Switches

1.2 GENERAL REQUIREMENTS: Section 16050, "Electrical General Requirements," and FAA-C-1217f apply to this section with additions and modifications specified herein. In each of the standards referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears. See Section 16300, "Underground Electrical and Communications Work."

1.3 SUBMITTALS: Provide submittals in accordance with Division One requirements.

1.3.1 Manufacturers' Data: Provide submittals for each of the following electrical components:

- a. Receptacles
- b. Circuit breakers
- c. Switches
- d. Conduit and fittings (each type)
- e. Surface Metal Raceway
- f. Pull Boxes
- h. Device plates
- i. Wire and cable
- j. Splices and terminations
- k. Outlet and junction boxes
- l. Fire stop products

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT, GENERAL: All materials, equipment, and devices shall, as a minimum, meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70. All items shall be new.

2.2 CONDUIT AND FITTINGS: Minimum conduit or tubing size shall be 3/4".

2.2.1 Rigid Metal Conduit/Rigid Steel Conduit (Zinc-Coated): ANSI C80.1. Heavywall zinc-coated rigid steel conduit. For installation below slab, on-grade, underground, and vertical sweeps. Where conduits enter enclosures without threaded hubs, double locknuts (one on each side of the enclosure wall) shall be used to securely bond the conduit to the enclosure. In addition, a metallic insulated bushing shall be installed on the interior threaded end of the conduit to protect conductor insulation.

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2.2.2 Electrical Metallic Tubing (EMT): ANSI C80.3. Galvanized electrical steel tubing. EMT shall not be used on circuits above 600 volts or in sizes greater than 4 inches in diameter. Where conduits enter enclosures without threaded hubs, an appropriate connector with threads and locknut shall be used to securely bond the conduit to the enclosure. The connector body and locknut shall be installed so that firm contact is made on each side of the enclosure. In addition, the connectors shall be the insulated-throat type.

2.2.3 Flexible Metal Conduit: Flexible conduits shall conform to UL 1. Flexible conduits of 12 inch minimum length (and 6 foot maximum length) shall be used for connections to motors, and to equipment subject to vibration or movement. Liquid-tight flexible conduits shall be used in wet locations.

- a. Liquid-Tight Flexible Metal Conduit (Steel): UL 360.

2.2.4 Fittings for Metal Conduit, Electrical Metallic Tubing, and Flexible Metal Conduit: UL 514B. All ferrous fittings shall be zinc-coated in accordance with UL 514B.

- a. Fittings for rigid metal conduit shall be threaded type. Split couplings are not acceptable.
- b. Fittings for electrical metallic tubing (EMT) shall be standard compression-type malleable iron either cadmium plated or hot dipped galvanized designed for this type of conduit. Screw-type fittings are not acceptable. Steel compression fittings with insulated throats to be used on 1" and smaller conduits. Larger conduits shall have insulated bushing added.

2.2.5 Bushings: Provide insulated bushings to bond ground conductor to raceway.

2.2.6 Provide through-wall waterproof seals for conduit penetrations through the foundation and exterior walls. Where conduits penetrate from heated space to unheated, provide conduit sealing bushing or Y-type conduit seal with sealing compound.

2.2.7 For raceway not in slab, provide flexible conduit with external bonding jumper for conduits passing across structural expansion joints.

2.3 NOT USED

2.4 OUTLET BOXES AND COVERS: Boxes shall be either the cast-metal threaded-hub type galvanized steel type or metal outlet boxes conforming to NEMA OS 1. Where not sized on the drawings, boxes shall be sized in accordance with the NEC.

2.4.1 Flush Device Box: Provide galvanized steel boxes of sufficient size to accommodate wiring devices to be installed at outlet. Provide an extension ring for the device to be installed. Square or rectangular boxes may be supplied. Provide 2-1/8 inch deep by 4-inch square boxes.

2.4.2 Exposed Device Boxes: Provide "FS" type conduit boxes for surface mounting in areas having exposed conduit systems.

2.4.3 Boxes for Lighting Fixtures: Provide galvanized steel octagonal boxes with fixture stud supports and attachments as required to properly support ceiling and bracket-type lighting fixtures. Unless otherwise noted, provide 4-inch boxes 2-1/8 inches deep.

2.5 NOT USED.

2.6 WIRES AND CABLES: Wires and cables shall meet the applicable requirements of NFPA 70 and UL for the type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to the site shall not be used.

