



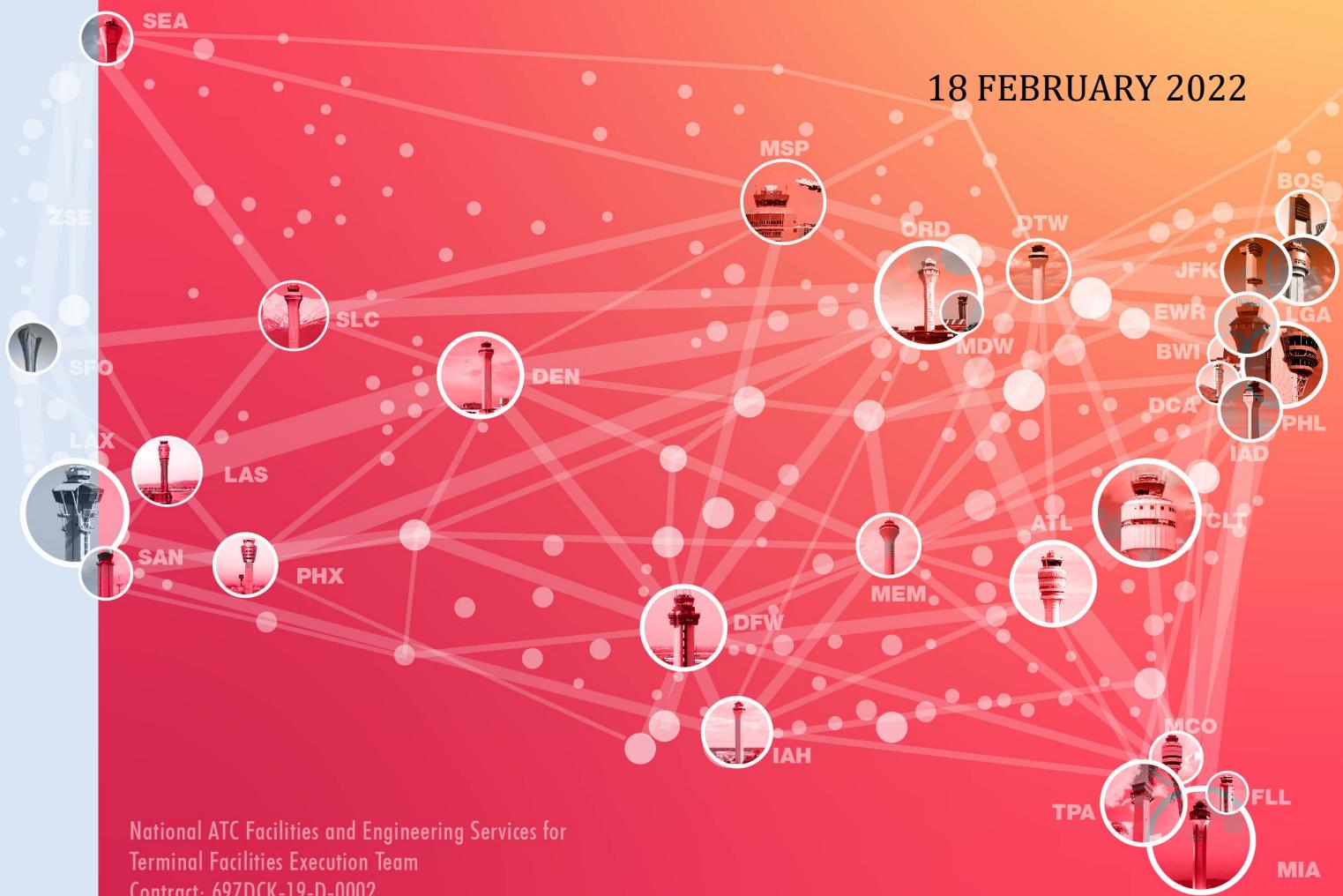
Potomac Consolidated TRACON Roof Replacement

Task Order 02

**Issued for Construction
Specifications**

Potomac Consolidated TRACON (PCT) Warrenton, VA

18 FEBRUARY 2022



National ATC Facilities and Engineering Services for
Terminal Facilities Execution Team
Contract: 697DCK-19-D-0002

Jacobs

Challenging today.
Reinventing tomorrow.

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SECTION 01 00 00 – GENERAL REQUIREMENTS

PART 1 - GENERAL

- 1.1 DRAWINGS, SPECIFICATIONS, AND OTHER CONTRACT DOCUMENTS**
- A. Drawings showing general outlines and details necessary for a comprehensive understanding of the work form a part of the Contract Documents. The total number and the titles of the drawings constituting the Drawings are given in the index of the Drawings. All work under the Contract must be performed in all respects in compliance with the requirements of the Contract Documents.
 - B. The Contract Documents provide for a complete work and may have been prepared in divisions of various crafts, trades and other categories of work. The Contractor is responsible for the performance of all work under the Contract regardless of any such divisions and must ensure that all of the work is performed and completed.
 - C. The FAA will provide the Contractor with one bound copy of the construction drawings and specifications for the Contractor's use during the execution of the Contract. The Contractor may reproduce these documents for its use during the performance of the work under this Contract.
 - D. The Contractor must maintain at the Site at all times at least one (1) copy of Drawings, Specifications and all other Contract Documents, together with at least one (1) complete set of approved Shop Drawings and approved samples.
 - E. The Contractor must make available at the job site one copy of each referenced standard or as directed by the Contracting Officer's Representative (COR), for the Contractor's and the FAA's use during the time that work is covered by the standard.
 - F. The Contract, Drawings, Specifications, and all referenced standards cited are essential parts of the Contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work.
 - G. On the drawings, calculated or figured dimensions govern over scaled dimensions.
 - H. In the event of a conflict between commercially available or industry standard documents and specific requirements in FAA Orders and Notices, the more stringent shall apply.
 - I. The contractor is responsible to provide a certification to FAA that all materials used on this project are free of lead and asbestos

- J. The Contractor must not take advantage of any apparent error, omission, discrepancy, or ambiguity on the Drawings or Specifications. If any error, omission, discrepancy, or ambiguity is found by the Contractor in the Drawings or Specifications, the Contractor must refer these to the Contracting Officer (CO) prior to beginning work on affected task(s), for interpretation and decision, and such decision must be final.
- K. The CO has the right to correct apparent errors or omissions in the Drawings and Specifications and to make such interpretations as he may deem necessary for the proper fulfillment of the Contract Documents. During the course of the work, should any conflicts, ambiguities, or discrepancies be found that are not addressed or any discrepancies between the Drawings and the Specifications to which the Contractor has failed to call attention before submitting the offer, then the CO will interpret the intent of the Drawings and Specifications and the Contractor hereby agrees to abide by the CO's interpretation and agrees to carry out the work in accordance with the decision of the CO. In such event the Contractor will be held to have included in the offer the most proper material and/or method of construction in order to fulfill the intent of the Contract Documents.
- L. When a material, article, or equipment is designated by a brand name, and more than one brand name is listed, it will be understood that the design is based on one of the brand name listed products. The Contractor will be responsible for all coordination necessary to accommodate the material, article, or equipment actually being provided and per the requirements of Section 01 25 00 without additional cost to the government.
- M. The organization of the specification into divisions, sections and articles, and the arrangement of Drawings does not restrict or limit the Contractor in dividing the Work among Subcontractors or in establishing the extent of work to be performed by any trade.
- N. Product and Reference Standards:
 - 1. When descriptive catalog designations including manufacturer's name, product brand name, or model number are referred to in the Contract Documents, such designations are considered as being those found in industry publications of current issue on the date of the first advertisement for offers.
 - 2. When standards of the Federal Government, State Department of Transportation, Standards Organization such as ASTM, AASHTO, AWS, or ANSI, trade societies, or trade associations are referred in the Contract Documents by specific date of issue, these are considered a part of this Contract. When such references do not bear a date of issue, the current published edition on the date of the first advertisement for offers are considered as part of the Contract.
 - 3. Where in the Contract Documents an item is identified by a particular manufacturer's name, model or other code it must be interpreted to include other manufacturers' product of like and equal quality whether the words "or equal" are included or not unless specifically stated otherwise.
 - 4. Wherever a particular manufacturer's product is required, to the exclusion of all others, appropriate language is included in the Contract Documents.

5. Wherever the terms, "as directed", "ordered", "permitted", "designate", "as approved", "approved equal", "or equal", "acceptable" and other words of similar meaning which authorize an exercise of judgement are used in the Contract Documents, such judgment is vested only in the CO or designated representative.
6. When a particular manufacturer's product is used, the Basis of Design and Section 01 25 00 shall be followed and be in conformance.

1.2 CONFORMITY WITH DRAWINGS AND SPECIFICATIONS

- A. No deviation from the Drawings, Specifications and other Contract Documents will be permitted without the prior written approval of the CO.

1.3 SUPERVISION AND CONSTRUCTION PROCEDURES

- A. At all times during performance of this contract, and until the work is completed and accepted, the Contractor must directly superintend the work or assign and have on the worksite a competent superintendent who is an employee of the Contractor and is satisfactory to the CO and has the authority to act for the Contractor.
- B. The Contractor must supervise and direct the Work, using the Contractor's best skill and attention. The Contractor is solely responsible for and has control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the Contract including coordination of the duties of all trades, unless the Contract Documents give other specific instructions concerning these matters.
- C. The Contractor must control its operations and those of its Subcontractors and Suppliers to assure the least inconvenience to the traveling public. Under all circumstances, safety must be the most important consideration.
- D. Contractor must lay out all work well enough in advance to avoid conflicts or interferences with other work in progress so that in case of interference the layout may be altered to suit the conditions, prior to the installation of any work and without additional cost to the FAA. The Contractor must be responsible to coordinate all work and take all action as required to avoid conflicts between trades.
- E. Contractor's use of GFM BIM and CAD files
 1. General: Building Information Modeling (BIM) and Computer Aided Design (CAD) files will be provided to Contractor for Contractor's use to avoid conflicts or interferences with other work, subject to the following conditions:
 2. While every effort has been made to ensure the accuracy of the information contained in the BIM files and the CAD drawing files, the FAA shall not be responsible for any mistake or inaccuracy that may be contained herein and all such liability and responsibility are expressly disclaimed by the FAA.
 - a. The Contractor shall comply with the requirements of Section 01 40 10, "Building Information Modeling."

- b. Contract Drawings and Specifications will govern in the event of a conflict between the BIM files and the plans and/or specifications.

1.4 CORRESPONDENCE

- A. Contract correspondence must be directed to the CO with a copy to the COR.
- B. Send submittals directly to the COR with a copy of the transmittal letter to the CO.

1.5 LIST OF SUBCONTRACTORS

- A. The Contractor must, within 10 calendar days after award, furnish to the CO with a copy to the COR, a list of subcontractors showing the type of work each will perform. If all subcontracts have not been awarded when the initial list is submitted, the Contractor must update the list monthly.

1.6 WORK NOT INCLUDED

- A. Items noted on the drawings, details, or schedules as "Not in Contract" ("N.I.C.") are not included in this contract.
- B. FAA Furnished Insurance
 - 1. FAA is not maintaining any insurance on behalf of Contractor covering against loss or damage to the Work or to any other property of Contractor. In the event Contractor maintains insurance against physical loss or damage to Contractor's construction equipment and tools, such insurance must include an insurer's waiver of rights of subrogation in favor of FAA.

1.7 SECURITY REQUIREMENTS FOR FIBER OPTICS (FOTS) AND DEMOLITION

- A. Personnel List: Contractor must provide the COR with a list of Contractor's personnel who will require access to the site. The list must be kept current during project work. The Contractor must provide all personnel with readily identifiable numbered badges during the period their access to the site is required. Badges must be in accordance with Airport Requirements and must be worn on outer clothes at all times when on airport property and at work in the site.
- B. Communication: The Contractor must request through the COR, a meeting with the Airport Manager and Control Tower personnel to discuss planned Contractor activities in the controlled airport operation area.
- C. Right to Search: Current procedures at FAA facilities located within airport boundaries include the "right to search". If in the judgment of the authorized security guard, or COR, a cause to search a vehicle or the person of personnel exists, such search will be made.

- D. Airport Requirements: Contractor must also meet all the Airport's security requirements for work at the airport. Pay all fees associated with airport requirements.

1.8 EXISTING WORK

- A. The disassembling, disconnecting, cutting, removal, or altering in any way of existing work must be carried on in such a manner as to prevent injury or damage to all portions of existing work, whether they are to remain in place, be re-used in the new work, or be salvaged and stored.
- B. All portions of existing work which have been cut, damaged, or altered in any way during construction operations must be repaired or replaced in kind in an approved manner to match existing or adjoining work. All work of this nature must be performed by the Contractor at his expense and must be as directed. Existing work must, at the completion of all operations, be left in a condition as good as existed before the new work started.

1.9 MATERIALS AND EQUIPMENT TO BE SALVAGED

- A. Except where specifically specified otherwise herein, or designated on the drawings, all existing materials and equipment which are required to be removed or disconnected to perform the work but are not indicated or specified for use in the new work, becomes the property of the Contractor and must be disposed of properly.

1.10 PARTIAL OCCUPANCY OR USE

- A. The FAA may occupy or use any completed or partially completed portion of the Work at any stage and, if the FAA chooses such partial occupancy, the Contractor and FAA must designate by an agreement the conditions of such partial occupancy. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the FAA and Contractor have accepted in writing the responsibilities assigned to each of them by the COR for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. Consent of the Contractor to partial occupancy or use by the FAA must not be unreasonably withheld.

1.11 UNCOVERING AND CORRECTION OF WORK

A. Uncovering Work

1. If any portion of the Work is covered contrary to the COR's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the COR be uncovered for his observation and be recovered (if corrections are not required) or be corrected, if applicable, at the Contractor's expense without change in the Contract Time.

B. Correction of Work

1. The Contractor must promptly correct Work rejected by the COR that fails to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor must bear all costs of correcting such rejected Work, including additional testing and inspections and compensation for the COR's services and expenses incurred by the FAA.
2. If, within two years after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established above, or by terms of an applicable special warranty required by the Contract Documents, any of the work is found to be not in accordance with the requirements of the Contract Documents, the Contractor must correct it promptly after receipt of written notice from the FAA to do so unless the FAA has previously given the Contractor a written acceptance of that specific condition. This period of two years must be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation survives acceptance of the Work under the Contract and termination of the Contract. The FAA must give such notice within a reasonable amount of time after discovery of the condition.
3. The Contractor must remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the FAA.
4. If the Contractor fails to correct nonconforming Work within a reasonable time, the FAA may correct it in accordance with General Provisions. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the COR, the FAA may correct or remove such nonconforming work and all costs for such corrections or removals must be assessed against the Contractor.
5. The Contractor must bear the cost of correcting destroyed or damaged Work, whether completed or partially completed, of the FAA or separate contractors caused by the Contractor's performing correction or removal of Work which is not in accordance with the requirements of the Contract Documents.
6. Nothing contained herein shall be construed to establish a period of limitation with respect to other obligations that the Contractor might have under the Contract Documents. Establishment of the time period of two years as described above relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability and damages with respect to the Contractor's obligations other than specifically to correct the Work.

1.12 UNDERGROUND UTILITIES

- A. Utilities Encountered - Efforts have been taken to locate all the underground utilities and cables on the contract drawings; however, unforeseen utilities and underground cables may be encountered. Actual cable locations must be verified in the field by the Contractor by hand digging a minimum of five (5') on each side of the cable. FAA owned cable will be marked by the FAA prior to the start of work by the Contractor.

1.13 LOCATION OF SERVICES

- A. The FAA does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the drawings. Any inaccuracy or omission in such information must not relieve Contractor of its responsibility to protect such existing features from damage or unscheduled interruption of service.

1.14 COOPERATE WITH OTHER ENTITIES

- A. Cooperate with the FAA and other public or private utility services, or a utility service of another government agency that may be authorized by the FAA to construct, reconstruct, or maintain such utility services or facilities during the progress of the work. Control operations to prevent the unscheduled interruption of such utility services and facilities.

1.15 NOTICE TO FAA/OPERATORS

- A. Prior to commencing the work in the general vicinity of an existing utility service or facility, Contractor must notify each FAA/operator in writing of activities that might affect its interests. If, in Contractor's opinion, the FAA/operator's assistance is needed to locate the utility service or facility or the presence of a representative of the FAA/operator is desirable to observe the work, such advice should be included in the notification. Furnish a copy of such written notices to COR.

1.16 EXCAVATION METHODS

- A. Where the outside limits of an underground utility service have been located and staked on the ground, Contractor must use excavation methods acceptable to the COR as may be required to insure protection from damage due to Contractor's operations.

1.17 DAMAGE TO SERVICES

- A. Should Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, it must immediately notify in writing the FAA/operator, appropriate public safety authorities, and the COR and must take all reasonable measures to prevent further damage or interruption of service. Cooperate with the utility service or facility FAA and the COR continuously until such damage has been repaired and service restored.

1.18 FAILURE TO PROTECT PROPERTY

- A. Contractor will not be entitled to any extension of time or compensation on account of Contractor's failure to protect all facilities, equipment, materials and other property as described herein. All costs in connection with any Improvements or restoration necessary or required by reason of unauthorized obstruction, damage, or use must be borne by Contractor.

1.19 UTILITY CONTRACTOR LICENSING REQUIREMENTS

- A. Contractor must comply with all state and local requirements for construction of utilities.

1.20 ASBESTOS AND LEAD FREE CERTIFICATION

- A. FAA policy is to construct all new facilities without asbestos or lead containing products. The Contractor must provide a letter on his company's standard letter head stating that to the best of his knowledge no product or material used on this project contains asbestos or lead. The statement must include the name of the project and the contract number and must be signed by an officer of the company. The statement must be furnished within 10 calendar days of the Substantial Completion date. Submission of this statement is a condition for final payment under the contract.
- B. Verification: If the FAA suspects the presence of asbestos or lead, tests will be performed on the material or product at the FAA's expense. If it is determined that the product or material does contain asbestos or lead, then the Contractor must remove the product or material and replace at his own expense including the expense of the testing and any retesting that may be necessary.
- C. Non – Compliance: If the Contractor fails to provide the above statement, then the FAA may have a complete building survey performed by a qualified testing firm and the costs deducted from the Contractor's final payment.

1.21 SAFETY DATA SHEETS (SDS):

- A. The Contractor must submit to the COR Safety Data Sheets (SDS) for all materials and/or products utilized during the course of the project accomplishment. During the course of the project, both the COR and the Contractor must routinely check products utilized on-site to ensure only products which have had SDS submitted are utilized. Copies of all SDS must be turned over to the local FAA office for their records.

1.22 INITIAL SUBMITTALS

- A. The following submittals are required to have FAA approval prior to Notice to Proceed.

1. Section 01 00 00	List of SubS, Certificate of Insurance
2. Section 01 32 00	Construction Schedule
3. Section 01 40 00	Contractor Quality Control
4. Section 01 50 10	FAA Field Representative's Office
5. Section 01 52 16	Safety Plans
6. Section 01 57 13	Erosion Control Plan & NPDES PERMIT
7. Section 01 71 33	Storm Protection Plan
8. Section 03 30 00	TOWER FOUNDATION REBAR SHOP DRAWINGS
9. Section 03 41 00	TOWER PRECAST SHOP DRAWINGS

1.23 KNOWLEDGE SHARING NETWORK (KSN) SITE

- A. The FAA maintains a joint use internet site for the purpose of electronic communication with the Contractor. It is a requirement to use this KSN site for submittals, RFI's and other communications with the government. The government will provide access and required passwords to allow access to this site.

1.24 UTILITY CONTACTS

- A. Duke Energy: Nathan Pinnix 336-312-6682
B. City of Greensboro Water Resources: Robbie Bald 336-373-2055

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Contractor's use of site and premises.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and Drawing conventions.
8. Miscellaneous provisions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of FAA's facilities.
2. Section 01 73 00 "Execution" for coordination of FAA-installed products.

1.3 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

B. Contracting Officer's Representative (COR): Individual authorized to receive and distribute information on the behalf of the Contracting Officer (CO). Also referred to as the Contracting Officer's Technical Representative (COTR) and/or Resident Engineer (RE) in some instances.

C. Some generic terms may be used in the documents where they are used the following shall apply:

1. Owner: When referred to herein the term Owner will mean the FAA.
2. Architect: Tasks and duties of the Architect when referred to herein will be performed by the CO, COR, COTR, or the RE depending on the project.