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2.6.1 Conductors: Conductors No. 10 AWG and smaller shall be solid, and those No. 8 AWG and larger shall be stranded. All conductors shall be copper. Minimum branch circuit conductor size shall be No. 12 AWG. Minimum control wire size shall be No. 22.

2.6.2 Insulation: All power and lighting wires shall be 600-volt copper and thermoplastic or thermosetting insulation. Type THWN, XHHW for general use or type THHN for use in dry locations only. Remote-control and signal circuits shall be Type THW or TF. Conductors shall conform to UL 83. Where lighting fixtures require 194-degree F conductors, only conductors with 194-degree F insulation or better shall be used. Wire to be installed in plenum spaces shall be plenum rated.

2.6.3 Bonding Conductors: ASTM B 1, solid copper wire for sizes No. 8 AWG and smaller; ASTM B 8, Class B, stranded copper wire for sizes No. 6 AWG and larger.

2.6.4 Color Coding: Provide for all service feeder, branch, control, and signaling circuit conductors. All circuits throughout the facility shall be color coded as specified herein. Single-phase branch circuits shall be color coded and identified/tagged with the feeder panel name and circuit breaker number at each end. The color coding shall be continuous throughout the facility on each phase conductor to its point of utilization so that the conductor phase connection is readily identifiable. Conductors covered with green insulation with yellow or orange tracers shall be used for other grounding systems as described in Section 16450, "Grounding". Color shall be green for grounding conductors. Neutral conductor shall be white for 120/208V and natural gray for 277/480V.

a. In any room, conduit, pullbox, raceway, wireway, or cable tray, where two or more grounded conductors of different systems are present (branch circuits, feeders, services, voltages, etc.), the grounded conductors shall be clearly identified. The identification of the grounded conductors for each system shall be consistent throughout the facility. The grounded conductor of one system may be white, natural gray or re-identified. The grounded conductors of the other systems shall be identified by paint, tape or by an identifiable colored stripe, not green, on white insulation.

b. Where Contractor can demonstrate that color coding is not available for conductors No. 4 AWG and larger, color coded tape half lapped for a minimum of 3 inches shall be used. In no case, however, shall green insulated conductors be re-identified for purposes other than grounding, nor shall white or neutral gray conductors be re-identified as other than neutral conductors, and at every point where the conductor is accessible. Where conductors are color coded in this manner, they shall be color coded in all junction boxes and pullboxes, accessible raceways, panelboards, outlets, and switches, as well as at all terminations. Conductors in accessible raceways shall be color coded so that by removing or opening any cover, the coding will be visible. The color of the ungrounded conductors in different voltage systems shall be as follows:

- (1) 208Y/120 volt, 3-phase: Phase A - Black, Phase B - Red, Phase C - Blue, Neutral - White.
- (2) 480Y/277 volt, 3-phase: Phase A - Yellow, Phase B - Brown, Phase C - Orange, Neutral - Gray/White.

c. Color coding for conductors in control cable shall be in accordance with NEMA Standard WC5. DC power conductors shall be color coded as follows: positive conductor, red with brown tracer; negative conductor, brown with red tracer.

The following list outlines color coding for control cables:

<u>Primary Wire Colors</u>	<u>Mate Colors</u>
Blue	White
Orange	White
Green	White
Brown	White
Slate	White

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Blue	Red
Orange	Red
Green	Red
Brown	Red
Slate	Red
Blue	Red
Orange	Black
Green	Black

<u>Primary Wire Colors</u>	<u>Mate Colors</u>
Brown	Black
Slate	Black
Blue	Black
Orange	Yellow
Green	Yellow
Brown	Yellow
Slate	Yellow
Blue	Yellow
Orange	Violet
Green	Violet
Brown	Violet
Slate	Violet

- d. Conductor Identification: In addition to color coding, all line, phase, and neutral conductors shall be identified by permanently attached markers. Panel and circuit numbers shall be identified. Conductor identification shall be provided at all terminations, and in all junction boxes through which these conductors pass. In addition to color coding, control circuit conductor identification shall be made by permanently attached markers. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved shop drawings. Hand lettering or marking is not acceptable.

2.6.5 Neutral conductors: Shared/common neutrals shall not be permitted. Each circuit shall have its own separate neutral conductor. Neutral conductor sizes shall not be less than the respective feeder or phase conductor sizes.

2.6.6 Fixture wiring: Fixture wiring shall be thermoplastic insulated type TF, TFF, TFN, or TFFN copper, rated for 600 volts.