- D. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, reground, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
- E. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

1.4 PROJECT INFORMATION

- A. Project Identification: Potomac Consolidated TRACON Reroof
1. Project Location: Warrenton, Virginia.
- B. FAA: Federal Aviation Administration (FAA).
1. FAA's Lead Project Engineer: Keith Hood.
 2. FAA's Contracting Officer (CO): Zane Edwards

1.5 WORK COVERED BY CONTRACT DOCUMENTS

FAA

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
1. Existing Base Building Roof Replacement
 2. Utilities adjustments.
 3. Replace 17 rooftop exhaust fans, provide fall protection, and new LPBG (Lightning Protection Bonding and Grounding) system.
 4. Other work indicated in the Contract Documents.
- B. Type of Contract:
1. Project will be constructed under a firm fixed price contract awarded to a single contractor.

1.6 PHASED CONSTRUCTION

- A. The Work shall be conducted in multiple phases. The Contractor must provide a phasing work plan to the for approval prior to starting work. The Contractor is limited to working on one roof at a time and only on a portion which can be completed in a single work period. The Contractor will be responsible for determining the sequence of operation to maintain security of the facility and the construction site.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Each Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to FAA, FAA's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. If any interference to the existing facility operation or site access seems to be unavoidable, the contractor shall advise the COR before such interference develops. He shall then proceed as directed by the COR. If the contractor at the inception of the contract could have foreseen the obstruction or interference, all steps to prevent the interference or obstruction shall be performed at no additional cost to the FAA. This shall not relieve the Contractor of his responsibility for any other damages due to his neglect or lack of foresight. The Contractor shall examine the premises and satisfy himself as to the existing conditions under which he will be obligated to perform the work included in this contract.
- D. The FAA reserves the right to suspend any work that is determined to be causing an impact on Air Traffic Control operations.

1.8 COORDINATION WITH OCCUPANTS

- A. FAA Limited Occupancy of Completed Areas of Construction: FAA reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. The Contracting Officer's Representative (COR) will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to FAA acceptance of the completed Work.
 2. Before limited FAA occupancy, fire protection, fire alarm, communications, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, FAA will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 3. On occupancy, FAA will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.9 WORK RESTRICTIONS

- A. This project has many phasing and work hour restrictions that include extensive off hour and weekend work. See contract drawing phasing plans for specifics on working hour limitations pertaining to work restrictions and project phasing. Contractor requests to work outside normal working hours require COR approval. However, the COR has full discretion to approve or disapprove, or withdraw approval of requests.
- B. Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- C. Contractor Deliveries: The Contractor must provide an individual, submitted to and approved by the COR, who will be responsible for arranging site access for periodic or unscheduled Contractor deliveries. This individual must coordinate with the COR and facility security personnel, prior to the delivery, for site access of the delivery vehicle. Facility security personnel must be provided, at a minimum, with the name of the vendor, the driver's name, and the purpose for site access. Delivery vehicles arriving at the gate without prior notice and acceptance will be denied access. Delivery vehicles shall only contain items being delivered to FAA; if vehicles contain deliveries for recipients other than FAA, the vehicle will not be allowed on site. The Contractor assumes complete liability for the actions of delivery personnel and vehicles while on site.

- D. On-Site Work Hours: Limit work to between 7:00 a.m. to 4:00 p.m., Monday through Friday (except U.S. Federal holidays), unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by FAA and authorities having jurisdiction.
- 1. Weekend Hours: 7:00 a.m. to 4:00 p.m. Permitted with COR's approval.
 - 2. Early Morning Hours: Permitted with COR's approval.
 - 3. Hours for Utility Shutdowns: Off peak travel hours see restrictions below.
 - 4. Hours for Core Drilling: Nights with Contracting Officer's approval.
 - 5. Hours for Roof work over the Operations Area of the building: 11:00 pm to 5:00 am Saturdays and Sundays only.
- E. On-Site Work Day Restrictions: Do not perform work resulting in utility shutdowns or resulting in noisy activity on-site during work black-out days indicated in below in paragraph "Limits of Operations".
- F. Contractor requests to work outside normal working hours require COR approval. However, the COR has full discretion to approve or disapprove, or withdraw approval of requests. If the contractor desires to work outside normal hours (including Saturdays, Sundays, and holidays), he shall submit his written request to the COR at least 48 hours in advance. Some typical constraints on working outside normal working hours are:
- 1. The Contractor's request must be made at least two days in advance (e.g., request received by close of business Wednesday for work on following Saturday). Prior to submitting the request, the Contractor must coordinate as needed (such as utility outages) and have all required people and materials for the work that will be performed.
 - 2. A Contractor with quality or safety problems (as determined by the COR) will be restricted to normal working hours. Contractors may also not work time outside of normal working hours if they are not present on the job site during normal working hours.
 - 3. A Contractor who fails to correct deficiencies within a reasonable time (as determined by the COR) will be restricted to normal working hours or may be allowed to work outside normal working hours only to correct those deficiencies.
 - 4. The Contractor shall schedule his work to cause the least amount of interference to normal activities.
- G. Limits on Operations: The FAA has established moratorium dates for construction activity at critical facilities. The intent is to minimize the possibility of any activity that may have an adverse impact on the ability of FAA to perform its operational activities. Moratorium dates may change without notice. The moratorium dates are generally:
- 1. September 10 thru 12
 - 2. November – Friday before Thanksgiving through Monday after Thanksgiving
 - 3. December/January – Friday before Christmas through Monday after New Years

- H. All construction activity during moratorium periods must be approved in advance by the FAA. Submit items of work to be performed during moratorium dates no later than forty-five (45) days prior to the moratorium dates. Activities that have, in the sole opinion of the FAA, potential to negatively impact FAA operations will not be approved. A written waiver will be provided by FAA to the Contractor outlining the allowable work items. No additional time or cost will be allowed for such denial.
- I. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by FAA or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify the FAA COR and the Utility provider not less than 10 days in advance of proposed utility interruptions.
 - 2. Obtain COR's and the Utility's written permission before proceeding with utility interruptions.
- J. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to FAA occupancy with COR.
 - 1. Notify the FAA COR not less than 10 days in advance of proposed disruptive operations.
 - 2. Obtain COR's written permission before proceeding with disruptive operations.
- K. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on FAA's property is not permitted.
- L. Employee Identification: Require personnel and visitors to use FAA issued identification badges at all times.
- M. Employee Screening: Comply with FAA's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with FAA's representative.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.
 - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in these Specifications are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications

- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 3. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 4. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 5. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- C. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- D. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- E. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.11 PERMITS AND FEES

- A. Contractor is responsible for paying all utility service charges associated with the construction of the project. This includes temporary and permanent utilities, permits, inspection fees, connection fees and equipment to be installed by utility companies. This allocation of financial responsibility applies to all utilities as well as City and County agencies and entities. Contractor is responsible for follow up with the issuing authority after submittal.
- B. Listed below are permits that govern this project. Unless otherwise noted, Contractor is responsible for applying for utility services, obtaining required permits, and payment for any associated fees. Compliance is required with the conditions of all permits that have been issued. Additional permits may need to be obtained by the Contractor and all fees must be paid by the Contractor.
 - 1. Sanitary Sewer - Permit approval will be provided to the Contractor. Contractor shall comply with all provisions of present approval and the permit plans or obtain new approval. Contractor will not be required to obtain a construction permit. Contractor will pay for connection fees and establish customer service which will be transferred to FAA at no cost at completion of construction contract.
 - 2. Water - Permit approval will be provided to the Contractor. Contractor shall comply with all provisions of present approval and the permit plans or obtain new approval. Contractor will not be required to obtain a construction permit. Contractor will pay for connection fees and establish customer service which will be transferred to FAA at no cost at completion of construction contract.
 - 3. Erosion Control –Permit approval and conditions will be provided to the Contractor. It is the responsibility of the Contractor to notify Virginia Department of Environmental Quality (DEQ) prior to beginning construction activities.
 - 4. Stormwater – Permit approval and conditions will be provided to the Contractor.
 - 5. Telephone and Electric Service – Obtain permits and pay all fees associated with temporary and permanent services which will be transferred to FAA at no cost at completion of construction contract.
 - 6. The contractor will be responsible for any additional fees, payments or applications required for the site utilities that have not been identified above.

1.12 BUILDING PERMIT APPLICATIONS

- A. Contractor will not be required to obtain a Building Permit from the local Jurisdiction.

1.13 CERTIFICATE OF OCCUPANCY

- A. Contractor will not be required to obtain a Certificate of Occupancy from the local jurisdiction.

1.14 INSURANCE

A. Insurance Requirements

1. The Contractor shall at its sole expense, procure and maintain in effect at all times during the performance of the Work insurance coverage with insurers and under forms of policies satisfactory to the FAA, and with limits not less than those set forth in the contract.
2. The contractor shall not commence work until he/she has obtained, and the Contracting Officer has approved, all insurance required within the contract, nor shall the contractor allow any subcontractor(s) to commence work on a subcontract until all similar insurance required of the subcontractor has been obtained and approved. The successful contractor shall be required to procure and maintain bodily injury, general liability, and property damage liability insurance in his/her own name as protection against damages to persons or property, including injury or death, which may result from his/her performance of the work.
3. The insurance required shall be written for not less than the limits of liability specified in the contract documents, or required by law, whichever is greater. The proof of insurance shall be furnished within ten (10) days from the date of the Notice of Award to the Contracting Officer for approval.
4. The insurance limits shall be maintained during the entire performance or contract work. No cancellations of any insurance, whether by the insurer or by the insured, shall be effective unless written notice thereof is given to the Contracting Officer at least thirty (30) days prior to the intended effective date thereof, which date has been expressed in the notice. Prior to the effective date of any such cancellation, the contractor shall take out new insurance to cover the policies so canceled. All insurance policies referred to shall be underwritten by companies authorized to do business in the state of construction. The Certification shall be an "ACCORD" certificate with the Contract number and job location identified.
5. Workmen's Compensation Insurance
 - a. This contract shall be void and of no effect unless the contractor secures compensation for the benefit of (and keep insured during the life of this contract) such employees as are required to be insured by the Workmen's Compensation Insurance Law in the state of construction. The contractor hereby agrees to secure such compensation in the manner prescribed by law. The contractor shall require any subcontractors similarly to provide Workmen's Compensation Insurance for all the latter's employees to be engaged in the work unless such employees are covered by the protection afforded by the contractor's Workmen's Compensation Insurance.

b. The above-indicated insurance shall be maintained during the entire performance of contract work. No cancellation of any insurance, whether by the insurer or by the insured, shall be effective unless written notice thereof is given to the Contracting Officer at least thirty (30) days prior to the intended effective date thereof, which date has been expressed in the notice. Prior to the effective date of any such cancellation, the contractor shall take out new insurance to cover the policies so canceled. All insurance policies referred to shall be underwritten by companies authorized to do business in the state of construction.

B. FAA Furnished Insurance

1. FAA is not maintaining any insurance on behalf of Contractor covering against loss or damage to the Work or to any other property of Contractor. In the event Contractor maintains insurance against physical loss or damage to Contractor's construction equipment and tools, such insurance shall include an insurer's waiver of rights of subrogation in favor of FAA.

C. Notifications

1. In accordance with the submittal requirements outlined above, Contractor shall deliver the original and two (2) copies of the Certificate(s) of Insurance required by this clause and all subsequent notices of cancellation, termination and alteration of such policies to the CO with a copy to the COR.

D. Certificate of Insurance

1. The scope of coverage shall be shown on the certificate of insurance as "All operations of the Named Insured".

1.15 SECURITY REQUIREMENTS

- A. This project is on a restricted entry site and no compromise of the security system in any nature or of any duration may be made without prior approval of the Contracting Officer. Generally, such compromises, when approved, will be less than 24 hours in duration.
- B. Contractor's personnel shall not violate any security regulations pertaining to the facility. Violators may be removed from the premises with the right to re-enter revocable.
- C. Personnel List: Contractor shall provide the COR with a list of Contractor's personnel who will require access to the site. The list shall be kept current during project work. The Contractor shall provide all personnel with readily identifiable numbered badges during the period their access to the site is required. Badges shall be worn on outer clothes at all times when on FAA property and at work in the site.

- D. Security Investigation: If contractor needs access to active facility, Contractor's site superintendent shall submit to an FAA security background check and obtain an official FAA contractor ID badge. Other Contractor personnel may be subject to security investigation by FAA. Upon request by the Contracting Officer's Representative, the Contractor shall promptly complete all security forms provided by FAA.
- E. Facility Access Badges: Contractor personnel shall be subject to a security investigation by the FAA and shall obtain FAA Identification Media Badge prior to start of on-site work. Contractor shall return all badges to the FAA prior to final acceptance.
1. After award the Contractor shall provide the Contracting Officer with a list of contractor personnel who shall request FAA Identification Media Badge. The list shall be kept current during the entire duration of the project. The Contractor shall designate a representative to be the POC for inputting employee information into the Vendor Applicant Process (VAP). The Contractor shall request from the Contracting Officer all necessary forms, including FD 258 Fingerprint Card, 1681 Application, OF 306, and I-9. The Contracting Officer shall provide instruction for submitting forms.
 2. Security Badge Process: Badging is a two-stage process. The initial phase includes VAP entry and background check conducted by FAA security. Notification shall be provided by FAA Security of "Interim Suitability". At that time, contractor employees will be notified to make an appointment at a FAA PIV Center. A FAA PIV Center is located on the grounds of the Washington ATCSCC (DCC). Alternate locations for PIV Centers can be provided upon request. The badging process takes approximately 30 days to complete. The timeframe varies based on filling out the forms timely and correctly, and scheduling appointments at the PIV Center promptly, etc.
 3. Types of FAA Identification Media Badge. FAA Identification Media consist of a Contractor PIV Badge and Contractor Yellow Badge. Contractor PIV Badge allows the contractor access to the grounds and work site and escort authorized visitors at the work site. Contractor Yellow Badge allows the individual employee access to the grounds and work site. The FAA reserves the right to limit the number of PIV Badges issued.
- F. Visitor Access: A visitor is defined as any employee who does not have a FAA Identification Media Badge. A minimum of 2 work day notification to the COR is required for admittance to the FAA facility. Contractor personnel with a "PIV badge" shall escort the visitor at all times while on site. FAA employees will not escort contractor employees except when it is coordinated and approved by the COR. Visitor access for the employee shall be renewed daily by the contractor. Visitor access is limited to single visit short duration employees.
- G. Some areas in the facility are classified as controlled areas that require FAA escort of Contractor's personnel. Contractor's personnel must not violate any security regulations pertaining to the facility. The Contracting Officer has the authority to remove anyone from the site, including anyone who is determined to be a security risk. This authority extends to the entire complex, not just the buildings.

1. Persons entering on to federal property (including visitor parking lot) are prohibited from having on their person or in their vehicle:
 - a. Guns
 - b. Knives with blades over 2.5 inches except for valid tools.
 - c. Projection devices, bow and arrows, paint ball weapons, blow guns, etc...
 - d. Clubs, batons, collapsible batons, or saps.
 - e. Stun guns or tazers.
 - f. Chemical agents, mace, or pepper sprays.
 - g. Martial arts weapons of any kind.
 - h. Weapons of any kind.
 - i. Alcohol
 - j. Illegal drugs
 - k. Animals with the exception of a verified service animal
 - l. Family members, friends, children, minors, anyone not authorized on the FAA visitor list.
- H. Communication: The Contractor shall request through the COR, a meeting with the Facility personnel to discuss planned Contractor activities in the controlled facility operation area.
- I. Right to Search: Current procedures at FAA facilities located within facility boundaries include the "right to search". If in the judgment of the authorized security guard, or COR, a cause to search a vehicle or the person of personnel exists, such search will be made.
- J. Failure of the contractor to fully comply with the above instructions and/or directions from the COR will result in an immediate shutdown of the entire project until such time as the contractor demonstrates compliance.
- K. Additional security requirements, if any, will be discussed at the pre-construction conference(s).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **01 10 00**

SECTION 01 10 12 - CONSTRUCTION ADMINISTRATION FORMS

PART 1 - GENERAL

1.1 Construction Administration Forms

A. INDEX OF CONSTRUCTION ADMINISTRATION FORMS:

1. Notice of Proposed Construction Alteration
2. RFI Standard Form
3. Approval or Disapproval of Contractor's Materials or Shop Drawings
4. Resident Engineer Environmental and Occupational Safety and Health Checklist
5. FAA Life Safety System Inspection and Test Report
6. FAA Fire Alarm System Certificate of Completion
7. Certificate of Substantial Completion (CoSC)
8. Substantial Completion Acceptance (SCA)
9. Partial Occupancy/Use Agreement (POUA)
10. Job Memorandum (JM)
11. Hot Work Permit
12. Pre-Construction and Maintenance Project Safety and Health Checklist (FAA 3900-18)
13. Lock Out/Tag Out Procedure (See Division 26)

B. SEE DIVISION 2 FOR ADDITIONAL FORMS ASSOCIATED WITH REMOVAL AND DISPOSAL OF HAZMAT

1. Contractor shall submit a copy of Airspace Form 7460.1 to COR
2. Contractor shall be responsible to follow up with airport division within 2 weeks of submission to verify receipt and ensure timely processing of the form.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 GENERAL

- ##### **A.** During the administration of the Contract, the Contractor will be required to complete various construction administration forms as a part of the Management System. These forms are identified above and will be issued at the Pre-Construction Conference. These forms may be revised during the construction period and the Contractor will be required to comply with any such revisions.

END OF SECTION 01 10 12

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U.S. Department of Transportation
Federal Aviation Administration

Failure To Provide All Requested Information May Delay Processing of Your Notice

Notice of Proposed Construction or Alteration

FOR FAA USE ONLY

Aeronautical Study Number

1. Sponsor (person, company, etc. proposing this action) :

Attn. of: _____

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

2. Sponsor's Representative (if other than #1) :

Attn. of: _____

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

3. Notice of: New Construction Alteration
Existing

4. Duration: Permanent Temporary (months, days)

5. Work Schedule: Beginning _____ End _____

6. Type: Antenna Tower Crane Building Power Line
 Landfill Water Tank Other _____

7. Marking/Painting and/or Lighting Preferred:

<input type="checkbox"/> Red Lights and Paint	<input type="checkbox"/> Dual - Red and Medium Intensity White
<input type="checkbox"/> White - Medium Intensity	<input type="checkbox"/> Dual - Red and High Intensity White
<input type="checkbox"/> White - High Intensity	<input type="checkbox"/> Other _____

8. FCC Antenna Structure Registration Number (if applicable):

21. Complete Description of Proposal:

9. Latitude: _____ ° _____ ' _____ "

10. Longitude: _____ ° _____ ' _____ "

11. Datum: NAD 83 NAD 27 Other _____

12. Nearest: City: _____ State: _____

13. Nearest Public-use (not private-use) or Military Airport or Heliport:

14. Distance from #13. to Structure: _____

15. Direction from #13. to Structure: _____

16. Site Elevation (AMSL): _____ ft.

17. Total Structure Height (AGL): _____ ft.

18. Overall height (#16. + #17.) (AMSL): _____ ft.

19. Previous FAA Aeronautical Study Number (if applicable):
_____ - OE

20. Description of Location: (Attach a USGS 7.5 minute Quadrangle Map with the precise site marked and any certified survey.)

Frequency/Power (kW)

**this form to be
applied on-line at:**

**[https://oeaaa.faa.gov/
oeaaa/external/puntal
.jsp](https://oeaaa.faa.gov/oeaaa/external/puntal.jsp)**

Notice is required by 14 Code of Federal Regulations, part 77 pursuant to 49 U.S.C., Section 44718. Persons who knowingly and willingly violate the notice requirements of part 77 are subject to a civil penalty of \$1,000 per day until the notice is received, pursuant to 49 U.S.C., section 46301 (a).

I hereby certify that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to mark and/or light the structure in accordance with established marking and lighting standards as necessary.

Date	Typed or Printed name and Title of Person Filing Notice	Signature
------	---	-----------

Please Type or Print on This Form

FAA Form 7460-1 (2-99) Supercedes Previous Edition
012-0008

Form Approved OMB No. 2120-0001

NSN: 0052-00-

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Federal Aviation Administration

Request For Information No. 000

Title: _____

From:
Contractor

Contractor address

Phone:

Fax:

Contact:

Drawing or Spec:

Project:

JOB TITLE

To:

Job Location

Contract:

Phone:

Fax:

RE:

Attachments? No

Date Started:

Priority: Normal

Potential Cost Impact? Yes No

Date Required:

Potential Schedule Impact? Yes No

Date Completed:

If yes to either, explain below.