2.7 SPLICES AND TERMINATION COMPONENTS: UL 486A as applicable for wire connectors, and UL 510 for insulating tapes. Connectors for wires No. 10 AWG and smaller shall be insulated pressure-type in accordance with UL 486A (twist-on splicing connector). Compression connectors shall be used to splice conductors No. 8 AWG and larger. All splices, including those made with insulated wire nuts, insulated electrical tape or heat shrink tubing to a level equal to that of the factory insulated conductors. Provide solderless terminal lugs on stranded conductors.

2.8 DEVICE PLATES: Provide UL listed, one-piece device plates for outlets and fittings to suit the devices installed. Plates shall be of satin finish stainless steel, minimum 0.03 inch thick, having round or beveled edges. Screws shall be machine type with countersunk heads in a color to match finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional type device plates will not be permitted. Device plates for telephone/data outlets shall be satin finish stainless,

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minimum 0.03 inch thick, having round or beveled edges, and shall be such that it accepts Quickport Snap-in module type CAT 3 and CAT 5 connectors or equivalent. Plates installed in wet locations shall be gasketed.

2.9 SWITCHES:

2.9.1 Toggle Switches: NEMA WD 1, totally enclosed with rectangular, decorator-style bodies of thermosetting plastic and a mounting strap. Color shall be coordinated and submitted on. Switches for the essential power system shall be red. Wiring terminals shall be of the screw type, side wired. Switches shall be rated quiet-type, 120/277 volts, with number of poles indicated and shall be fully rated 20 amperes, AC only. Switches with push-in connections or a combination of screw-type and push-in connectors are not acceptable. Where switches have grounding terminals, they shall be grounded with a green grounding pigtail connected from the switch grounding screw directly to the grounding lug on the outlet box where the green equipment grounding conductor is terminated. Switches shall be the silent-operating type. Not more than one switch shall be installed in a single gang position.

2.9.2 NOT USED

2.9.3 NOT USED

2.9.4 NOT USED

2.9.5 NOT USED

2.9.6 Occupancy Sensor/Switch: Wall mounted, or ceiling mounted, as shown in drawings, occupancy sensor. Automatically turns lighting on when viewing area entered. Viewing angle of 180°. Time out delay adjustable from 7 seconds to 15 minutes. Manual override.

2.10 RECEPTACLES: UL 498 and NEMA WD1, heavy-duty specification grade grounding type. Ratings and configurations shall be as indicated. Bodies shall be of rectangular, decorator style. Bodies shall be thermosetting plastic supported on a metal mounting strap. Color shall be coordinated and submittal on. Wiring terminals shall be of the screw type, side wired. Receptacles with push-in connections or a combination of screw-type and push-in connectors are not acceptable. All receptacles, unless they are of the isolated-ground type, shall be grounded by the installation of a green grounding pigtail from the receptacle grounding screw directly to the grounding lug on the outlet box where the green equipment grounding conductor is terminated. The equipment grounding conductor shall be installed with the receptacle power conductors and shall terminate at the ground bus in the electrical service panel.

2.10.1 NOT USED

2.10.2 NOT USED

2.10.3 Special Purpose Receptacles: Provide in ratings and configurations indicated on drawings or required for the anticipated purpose. Contact surfaces may be either round or rectangular. One appropriate straight or angle-type plug shall be furnished with each receptacle. Locking facilities, where indicated, shall be accomplished by the rotation of the plug. Telephone/data outlets shall match the specified wall outlets.

2.10.4 Duplex Receptacles: 20 amperes, grounding type 125 volts, NEMA 5-20R per NEMA standard WD-1.

2.11 NOT USED

2.12 NOT USED

2.13 NOT USED

2.14 NOT USED

2.15 NOT USED

2.16 NOT USED.

2.17 NOT USED

2.18 NOT USED

2.19 NOT USED

2.20 NOT USED

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2.21 FIRESTOPS: Provide materials classified by U.L. to provide fire stopping equal to the fire rating of construction being penetrated. Provide fire stops in accordance with Section 07270, "Firestopping".

PART 3 - EXECUTION

3.1 INSTALLATION:

3.1.1 General Requirements: Electrical installations shall conform to the requirements of NFPA 70 and to the requirements specified herein.

3.2 RACEWAYS

3.2.1 Size of Conduits: Size of conduits shall be as indicated on the Drawings. The conduits shall be sized in accordance with the requirements of the NFPA 70. Minimum size of conduits shall be 3/4 inch.