Question (Include Potential Impacts):

Response:

By: , FAA

Date:

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APPROVAL OR DISAPPROVAL OF CONTRACTOR'S
MATERIALS OR SHOP DRAWINGS

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

A.

1. TO: Contractor Address ATTN: Tel: Fax:	2. DATE CONTRACTOR'S SUBMITTAL RECEIVED:	3. DATE SUBMITTAL RETURNED:
	4. GOVT TRANS. NO.	5. CONTRACTOR'S TRANS. NO.
	6. PROJECT NAME	
	7. CONTRACT NUMBER	

8. TRANSMITTAL REFERENCE TO CONTRACT DRAWINGS and/or SHOP DRAWINGS

9. TRANSMITTAL REFERENCE TO CONTRACT DRAWINGS AND PARAGRAPH NUMBER and/or CHANGE ORDER NUMBER

10. FACTS:

Gentlemen: We are returning herewith the following Submittal Data:

A. ITEM NO.	B. NO. COPIES	C. NAME OF SUPPLIER	D. TYPE OF MATERIAL OR EQUIPMENT	E. APPROVAL AS SUBMITTED	E. APPROVAL AS NOTED*	F. NOT APPROVED †	F. REVISE AND RESUBMIT
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

G. REMARKS

H. STIPULATIONS

*Data marked "Approved as Noted" is satisfactory, contingent upon contractor acceptance of corrections and/or notations, and if accepted does not require re-submittal.

†Data marked "Not Approved" does not meet job requirements, and contractor must re-submit on proper basis.

Approval of Data does not obviate Contractor Responsibility for correct take-off or installation clearance.

Carbon Copies Transmitted To:

Sincerely,

Resident Engineer

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Section A. Purpose

This checklist is intended to be used as a tool by the resident engineer (RE) and other personnel overseeing construction to ensure adherence to Environmental and Occupational Safety and Health (EOSH) requirements at a project site. It must be noted that contractors are responsible for ensuring the safety of their employees. The checklist may be used by the RE as a tool to support their oversight role at the construction site. The checklist may be completed at the beginning of the project and reviewed and updated as the project proceeds.

This checklist relies on the training and professional judgment of the user. EOSH personnel should be consulted as needed.

Section B. Project Summary Information

The purpose of this section is to provide a brief description of the construction project and/or specific maintenance tasks, and identify key personnel responsible for project completion. Fill in the requested site-specific information. Indicate if this work will occur in or adjacent to an occupied space. Note: Provide further explanation of activities on additional sheets if necessary.

Project Name and Description:	
Project Location: _____	
Facility: _____	
Planned Start Date: _____	
Expected Completion Date: _____	
Contractor Contact:	Name: _____ Phone: _____
Project/Design Representative:	Name: _____ Phone: _____
COTR/Specialist:	Name: _____ Phone: _____
EOSH Contact:	Name: _____ Phone: _____
Facility Representative:	Name: _____ Phone: _____

Section C. Construction Safety Subject Areas

The following questions cover the most common EOSH related areas that may be encountered. This list is not inclusive. Consult with your designated EOSH professionals for additional guidance and assistance.

Construction Safety Subject Area	Yes	No/NA	Comment
GENERAL			
The project has the budget, work force, and schedule to develop an Accident Prevention Plan.			The accident prevention plan must include procedures for; Preventing Accidents, Educating Employees and Conducting Accident Investigation. 29 CFR 1926 Subpart C
The construction site will be inspected before, during and after each shift for obvious hazards.			OSHA has the right to enter the work site to conduct an inspection at any time. Conducting routine inspections, correcting potential violations, and maintaining good general housekeeping can minimize possible findings. 29 CFR 1903.3, 29 CFR 1926.3(a), 29 CFR 1926.25
A bulletin board will be posted with all required OSHA Notifications, safety literature, copies of accident reports and OSHA 300 Form.			Each employer is required to establish a location for posting of information, including: copies of the OSHA standards, specific safety standards, accident reports, and State specific safety postings. 29 CFR 1903.2(a)(1) and (2)
Concrete and/or masonry construction will take place as part of the project			If yes, complete Concrete and Masonry section below. 29 CFR 1926.700(a)
Structural Steel erection will take place as part of this project.			If yes, complete Steel Erection section below. 29 CFR 1926.750(a), (b) and (c)
The project will require welding, cutting, and/or brazing.			If yes, complete Welding, Cutting, and Brazing section below. 29 CFR 1926.350, 1926.351 and 1926.352
This project will involve structural demolition.			If yes, complete Demolition section below.

Construction Safety Subject Area	Yes	No/NA	Comment
CONCRETE and MASONRY			
Formwork and shoring must be adequate to support all intended loads during concrete placement.			29 CFR 1926.703(a)(1)
All protruding reinforcing steel will be guarded to eliminate impalement hazards.			29 CFR 1926.701(b)
All forms and shoring shall remain in place until a competent person determines that the concrete can support its weight and the weight of any superimposed loads.			29 CFR 1926.701(a)
Shoring equipment must be inspected immediately prior to, during and immediately after concrete placement.			29 CFR 1926.703(b)(3)
Work conducted over 4 feet above the next lower level shall comply with fall protection requirements.			See Climbing/Walking and Work Surfaces.
Pre-cast wall units, structural framing, and tilt-up wall panels shall be supported to prevent overturning and collapse until permanent connections are made.			29 CFR 1926.704(a)
A limited access zone will be established during masonry wall construction.			29 CFR 1926.701(c)
All masonry walls over eight feet in height shall be braced or supported to prevent collapse.			29 CFR 1926.706(b)
STRUCTURAL STEEL ERECTION			
The project has the schedule, budget and manpower needed to ensure the concrete attains 75% of its compressive strength.			Prior to beginning steel erection the prime/controlling contractor must provide written notice to the steel erection firm that the concrete has attained at least 75% of its compressive strength. 29 CFR 1926.751(a)
The project will require development of a site-specific traffic plan and site-specific erection plan. Qualified person (also defined in § 1926.32) means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.			The controlling contractor is responsible for traffic control on the site to allow ease of steel delivery and movement of derricks, cranes, etc. Further, to ensure employee safety a site specific erection plan is required to be developed by a "qualified person." 29 CFR 1926.752(c)(1) and (d)
The project requires inspections of all cranes, derricks, etc. by a qualified person before beginning each shift and of all rigging by a qualified rigger.			The contractor should supply or be able to supply their shift inspection form for equipment being used on the site. 29 CFR 1926.753(c)(1) and (2)
The crane or derrick operators training certificate is on site and copies of the certificates are maintained in the project file.			American National Standards Institute (ANSI) B30.2 through B30.22.
The crane operation is performed by a qualified or certified operator, with appropriate clearance from power lines and appropriate work area control.			OSHA Crane standard was recently revised extensively to cover crane operations, including certifications, operation, and training requirements. 29 CFR 1926.1400
The project requires all decking or roofing holes where an employee could fall 15 feet or more be guarded with railings, netting, perimeter safety wire, etc.			Any openings in decking or roofing are required to be closed unless structurally impossible. In the case were the whole cannot be decked or roofed over, fall protection must be installed, or the opening must be guarded. 29 CFR 1926.760(a)(1)
Protection from overhead falling objects will be required.			29 CFR 1926.759(b)
Fall protection training and equipment will be provided for all employees working over 6 feet above the next lower deck and Controlled Decking Zone (CDZ) training for all personnel required to work on a CDZ.			29 CFR 1926.760(a) and (c), 1926.761(b) and (c)(3)
A safety railing of at least a 1/2 inch wire rope or equivalent is installed approximately 42 inches around the periphery of all temporary planked or temporary metal decked floors of tiered buildings and other multi-floored structures during structural steel assembly.			29 CFR 1926.750(b)(1)(iii)

Construction Safety Subject Area	Yes	No/NA	Comment
DEMOLITION			
Demolition with Hazardous Materials (HazMat)			
A hazardous material assessment will be conducted to identify any asbestos, lead paint, transformers, light ballasts, etc., prior to initiation of demolition.			29 CFR 1926.850(e)
Asbestos will be abated prior to demolition of the structure.			29 CFR 1926.850(e) See ASBESTOS
All transformers and light ballasts will be removed from the structure prior to demolition.			29 CFR 1926.850(e), See POLYCHLORINATED BIPHENYLS for disposal options.
All hazardous materials and/or hazardous waste will be removed from the structure prior to demolition.			29 CFR 1926.850(e), See HAZARDOUS MATERIAL MANAGEMENT AND HAZARDOUS WASTE, as applicable.
Lead based paint will be abated and/or the ground surface will be protected from paint chips.			
Demolition without HazMat or After Abatement			
An engineering survey of the structure, assessing the potential for unplanned collapse shall be provided in writing.			Prior to beginning demolition an engineering survey assessing the potential for structural collapse must be provided in writing to the demolition contractor. 29 CFR 1926.850(a)
Continuous inspections should be made by a competent person as demolition work progresses to detect hazards from weakened or deteriorated floors or walls or loosened materials.			29 CFR 1926.859(g)
All utilities will be removed and capped prior to beginning demolition.			Gas, electrical, water and sewer lines must be disconnected and capped to prevent fire, electrocution or other hazard to the employee. 29 CFR 1926.850(c)
The area around the structure shall be protected from fragmenting glass and or falling building debris.			Employees and, where applicable, the public shall be protected from hazards posed by fragmenting and falling glass and or building materials. 29 CFR 1926.850(f)
A covered and protected walkway will be provided for any multi-story demolition.			29 CFR 1926.850(k)
Holes in flooring shall be repaired unless being used to chute materials out of the structure.			Holes in flooring must be guarded or repaired to protect workers from falling hazards, unless the hole is being used as part of a disposal chute for removing materials from the structure. All disposal chute openings must be protected by a guardrail at least 42 inches high. 29 CFR 1926.851, 852 and 853
Areas below openings where debris/materials are dropped through holes in floor, without the use of a chute, should be completely enclosed with barricades at least 42 inches high and at least six feet back from the projected edge of the opening above.			29 CFR 1926.850(h) and 1926.502(b)
Floor openings not used as debris/material drops should be equipped with a properly secured cover that will support two times the weight of employees, equipment, and materials that may be imposed on the cover at any one time.			29 CFR 1926.850(i) and 29 CFR 1926.502(i)
ELECTRICAL SAFETY			
The project will involve installation or removal of electrical systems, components or otherwise expose employees to electrical hazards.			29 CFR 1926.403; NFPA 70E Requirements
Electric equipment and lines should be considered energized until verified to be de-energized by test or other appropriate methods or means.			
Electrical equipment should be free from recognized hazards that may cause death or serious harm.			29 CFR 1926.403(b)(1)
Electrical disconnects such as circuit breakers, switches, and other disconnect means should be legibly marked to indicate purpose unless they are located so that purpose is evident.			29 CFR 1926.403(h)

Construction Safety Subject Area	Yes	No/NA	Comment
All electrical equipment should have ground fault circuit interrupters (GFCIs) to protect employees. An assured equipment grounding program should be in place if GFCIs are not in use.			29 CFR 1926.404(b)(1)(i) and (iii)
Electrical equipment used in hazardous locations must be either approved for the location or intrinsically safe.			29 CFR 1926.407(b)
When working on buried cable or a cable in manholes, metallic sheath continuity should be maintained by bonding across the opening or by an equivalent means.			29 CFR 1926.956(c)(7)
Hazardous energy controls (lockout/tagout) shall be used before servicing or maintenance activities on any machinery and equipment to prevent the unexpected energizing, startup, or release of stored energy that could cause injury.			29 CFR 1910.147(a)(2)(i)
EMERGENCY PREPAREDNESS			
A written Emergency Action Plan will be developed for the project and shall be available at the worksite.			An emergency action plan must be developed outlining that the employee is expected to take in the event of an emergency. The written plan must be available at the worksite. 29 CFR 1926.35(a) and (e)(3)
Employees will receive training in the alarm system, actions to be taken in the event of emergency, expected duties, and reporting requirements.			The emergency action plan must include: <ul style="list-style-type: none">• Emergency escape procedures and emergency escape route assignments;• Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;• Procedures to account for all employees after emergency evacuation has been completed;• Location of assembly area;• Rescue and medical duties for those employees who are to perform them;• The preferred means of reporting fires and other emergencies; and• Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan. 29 CFR 1926.35(b)
Emergency medical, fire and evacuation drills will be conducted at the project site.			Fire, medial and evacuation drills should be conducted on-site to familiarize employees with alarms, rally areas, emergency exits/evacuation routes and emergency procedures. 29 CFR 1926.35(e)
Documentation of employee training and drills will be maintained in the project file.			Documentation of any training should be maintained in the project file, as Emergency Action Plan training is site specific. Further, documentation of FAA employees/contractors on-site or visiting the site being briefed should also be maintained in the project files.
EXCAVATING and TRENCHING			
The project will have the budget, schedule and personnel to arrange utility clearances with the local utility companies, if applicable.			The utility companies must be contacted and allowed at least 24 hours to respond to the request for a utility locate. If the utility company does not respond, the work can continue but precautions must be taken. A record of all utility clearances or attempts to obtain utility clearances should be maintained with the project file. 29 CFR 1926.651(b)
The project includes budget and schedule for use of proper sloping, shoring, shielding or trench boxes.			29 CFR 1926.651(i)
The project includes budget, schedule and manpower to conduct daily inspection of all excavations to prevent cave-in.			A daily inspection of the excavation by a competent person is required to look for signs of soil movement, fracturing of soils, or other issues increasing the risk of a cave in. Documentation of each daily excavation inspection should be maintained in the project file. 29 CFR 1926.651(k)

Construction Safety Subject Area	Yes	No/NA	Comment
The project includes the budget and schedule to properly shore, brace or underpin adjoining buildings, ground or walls affected by the excavation.			A registered engineer must properly design all shoring, bracing or underpinning. 29 CFR 1926.651(i)
Trenches shall be equipped with ladders so that employees in the trench do not have to travel more than 25 feet to egress any portion of the excavation.			29 CFR 1926.651(c)(2)
The site layout plan identifies safe distance requirements for stockpiling materials or excavated soils, to avoid sidewall collapse.			Materials must be kept a minimum of 2 feet from the edge of the excavation, and may require more clearance dependent upon soil type. 29 CFR 1926.651(j)
All applicable utility companies (power, gas, water, telephone, etc.) shall be contacted in order to determine the location of potential underground obstructions/hazards prior to cutting into the soil. If the utility companies are not able to specifically locate the underground obstructions/hazards, either instruments or probes shall be used to locate the underground obstructions/hazards, prior to the start of operations.			29 CFR 1926.651(b)(2) and (3)
Any trench or excavation five feet or more in depth must be provided with cave-in protection through such means as shoring, sloping, benching, or use of hydraulic shoring, trench shields, or trench boxes. Trenches or excavation less than five feet in depth, that have a potential for cave-in, must be provided with cave-in protection.			29 CFR 1926.652(a)(1)
Fences or other appropriate physical barriers are required to be erected around the excavation or trench. Flashing caution lights are required if work is being conducted at night or when the opening is left uncovered during evening periods. Both the barriers and flashing caution lights must be maintained around the opening until the work is completed or the opening is adequately covered.			
Testing and engineering controls need to be established to prevent employee exposure to hazardous atmospheres that could enter trenches/excavations.			29 CFR 1926.651(g)
A competent person is required to inspect each excavation/trench daily. These inspections shall be conducted before the start of work, at the beginning of each shift, after every rainstorm or other hazardous occurrence, and as needed throughout the shift.			29 CFR 1926.651(K)(1)
FIRE PREVENTION and PROTECTION			
A written fire prevention and protection plan shall be maintained at the site.			A site-specific fire prevention and protection plan should be established for the each construction site, establishing fire alarm procedures, fire extinguisher locations and use, fire suppression system (if available), etc. 29 CFR 1926.150(a)
Instructions for reporting a fire shall be conspicuously posted at the work site.			29 CFR 1903.2(a)(1)
Adequate fire extinguishers shall be provided to allow employees to evacuate the work site.			The project manager will need to determine if the construction contractor will be required to provide fire fighting services or simply have his/her employees evacuate the site in the event of an emergency. All fire extinguishers must be within their annual certification and must be visually inspected on a monthly basis. All fire extinguishers should be conspicuously located and marked. 29 CFR 1926.150(a)(3), (5) and (c)
Flammable and combustible liquids stored at the site shall be kept in approved containers and will be stored in rooms or flammable storage cabinets meeting fire resistance requirements.			29 CFR 1926.152(a), (b) and (c)
Smoking on the work site shall be prohibited.			29 CFR 1926.151(a)(3)

Construction Safety Subject Area	Yes	No/NA	Comment
At least one portable fire extinguisher, with a rating of not less than 20-B:C, must be located within 75 feet of each pump, dispenser, underground fuel pipe opening, and lubrication or service area.			29 CFR 1926.152(g)(11)
HAND and POWER TOOLS			
Hand and Power Tools that can accommodate guards, shall be equipped with the appropriate guards.			If a hand tool or power tool can support guards, the guards must be installed. Further, the point of operation, the area where actual work is performed, shall be arranged and/or guarded to keep workers from placing themselves in danger. 29 CFR 1926.300(b)
Hand and power tools shall be inspected for defects, missing prongs on plugs, and frayed power cords prior to each work shift.			Employers are responsible for ensuring that employees are not using unsafe hand or power tools. All tools should be inspected prior to each work shift, the inspection documented (especially for power tools), and the documents kept in the project files. Damaged tools shall be removed from the project immediately. 29 CFR 1926.301(a)
Electric power tools must be properly grounded or double insulated.			29 CFR 1926.302(a)
Powder actuated tools shall only be used by trained personnel.			Powder actuated tools may only be used by trained employees. Copies of personnel's training records should be included in the project file and maintained on-site for the duration of the project. 29 CFR 1926.302(e)
Personnel using hand and power tools shall be issued personnel protective equipment required to protect them from the hazards associated with each particular hand or power tool.			Personnel must be issued Personal Protective Equipment (PPE) required to protect them from falling, flying, abrasive and splashing objects, dusts, fumes, mists or other hazards caused by hand or power tools. Personnel must be trained to use the PPE they are issued. Copies of training documents should be kept in the project file. 29 CFR 1926.301(c)
WELDING, CUTTING, and BRAZING			
Only trained, licensed or certified employees shall conduct welding, cutting, or brazing.			All welders must be trained in the proper use of their equipment and understand the hazard associated with the equipment use, and how to protect themselves from those hazards.
A hot work permit will be required to authorize any welding, cutting, or brazing outside of an area designed for these activities; such as welding booths.			A Hot Work Permit program allows the project manager or site supervisor to inspect the welding area prior to initiation of welding or cutting activities. This also ensures that any combustible materials have been removed or shielded, and any other fire protection requirements have been put in place. 29 CFR 1910.252(a)(1) and (2), 29 CFR 1926.352
Workers conducting any welding or cutting shall be provided personnel protective equipment including proper protective lenses.			PPE must be provided to protect workers from sparks, molten steel and damage to their eyes. Further, mechanical ventilation or respirator protection may be required to ensure workers are not over-exposed to metal fumes generated by welding or cutting activities. 29 CFR 1910.252(b), 29 CFR 1926.351(e) and 353(a)
All welding equipment, tips, cylinders, valves, etc., shall be inspected prior to each use or at the beginning of each shift.			All welding equipment should be inspected prior to use. All gas hoses must be inspected prior to each use. Copies of all inspections records should be maintained in the project file for the duration of the project. 29 CFR 1926.350(f)(3)
The project has the budget to provide a fire watch for all welding required by the project.			A fire watch is required for any welding activity where combustible materials cannot be removed, moved, or shielded and are within 35 feet of welding activities. 29 CFR 1910.252(a)(iii)
All compressed gas cylinders shall be secured in an upright position and protective caps in place during storage. Cylinders should be secured in a vertical position when transported by power vehicles.			29 CFR 1926.350(a)(4) and (9)

Construction Safety Subject Area	Yes	No/NA	Comment
Mechanical ventilation system of sufficient capacity and so arranged shall be provided to remove fumes and smoke and keep the concentration within safe limits.			29 CFR 1926.353(a)(2) and (3)
General mechanical ventilation, local exhaust ventilation, or airline respirators must be provided to employees who are required to conduct welding, cutting, or brazing operations in permit required confined spaces.			29 CFR 1926.353(b)(1)
Approved fire extinguishers shall be provided and maintained in all areas where welding will be conducted and the extinguishers must be the proper class for potential class of fire in the area.			Approved fire extinguishing media shall be immediately available at any location where welding is taking place. 29 CFR 1926.353(d) 29 CFR 1910.252(a)(1)(ii)
HOUSEKEEPING			
Separate containers shall be provided for disposal of trash, oily/combustible rags, fuel soaked rags, flammable or hazardous wastes and acidic wastes.			Waste should be collected from around the site to minimize fire hazards. Further, wastes should be segregated to avoid possible waste incompatibilities and minimize potential hazardous waste disposal costs. 29 CFR 1926.25(c), 40 CFR 262.11 See HAZARDOUS MATERIAL MANAGEMENT AND HAZARDOUS WASTE MANAGEMENT.
All wastes collected at the site shall be reviewed to ensure they are being disposed of properly.			40 CFR 262.11 See HAZARDOUS MATERIAL MANAGEMENT AND HAZARDOUS WASTE MANAGEMENT.
Work areas should be cleaned at the end of each shift, trash collected, any protruding nails removed or fixed, ladders and equipment inspected, tools and supplies organized and the floor cleared of any debris.			
LADDER and TEMPORARY STAIRWAY SAFETY			
Stairways			
All stairways shall meet industry accepted standards for angle and rise versus run.			29 CFR 1910.24(e)
Stairway treads shall be non-slip and/or slip resistant.			All treads and stair nosing must be relatively slip resistant, and the edge of the stair tread must be easily identifiable by persons using the stairwell. 29 CFR 1910.24(f)
Flights of stairs with four or more risers equipped should be equipped with standard stair railings or handrails.			Hand rails must be provided on all stairwells, closed or open. On open sided stairwells must have railings and handrails on the open side. Railings must be 42 inches high, with handrails being between 30 and 34 inches in height. Railing is able to hold at least a 200 lb load. 29 CFR 1910.23(d) and (e), and 24(h)
Stairs shall be at least 22 inches wide.			Minimum allowable stairway width is 22 inches. Stairways may be wider, but cannot be narrower. Stairways wider than 22 inches need to meet additional railing or handrail requirements. 29 CFR 1910.23(d) and (e)
Stairways shall be inspected on a regular basis.			All temporary stairways must be inspected for defects or damage. Records of these inspections should be maintained in the on-site project file for the duration of the project. Damaged or defective stairways must be taken out of service and/or repaired. 29 CFR 1926.851(b)
Ladders			
All ladders in use on the project shall be inspected on a regular basis.			All temporary stairways must be inspected for defects or damage. Records of these inspections should be maintained in the on-site project file for the duration of the project. Damaged or defective stairways must be taken out of service and/or repaired. 29 CFR 1910.26(d)(1)(x) and 1926.1053(b)(15)
All ladders shall be secured in place using bracing at the base and being tied off at the top.			While bracing can be used to help secure a ladder in place, it does not take the place of lashing the ladder at the top to prevent slippage or sliding. 29 CFR 1910.26(d)(1)(xix) and 1926.1053(b)(1)

Construction Safety Subject Area	Yes	No/NA	Comment
Side rails of ladders should extend at least 36 inches above the landing or roof edge.			29 CFR 1926.1053(b)(1)
ILLUMINATION			
The project has the budget to provide light sets to provide adequate lighting throughout the entire construction site.			The amount of lighting required is dependent upon the activities being performed in each area. For foot-candle illumination requirements see 29 CFR 1926.56(a) Table D-3 .
Construction areas, ramps, runways, corridors, offices, shops, and storage areas must be lighted with either natural or artificial illumination.			29 CFR 1926.56(a)
All overhead objects (i.e. lights, signs, wiring and piping) shall be at least 7 feet above floor level.			All overhead objects are at least 7 feet above floor level to minimize the potential for head injuries. 29 CFR 1910.24(i)
All lights will be guarded to prevent breakage.			
OCCUPATIONAL HEALTH and ENVIRONMENTAL CONTROLS			
NOISE			
The project has the budget to conduct personal and/or area noise monitoring.			Engineering and administrative controls must be implemented when noise exceeds 90 dBA for 8 hours. If noise levels are louder, then the total exposure must be calculated. If calculated sound levels exceed 85 dBA, then a hearing conservation program must be implemented. Also, all monitoring records must be maintained in the project file for at least two years. 29 CFR 1910.95(a), 1910.95(m)(3)(I), and 29 CFR 1926.52(d)(1)
The project has the budget and schedule to develop a Hearing Conservation Program.			If noise levels exceed 85 dBA for an 8-hour time weighted average (TWA), then the employer must develop a Hearing Conservation Program. 29 CFR 1910.95(c)(1)
All employees exposed to noise above 85 dBA will be notified.			Any employee exposed to noise levels above 85 dBA TWA shall be notified of the noise monitoring results. 29 CFR 1910.95(e)
Employees exposed to noise levels above 85 dBA shall have hearing protection.			All employees exposed to noise levels above 85 dBA TWA shall be provided hearing protection and the employer shall ensure that employees wear the hearing protection. 29 CFR 1910.95(i)
Employees will be briefed regarding the hazards of noise over-exposure, how to recognize noise over-exposure and how to protect themselves.			During the hazard communications briefing, all employees should be briefed on the hazards associated with noise over-exposure and methods to protect themselves. The briefing should also cover proper use of any PPE supplied. Records of such training should be maintained in the project file.
SANITATION			
The project has the budget to supply drinking water, either as bottled water or as a drinking water supply with disposable cups.			Employers are required to supply an adequate potable water supply. Further, using a shared cup or allowing dipping of water from a container is prohibited. If a mutual water container is provided, disposable water cups must be supplied. 29 CFR 1926.51(a)(1) and (a)(2)
All water coolers shall be clearly marked Drinking Water-Do Not Use For Any Other Purpose.			29 CFR 1926.51(a)(3)
All water sources shall be marked as either Potable or Non-Potable.			29 CFR 1926.51(a)(6)
The project has the budget to supply heated, ventilated and well-lighted quarters.			If the project is providing temporary sleeping quarters or will be a work camp environment, sleeping quarters must be heated, ventilated and lit. 29 CFR 1926.51(e)
The project has the budget to properly manage food preparation, if necessary.			If the project is providing food to on-site workers or if the project is establishing a work camp, where employees, contractors and sub-contractors will be fed, then all local, state and federal laws and ordinances must be met. 29 CFR 1926.51(d)

Construction Safety Subject Area	Yes	No/NA	Comment
The project has the budget to provide adequate toilets and wash facilities.			If the project is providing quarters or housing on- site for the duration of the project, then lavatories and shower facilities must be established. If showers are provided, the project must also provide soap, hot and cold water and clean towels (i.e. meaning a facility for washing towels will also be required). At a minimum the number of toilet required at the job-site must meet the minimum number of toilets and urinals identified in 29 CFR 1926.51(c)(1). 29 CFR 1926.51(c)(1) and 1926.51(f)(4)
GASES, FUMES and VAPORS			
The project is utilizing hazardous materials that have established exposure limits.			If the project is using a hazardous material with an established Threshold Limit Value (TLV) or Permissible Exposure Limit (PEL), then precautions shall be taken to prevent employee exposure at levels above the TLV/PEL. 29 CFR 1926.55(a)
The project has the budget to conduct personal or area air monitoring to assess employee exposure.			
Personnel will be issued Personal Protective Equipment necessary to protect themselves from any gases, fumes or vapors.			PPE shall only be issued if engineering and administrative controls cannot reduce exposure to below the TLV/PEL. Prior to issuing respiratory protection, airborne concentrations of hazardous materials must be determined to ensure that provided respiratory protection will properly protect employees. Employees using respiratory protection must have been trained in the proper use, limitations and maintenance of the respirator. Further, employees required to use a respirator must be medically capable of using a respirator. Finally, a written respirator program must be available and should be maintained on-site for the duration of the project. 29 CFR 1910.134
HEAT and COLD EXPOSURE			
Employees will be provided Physical Hazard Data Sheets on Cold and Heat exposure during the Hazard Communication brief.			Heat and cold exposure are physical hazards that should be discussed during the Hazard Communication in-briefing at the site. Employees should be trained to recognize the signs of heat stress/heat stroke and hypothermia. Further, methods employees can use to protect themselves from these hazards should be identified.
Temperature and humidity will be monitored and rest-breaks adjusted to minimize potential for heat or cold related injuries.			
The project has the budget necessary to provide longer breaks for either warming up or cooling off, required to avoid heat and cold injuries in inclement weather.			
MATERIAL HANDLING			
For lift operations using motorized equipment, procedures for lifting and handling of materials and equipment must be developed prior commencing operations.			
Hoistways and aisles will be kept clear of any stored materials.			29 CFR 1926.250(a)(3)
Personnel required to work on stored materials (i.e. stacked, tiered storage, etc.) shall be provided with Fall Protection.			Any person required to work over 1.8 meters (6 feet) above the next lower working surface, shall be provided fall protection. 29 CFR 1926.501(b)(1)

Construction Safety Subject Area	Yes	No/NA	Comment
All slings, riggings and fastenings shall be inspected prior to each work shift by a competent person.			Each sling, rigging, fastener or other equipment used for lifting must be inspected each day before being used by a competent person. Additional inspections may be warranted depending on use, but any damaged equipment must be removed from service immediately. Records of each daily inspection and removal of equipment from service should be maintained in the project file on-site for the duration of the project. 29 CFR 1926.251(a)(6)
Areas where lifting or overhead slinging of materials occurs will have restricted access and suspended loads shall not travel over workers heads.			29 CFR 1926.550(a)(9)
Where stacked or tiered storage is being used, load limits will be identified and posted on each tier of storage.			
Materials being dropped into a disposal container shall be enclosed by a chute.			
Prescribed hand signals for all guiding all motorized equipment shall be established for the project and will be communicated to the employees.			Prescribed hand signals should be established to cover all equipment guiding being conducted during the project. All personnel responsible for guiding equipment operations should be trained in the accepted hand signals. Non-standard hand signals should be discouraged. 29 CFR 1926.550(a)(4)
All lifting/hoisting equipment on-site shall be inspected before being used each day or each shift.			Records of daily inspections of all motorized equipment should be maintained in the on-site project file for the duration of the project. 29 CFR 1926.550(a)(5)
All alarms, warning lights, etc., will be inspected for correct function before equipment is used each day or each shift.			Equipment used for material handling must be inspected before use and as necessary to ensure that it is safe. 29 CFR 1926.550(a)(5) and .601(b)(14)
Annual certificates of inspection shall be kept on-site for all equipment.			All lifting and hoisting equipment is required to have an annual inspection by a competent person or government entity. Copies of the annual certificate of inspection shall be kept in the on-site project files for the duration of the project. If equipment does not have a current inspection certificate it cannot be used on the project. 29 CFR 1926.550(a)(6)
The "swing" area around all heavy equipment and areas where employees could be pinned between heavy equipment and other objects, will be barricaded.			The swing area, especially for equipment with large counterweights must be restricted to avoid employees working in areas where the equipment operator may not be able to see them. 29 CFR 1926.550(a)(9)
All equipment shall be supplied with functional portable fire extinguishers within immediate access of the operator.			Cranes, derricks, etc., are required to have a fire extinguisher readily available to them. All equipment and vehicles at a site should be equipped with a fire extinguisher for any emergency. 29 CFR 1926.550 (14)
Aerial lift trucks working near energized lines or equipment must be grounded or barricaded and considered as energized equipment or the truck should be insulated for the work being performed.			Spotters and tag lines, or other suitable devices used to control loads being handled, are required when lifting operations are conducted adjacent to energized overhead power lines. Keep lift trucks at least 15 feet from all power lines. 29 CFR 1926.952(c)
Spotters and tag lines, or other suitable devices used to control loads being handled, are required when lifting operations are conducted adjacent to energized overhead power lines.			29 CFR 1926.952 (d)
SCAFFOLDING			
The project has the budget to have a "qualified" person design the scaffolding system.			All scaffolding must be designed by a qualified person and then must be constructed to meet that design. Further, all scaffolding must be constructed, dismantled or moved under the supervision of a "qualified" person. 29 CFR 1926.451(a)(6) and (f)(7)

Construction Safety Subject Area	Yes	No/NA	Comment
All employees constructing scaffolding shall be trained in erecting, dismantling, operating, moving, repairing, maintaining and inspecting scaffolding.			Copies of all training records for personnel erecting or otherwise working with scaffolding should be maintained in the on-site project file for the duration of the project. 29 CFR 1926.454(b)
The project has the budget to supply all personnel constructing and dismantling any required scaffolding fall protection.			Employers are required to supply fall protection for all employees erecting, or dismantling supported scaffolds, unless it can be demonstrated that the fall protection creates a greater hazard to the employee. NOTE: Requirements for fall protection should be reviewed prior to construction of any scaffolding, as requirements vary dependent upon the type of scaffolding being used on the project. 29 CFR 1926.451(g)(2)
All scaffolding more than 3.1 meter or 10 feet above ground level, shall be equipped with a guardrail capable of supporting a 200 lbs load.			NOTE: Requirements for guardrails should be reviewed prior to construction of any scaffolding, as requirements vary dependent upon the type of scaffolding being used on the project. 29 CFR 1926.451(a)(4)
Scaffolds should be capable of supporting at least four times their maximum intended load.			29 CFR 1926.451(a)(7)
Manually propelled mobile scaffolds must be erected so that their height is no more than four times the minimum base dimension.			29 CFR 1926.451(e)(1)
All scaffolding will be conspicuously marked with the maximum rated load.			Scaffolding is required to support up to six times the maximum rated load dependent upon the type of scaffolding, footings and suspension being used. Further, all working floors are required to be marked with the floors load capacity.
All employees required to work on a scaffold shall be trained in working from a scaffold.			Each employee required to work on a scaffold shall be trained by a person qualified in the subject matter to recognize hazards associated with the types of scaffolding being used and methods to control those hazards and protect themselves. Copies of all training records for personnel working on scaffolding should be maintained in the on-site project folder for the duration of the project. 29 CFR 1926.454(a)
The project has the budget to have scaffold flooring erected by a competent person.			Scaffolds must be erected such that the space between the platform, uprights and adjoining sections is no more than one (1) inch. 29 CFR 1926.451(b)(1)
The project has the budget to provide fall protection to all employees working on the scaffolding less than 18 inches wide.			Scaffolding must be at least 18 inches wide; unless the employer can demonstrate that it is not feasible. If scaffolding is less than 18 inches wide, it MUST be equipped with guardrails or each employee MUST be equipped with fall protection. 29 CFR 1926.451(b)(2)
All supported scaffolding footings shall be level, sound, rigid and capable of supporting the load.			Unstable objects shall not be used as footing or supports to establish or jury
Each scaffold shall be inspected by a person trained in erecting, repairing and inspecting scaffolding before work begins on the scaffolding, each day.			Copies of daily inspection records should be maintained in the on-site project file for the duration of the project.
MEDICAL SERVICES, FIRST AID, SANITATION			
A facility for the treatment of injured employees should be located within a reasonable distance from all FAA facilities where construction activities are being conducted site. If not, there should be a first aid trained employee(s) at the site.			29 CFR 1926.50(c)
Adequate potable (drinking) water and toilet facilities should be available at all FAA facilities where construction activities are being conducted.			29 CFR 1926.51(a) and (c)
Adequate warning signs must be posted to inform workers of potential health and safety concerns (e.g., areas where hard hats and hearing protection are required).			29 CFR 1926.200

Section D. Review Information

The appropriate FAA EOSH professionals and the Facility Representative, as applicable, will sign below to document discussion of the items on this form. **This checklist is intended to be used as a tool by the Resident Engineer (RE) to ensure adherence to EOSH requirements at the FAA contractor site.**

Completed by:	Date
Reviewed by:	Date

Notes (e.g., provide further explanation of potential hazards, locations, etc. below and attach additional sheets if necessary)

FAA Life Safety System Inspection & Test Report

PART 1 FIRE SYSTEM LOCATION, NOTIFICATION OF TEST & VISUAL INSPECTION

PROTECTED PROPERTY:

PERSON RESPONSIBLE: _____

TITLE: _____

PHONE: _____

FAX: _____

Check each box that applies to the fire system being tested.

- STANDARD ATCT
 NON-STANDARD ATCT
 SMO
 SSC
 AFSS
OTHER _____

- PROPERTY FAA OWNED
 PROPERTY FAA LEASED
 ARSR SITE
 SITE OCCUPIED
 SITE UNOCCUPIED

NOTIFICATION PRIOR TO FIRE SYSTEM TESTING:

Notify the following Individuals and/or Office of the fire system test.

- FIRE DEPARTMENT
 A. F. MANAGER
 TERMINAL MANAGEMENT
OTHER _____

- CENTRAL STATION
 SMO SAFETY OFFICER
 AIR TRAFFIC MANGER

- BUILDING OCCUPANTS
 REGION SAFETY MANAGER
 AIRPORT MANAGEMENT

VISUAL INSPECTION OF SYSTEM PRIOR TO TESTING:

Visually inspect the following Prior to Testing.

- CONTROL PANEL(S)
 PANEL SWITCHES
 PRESSURIZATION FAN(S)
 BATTERY CHARGER TEST
 ELEVATOR EQUIPMENT
 DACT
 REMOTE DETECTOR INDICATOR
 SYSTEM MODIFICATIONS
OTHER _____

- PANEL LIGHTS
 SYSTEM BATTERIES
 LOAD VOLTAGE
 HVAC SYSTEM(S)
 AUDIO DEVICES
 SUPPRESSION SYSTEM(S)
 SYSTEM RECORDS
 EMERGENCY GEN.

- PULL STATIONS
 POWER SUPPLIES
 SMOKE DETECTORS
 STROBES
 REMOTE ANNUNCIATOR
 PRINTER
 RECORD DRAWINGS
 OPERATORS MANUAL

Make notations below in the comment section for items which are deficient and noted during the visual inspection.
Additional space is available for notation of deficiencies in each section below.

WARNING:

IF THIS SYSTEM PROVIDES DETECTION AND/OR CONTROL FOR AUTOMATIC SUPPRESSION, THE AGENT RELEASE PORTION OF THE SUPPRESSION SYSTEM(S) MUST BE DISABLED PRIOR TO TESTING ANY SYSTEM INITIATING DEVICES TO PREVENT INADVERTENT AGENT RELEASE!

THIS FACILITIES HVAC SHUTDOWN, ELEVATOR RECALL AND PRESSURIZATION FAN SYSTEMS MUST BE TESTED ANNUALLY, TO INSURE PROPER OPERATION. AVOID UNNECESSARY CYCLING OF THESE SYSTEMS AND DISABLE THE CONTROLLING RELAYS OR ACTIVATE THE PREPROGRAMMED BY-PASS SWITCH AFTER INITIAL TESTING AND VERIFICATION OF EACH.

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PART 2

FIRE SYSTEM PANEL DATA & SERVICE INFORMATION

LOCATION OF THE FIRE ALARM PANEL/FIRE COMMAND CENTER:

SYSTEM MANUFACTURER _____

MODEL NO.: _____

DATE SYS. COMMISSIONED: _____

SERVICE COMPANY: _____

PHONE: _____

FAX: _____

ADDRESS: _____

CONTACT: _____

SERVICE CONTRACT: YES NO

NICET CERT. NO.: _____

NICET LEVEL: _____

STATE LICENSE NO.: _____

DATE SERVICE STARTED: _____

DATE SERVICE DEFAULTS: _____

DATE OF LAST SYSTEM SERVICE: _____

DATE OF LAST SYSTEM TEST: _____

DOES THE PANEL APPEAR TO BE OPERATING PROPERLY (NORMAL CONDITION) YES NOIS THE FIRE PANEL A POWER LIMITED SYSTEM YES NOARE ALL CIRCUITS SUPERVISED YES NOIS A SYSTEM SMOKE DETECTOR PROVIDED TO PROTECT THE PANEL YES NOIS ADEQUATE BATTERY BACK-UP PROVIDED AS PER NFPA 72 YES NOIS SURGE SUPPRESSION PROVIDED AT THE AC CIRCUIT BREAKER YES NOIS THE 110 VOLT CIRCUIT PERMANENTLY LABELED "FIRE ALARM" YES NOIS AN EMERGENCY GENERATOR PROVIDING BACK-UP POWER YES NOIS THERE MORE THAN ONE SYSTEM PANEL INSTALLED YES NO

PANEL POWER SUPPLY, PRIMARY (MAIN), NOMINAL VOLTAGE _____, AMPS _____

OVERCURRENT PROTECTION, TYPE _____, AMPS _____, LOCATION _____

POWER DISCONNECT MEANS _____, LOCATION _____, LOCKOUT _____

SECONDARY (STANDBY) POWER _____ STORAGE BATTERY, AMP-HOUR RATING _____

CALCULATED CAPACITY TO OPERATE SYSTEM, IN HOURS: 4 _____ 24 _____ 60 _____

BATTERY TYPE: _____

 DRY CELL NICKEL CADMIUM SEALED LEAD ACID LEAD ACID OTHER _____ENGINE GENERATOR DEDICATED TO THE FIRE ALARM SYSTEM POWER CIRCUIT YES NO**TRANSIENT SUPPRESSION:**

120V CIRCUIT DEVICE TYPE:	QTY.	LOCATION:
INITIATION CIRCUIT TYPE:	QTY.	LOCATION:
AUDIO CIRCUIT TYPE:	QTY.	LOCATION:
VISUAL CIRCUIT TYPE:	QTY.	LOCATION:
SIGNALING LINE CIRCUIT TYPE:	QTY.	LOCATION:
OTHER:		

A transient suppression device (listed for operation with the system) is required for each circuit that exits or enters a

building. The device shall be mounted in a junction box at the point of exit and entry. Label each circuit being protected.