3.2.2 Conduits of the designated type shall be installed in application as specified in Table A below.

3.2.3 Metallic conduits must be mechanically and electrically continuous between enclosures such as outlet, junction and pull boxes, panels, cabinets, motor control centers, etc. The conduit must enter and be secured to enclosures so that each system is electrically continuous throughout.

3.2.4 Run concealed or exposed conduit parallel or at right angles to building or other construction lines in a neat and orderly manner. Conceal conduit in finished areas. Run conduit in or below the floors as directed and with largest radius bends as possible. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install above water and steam piping.

3.2.5 Changes in direction or runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

3.2.6 Where conduits cross over expansion joints in walls and ceilings, use expansion fittings to accommodate motion. See architectural and structural drawings for these locations. Where conduits cross over expansion joints in slab or structure, use expansion-deflection fittings to accommodate motion. See architectural and structural drawings for these locations.

3.2.7 Threads: Clean all threads of rigid conduit. Coat all male threads of conduit installed in concrete with sealing compound to enhance electrical contact and provide waterproof joint or connection immediately before being coupled together. Running threads will not be allowed.

3.2.8 Protection: Cap raceways stubbed up, including those in cabinets, immediately upon their installation. The use of paper or rag wads will not be permitted.

3.2.9 All raceways with PVC coating shall be installed in accordance with manufacturer's directions, particularly where threaded fittings are used.

3.2.10 Electrical equipment located in the air conditioned spaces and subject to vibration and movement excluding motors: flexible metal conduit, 24 inches or 10 diameters minimum length; 6 feet maximum length.

3.2.11 Electrical equipment subject to vibration and movement, and all motors: liquid-tight flexible metal conduit, 24 inches or 10-conduit diameter minimum length; 6 feet maximum length.

3.2.12 NOT USED

3.2.13 Raceways in furred spaces: Install raceways in accordance with code requirements. Do not anchor or strap conduits to the ceiling furring channels or attach to furred ceiling hanger wires. Raceways shall not be attached to the suspension system (wire hangers) of drop ceilings.

3.2.14 Installation Methods:

- a. Install each entire conduit system complete before pulling in any conductors; clean the interior of every run of conduit before pulling in conductors to guard against obstructions and omissions.
- b. Cut all joints square, then thread and ream smooth. Coat cuts, threads or scratches on steel conduit with an approved zinc chromate or with a 90-percent zinc paint. When dry, draw up tight.
 - c. Make bends with standard ells or conduit bent to not less than same radius. Bends must be free from dents or flattening. Use no more than the equivalent of four 90-degree bends in any run between terminals and cabinets, or between outlets and junction boxes or pull boxes.
 - d. Conduit bodies may be used in lieu of conduit ells for 3/4" and 1" conduit sizes where ease of installation and appearance warrants. Conduit bodies larger than one inch may be used only where shown on the drawings.
 - e. Pull wire: The pull wire shall be zinc-coated steel or polyethylene with a minimum 200 pound tensile strength. Ten inches of slack shall be left at each end of the pull wire. All empty conduits shall have a pull wire installed.

3.2.15 With a coupling, terminate concealed conduit for future use at structural surfaces. Install a pipe plug flush with the surface.

3.2.16 Bushings and locknuts: Every conduit termination, whether into a box or a free end, shall have a plastic insulating bushing installed including where grounding bushings are required. Where GRS conduits terminate into boxes, they shall be fastened with double locknuts (inside and outside of box) and bushings. Where EMT conduits terminate into boxes, they shall be fastened with one locknut, compression box connector fitting and insulated bushing.

3.2.17 Ground bushings: Ground bushings are required on conduit ends where the conduit enters the building, underground conduits, and any conduit specifically used for a ground connection.

3.2.18 Conduit Support: Support conduit by pipe straps, wall brackets, hangers or ceiling trapeze at intervals not more than 10 feet. Provide supports at intervals of not more than 8 feet on each side of a change in direction. Fasten by concrete inserts or expansion bolts on concrete; by machine screws, welded threaded studs, by spring-tension clamps on steel work. Nail type nylon anchors or threaded studs driven by a power charge and provided with lock washers and nuts may be in lieu of expansion bolts or machine screws. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. The load applied to fasteners shall not exceed one-fourth of the proof test load. Raceways shall not be supported from sheet-metal roof decks. Fill holes that are not used. In suspended-ceiling construction, run conduit above the ceiling. Do not support conduits from the ceiling support system. Spring steel fasteners may be used for lighting branch circuit conduit supports in suspended ceiling in dry locations.