PART 1 AND 2 DEFICIENCIES NOTED AND/OR COMMENTS:

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NOTE: The comment portions of this form are required to have an entry. If a deficiency does not exist then the Technician shall enter "A deficiency has not been noted." If more than one alarm panel exists, complete this form for each.

PART 3 DIGITAL ALARM COMMUNICATOR & MONITORING COMPANY

IS THIS FIRE ALARM SYSTEM MONITORED VIA A DACT
IS THE DACT A DUAL CHANNEL

YES NO
 YES NO

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IS THE SPRINKLER OR SUPPRESSION SYSTEM (IF EXISTING) MONITORED: YES NO
IS THE DACT A FOUR CHANNEL, DUAL LINE DACT (REQUIRED FOR SPRINKLER) YES NO
IS THE DACT POWER FROM THE CONTROL PANEL YES NO
IS THE POWER SUPERVISED YES NO
IS THERE A DEDICATED PRIMARY PHONE LINE YES NO
IS THERE A SECONDARY PHONE LINE YES NO

DACT MANUFACTURER: _____ MODEL NO.: _____

NAME OF CENTRAL STATION: _____ POINT OF CONTACT: _____

ADDRESS: _____

ACCOUNT # _____ PHONE: _____ FAX: _____

DATE CONTRACT STARTED: _____ DATE CONTRACT DEFAULTS: _____

LIST NAME AND PHONE NO. OF EACH PERSON(S) TO BE CONTACTED BY THE CENTRAL STATION:

NOTED DACT DEFICIENCIES AND/OR COMMENTS:

NOTE: The comment portions of this form are required to have an entry. If a deficiency does not exist then the Technician shall enter "A deficiency has not been noted."

PART 4 INITIATION DEVICES AND INITIATING, OR SIGNALING CIRCUIT TYPE

Initiating devices, are those system(s) devices which *initiate* an alarm or supervisory condition. An Initiating Device Circuit (IDC) is a *hard-wired* (non-addressable) circuit(s), which employees initiating (non-addressable) devices, to send an alarm condition to the fire panel. A Signaling Line Circuit (SLC) is a circuit(s) which employees *addressable* initiating devices (for the purpose of this section). A fire system configuration may consist of both *hard-wired* and *addressable* circuits. Additional information is available to complete this section, in the NFPA 72, Section 23.5 and 12.3 for IDC hardwired circuits and Section 23.6 and 12.3 for SLC addressable signaling line circuits. Check those boxes below that apply to the initiating devices and circuits. PART 6 of this report is for panel to panel communications and/or LCD/Printer communications. In filling out the device chart below wire class should be either "Class A", "Class B", or "Class X".

ADDRESSABLE SYSTEM, SIGNALING LINE CIRCUIT (SLC):

ADDRESSABLE (CLASS A) (CLASS B) (CLASS X)

TOTAL QTY. OF ADDRESSABLE CIRCUITS _____ EACH CIRCUIT CAPACITY (MAX) _____

QTY. OF SPARE ADDRESSABLE POINTS _____ ON CIRCUIT(S) _____

PANEL CAPACITY FOR ADDITIONAL MODULES _____

ADDRESSABLE SYSTEM SOFTWARE:

REVISION NUMBER: _____

REVISION DATE:

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ALARM INITIATING, SUPERVISORY & CONTROL DEVICE INFORMATION:

Information of the fire alarm Circuits, Class and Style is noted below. For additional guidance regarding the characteristics of each circuit noted, refer to 12.3 and 23.6 for SLC in NFPA 72.

SYSTEM POINT OR DEVICE TYPE	QUANTITY OF DEVICE TYPE:	WIRE CLASS: (A, B, or X)	CIRCUIT NUMBER:
ADDRESSABLE SYSTEM:			
MANUAL STATIONS	_____	_____	_____
IONIZATION DETECTORS	_____	_____	_____
PHOTOELECTRIC DETECTORS	_____	_____	_____
ION DUCT DETECTORS	_____	_____	_____
PHOTO DUCT DETECTORS	_____	_____	_____
FIXED TEMP HEAT DETECTORS	_____	_____	_____
R OF R HEAT DETECTORS	_____	_____	_____
RATE COMPENSATED DETECTORS	_____	_____	_____
MONITOR OR CONTROL MODULE FOR:			
FIXED TEMP HEAT DETECTOR	_____	_____	_____
BEAM DETECTORS	_____	_____	_____
UV/IR DETECTORS	_____	_____	_____
COMBINATION DETECTOR	_____	_____	_____
WATERFLOW ALARM SWITCH	_____	_____	_____
WATER SUPERVISORY SWITCH	_____	_____	_____
POST INDICATOR VALVE	_____	_____	_____
WATER SYSTEM AIR PRESSURE	_____	_____	_____
SUPPRESSION PANEL ALARM	_____	_____	_____
SUPPRESSION PANEL TROUBLE	_____	_____	_____
SUPPRESSION PANEL RELEASE	_____	_____	_____
SUPPRESSION PRESSURE SWITCH	_____	_____	_____
SUPPRESSION SUPERVISORY	_____	_____	_____
SECURITY CONTACT	_____	_____	_____
STAIRWELL PRESSURIZATION FAN ON	_____	_____	_____
STAIRWELL PRESSURIZATION FAN OFF	_____	_____	_____
STAIRWELL PRESSURIZATION MANUAL	_____	_____	_____
EMERGENCY GENERATOR ON	_____	_____	_____
EMERGENCY GENERATOR OFF	_____	_____	_____
ELEVATOR RECALL (PRIMARY)	_____	_____	_____
ELEVATOR RECALL (SECONDARY)	_____	_____	_____
FIRE PUMP POWER	_____	_____	_____
FIRE PUMP TROUBLE	_____	_____	_____
FIRE PUMP AUTO.	_____	_____	_____
FIRE PUMP RUNNING	_____	_____	_____
FIRE PUMP OFF	_____	_____	_____
FIRE PUMP PHASE REFFERSAL	_____	_____	_____
OTHER ALARM _____	_____	_____	_____
OTHER TROUBLE _____	_____	_____	_____
OTHER SUPERVISORY _____	_____	_____	_____
OTHER _____	_____	_____	_____

HARDWIRED SYSTEM, INITIATING DEVICE AND SUPERVISORY CIRCUIT (IDC):

HARDWIRED

CLASS A

CLASS B

TOTAL QTY. OF HARDWIRED CIRCUITS _____

QTY. OF SPARE CIRCUITS _____

PANEL CAPACITY FOR ADDITIONAL ZONE MODULES

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ALARM INITIATING & SUPERVISORY DEVICE INFORMATION:

Information of the fire alarm Circuits, Class and Style is noted below. For additional guidance regarding the characteristics of each circuit noted, refer to 12.3 and 23.5 for IDC in NFPA 72.

SYSTEM POINT OR DEVICE TYPE TYPE: HARDWIRED SYSTEM:	QUANTITY OF DEVICE (A or B)	WIRE CLASS: (Letter)	CIRCUIT OR ZONE
MANUAL STATIONS	_____	_____	_____
IONIZATION DETECTORS	_____	_____	_____
PHOTOELECTRIC DETECTORS	_____	_____	_____
ION DUCT DETECTORS	_____	_____	_____
PHOTO DUCT DETECTORS	_____	_____	_____
FIXED TEMP HEAT DETECTORS	_____	_____	_____
R OF R HEAT DETECTORS	_____	_____	_____
RATE COMPENSATED DETECTORS	_____	_____	_____
FIXED TEMP HEAT DETECTOR	_____	_____	_____
BEAM DETECTORS	_____	_____	_____
UV/IR DETECTORS	_____	_____	_____
COMBINATION DETECTOR	_____	_____	_____
WATERFLOW ALARM SWITCH	_____	_____	_____
WATER SUPERVISORY SWITCH	_____	_____	_____
POST INDICATOR VALVE	_____	_____	_____
WATER SYSTEM AIR PRESSURE	_____	_____	_____
SUPPRESSION PANEL ALARM	_____	_____	_____
SUPPRESSION PANEL TROUBLE	_____	_____	_____
SUPPRESSION PANEL RELEASE	_____	_____	_____
SUPPRESSION PRESSURE SWITCH	_____	_____	_____
SUPPRESSION SUPERVISORY	_____	_____	_____
SECURITY CONTACT	_____	_____	_____
STAIRWELL PRESSURIZATION FAN ON	_____	_____	_____
STAIRWELL PRESSURIZATION FAN OFF	_____	_____	_____
STAIRWELL PRESSURIZATION MANUAL	_____	_____	_____
EMERGENCY GENERATOR ON	_____	_____	_____
EMERGENCY GENERATOR OFF	_____	_____	_____
ELEVATOR RECALL (PRIMARY)	_____	_____	_____
ELEVATOR RECALL (SECONDARY)	_____	_____	_____
FIRE PUMP POWER	_____	_____	_____
FIRE PUMP TROUBLE	_____	_____	_____
FIRE PUMP AUTO	_____	_____	_____
FIRE PUMP RUNNING	_____	_____	_____
FIRE PUMP OFF	_____	_____	_____
FIRE PUMP PHASE REFFERSAL	_____	_____	_____
OTHERALARM _____	_____	_____	_____
OTHER TROUBLE _____	_____	_____	_____
OTHER SUPERVISORY _____	_____	_____	_____
OTHER _____	_____	_____	_____

NOTED SIGNALING DEVICE CIRCUIT (SLC), INITIATING DEVICE CIRCUIT (IDC) AND INITIATING DEVICE OR SUPERVISORY DEVICE DEFICIENCIES AND COMMENTS:

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NOTE: The comment portions of this form are required to have an entry. If a deficiency does not exist then the Technician shall enter "A deficiency has not been noted".

PART 5

NOTIFICATION APPLIANCE CIRCUIT (NAC)

Notification Appliance Circuits (NAC) are those system circuits that employ notification appliance device(s) which provides both *audio* and *visual* notification, in the event of a fire. Section 12.3 and 23.7 of the NFPA 72, shall provide additional information in regards to circuit performance capabilities. Refer to Section 12.3 for NAC Class configurations. Other documents that effect the fire system audio/visual devices are as follows:

1. ANSI S3.41, *American National Standard Audible Emergency Evacuation Signal*, which requires that the fire alarm signals be *distinctive* in sound from other signals and not to be used for any other purpose. See NFPA 72, 18.4.2

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2. The use of the three-pulse temporal pattern fire alarm evacuation signal has been adopted by both the American National Standard, ANSI S3.41 (as referenced above) and International Standard, ISO 8201, *Audible Emergency Evacuation Signal*. Information regarding performance, location, and mounting of Notification Appliance(s) is available in NFPA 72, Chapter 6. For control and power supplies refer to Chapter 1 and Chapter 3.

VISUAL STROBE DEVICES:

Strobes shall be UL *labeled* and the label shall indicate compliance with UL 1971, *Signaling Applications for the Hearing Impaired*. Further details are available in the NFPA 72, Chapter 18.4, regarding strobe flash rate and intensity. Spacing information, for strobe placement in room, is available in the NFPA 72 Paragraph 18.5.4, Tables 18.5.4.3.1(a), 18.5.4.3.1(b), and Figures 18.5.4.3.1. Spacing information for strobe placement in corridors is available in Chapter 18.5.4.4.

STROBE CIRCUIT NUMBER	STROBE CIRCUIT CLASS: (A or B)	IS CIRCUIT SUPERVISED AS REQUIRED PER NFPA 72:	QTY. OF STROBES PER CIRCUIT:	POWER (AMPS) REQUIRED TO DRIVE CIRCUIT:
# 1	_____	_____	_____	_____
# 2	_____	_____	_____	_____
# 3	_____	_____	_____	_____
# 4	_____	_____	_____	_____
# 5	_____	_____	_____	_____
# 6	_____	_____	_____	_____
# 7	_____	_____	_____	_____
# 8	_____	_____	_____	_____
# 9	_____	_____	_____	_____
# 10	_____	_____	_____	_____
# 11	_____	_____	_____	_____
# 12	_____	_____	_____	_____
# 13	_____	_____	_____	_____
# 14	_____	_____	_____	_____
# 15	_____	_____	_____	_____
# 16	_____	_____	_____	_____
# 17	_____	_____	_____	_____
# 18	_____	_____	_____	_____
# 19	_____	_____	_____	_____
# 20	_____	_____	_____	_____
# 21	_____	_____	_____	_____
# 22	_____	_____	_____	_____
# 23	_____	_____	_____	_____
# 24	_____	_____	_____	_____
# 25	_____	_____	_____	_____
# 26	_____	_____	_____	_____
# 27	_____	_____	_____	_____
# 28	_____	_____	_____	_____
# 29	_____	_____	_____	_____
# 30	_____	_____	_____	_____

TOTAL POWER (IN AMPS) CONSUMED BY THE VISUAL CIRCUIT(S) _____

POWER (IN AMPS) AVAILABLE AT THE CONTROL PANEL FOR THE CIRCUIT(S) _____

IS ADEQUATE BATTERY BACK-UP PROVIDED FOR THE CIRCUITS LISTED _____

ARE THE CIRCUITS LISTED POWERED BY ONE FIRE CONTROL PANEL _____

ARE ADDITIONAL PANELS EMPLOYED TO PROVIDE CIRCUIT POWER _____

ARE THE ADDITIONAL PANELS SUPERVISED BY THE MAIN PANEL _____

ARE THE ADDITIONAL PANELS PROTECTED WITH A SYSTEM DETECTOR _____

ARE THE ADDITIONAL PANELS EQUIPPED WITH BATTERY BACK-UP _____

IS ADEQUATE BATTERY BACK-UP PROVIDED FOR THE PANELS _____

<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO

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ARE THE ADDITIONAL PANELS EQUIPPED WITH SURGE SUPPRESSION

YES NO

ARE STROBES INSTALLED THROUGHOUT THE FACILITY*

YES NO

ARE STROBES INSTALLED IN ONLY PART OF THE FACILITY

YES NO

ARE THE STROBES INCANDESCENT (FLASHLIGHT TYPE BULB)

YES NO

ARE THE STROBES XENON TYPE (ELONGATED TYPE BULB)

YES NO

ARE THE STROBES COMPLIANT WITH UL 1971 (LABELED)

YES NO

* Strobe placement shall comply with the above referenced sections of the NFPA 72 as applicable.

For additional circuits fill out another page 8 of this form and attach.

NOTED VISUAL APPLIANCE AND/OR NOTIFICATION APPLIANCE CIRCUIT DEFICIENCIES AND COMMENTS:

NOTE: The comment portions of this form are required to have an entry. If a deficiency does not exist then the Technician shall enter "A deficiency has not been noted."

AUDIO DEVICES AND CIRCUITS:

Tower Cabs, TRACON Rooms and Traffic Control Rooms which must remain in operation during the investigation period of a reported fire, shall not be required to meet the dBA levels of Audio notification noted in NFPA 72, Chapter 18.4.3.1. Chimes and/or Visual devices shall be employed in those areas. Notification Appliance Circuits in the noted areas, shall be programmed to be silenced, while the visual signals in the remainder of the facility continue. Visual notification circuits in the remainder of the facility shall continue to signal an alarm, until the Fire Alarm Control Panel, is clear of all fire conditions. Any subsequent Alarm from a fire initiation device shall resound the audio and visual devices.

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For areas of general occupancy, Audible signals shall have a sound level of not less than 75 dBA at a distance of 10 feet from the audio device. The sound level of the audio device shall be 15 dBA above the average ambient sound level or 5 dBA above the maximum sound level having a duration of at least 60 seconds (whichever is greater), measured 5 feet from above the floor in the occupiable area. The sound level of an audio device shall not exceed 110 dBA. Refer to NFPA 72, Chapter 18.4.8 for audio device location.

AUDIO CIRCUIT NUMBER	AUDIO CIRCUIT CLASS: (A or B)	IS CIRCUIT SUPERVISED AS REQUIRED PER NFPA 72:	QTY. OF DEVICES PER CIRCUIT:	POWER (AMPS) REQUIRED TO DRIVE CIRCUIT:
# 1	_____	_____	_____	_____
# 2	_____	_____	_____	_____
# 3	_____	_____	_____	_____
# 4	_____	_____	_____	_____
# 5	_____	_____	_____	_____
# 6	_____	_____	_____	_____
# 7	_____	_____	_____	_____
# 8	_____	_____	_____	_____
# 9	_____	_____	_____	_____
# 10	_____	_____	_____	_____
# 11	_____	_____	_____	_____
# 12	_____	_____	_____	_____
# 13	_____	_____	_____	_____
# 14	_____	_____	_____	_____
# 15	_____	_____	_____	_____
# 16	_____	_____	_____	_____
# 17	_____	_____	_____	_____
# 18	_____	_____	_____	_____
# 19	_____	_____	_____	_____
# 20	_____	_____	_____	_____
# 21	_____	_____	_____	_____
# 22	_____	_____	_____	_____
# 23	_____	_____	_____	_____
# 24	_____	_____	_____	_____
# 25	_____	_____	_____	_____
# 26	_____	_____	_____	_____
# 27	_____	_____	_____	_____
# 28	_____	_____	_____	_____
# 29	_____	_____	_____	_____
# 30	_____	_____	_____	_____

TOTAL POWER (IN AMPS) CONSUMED BY THE AUDIO CIRCUIT(S) _____

POWER (IN AMPS) AVAILABLE AT THE CONTROL PANEL FOR THE CIRCUIT(S) _____

IS ADEQUATE BATTERY BACK-UP PROVIDED FOR THE CIRCUITS LISTED _____

ARE THE CIRCUITS LISTED POWERED BY ONE FIRE CONTROL PANEL _____

ARE ADDITIONAL PANELS EMPLOYED TO PROVIDE CIRCUIT POWER _____

ARE THE ADDITIONAL PANELS SUPERVISED BY THE MAIN PANEL _____

ARE THE ADDITIONAL PANELS PROTECTED WITH A SYSTEM DETECTOR _____

ARE THE ADDITIONAL PANELS EQUIPPED WITH BATTERY BACK-UP _____

IS ADEQUATE BATTERY BACK-UP PROVIDED FOR THE THOSE PANELS _____

ADDITIONAL PANELS EQUIPPED WITH SURGE SUPPRESSION _____

ARE AUDIO DEVICES INSTALLED THROUGHOUT THE FACILITY * _____

ARE AUDIO DEVICES INSTALLED IN ONLY A PORTION OF THE FACILITY _____

ARE THE AUDIO DEVICES ALL OF THE SAME TYPE (HORN, BELLS, CHIMES, ETC) _____

ARE THE AUDIO DEVICES COMPLIANT WITH NFPA 72 _____

ARE THERE ANY SPARE AUDIO/VISUAL CIRCUITS AVAILABLE ON THE SYSTEM _____

<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO

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* Note the exceptions allowed for Tower Cabs, TRACON Rooms, Control Rooms, etc.

For additional circuits fill out another page 10 and 11 of this form and attach.

NOTED AUDIO APPLIANCE AND/OR NOTIFICATION APPLIANCE CIRCUIT DEFICIENCIES AND COMMENTS:

NOTE: The comment portions of this form are required to have an entry. If a deficiency does not exist then the Technician shall enter "A deficiency has not been noted."

PART 6

REMOTE ANNUNCIATION TYPE & CIRCUIT

Check those boxes that apply.

- ADDRESSABLE ALPHA/NUMERIC
- GRAPHIC ANNUNCIATOR
- CLASS A
- SERIAL PRINTER(S) QTY. _____

- HARDWIRED ALPHA/NUMERIC
- HARDWIRED DIRECTORY ANNUNCIATOR
- CLASS B
- OTHER _____

ARE THE ANNUNCIATION DEVICES SUPERVISED
ENTRY EQUIPPED WITH AN ANNUNCIATOR
ANNUNCIATORS EQUIPPED WITH AN ALARM SILENCE
ANNUNCIATORS EQUIPPED WITH A SYSTEM RESET SWITCH

<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> YES	<input type="checkbox"/> NO

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ADDRESSABLE SYSTEM ANNUNCIATORS EQUIPPED WITH ACKNOWLEDGE

YES NO

NOTED REMOTE ANNUNCIATOR DEFICIENCIES AND COMMENTS:

NOTE: The comment portions of this form are required to have an entry. If a deficiency does not exist then the Technician shall enter "A deficiency has not been noted."

PART 7 VOICE EVACUATION SYSTEM CONTROLS AND DEVICES

VOICE EVACUATION SYSTEM CONTROLS:

VOICE PANEL LOCATION:

PANEL MANUFACTURER: _____ MODEL NO.: _____

- DOES THE PANEL APPEAR TO BE OPERATING PROPERLY (NORMAL CONDITION) YES NO
IS THE PANEL EQUIPPED WITH A MIC. YES NO
IS THE PANEL EQUIPPED WITH A FIRE PHONE SYSTEM YES NO
ARE EXTRA FIRE PHONES AVAILABLE QTY. _____ YES NO
ARE ALL CIRCUITS SUPERVISED YES NO
IS A SYSTEM SMOKE DETECTOR PROTECTING THE PANEL YES NO
IS ADEQUATE BATTERY BACK-UP PROVIDED AS PER NFPA 72 YES NO
IS SURGE SUPPRESSION PROVIDED AT THE 110 VOLT AC CIRCUIT YES NO
IS THE 110 VOLT CIRCUIT PERMANENTLY LABELED "FIRE ALARM" YES NO
IS THE SYSTEM EQUIPPED WITH BACK-UP AMPLIFIERS YES NO
IS THERE MORE THAN ONE VOICE SYSTEM PANEL YES NO
IS THE VOICE MESSAGE AUDIBLE YES NO
IS THE VOICE MESSAGE APPLICABLE TO THE FACILITIES NEEDS YES NO
PANEL POWER SUPPLY, PRIMARY (MAIN), NOMINAL VOLTAGE _____, AMPS _____

OVERCURRENT PROTECTION, TYPE _____, AMPS _____, LOCATION _____

POWER DISCONNECT MEANS _____, LOCATION _____, LOCKOUT _____

SECONDARY (STANDBY) POWER _____ STORAGE BATTERY, AMP-HOUR RATING _____

CALCULATED CAPACITY TO OPERATE SYSTEM, IN HOURS: 4 _____ 24 _____ 60 _____

BATTERY TYPE:

DRY CELL NICKEL CADMIUM SEALED LEAD ACID LEAD ACID OTHER _____

TRANSIENT SUPPRESSION:

120V CIRCUIT DEVICE TYPE: _____ QTY. _____ LOCATION: _____

AUDIO CIRCUIT TYPE: _____ QTY. _____ LOCATION: _____

Additional information regarding Voice system requirements is available in the NFPA 72, Chapter 24.

VOICE CIRCUIT NUMBER	VOICE CIRCUIT CLASS: (A or B)	IS CIRCUIT SUPERVISED AS REQUIRED PER NFPA 72:	QTY. OF DEVICES PER CIRCUIT:	POWER (WATTS) TO DRIVE CIRCUIT:
# 1	_____	_____	_____	_____
# 2	_____	_____	_____	_____
# 3	_____	_____	_____	_____
# 4	_____	_____	_____	_____

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# 6	_____	_____	_____	_____
# 7	_____	_____	_____	_____
# 8	_____	_____	_____	_____
# 9	_____	_____	_____	_____
# 10	_____	_____	_____	_____
# 11	_____	_____	_____	_____
# 12	_____	_____	_____	_____
# 13	_____	_____	_____	_____
# 14	_____	_____	_____	_____
# 15	_____	_____	_____	_____
# 16	_____	_____	_____	_____
# 17	_____	_____	_____	_____
# 18	_____	_____	_____	_____
# 19	_____	_____	_____	_____
# 20	_____	_____	_____	_____
# 21	_____	_____	_____	_____
# 22	_____	_____	_____	_____
# 23	_____	_____	_____	_____
# 24	_____	_____	_____	_____
# 25	_____	_____	_____	_____

TOTAL POWER (IN WATTS) REQUIRED BY THE AUDIO CIRCUIT(S)

POWER (IN WATTS) AVAILABLE AT THE VOICE PANEL FOR THE CIRCUIT(S)

IS THE PANEL(S) SUPERVISED BY THE MAIN PANEL

 YES NO

IS ADEQUATE BATTERY BACK-UP PROVIDED FOR THE CIRCUITS LISTED

 YES NO

IS THE PANEL UL CROSS LISTED WITH THE FIRE CONTROL PANEL

 YES NO

IS THE PANEL EQUIPPED WITH MANUAL ZONE SELECTION SWITCHES

 YES NO

ARE ADDITIONAL PANELS EMPLOYED TO PROVIDE CIRCUIT POWER

 YES NO

ARE THE ADDITIONAL PANELS PROTECTED WITH A SYSTEM DETECTOR

 YES NO

ARE THE ADDITIONAL PANELS EQUIPPED WITH BATTERY BACK-UP

 YES NO

IS ADEQUATE BATTERY BACK-UP PROVIDED FOR THE THOSE PANELS

 YES NO

ADDITIONAL PANELS EQUIPPED WITH SURGE SUPPRESSION

 YES NO

ARE AUDIO DEVICES INSTALLED THROUGHOUT THE FACILITY *

 YES NO

ARE AUDIO DEVICES INSTALLED IN ONLY A PORTION OF THE FACILITY

 YES NO

ARE THE AUDIO DEVICES ALL POWER TAPPED THE SAME

 YES NO

ARE THERE ANY SPARE AUDIO CIRCUITS AVAILABLE ON THE SYSTEM

 YES NO

* Note Audio Devices are not to be installed in Tower Cabs, TRACON Rooms, Control Rooms, ETC.

For additional circuits fill out another page 13 of this form and attach.

NOTED AUDIO APPLIANCE AND/OR NOTIFICATION APPLIANCE CIRCUIT DEFICIENCIES AND COMMENTS:

FAA Life Safety System Inspection & Test Report

NOTE: The comment portions of this form are required to have an entry. If a deficiency does not exist then the Technician shall enter "A deficiency has not been noted."

ADDITIONAL NOTATIONS OF THE ANNUAL FIRE SYSTEM INSPECTION AND TEST:

PART 8

ACCEPTANCE OF THE ANNUAL TEST & SIGNATURES

The Annual Inspection and Test of the above noted system(s), at the above noted FAA facility was performed as per the following: FAA ORDER, 6930.1B, Fire Prevention and Maintenance of Fire Protection Equipment, 6470.5A, Maintenance of Air Route Traffic Control Center Environmental Systems, 6480.8A, Maintenance of Airport Traffic Control Towers, 3900.19B, the Occupational Safety and Health Administration, the National Fire Protection Association, the National Fire Alarm Code, and the recommendations of the System Manufacturer. Upon completion this form shall be filed with each individual noted below and the FAA Regional Safety Office.

By Technician performing the annual test and inspection.

FAA Life Safety System Inspection & Test Report

Date: _____ Time: _____ Signature: _____

NICET Cert. #: _____ Printed Name and Title: _____

Employed by: _____ Phone Number: _____

State License or other Credentials: _____

FAA Individual whom witnessed the Fire System returned to normal operation.

Date: _____ Time: _____ Signature: _____

Printed Name and Title: _____

The individuals listed below, with their signatures, affirm that the Fire Life Safety System(s) noted above have been restored to an operational condition. If upon completion of this test an acceptable level of protection is in question, due to the deficiencies noted, then immediate action shall be taken to correct all the deficiencies. A retest of the defective device(s) or system operation(s) shall be required. Appropriate action shall be taken to insure the safety of the facilities individuals and operations during any system repairs and/or service. The responsible FAA Safety Individual shall provide the facilities Manager with Fire Watch training and information if required to insure a continued safe operation during the repairs and service.

By Technician performing the annual test and inspection.

Date: _____ Time: _____ Signature: _____

NICET Cert. #: _____ Printed Name and Title: _____

Employed by: _____ Phone Number: _____

State License or other Credentials: _____

FAA Individual whom witnessed the Fire System returned to normal operation.

Date: _____ Time: _____ Signature: _____

Printed Name and Title: _____

Authority having Jurisdiction and/or approving authority:

Name and Title: _____ Phone: _____ FAX: _____

Representing: _____ Signature: _____

Local Fire Department: _____ Phone: _____ FAX: _____

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FAA Fire Alarm System Certificate of Completion

PROTECTED PROPERTY:

ADDRESS:

FAA CONTACT:

TELEPHONE: (____) _____ FAX: (____)

REPRESENTATIVE: _____ NICET CERT.#:

TELEPHONE: (____) _____ FAX: (____)

REPRESENTATIVE:

TELEPHONE: (____) _____ FAX: (____)

SERVICE ORGANIZATION:

ADDRESS:

REPRESENTATIVE: _____ NICET CERT.#:

TELEPHONE: (____) _____ FAX: (____)

Location of AS BUILT Drawings: _____

Location of OWNER'S MANUAL: _____

Location of TEST REPORTS: _____

DIRECTION:

Page 1 of 9

Updated 12/15/10

FAA Fire Alarm System Certificate of Completion

Parts 1 and 3 through 9 of this Certification shall be completed after the system is installed and the installation wiring has been checked. Part 2 shall be completed after the operational acceptance tests (FAA, Life Safety System Inspection & Test Report) have been completed and approved by the FAA Safety Office. A preliminary copy of this certificate shall be given to the FAA Project Engineer and to the authority having jurisdiction who will witness operational acceptance tests. A final copy with all signatures after completion of final operational acceptance tests shall be delivered to:

FAA Southern Region Headquarters
Life Safety Office, ASO-471
1701 Columbia Ave.
College Park, GA 30337-2754

PART 1.

CERTIFICATION OF SYSTEM INSTALLATION

The system was installed and inspected by:

Name & Title: _____ Company: _____ on _____ and found to comply with the installation requirements of the FAA project drawings, specifications, and the installation requirements of the NFPA Codes and Standards Referenced, to include all associated appendix sections. The Technician or Electrician, who's signature appears below shall initial each of the following designated spaces below. The initials certify that the required documents have been complied with.

NFPA 72 National Fire Alarm Code 2010 Edition

- Chapter 10 Fundamentals
- Chapter 10.18 Documentation
- Chapter 23 Protected Premises Fire Alarm Systems
- Chapter 26.4 Proprietary Supervising Station Systems
- Chapter 26.6 Digital Alarm Communicator Systems
- Chapter 17 Initiating Devices
- Chapter 18 Notification Appliances for Fire Alarm Systems
- Chapter 14 Inspection, Testing and Maintenance
- Article 760 of NFPA 70 2011 Edition, National Electrical Code
- Chapter 5 and Chapter 6 of NFPA 90A 2009 Edition, Standard for the Installation of Air Conditioning and Ventilating Systems
- Manufacturer's Guidelines Recommendations and Instructions
- FAA Project Specifications, Drawings, Written Instructions and Change Orders

PART 2.

CERTIFICATION OF SYSTEM OPERATION

FAA Fire Alarm System Certificate of Completion

All operational features and functions of this system were inspected and tested by:

Name & Title: _____ Company: _____ on _____ and found to comply with the installation requirements of the FAA project drawings, specifications written instructions, change orders, and the installation requirements of the NFPA Codes and Standards Referenced, to include associated appendix. The system was found to be operating properly in accordance with the requirements of NFPA 72 National Fire Alarm Code, 2010 Edition. The Technician who's signature appears below shall initial each of the following designated spaces below. The initials certify that the required documents have been complied with:

NFPA 72 National Fire Alarm Code 2010 Edition

Chapter 10 Fundamentals of Fire Alarm Systems

Chapter 23 Protected Premises Fire Alarm Systems

Chapter 26.4 Proprietary Supervising Station Systems

Chapter 26.6 Digital Alarm Communicator Systems

Chapter 17 Initiating Devices

Chapter 18 Notification Appliances for Fire Alarm Systems

Chapter 14 Inspection, Testing, and Maintenance

Article 760 of NFPA 70 2011 Edition, National Electrical Code

Chapter 5 and Chapter 6 of NFPA 90A 2009 Edition, Standard for the Installation of Air Conditioning and Ventilating Systems

Manufacturer's Guidelines Recommendations and Instructions

FAA Project Specifications, Drawings, Written Instructions and Change Orders

Configuration of Control Panel Jumper(s):

Is the Control Panel equipped with a Jumper that is capable of disabling detection of Ground Fault conditions YES NO

Provide a description of the location and the position required for detecting system ground faults:

Is the Control Panel equipped with other field configured Jumpers

YES NO

Note each Jumper and it's current configuration below:

Note: Contractor may provide a panel schematic diagram with highlighted jumpers) configuration(s) noted in lieu of the above.

PART 3.

DACT SYSTEM SERVICE

Enter location(s) of off premise monitoring station:

FAA Fire Alarm System Certificate of Completion

Central Station Name: _____

Address: _____

Central Station Supervisor:

Name: _____ Title: _____

Account #: _____ Phone: (____) _____ FAX: (____) _____

Part 4. ALARM INITIATING DEVICE CIRCUITS

See NFPA 72 Chapter 23.5 Performance of Initiating Device Circuits (IDC):

Crt. # 1	Device Qty	Building Location	Class/Style
Crt. #2	Device Qty	Building Location	Class/Style
Crt. #3	Device Qty	Building Location	Class/Style
Crt. #4	Device Qty	Building Location	Class/Style
Crt. #5	Device Qty	Building Location	Class/Style
Crt. #6	Device Qty	Building Location	Class/Style
Crt. #7	Device Qty	Building Location	Class/Style
Crt. #8	Device Qty	Building Location	Class/Style
Crt. #9	Device Qty	Building Location	Class/Style
Crt. #10	Device Qty	Building Location	Class/Style
Crt. #11	Device Qty	Building Location	Class/Style

Types and quantities of alarm/supervisory initiating devices installed. Check type devices installed, indicate circuit # and quantity of devices:

Qty.	Circuit #(s)
<input type="checkbox"/> Manual Stations	_____
<input type="checkbox"/> Photo Smoke Detectors	_____

FAA Fire Alarm System Certificate of Completion

<input type="checkbox"/> Ion Smoke Detectors	_____
<input type="checkbox"/> Fixed Temp Heat Detectors	_____
<input type="checkbox"/> R of R Heat Detectors	_____
<input type="checkbox"/> Rate Comp. Heat Detectors	_____
<input type="checkbox"/> Photo Duct Detectors	_____
<input type="checkbox"/> Ion Duct Detectors	_____
<input type="checkbox"/> Sprinkler Water Flow Switches	_____
<input type="checkbox"/> Sprinkler Tamper Switches	_____
<input type="checkbox"/> Sprinkler PIV Switch	_____
<input type="checkbox"/> Water System Air Pressure	_____
<input type="checkbox"/> Suppression Panel Alarm	_____
<input type="checkbox"/> Suppression Panel Trouble	_____
<input type="checkbox"/> Suppression Panel Agent Release	_____
<input type="checkbox"/> Supplemental Fire Panel Alarm	_____
<input type="checkbox"/> Supplemental Fire Panel Trouble	_____
<input type="checkbox"/> Beam Detectors (Xmtr/Rev Pair)	_____
<input type="checkbox"/> Flame Detectors	_____
<input type="checkbox"/> Kitchen Hood Extinguishing System	_____
<input type="checkbox"/> Security Contact	_____
<input type="checkbox"/> Fire Pump	_____
<input type="checkbox"/> Engine Generator	_____
<input type="checkbox"/> Other _____	_____

Part 5. ALARM NOTIFICATION APPLIANCES AND CIRCUITS

Quantity of Notification Appliance Circuits (NAC) connected to system and type of Evacuation Signal:

1 / _____	5 / _____	9 / _____
2 / _____	6 / _____	10 / _____
3 / _____	7 / _____	11 / _____
4 / _____	8 / _____	12 / _____

Number/Quantity of Devices/Class/Style/Amps or Watts (see Chapter 23.7 NFPA 72).

General Alarm _____ Temporal Code _____ Voice Evac _____ Fire Phone _____ Other _____

Audible Devices:

Note type and list quantities of alarm indicating appliances (Circuit #/Qty)

____ Bells, 6" ____ 10" ____ for notification of Sprinkler System flow on NAC # ____/____, ____/____

FAA Fire Alarm System Certificate of Completion

- Horns, Electronic Vibrating on NAC# / , / , / , / , /
- Chimes, Electronic Mechanical on NAC# / , / , / , /
- Mini-Horns on NAC # / , / , / , / , / , / , /
- Other _____ on NAC# / , / , / , / , / , /

Speakers:

- .25 Watt Speakers on NAC# / , / , / , / , / , /
- .5 Wan Speakers on NAC# / , / , / , / , / , /
- .75 Watt Speakers on NAC# / , / , / , / , / , /
- 1.0 Watt Speakers on NAC# / , / , / , / , / , /
- 1.5 Watt Speaker on NAC# / , / , / , / , / , /
- 2.0 Watt Speakers on NAC# / , / , / , / , / , /
- Watt Speaker on NAC# / , / , / , / , / , /

____ tone for Pre-Alert

____ tone for Evacuation

____ tone for All Clear

____ tone for _____

Strobes:

- Visual Lights on NAC# / , / , / , / , / , / , /
- Incandescent Red Lense on NAC# / , / , / , / , / , /
- Xenon Strobe (ADA) Candela on NAC # Candela on NAC #
- Candela on NAC # , Candela on NAC # , Candela on NAC #

Check the appropriate circuit configuration.

Audible/Visual Circuits Combined Audible Circuits Separate Visual Circuits Separate

Audible Devices turn off upon Alarm Silence Only Visual Devices turn off upon System RESET

Part 6. SIGNALING LINE CIRCUITS AND DEVICES

See NFPA 72 Chapter 23.6 Performance of Signaling Line Circuits (SLC), note Device Quantity, Circuit Capacity and Class (Class A, B, or X) of circuit.

SLC#1 /
Qty/Capacity _____ Building Location _____ Class _____

SLC#2 /
Qty/Capacity _____ Building Location _____ Class _____

FAA Fire Alarm System Certificate of Completion

SLC#3	<u> / </u> Qty/Capacity	Building Location	Class
SLC#4	<u> / </u> Qty/Capacity	Building Location	Class
SLC#5	<u> / </u> Qty/Capacity	Building Location	Class
SLC#6	<u> / </u> Qty/Capacity	Building Location	Class
SLC#7	<u> / </u> Qty/Capacity	Building Location	Class
SLC#8	<u> / </u> Qty/Capacity	Building Location	Class
SLC#9	<u> / </u> Qty/Capacity	Building Location	Class
SLC#10	<u> / </u> Qty/Capacity	Building Location	Class

Types and quantities of addressable initiating-supervisory devices installed . Check type devices installed, indicate circuit # and quantity of devices:

Qty.	Circuit # (s)
<input type="checkbox"/> Manual Stations	_____
<input type="checkbox"/> Photo Smoke Detectors	_____
<input type="checkbox"/> Ion Smoke Detectors	_____
<input type="checkbox"/> Fixed Temp Heat Detectors	_____
<input type="checkbox"/> R of R Heat Detectors	_____
<input type="checkbox"/> Rate Comp. Heat Detectors	_____
<input type="checkbox"/> Photo Duct Detectors	_____
<input type="checkbox"/> Ion Duct Detectors	_____
<input type="checkbox"/> Sprinkler Water Flow Switches	_____
<input type="checkbox"/> Sprinkler Tamper Switches	_____
<input type="checkbox"/> Sprinkler PIV Switch	_____
<input type="checkbox"/> Water System Air Pressure	_____
<input type="checkbox"/> Suppression Panel Alarm	_____
<input type="checkbox"/> Suppression Panel Trouble	_____
<input type="checkbox"/> Suppression Panel Agent Release	_____
<input type="checkbox"/> Supplemental Fire Panel Alarm	_____
<input type="checkbox"/> Supplemental Fire Panel Trouble	_____
<input type="checkbox"/> Beam Detectors (Xmtr/Rcvr Pair)	_____

FAA Fire Alarm System Certificate of Completion

<input type="checkbox"/> Flame Detectors	_____
<input type="checkbox"/> Kitchen Hood Extinguishing System	_____
<input type="checkbox"/> Security Contact	_____
<input type="checkbox"/> Fire Pump	_____
<input type="checkbox"/> Engine Generator	_____
<input type="checkbox"/> Other _____	_____

Part 7.