3.2.19 NOT USED

3.2.20 Flexible Connections: Provide flexible steel conduit between 3 and 6 feet in length for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement such as dry type transformers and unit heaters; for all motors and for other applications permitted by NEC. Install flexible conduit to

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allow 20 percent slack. Minimum flexible steel conduit size shall be 3/4 inch diameter for power circuits. Liquid-tight flexible conduit shall be used in wet locations. An outside bonding conductor shall be provided across flexible connections in addition to the equipment grounding conductor run in the conduit with its related power controls. This conductor shall be bonded to the connecting devices at each end of the flexible conduit.

3.2.21 Fire Rated Wall and Ceiling Penetrations: Use rigid steel conduit only. Provide seals to maintain the integrity of the fire rating.

3. NOT USED

3.4 BOXES, OUTLETS, AND SUPPORTS: Provide boxes in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.

3.4.1 Boxes for metallic raceways shall be of the cast-metal threaded-hub type when located in normally wet locations, when surface mounted on outside of exterior surfaces and when installed exposed up to 7 feet above interior floors and walkways.

3.4.2 Boxes in other locations shall be one piece sheet steel or cast-metal threaded-hub type with covers designed for surface installation.

3.4.3 Each box shall have the volume required by NFPA 70 for the number of conductors enclosed in the box. Boxes for mounting lighting fixtures shall be not less than 4 inches square (or octagonal), except that smaller boxes may be installed as required by fixture configurations. Boxes for use in tile walls shall be square-cornered tile-type, or standard boxes having square-cornered tile-type covers.

3.4.4 Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces. Each outlet box shall have a machine screw which fits into a tapped hole in the box for the ground connection.

3.4.5 Boxes installed for concealed wiring shall be provided with extension rings or plaster covers. The front edge of the box shall be flush or recessed not more than 1/4-inch from the finished wall surface (whether the finished surface is drywall, or drywall and a sound-absorbing material). Boxes shall not be supported from sheet-metal roof decks.

3.4.6 Provide separate boxes for flush or recessed fixtures when required by the fixture terminal operating temperature; fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided.

3.4.7 Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of the ceiling supports or make adequate provisions for distributing the load over the ceiling support members in an approved manner. Fasten boxes and supports with bolts and expansion shields on concrete, and with machine screws or welded studs on steel work. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes or cast metal boxes having threadless connectors directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type fastener not more than 24 inches from the box. Threaded studs driven by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws.

3.4.8 Boxes for use with raceway systems shall not be less than 1-1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting-fixture outlets shall be not less than 4 inches square, except that 4 inches by 2 inches boxes may be used where only one raceway enters the outlet. Telephone/data outlets shall be a minimum of 4 inches square by 1-1/2 inches deep.

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3.4.9 Mounting height: Mounting height of a wall-mounted outlet box means the height from finished floor to horizontal center line of the cover plate. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical pattern with all tops at the same elevation. Where outlets are indicated adjacent, but with different mounting heights, line up outlets to form a symmetrical vertical pattern on the wall. Verify the final location of each outlet with COR before rough-in. Remove and relocate any outlet box placed in an unsuitable position.

3.4.10 Back-to-back boxes: Provide 12-inch separation between outlets on opposite sides of wall unless approval is obtained. Where such a connection is necessary to complete a particular installation, fill the voids around the wire between the boxes with sound insulating material.

3.4.11 Box openings: Provide only the conduit openings necessary to accommodate the conduits at the individual location.

3.5 JUNCTION AND PULL BOXES:

3.5.1 Pull Boxes: Construct of not less than the minimum size required by NFPA 70 of code-gage aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified above. Furnish boxes with screw-fastened covers. Where several feeders pass through a common pull box, tag the feeders to indicate clearly the electrical characteristics, circuit number, and panel designation.

3.5.2 Install boxes as required to facilitate cable installation in raceway systems. Generally provide boxes in conduit runs of more than 100 feet or with more than three 90-degree bends. Locate boxes strategically and make them of such shape to permit easy pulling of wire or cables.

3.5.3 Install pull boxes in locations that will be accessible after completion of the building. Provide pull boxes or junction boxes to limit conduit runs to 125 feet and to limit angles to the equivalent of 270 degrees. Additional pull boxes may be provided to facilitate wire pulling.

3.5.4 Covers: Provide boxes so that covers are readily accessible and easily removable after completion of the installation. Include suitable access doors for boxes above suspended ceilings.

3.6 WIRE AND CABLES

3.6.1 Install to ensure total compliance with NFPA 70.

3.6.2 Protection: Mechanically protect conductors for systems by installing in raceways. Do not install the conductor until raceway system is complete. Use an approved wire-pulling compound when pulling large conductors. Do not bend any conductor either permanently or temporarily during installation to radii less than eight times the outer diameter of 600-volt insulated conductors. Do not exceed manufacturer's recommended values for maximum pulling tension.

3.6.3 Splices and Terminations: Use tool installed compression connectors for terminations or splices of all stranded conductors. Use ring-tongue type terminators on all data wiring. Utilize preinsulated connectors for splices and taps in conductors No. 10 AWG and smaller. All other twist-on connectors must be reviewed by the COR prior to installation.

- a. Tape all splices and joints with vinyl plastic tape. Use sufficient tape to secure insulation strength equal to that of the conductors joined. Cover all splices in handholes with submersible, heat-shrink or tape insulation.
- b. Cable Splices: Cable splices shall be made by qualified cable splicers in strict accordance with the cable manufacturer's recommendations, except where otherwise specified herein. A copy of the manufacturer's recommendations shall be furnished to the COR for inspection purposes. Splices in cables shall provide insulation and jacket equal in every respect to that of the cable. In order to prevent the possibility of moisture

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entering the splice, the jacket shall be cut back sufficiently to expose the required length of insulation between the jacket and the tapered end of the insulation as recommended by the manufacturer of the splicing material. All cable splice envelopes shall also meet the following requirements:

- c. Power cables 600 volts and below: Splices in manholes, handholes, or below ground shall be encased with water submersible heat-shrink or tape insulation.
- d. Connectors, power cable: Connections of cable conductors shall be made using crimp connectors utilizing a crimping tool designed to make a complete crimp before the tool can be removed.
- e. Connectors, data: Data conductors shall be installed per manufacturer's recommendations. Color coding of the conductors shall be followed throughout the installation.

3.6.4 Appearance: Neatly and securely bundle or cable all conductors in an enclosure using nylon straps with a locking hub or head on one end and a taper on the other.

3.6.5 Size: Install conductor sizes as indicated. Provide No. 10 conductor for single-phase, 20-ampere circuits for which the distance from panelboard to the first outlet is more than 100 feet. Conductors 250KCM or greater shall be installed with the use of a hydraulic cable bender.

3.6.6 Home runs: Each branch circuit shall have its own neutral conductor and separate green insulated equipment grounding conductor. No common neutral shall be used. Use home run circuit numbers as indicated for panelboard connections.

3.6.7 Conductor support: Provide conductor supports as required by the code and recommended by the cable manufacturer.

3.6.8 Underfloor wiring in air plenums of raised floors must be installed in raceways.

3.7 COVERS AND DEVICE PLATES: Provide device plates for each outlet box of the type required for service and device involved. Mount ganged devices under a single, one-piece, device plate. Engrave plates with 1/8 inch high black letters, if designated for engraving. Install with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed.

3.8 WALL SWITCHES: Set all switches in a suitable steel outlet box centered at the height of 48 inches from the floor. Install switch on the strike side of the door as finally hung. Install wall switches in a uniform position so the same direction of operation will open and close the circuits throughout the job, generally up or to the left for the ON position. The COR reserves the right to move receptacles \pm 10 linear feet along the wall line without change in the contract sum.

3.9 RECEPTACLES: Mount receptacles vertically in a suitable steel outlet box centered at the height of 15 inches from the floor or as shown on the Drawings. The COR reserves the right to move receptacles \pm 10 linear feet along the wall line without change in the Contract sum. Ground all receptacles to the enclosing metal box by connecting the device ground terminal to the box with #12 bare copper wire. Measure mounting heights of wiring devices and outlets to the center of device or outlet. Provide independent channel support structure for all devices not secured to the building structural.

3.10 DISCONNECT SWITCHES AND ENCLOSED CIRCUIT BREAKERS: Install disconnect switches and enclosed circuit breakers in locations as indicated, according to manufacturer's written instructions. Install level and plumb. Install wiring between disconnect switches, enclosed circuit breakers, data, and indication devices. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.

3.11 NOT USED.

3.12 NOT USED.

3.13 NOT USED.

3.14 NOT USED.

3.15 METAL FRAMING AND SUPPORTS: Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements. Coordinate with the building structural system and with other electrical installation.