SYSTEM POWER SUPPLIES

Primary (Main) Power Supply

Nominal Voltage _____, _____ Amps

Overcurrent Protection

Type: _____ Amps: _____

Location:

Secondary (Standby) Power Supply:

Storage Battery' _____ AH (Amp-Hr Rating) Battery Type: _____

Calculated capacity-to operate system: _____ Hour Standby _____ Minutes Alarm

Fire Alarm System provided back-up power from Engine-driven generator.

Location of fuel storage: _____ Fuel Tank Capacity: _____

Emergency or Standby System used as backup to Primary Power Supply, instead of using a Secondary Power Supply:

Emergency System described in NFPA 70, Article 700.

Legally Required Standby System described in NFPA 70, Article 701.

Optional Standby System described in NFPA 70, Article 702, which also meets the performance requirements of Article 700 or 701.

PART 8. SYSTEM DEVIATIONS FROM THE REFERENCED STANDARDS:

None As Follows (describe fully)

FAA Fire Alarm System Certificate of Completion

PART 9.

CERTIFICATION SIGNATURES

The individual(s) and/or contractor(s) signatures below, with their signatures, affirm that the Fire Life Safety System(s) noted herein have been installed to an operational condition that meets or exceeds the codes and standards noted. If upon completion of this certification an acceptable level of protection is in question, due to deficiencies noted, then immediate action shall be taken to correct all the deficiencies. A re-certification of the system(s) installation and/or operation(s) shall be required at no added cost to the FAA. Appropriate action shall be taken to insure the safety of the facilities individuals and operations during any system repair(s) and/or service. The FAA Safety Individual at the CAI shall provide the AF Manager with Fire Watch information to insure a continued safe facility operation during the repairs and service. Any costs incurred as a result of providing a fire watch shall be the contractors responsibility and may be deducted from monies due under the contract. This form shall be accompanied with the required "FAA Life Safety System Inspection & Test Report" for completion of a CAI.

System Installation Contractor:

<hr/> <p>(Signature-Title)</p> <hr/>	<hr/> <p>(NICET Certification)</p> <hr/>	<hr/> <p>(Date)</p> <hr/>
<hr/> <p>(Organization)</p> <hr/>	<hr/> <p>(Phone and FAX)</p> <hr/>	
<hr/> <p>(Print Name and Title of FAA Test Witness)</p> <hr/>	<hr/> <p>(Phone and FAX)</p> <hr/>	
<hr/> <p>(AHJ Witness)</p> <hr/>	<hr/> <p>(Phone and FAX)</p> <hr/>	

System Commission Contractor:

<hr/> <p>(Signature-Title)</p> <hr/>	<hr/> <p>(NICET Certification)</p> <hr/>	<hr/> <p>(Date)</p> <hr/>
<hr/> <p>(Organization)</p> <hr/>	<hr/> <p>(Phone and FAX)</p> <hr/>	
<hr/> <p>(Print Name and Title of FAA Test Witness)</p> <hr/>	<hr/> <p>(Phone and FAX)</p> <hr/>	
<hr/> <p>(AHJ Witness)</p> <hr/>	<hr/> <p>(Phone and FAX)</p> <hr/>	

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CERTIFICATE OF SUBSTANTIAL COMPLETION (CoSC)

TO: FEDERAL AVIATION ADMINISTRATION

DATE OF SUBSTANTIAL COMPLETION:

PROJECT TITLE: _____

CONTRACT NO. _____

PROJECT OR SPECIFIED PART SHALL INCLUDE:

LOCATION: _____

CONTRACTOR: _____

NTP DATE: _____

The Work performed under this Contract has been inspected by authorized representatives of the FAA and Contractor and the Project (or specified part of the Project, as indicated above) is hereby declared to be substantially completed on the above date.

DEFINITION OF SUBSTANTIAL COMPLETION

The date of substantial completion of a project or specified area of a project is defined by the Contract Documents, General Conditions

A tentative list of items to be completed or corrected is appended hereto. This list may not be exhaustive, and the failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents.

The Contractor accepts the above Certificate of Substantial Completion and agrees to complete and correct the items on the tentative list within the time indicated.

CONTRACTOR _____ (Typed)

AUTHORIZED REPRESENTATIVE (Signature) DATE

FAA RESIDENT ENGINEER _____ (Typed)

FAA RESIDENT ENGINEER (Signature) DATE

OWNER – FEDERAL AVIATION ADMINISTRATION

The applicable FAA AT, SSC, and SMO concurs with Substantial Completion for the purposes of maintenance and operations of the completed Work.

FAA AIR TRAFFIC REPRESENTATIVE _____ (Typed)

FAA AIR TRAFFIC REPRESENTATIVE (Signature) DATE

FAA SSC REPRESENTATIVE _____ (Typed)

FAA SSC REPRESENTATIVE (Signature) DATE

FAA SMO REPRESENTATIVE _____ (Typed)

FAA SMO REPRESENTATIVE (Signature) DATE

REMARKS:

Attached: Substantial Completion Acceptance Form (Copy)
Punchlist Dated _____
Certificate of Occupancy Dated _____ (As Required)

cc: FAA Contracting Officer
FAA Project Engineer

CERTIFICATE OF SUBSTANTIAL COMPLETION (CoSC) *(Continued)*

CONTRACT NO. _____

Concurrent with the issuance of this Certificate, the areas of responsibilities are assigned as follows:

SECURITY: _____

MAINTENANCE: _____

OPERATIONS (CLEANING/HOUSEKEEPING): _____

UTILITIES: _____

PROTECTION OF THE WORK: _____

INSURANCE: _____

HEAT: _____

COMPLETE RECORD DOCUMENTS (DATE): _____

COMPLETE O&M MANUALS (DATE): _____

DATE REQUIRED FOR COMPLETION OF CORRECTIONS TO THOSE ITEMS CONTAINED IN THE ATTACHED PUNCHLIST: _____



U.S. Department
of Transportation
**Federal Aviation
Administration**

ATLANTA TERMINAL ENGINEERING CENTER

P.O. Box 20636
Atlanta, Georgia 30320-0631

SUBSTANTIAL COMPLETION ACCEPTANCE (SCA)

(72 Hours Notice of Inspection is Required)

PROJECT: _____
(Number & Description)

PART I - NOTICE OF INSPECTION:

The Contractor has requested a substantial completion inspection for referenced project and has submitted the attached punchlist. This inspection is scheduled for:

_____ at _____
DATE TIME

All parties will meet at _____ at the above date and time. Please ensure authorized representatives from the following are present:

Contractor: _____

FAA Resident Engineer: _____

FAA Air Traffic: _____

FAA SSC: _____

FAA SMO: _____

FAA ASO-470: _____

Others: _____

PART II – SIGNATURES OF ACCEPTANCE OF SUBSTANTIAL COMPLETION:

The following parties concur referenced project, at the above date and time of inspection, is substantially complete contingent upon concurrence of the punchlist.

Contractor: _____

FAA Resident Engineer: _____

FAA Air Traffic: _____

FAA SSC: _____

FAA ASO-470: _____

Others: _____

SUBSTANTIAL COMPLETION ACCEPTANCE (SCA) *(Continued)*

PROJECT: _____
(Number & Description)

PART III - PUNCHLIST REVIEW/ACCEPTANCE:

The following parties concur the attached punchlist dated _____ is a comprehensive punchlist to the best of their knowledge and is the substantial completion punchlist.

Contractor: _____

FAA Resident Engineer: _____

FAA Air Traffic: _____

FAA SSC: _____

FAA ASO-470: _____

Others: _____

PART IV - FINAL ACCEPTANCE:

The following parties concur all punchlist items for referenced project were completed on _____.

Contractor: _____

FAA Resident Engineer: _____

FAA Air Traffic: _____

FAA SSC: _____

FAA ASO-470: _____

Others: _____

Part IV must be completed prior to processing the Contractor's final Pay Application. **The OAR is to attach proof of FAA/TN DOT final inspections, as required.**

A copy of this form is to be attached to the Certificate of Substantial Completion at the time of issuance with Parts I through III completed.

cc: FAA Contracting Officer
 FAA Project Engineer



U.S. Department
of Transportation
**Federal Aviation
Administration**

ATLANTA TERMINAL ENGINEERING CENTER

P.O. Box 20636
Atlanta, Georgia 30320-0631

PARTIAL OCCUPANCY / USE AGREEMENT (POUA)

TO: FEDERAL AVIATION ADMINISTRATION

DATE OF PARTIAL OCCUPANCY/USE: _____

PROJECT TITLE : _____

PROJECT OR SPECIFIED PART SHALL INCLUDE:

CONTRACT NO: _____

LOCATION: _____

CONTRACTOR: _____

NTP DATE: _____

The Work performed under this Contract has been inspected by authorized representatives of the FAA and Contractor and the Project (or specified part of the Project, as indicated above) is hereby declared to be acceptable for Partial Occupancy/Use on the above date.

DEFINITION OF PARTIAL OCCUPANCY/USE

The date of Partial Occupancy/Use of a project or specified area of a project is defined by the Contract Documents, General Conditions

A tentative list of items to be completed or corrected is appended hereto. This list may not be exhaustive, and the failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents.

The Contractor accepts the above Partial Occupancy/Use Agreement and agrees to complete and correct the items on the tentative list within the time indicated.

CONTRACTOR _____ (Typed)

AUTHORIZED REPRESENTATIVE (Signature) DATE

FAA RESIDENT ENGINEER _____ (Typed)

FAA RESIDENT ENGINEER (Signature) DATE

OWNER – FEDERAL AVIATION ADMINISTRATION

The applicable FAA AT, SSC, and SMO concurs with Partial Occupancy / Use for the purposes of maintenance and operations of the completed Work.

FAA AIR TRAFFIC REPRESENTATIVE _____ (Typed)

FAA AIR TRAFFIC REPRESENTATIVE (Signature) DATE

FAA SSC REPRESENTATIVE _____ (Typed)

FAA SSC REPRESENTATIVE (Signature) DATE

FAA SMO REPRESENTATIVE _____ (Typed)

FAA SMO REPRESENTATIVE (Signature) DATE

REMARKS: _____

Attached: Punchlist Dated _____
Certificate of Occupancy Dated _____ (As Required)

cc: FAA Contracting Officer
FAA Project Engineer

PARTIAL OCCUPANCY/USE AGREEMENT (POUA) *(Continued)*

CONTRACT NO. _____

Concurrent with the issuance of this Agreement, the areas of responsibilities are assigned as follows:

SECURITY: _____

MAINTENANCE: _____

OPERATIONS(CLEANING/HOUSEKEEPING): _____

UTILITIES: _____

PROTECTION OF THE WORK: _____

INSURANCE: _____

HEAT: _____

COMPLETE RECORD DOCUMENTS (DATE): _____
(Status)

WARRANTY STARTS (DATE): _____

COMPLETE O&M MANUALS (DATE): _____
(Status)

DATE REQUIRED FOR COMPLETION OF CORRECTIONS TO THOSE ITEMS CONTAINED IN THE ATTACHED PUNCHLIST:



U.S. Department
of Transportation
**Federal Aviation
Administration**

ATLANTA TERMINAL ENGINEERING CENTER

P.O. Box 20636
Atlanta, Georgia 30320-0631

-6505

JOB MEMORANDUM (JM)

JM No.: _____ Date: _____ Sheet _____ of _____

To: _____

Project: _____ (B.P. _____)

Field inspection has indicated that the following work is not being performed in accordance with the Contract Documents. The Contractor is requested to provide his proposed Contractor Corrective Action (CCA) no later than

Reference: Sheet No.: _____ Specification No.: _____ Other: _____
Subject: _____

Description of Discrepancy: _____

Resident Engineer _____

CONTRACTOR'S CORRECTIVE ACTION (CCA)

CCA No.: _____ Date: _____
To: **FEDERAL AVIATION ADMINISTRATION – RESIDENT ENGINEER**
The following action has been
taken _____

Contractor _____

FAA's Response: _____

cc: FAA Contracting Officer, FAA Project Engineer, A/E

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HOT WORK PERMIT

(for welding, cutting, or brazing activities)

THIS FORM MUST BE COMPLETED IN ITS ENTIRETY BY THE RESPONSIBLE PERSON PERFORMING THE HOT WORK, OR THE RESIDENT ENGINEER OVERSEEING THE CONTRACTOR WHO IS PERFORMING THE HOT WORK.

Facility ID and Type: _____

Date: _____

Responsible Person: _____

Start Time: _____

Finish Time: _____

Work to be performed: _____

Building: _____

Room Number, Area or Equipment: _____

Is it possible to perform this work in a welding shop or other type of workshop?

Yes

No

Complete the checklist below and if any of the tasks have not been completed, please provide, in the comments section the reasons for not completing the tasks and the precautionary measures that will be implemented.

Task	Yes	No	<u>Comments and/or Corrective Measures</u>
Flame or spark-producing equipment to be used has been inspected and found in good repair.			
Fire Alarm systems are operational and will not be taken out of service while welding, cutting, or brazing activities are performed.			
If necessary, the automatic smoke detectors in the immediate vicinity of the hot work may be temporarily disabled via functions at the fire alarm control panel or otherwise covered, and returned to operational immediately following the smoke producing activities associated with the hot work.			
Sprinklers, where provided, are operational and will not be taken out of service while this work is being done.			
There are no combustible fibers, dusts, vapors, gases or liquids in the area.			
The work will only be performed in the area specified on this permit.			
Surrounding floors have been swept clean and, if combustible, wet down.			
All floor and wall openings within 35 feet of the operations have been tightly covered.			
All combustibles have been relocated at least 35 feet from the operation.			
If no, then are barriers or guards used to contain the heat, sparks and slag. Protection should include metal guards or flame-proofed curtains, blankets, or covers (not ordinary tarpaulins (tarps)).			

<u>Task</u>	<u>Yes</u>	<u>No</u>	<u>Comments and/or Corrective Measures</u>
A "Fire Watch" will be posted in area of activity, prior to starting welding, cutting, and brazing activity, and will patrol the area, including floors above and below, during any lunch or rest period and for at least one-half hour after the work has been completed to ensure the sparks and slag have not started fires.			
If bystanders and/or fire watch may be exposed to UV or burn hazards they will be appropriately protected with PPE.			
Fire extinguisher available for instant use within 20 ft.			
Cutter/welder is trained in safe operation of equipment and the safe use of the process.			
On-site contractors were advised about flammable material or hazardous conditions of which they may not be aware.			
Welding or cutting on material containers that contain or did contain flammables: Container thoroughly cleaned and ventilated; Any pipe lines or connections to containers disconnected or blanked; and Approved by ROSHM or EOSH Coordinator.			
Personal Protective Equipment (PPE) used: Eye protection Helmets Protective clothing Other (Specify)			
Warning sign posted to warn of hot metal.			
Appropriate ventilation provided.			
When working in confined spaces a permit has been issued as per 1910.146 and local Confined Space Program.			

For specific requirements refer to General Industry Standards 1910.146; 1910.252; .253; .254 and .272 and Construction Standards 1926.803; .350; .352 and .353.

I attest that the above precautions have been taken:

Printed Name of Person Responsible
for Performing Hot Work

Signature

Approval:

Facility Manager - Printed Name

Facility Manager - Signature

NOTE: THIS PERMIT EXPIRES 24 HOURS AFTER THE DESIGNATED "START TIME". IF WORK IS TO CONTINUE ANOTHER PERMIT MUST BE ISSUED. MAINTAIN THE COMPLETED AND APPROVED PERMITS ON FILE FOR A MINIMUM OF ONE YEAR.

Pre-Construction/Installation Environmental and Occupational Safety and Health Checklist

INSTRUCTIONS FOR COMPLETING FAA FORM 3900-18

Section A. Purpose. FAA Form 3900-18, Pre-Construction/Installation Environmental and Occupational Safety and Health (EOSH) Checklist, must be used to review construction, installation and non-routine maintenance activities involving construction prior to commencement of work that potentially has EOSH impacts on NAS operations and employees. The organization that directly manages the construction project is responsible for completing the checklist. They must coordinate with the appropriate District Office prior to commencement of work. Construction must not be initiated prior to completion and review of the checklist. This form must be used at the pre-construction meeting and similar meetings. Emphasis should be placed on using this checklist as a tool to assess as well as reassess hazards as the work progresses.

Responsibilities: Responsibility for completing the checklist may vary depending on the work being performed.

- a. The District Office Manager will be responsible for District Office projects.
- b. The Project Engineer for Engineering Services projects.
- c. The Facilities Maintenance Program (FMP) Manager for FMP projects.
- d. For turnkey projects managed by Headquarters organizations, the Headquarters program office will be responsible for completing the checklist.

Section B. Work Summary Information. The individual/organization initiating the checklist will complete this portion of the checklist.

1. District Office: Name of the District Office.
2. Work Location: City, State, Airport, building, room within building.
3. Facility: Facility type, associated runway, facility LOC ID.
4. Work Description: Provide a concise statement as to the nature of the work to be accomplished. Example: Asbestos abatement of the control room attic.
5. Project Number/JCN: Provide the Project Number and or Job Control Number (JCN).
6. Planned Start Date: Provide the expected start date of the work.
7. Expected Completion Date: Provide the expected completion date of the work.
8. Contractor Contact: Provide the name and telephone number for a contractor representative who has the authority to make decisions and implement stop work/change orders. If the work is being accomplished by an FAA employee(s) or FAA contract employee(s), provide the name, organization, and telephone number of the on-site lead.
9. Project/Design Representative: Provide the name for the designer of the work (e.g., Engineering Services project engineer, District Office engineer, Headquarters program manager for turnkey projects).
10. COR/Specialist: Provide the name, organization, and telephone number of the on-site lead (e.g., Contracting Officer's Representative, Resident Engineer).
11. District Office EOSH Contact: Provide the name and telephone number of the person responsible for the occupational safety and health/environmental program for the District Office (e.g., SECM, District Office EOSH Professional).
12. Facility Representative: Provide the name and telephone number for an ATO representative at the facility who has the authority to make decisions for facility management.

Section C. Evaluation: The District Office Manager or designee may evaluate whether the remainder of the checklist needs to be completed. If necessary, the District Office Manager or designee will be provided any additional information regarding the project that will facilitate their determination on whether the remainder of the checklist should be completed. If there is an impact (yes), forward the checklist to the organization directing the construction project for completion of the remainder of the checklist. If there is no impact, provide a justification, sign and date the form, and then proceed to Section I, Distribution List, for distribution only. The designee may be the COR, SSC Manager, or other party.

Section D. Facility Procedures: The individuals/organization performing the work, and their contractors, along with the facility POC, must review all applicable facility specific procedures and plans. The intent of this section is to review applicable facility procedures and plans for the project and that it may be necessary to supplement this form.

1. Asbestos Contingency Plan: Determine the responsibilities of the personnel performing the work in the event of an incident requiring implementation of the asbestos contingency plan.
2. Hazard Communication: The personnel performing the work must be made familiar with the facility Hazard Communication program. Information such as safety data sheets (SDS) must be shared between the facility and the personnel performing the work.
3. Lockout/Tagout (LOTO): The work must be performed in accordance with the facility LOTO program. Determine if the facility LOTO procedures require equipment to be locked out/tagged out by an FAA technician, or if the personnel performing the work will be allowed to LOTO the equipment.