3.15.1 Raceway Supports: Comply with the NEC and the following requirements:

- a. Conform to manufacturer's recommendations for selection and installation of supports.
- b. Strength of each support shall be adequate to carry design load plus 25 percent for future use, multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lb., provide additional strength until there is a minimum of 200 lb. safety allowance in the strength of each support.
- c. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
- d. Support parallel runs of horizontal raceways together on trapeze-type hangers.
- e. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
- f. Space supports for raceways in accordance with Table B of this section. Space supports for raceway types not covered by the above in accordance with NEC.
- g. Support exposed and concealed raceway within 1 foot of an unsupported box and access fitting. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
- h. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- i. Neither raceways nor boxes shall be fastened to suspended ceiling supports.

3.15.2 Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

3.15.3 In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers.

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Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.

- a. Cast metal boxes having threadless connectors and sheet-metal boxes shall be supported directly from the building structure or by bar hangers.

3.15.4 Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, lighting fixtures, and control components in accordance with the following:

- a. Fasten by means of wood screws, nails, screw-type nails, carriage bolts, or lag screws of equal holding strength on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
- b. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
- c. Coordinate any cutting or boring of structural beams with Structural Engineer prior to any work being done.
- d. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.
- e. Coordinate with structural engineer on expansion joints used to support raceways.

TABLE B: SPACING FOR RACEWAY SUPPORTS

HORIZONTAL RUNS

Raceway Size (Inches)	No. of Conduits in Run	Location	RMC/RSC/GRS & IMC (1)	EMT (1)
1/2, 3/4	1 or 2	Flat ceiling or wall.	5	5
1/2, 3/4	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction.	7	7
1/2, 3/4	3 or more	Any location.	7	7
1/2-1	3 or more	Any location.		
1 & larger	1 or 2	Flat ceiling or wall.	6	6
1 & larger	1 or 2	Where it is difficult	10	10

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		to provide supports except at intervals fixed by the building construction.		
1 & larger	3 or more	Any location.	10	10
Any	---	Concealed.	10	10

VERTICAL RUNS

Raceway Size (Inches)	No. of Conduits in Run	Location	GRS & IMC (1)	EMT (1)
1/2, 3/4	----	Exposed.	7	7
1, 1-1/4	----	Exposed.	8	8
1-1/2 and larger	----	Exposed.	10	10
Up to 2	----	Shaftway.	14	10
2-1/2	----	Shaftway.	16	10
3 & larger	----	Shaftway.	20	10
Any	----	Concealed.	10	10

NOTES:

- (1) Maximum spacing of supports (feet)
- (2) Maximum spacings for IMC above apply to straight runs only.
Otherwise, the maximum for EMT apply.

<u>Abbreviations</u>	
EMT	Electrical metallic tubing
IMC	Intermediate metallic conduit.
GRS	Galvanized rigid steel conduit.
RMC	Rigid Metal Conduit
RSC	Rigid Steel Conduit

3.16 NOT USED

3.17 FIELD TESTS: The Contractor shall provide all test equipment and personnel and submit written copies of all test results. All tests shall be performed in the presence of the COR or his designated representative. All instruments shall have been calibrated within the period of two years preceding testing.

3.17.1 Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

3.17.2 Cables: All cables shall be tested prior to installation and again upon completion of the installation. All testing shall be accomplished before connection is made to any existing equipment.

3.17. NOT USED.

3.17.4 Insulation Resistance Tests 600V and Below: Feeder and branch circuit insulation tests shall be performed after installation, but before connection to fixtures or appliances. Motors shall be tested for grounds or short circuits after installation but before start-up. All conductors shall test free from short circuits and grounds, and have a minimum phase-to-phase and phase-to-ground insulation resistance of 30 mega-ohms when measured with a 500-volt DC insulation resistance tester. The contractor shall submit a test report to the COR prior to final Government inspection of the contractor's work. The report shall list the tests performed and results obtained.

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3.17.5 NOT USED

3.17.6 Operating Test: After the interior wiring system installation is completed, and at such time as the COR may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the COR.

3.18 NOT USED.

3.19 FIRE STOPS

3.19.1 Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

3.19.2 Installation: Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instruction. Seal holes or voids made by penetrations to ensure an effective smoke barrier. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor. Protect materials from damage on surfaces subject to traffic.

3.19.3 Field Quality Control: Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas. Keep areas of work accessible until inspection by applicable code authorities. Perform under this section patching and repairing of fire stopping caused by cutting or penetration by other trades.

3.20 SPARES: Provide three (3) spare lamps for each lamp type used.

**TABLE A
CONDUIT APPLICATIONS**

<u>Conduit Type</u>	<u>Application</u>
Rigid Steel	a. Unheated, sheltered areas exposed to environmental elements (i.e., snow, wind, rain, sun). b. Fire rated penetrations.
Electrical Metallic Tubing	a. Heated Areas - Concealed in walls or ceiling. b. Heated Areas - Exposed.
Flexible Metallic Conduit	a. Heated Areas - Final for all vibrating or noise transmitting equipment including transformers, lighting, unit heaters, motors, etc.

END OF SECTION

SECTION 16740

DATA CABLING SYSTEMS

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest issue of the publications shall be used.

1.1.1 National Fire Protection Association (NFPA) Publication:

70 National Electric Code (NEC)

1.1.2 EIA Compliance: Comply with applicable requirements of EIA/TIA Standards EIA/TIA-568 and -569 pertaining to Telecommunications Wiring, Pathways and Spaces for Commercial Buildings.

1.2 GENERAL REQUIREMENTS: Section 16050, "Electrical General Requirements," applies to this section, with the additions and modifications specified herein.

1.3 SCOPE OF WORK: The following data systems will be defined herein. Provide outlets in the walls at locations specified on the drawings with cables routed to the communication cable tray located in the ceiling space of the facility. Minimum size conduit is 3/4" diameter unless noted otherwise.

1.3.1 Data and Miscellaneous Communication Cable Raceway Provisions: These raceway systems are intended to establish cable routing paths for multi-conductor cable installations. This work will consist primarily of providing outlets in the walls at locations specified on the floor plan drawings with conduit routed to the cable trays.

1.4 SUBMITTALS: Provide submittals in accordance with Division One requirements.

1.4.1 Manufacturer's Data

a. Cover plates and data-ports

PART 2 - PRODUCTS

2.1 DATA SYSTEM PROVISIONS

2.1.1 Data Communication Mounting Provisions: Provide flush-mounted, single gang outlet box mounted as shown in the plans with a single-gang faceplate at each of the intercommunication system points indicated on the floor plans. Provide a minimum 3/4" conduit with spare pull tape from each outlet box cable tray. Where communication cable tray is available, conduit may be routed to the cable tray and cable tray may be used to complete part of the route to the telephone backboard.

2.2.1 Data cabling shall be 4-pair, 24AWG, Category 6. Shielded Data cabling shall be 4-pair, 24AWG, Category 6 installed for Video Network components where noted on drawings. All data

runs shall be homeruns with no splices. No individual cable runs shall exceed 300 ' in total length. Data cabling shall be terminated on both ends. The user end shall be terminated to Quickport Snap-in Modules Category 6 jack; Leviton part # 41108-R*5CAT 6 rated modular adapter, 4-position or equal. Provide 20% spare. On other end, terminate on console/rack-mounted, 96-port, Category 6 Patch Panel; Leviton Part # 49484-B96.

- 2.2.2 Contractor shall provide forty(20) – 6-foot, Category 6, Straight through Patch cords with RJ-45 connectors on each end. Contractor shall provide forty(20) – 6-foot, Shielded Category 6, Straight through Patch cords with Shielded RJ-45 connectors on each end. Contractor shall provide twenty(20) – 3-foot, Category 6, Straight through Patch cords with RJ-45 connectors on each end. Color coordinate with the COR.

PART 3 - EXECUTION

3.1 Provide raceway system as shown on the drawings with conduit, pull boxes, and telephone outlet boxes as required for outlets. All wiring shall be as specified in par. 2.1. Route conduits to the cable tray and ground to cable tray with grounding bushing.

3.2 All conduits to be minimum size of 3/4" unless otherwise stated on drawings. Type of conduit is dependent on application; refer to Specification Section 16400, "Service and Distribution," for restrictions. Telephone and signal system raceways shall be installed in accordance with the requirements for conduit. In addition, no length of run shall exceed 50 feet for 3/4-inch sizes, and 100 feet for 1-inch or larger sizes; there shall be no more than 180 degrees of bends per length (e.g., two 90-degree bends). Pull or junction boxes shall be installed to comply with these limitations, whether or not indicated on the drawings. Bends in conduit, shall have minimum inside radii of 10 times the nominal conduit diameter.

*** END OF SECTION ***