Pre-Construction/Installation Environmental and Occupational Safety and Health Checklist

INSTRUCTIONS FOR COMPLETING FAA FORM 3900-18

4. Work Permits: Applicable FAA facility, District Office, or Service Area work permits must be submitted by the individuals/organization performing the work, signed and posted at the work site. General note: All work permits should be included in this document (e.g., asbestos, lead, hot work, welding, cutting, brazing).
5. Emergency Plans: Describe the responsibilities, including the points of contact, in the event of an incident that requires implementation of the facility Occupant Emergency Plan or Fire Prevention Plan
6. Impacts to Fire Protection Systems (e.g., fire alarm, fire suppression, smoke control, fire rated doors): Identify the Fire Alarm and Suppression System and instructions to avoid unintentional impact to it. If the work involves intentional impact to the Fire Alarm and Suppression System, determine what coordination has to be done to ensure no disruption of the NAS. Determine what interim life safety measures (i.e., egress pathways, occupant emergency notification & fire alarm impairments) will be required during the project.
7. Confined Space Entry: Describe the facility procedures used in and around confined spaces. In addition, describe specific procedures for permit-required confined space in and around where the work will take place.
8. Work at Heights: Describe procedures for working at elevated surfaces (e.g., catwalks, towers, roofs) that may require fall protection procedures or equipment. Review rescue procedures and ensure awareness of responsibilities.
9. Restricted Areas due to EOSH Concerns: Describe those areas of the facility that have restricted access due to safety and health hazards (e.g., asbestos regulated areas, radiation, noise).
10. First Aid/Bloodborne Pathogens: Describe the facility procedures for dealing with emergency first aid situations and other trauma situations.
11. Other: The personnel performing the work should be made familiar with other facility programs, procedures, and requirements.

Section E. Activity Hazard: The individuals/organization performing the work, and their contractors, along with the facility POC, must identify potential EOSH hazards that may be encountered during the accomplishment of the work. Determine the possibility of causing disruption of NAS operations.

1. Asbestos: Determine if known or assumed asbestos containing material will be impacted by this work.
2. Chemical, Gases, Fumes, Vapors, Mist, Dust, Radiation: Determine if any products or methods will be used that may cause odors or vapors (from chemicals volatizing or biological agents), fumes (from welding or burning), excessive dust (e.g., sanding, grinding), or radiation (e.g., heat sources, light sources such as lasers, ionizing radiation sources such as X-ray equipment).
3. Use and Storage of Hazardous Materials: Determine if substances that exist at the facility may be impacted and what substances may be brought into the facility, which may have an impact on the facility and/or occupants.
4. Waste Management: Determine if work activities will generate wastes (e.g., construction waste, hazardous waste) and what procedures will be used for waste management (e.g., accumulation area, training).
5. Impact on HVAC System: Determine whether the environmental control elements of the facility may be impacted by the accomplishment of the work.
6. Equipment Removal/Installations: Determine if work activities will cause disturbance of excessive dust (e.g., disturbance of equipment which has been in place for a long time).
7. Fire Protection: Determine if work activities will impact fire protection systems and procedures at the facility (e.g., blocking egress, removing fire stopping, impacting fire rated barriers).
8. Impact to Integrity of Fire Alarm/Suppression System: Identify impacts to the fire alarm and suppression system. If the work involves intentional impact to the fire alarm and suppression system, determine what coordination has to be done to ensure no disruption of the NAS. Determine what interim life safety measures will be required during the project.
9. Lead Exposure: Determine if activities will expose FAA employees to lead dust, lead fumes, or other exposure to lead from known or assumed lead-containing material during the construction project.
10. Electrical Safety: Determine if work activities will expose FAA employees to electrical safety hazards (e.g., open electrical panel doors, exposed energized conductors, energized work).
11. Excessive Noise Exposure: Determine if work activities will expose FAA employees to excessive noise.
12. Walking Working Surfaces: Determine if work activities will expose FAA employees to tripping, slip and fall hazards (e.g., open panels in a raised floor, uneven floors, raised or loose carpeting, stairs, wet floors, etc.).
13. Work above Equipment/People: Determine if work activities will expose FAA employees to objects dropped from above.
14. Water Quality/Sanitation: Determine if work activities may cut off or contaminate the facility's potable water system.
15. Cranes/Rigging/Hoisting: Determine if work activities will expose FAA employees to hazards associated with rigging, hoisting and cranes.

Pre-Construction/Installation Environmental and Occupational Safety and Health Checklist

INSTRUCTIONS FOR COMPLETING FAA FORM 3900-18

16. Lighting: Determine if work activities will create insufficient lighting for FAA employees.
17. Machinery and Mechanized Equipment: Determine if work activities may expose FAA employees to hazards such as being struck by, caught in, or injured by machinery and mechanized equipment.
18. Excavation: Determine if work activities performed near facilities may cause catastrophic failure of a NAS facility.
19. Other: Other work activities that may impact NAS operations and employees.

Section F. Site Safety and Health – Controls. Ensure that measures and controls to address applicable site safety and health risks (e.g., through discussions, available site safety plans, or other applicable documents) have been identified. If a hazard has been identified in Section E, Activity Hazard, briefly describe the controls to be used.

1. Identify issues/hazards in Section E, Activity Hazard.
2. “Description of Controls” – The purpose of this column is to very briefly describe the controls in place for addressing each hazard.

Section G. Site Walk-Through: Following review of all applicable facility procedures, activity hazards and applicable control measures, the personnel performing the work must participate in a walk-through of the area of the facility where the work will be accomplished, led by a facility representative. The purpose of the walk-through is to allow the personnel performing the work to be introduced to the facility and the potential hazards as referenced in Sections E and F. It also allows the personnel performing the work to become familiar with the facility with respect to the work being done and awareness of the method of implementation of the various emergency plans. If the project is located at a staffed Air Traffic facility, inclusion of the Air Traffic Manager is warranted. The time, date, and personnel present for the walk-through must be recorded in Section G.

Section H. Review Information. This form must be reviewed by those individuals identified below, as appropriate, during design of the project, during pre-bid conferences, prior to the beginning of work (preferably at or prior to the pre-construction conference) and periodically throughout the completion of the project.

1. Originator: This is the individual/organization responsible for initiating the work (e.g., project engineer, senior engineer, technical support office) or the organization directly managing the day-to-day activities in the construction project.
2. Contractor/Installation Crew Lead/Specialist: These are the individuals performing the work who have the authority to make decisions and implement stop work/change orders. If the work is being accomplished by an FAA employee or an FAA contract employee, the employee should sign the form and provide a routing symbol and platform title.
3. District Office Manager or designee: This person must be the District Office Manager or designee. The designee may be the COR, SSC Manager, or other party.

Section I. Distribution List: This form must be forwarded to the following as applicable:

1. District Office Manager.
2. Safety and Environmental Compliance Manager (SECM) or District Office EOSH Professional.
3. Engineering Services EOSH Coordinator.
4. Engineering Services Manager.
5. Engineering Services Project Engineer.
6. Contracting Officer’s Representative.
7. Facility Air Traffic Manager.

Pre-Construction/Installation Environmental and Occupational Safety and Health Checklist

Section A. Purpose

This checklist is intended to review construction, installation and non-routine maintenance activities, prior to commencement, that potentially have occupational safety and health related impacts on NAS operations and employees. This tool must be used, as appropriate, during critical phases of the work (e.g., the pre-construction meeting, prior to commencement of work, etc.). Emphasis should be placed on using this checklist as a tool to assess as well as reassess hazards as the work progresses. This form is required to be completed as per FAA Order JO 3900.57A.

Section B. Work Summary Information

The purpose of this section is to provide a brief description of the construction project and/or specific maintenance tasks, and identify key personnel responsible for project completion. Fill in the requested site-specific information. Indicate if this work will occur in or adjacent to an occupied space (e.g., equipment room, ATCT cab, etc.). Note: Provide further explanation of activities on additional sheets if necessary.

1. District Office:	2. Work Location:	3. Facility:
4. Work Description:		
5. Project Number/JCN:	6. Planned Start Date:	7. Expected Completion Date:
8. Contractor Contact Name:	Phone:	
9. Project/Design Representative Name:	Phone:	
10. COR/Specialist Name:	Phone:	
11. District Office EOSH Contact Name:	Phone:	
12. Facility Representative Name:	Phone:	

Section C. Evaluation

The purpose of this section is to allow the District Office Manager or designee to determine whether the remainder of the checklist needs to be completed. If there is a potential EOSH hazard, then no signature is required in Section C and subsequent sections of the form are to be completed by the organization managing the construction project or maintenance task. If there is no potential hazard, the District Office Manager or designee must sign below and provide an explanation, then proceed to Section I.

Is there a potential EOSH hazard?	Yes	(Explanation)
	No (if no, explain)	
Name: (print)		(Title)
Signature:		(Date)

Pre-Construction/Installation Environmental and Occupational Safety and Health Checklist

Section D. Facility Procedures

Review site-specific FAA procedures and considerations with the contractor/installer/specialist. For example, discuss when or how during the work, emergency plans will be required and/or used.

Facility Procedures	Reviewed? [Yes/No/N/A]	Notes
1. Asbestos Contingency Plan		
2. Hazard Communication (e.g. SDSs)		
3. Lockout/Tagout		
4. Work Permits (e.g., asbestos, lead, hotwork)		
5. Emergency Plans (e.g., Occupant Emergency Plan)		
6. Impacts to Fire Protection Systems		
7. Confined Space Entry		
8. Work at Heights		
9. Restricted Areas due to EOSH Concerns		
10. First Aid/Bloodborne Pathogens		
11. Other		

NOTE: Think about your work and its potential hazards. Consider sensitive NAS operations and all facility personnel that may be impacted by your work. As an example, construction activities with potential for impacting asbestos materials in or near sensitive operations could result in incidents that may disrupt NAS operations.

Section E. Activity Hazard

Note: Provide further explanation of potential hazards, locations, etc. below and attach additional sheets if necessary.

Potential Hazardous Exposures and/or Activities Consider Sensitive NAS Operations	Potential for Exposure/Release / Incident [Yes/No/N/A]	Description of Hazard
1. Asbestos (e.g., tiles & insulation)		
2. Chemical, Gases, Fumes, Vapors, Mist, Dust, Radiation		
a. Painting/Solvent/Adhesive/Sealant		
b. Grinding/Sanding/Cutting/Welding/Soldering		
c. Indoor Air Quality (e.g., biological agents, mold, odors, CO ₂)		
3. Use and Storage of Hazardous Materials (e.g., flammables, compressed gas)		
4. Waste Management		
5. Impact on HVAC System		
6. Equipment Removal/Installation (e.g., dust disturbance)		
7. Fire Protection (e.g. blocked egress, fire barrier penetration)		

Pre-Construction/Installation Environmental and Occupational Safety and Health Checklist

Potential Hazardous Exposures and/or Activities Consider Sensitive NAS Operations	Potential for Exposure/Release / Incident [Yes/No/N/A]	Description of Hazard
8. Impact to Integrity of Fire Alarm/Suppression System(s)		
9. Lead Exposure (e.g., lead-based paint)		
10. Electrical Safety		
a. Work on Live Electrical Systems		
b. Temporary Wiring		
11. Excessive Noise Exposure		
12. Walking/Working Surfaces (e.g., tripping hazards, work at heights)		
13. Work above Equipment/People		
14. Water Quality/Sanitation		
15. Cranes/Rigging/Hoisting		
16. Lighting		
17. Machinery and Mechanized Equipment (e.g., operator training and certification and equipment certification)		
18. Excavation		
19. Other		

Section F. Site Safety and Health – Controls

After reviewing the potential hazards in Section E, ensure that measures and controls to address applicable site safety and health risks (e.g., through discussions, available site safety plans, or other applicable documents) have been identified. If a hazard has been identified in Section E, briefly describe the controls to be used. Note: Provide further explanation of controls below and attach additional sheets if necessary.

Potential Hazardous Exposures and/or Activities	Identified as a hazard in Section E? [Yes/No/N/A]	Description of Controls (e.g., addressed in Accident Prevention Plan or Site Safety Plan)
1. Asbestos (e.g. tiles & insulation)		
2. Chemical, Gases, Fumes, Vapors, Mist, Dust, Radiation		
a. Painting/Solvent/Adhesive/Sealant		
b. Grinding/Sanding/Cutting/Welding/Soldering		
c. Indoor Air Quality (e.g., biological agents, mold, odors, CO ₂)		
3. Use and Storage of Hazardous Materials (e.g., flammables, compressed gas)		
4. Waste Management		
5. Impact on HVAC System		

Pre-Construction/Installation Environmental and Occupational Safety and Health Checklist

Potential Hazardous Exposures and/or Activities	Identified as a hazard in Section E? [Yes/No/N/A]	Description of Controls (e.g., addressed in Accident Prevention Plan or Site Safety Plan)
6. Equipment Removal/Installation (e.g., dust disturbance)		
7. Fire Protection (e.g., blocked egress, fire barrier penetration)		
8. Impact to Integrity of Fire Alarm/Suppression System(s)		
9. Lead Exposure (e.g., lead-based paint)		
10. Electrical Safety		
a. Work on Live Electrical Systems		
b. Temporary Wiring		
11. Excessive Noise Exposure		
12. Walking/Working Surfaces (e.g., tripping hazards, work at heights)		
13. Work Above Equipment/People		
14. Water Quality/Sanitation		
15. Cranes/Rigging/Hoisting		
16. Lighting		
17. Machinery and Mechanized Equipment (e.g., operator training and certification and equipment certification)		
18. Excavation		
19. Other		

Section G. Site Walk-Through

Time/date of site walk-through with appropriate personnel (e.g., District Office representative, SSC Manager, SECM, Air Traffic Manager, Resident Engineer, COR, Contractor).

Site Walk Through:	
(Date)	(Time)
Appropriate Personnel:	
(Name)	(Organization)
(Name)	(Organization)
(Name)	(Organization)

Pre-Construction/Installation Environmental and Occupational Safety and Health Checklist

Section H. Review Information

The appropriate FAA point-of-contact and the contractor/installation crew lead/specialist print and sign below to document discussion of the items on this form.

Completed By:

FAA Originator of Work (e.g., Project Engineer, Resident Engineer):

(Print or Type Name)	(Signature)	(Title)	(Date)
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Contractor Name:

(Print or Type Name)	(Signature)	(Title)	(Date)
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Reviewed By:

District Office Manager or Designee:

(Print or Type Name)	(Signature)	(Title)	(Date)
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Section I. Distribution List

This form must be forwarded to the following as applicable:	Name/Routing Symbol
1. District Office Manager	
2. SECM/District Office EOSH Professional	
3. Engineering Services EOSH Coordinator	
4. Engineering Services Manager	
5. Engineering Services Project Engineer	
6. Contracting Officer (if contractor resources perform the construction work)	
7. Facility Air Traffic Manager	

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:

1. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 1. Any product or material that is submitted that is not the exact make and model number of the design basis shall be considered a substitution. This includes products that are from the same manufacturer, but are different models. If the design basis is discontinued or obsolete, any product replacement is also considered a substitution. All substitutions shall follow the substitution procedures listed herein.
 2. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 3. Substitutions for Convenience: Changes proposed by Contractor or FAA that are not required to meet other Project requirements but may offer advantage to Contractor or FAA.
- B. Known Acceptable Source: A manufacturer of a particular product or material that has been utilized successfully on past FAA projects. This is not an indication that a particular manufacturer will meet the requirements of each FAA project, only that they have been found to meet the requirements on past projects.

- 1.4 Basis of Design: Well-defined requirements consist of a set of statements that could form the basis of inspection and test acceptance criteria.**ACTION SUBMITTALS**
- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use form that is part of web-based Project management software or form acceptable to COR.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable. Identify product by specification section and paragraph number.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by FAA and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures. Manufacturer's name and address, trade name and model number of product (if applicable), and name of fabricator or supplier (if applicable). List of maintenance services and replacement materials available.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.

1. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. COR's Action: If necessary, the COR will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. The COR will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance: Change Order, Construction Change Directive, or COR's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if COR does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 SUBMISSION PROCEDURES

- A. Submission of request for substitution shall constitute a representation by the Contractor that he:
1. Has investigated the proposed product and determined that it is equal to or better than the specified product. Absence of an explicit comparison of any characteristic of the proposed product to the specified product shall constitute a representation that the proposed product is equal to or better than the specified product with regard to that characteristic.
 2. Will provide the same warranty for the proposed product as for the specified product.
 3. Will coordinate the installation and make other changes which may be required for the work to be complete in all respects, including:
 - a. Redesign.
 - b. Additional components and capacity required by other work affected by the change.
 - c. Update BIM.
 4. Waives all claims for additional costs and time extensions which subsequently may become apparent and which are caused by the change.

5. Will reimburse the FAA for additional costs for evaluation of the substitution request, redesign if required, and reapproval by authorities having jurisdiction if required.
- B. Substitutions will not be considered when acceptance would require substantial revision of the contract documents.
- C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request.
- D. Substitution requests will not be considered when submitted directly by subcontractor or supplier.
- E. Substitution Request Procedure: Submit written request with complete data substantiating compliance of the proposed product with the requirements of the contract documents.
 1. Submit request to the Contracting Officer Representative (COR).
 2. Submit 3 copies of each request and accompanying data.
 3. Submit all requests on a standard form provided.
 4. Only one request for substitution will be considered for each product.
- F. Data Required with Substitution Request: Provide data listed in Submittals Paragraphs above.
- G. The COR will determine acceptability of the proposed substitution.
- H. When the proposed substitution is not accepted, provide the product (or one of the products, as the case may be) specified.

1.7 SUBSTITUTIONS

- A. Substitution Request Procedure: Submit written request with complete data substantiating compliance of the proposed product with the requirements of the contract documents.
- B. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 1. Conditions: COR will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, COR will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

- b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1 requirements.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- C. Substitutions for Convenience: COR will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of COR.
- 1. Conditions: COR will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, COR will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers FAA a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities FAA must assume. FAA's additional responsibilities may include compensation to COR for redesign and evaluation services, increased cost of other construction by FAA, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1 requirements.
 - e. Substitution request is fully documented and properly submitted.
 - f. Requested substitution will not adversely affect Contractor's construction schedule.
 - g. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - h. Requested substitution is compatible with other portions of the Work.
 - i. Requested substitution has been coordinated with other portions of the Work.
 - j. Requested substitution provides specified warranty.
 - k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

1.8 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **01 25 00**

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. RFIs.
5. Digital project management procedures.
6. Project meetings.

- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

- C. Related Requirements:

1. Section 01 12 00 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
3. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.
5. Section 01 91 13 "General Commissioning Requirements" for coordinating the Work with FAA's Commissioning Authority.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory (if used), and in prominent location in each built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for FAA and separate contractors if coordination of their Work is required.
- C. Project Coordination Schedule: The General Contractor will prepare and maintain a mutually agreed upon spatial coordination schedule with coordination drawing submittal milestones that meet the overall project construction schedule. Coordination drawing development, coordination submittal drawing submission and review by the COR, fabrication duration, and delivery lead times will be included to support the project construction schedule.
- D. Coordination Meetings: The Coordinating Engineer shall host regular weekly (or more frequent) coordination meetings in accordance with this section. Attendance is mandatory by all Team members to maintain the coordination and construction schedules.

E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as FAA's property.

1.6 KEY PERSONNEL

A. Key Personnel Names: Within 14 calendar days of Notice to Proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.7 CONTRACTOR PERSONNEL REQUIREMENTS

A. Project Manager with a minimum of a Bachelor of Science (BS) degree in Civil, Mechanical, or Electrical Engineering from an accredited institution of higher learning, or a technical degree, and ten (10) years of experience with coordinating subcontractors on projects with complex mechanical, electrical, and control systems in the heavy construction industry.

B. Project Superintendent with a minimum of ten (10) years of experience in coordinating mechanical, electrical, and control subcontractors in heavy construction industry.

C. Project Scheduler with minimum of five (5) years of experience in coordinating large complex construction projects involving multiple construction disciplines with a typical project length of 18 or more months.

- D. Quality Control (QC) Manager with a minimum of eight (8) years of experience as a superintendent, inspector, QC manager, project manager, project engineer or construction manager on similar size and type construction contracts that include the major trades that are part of this requirement. The QC Manager is required to be on site at all times and his duties can be combined with those of the Coordinating Engineer. The QC manager must be employed by the prime Contractor. The QC manager will be responsible for implementing the QC plan and interacting with the Third Party QC firm/agency.

1.8 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to COR indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

- B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 3. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 4. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 5. Review: COR will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If COR determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, COR will so inform Contractor, who shall make suitable modifications and resubmit.
 6. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
 2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
 3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
 4. Electrical Installer will indicate service and feeder conduit runs and equipment in green color.
 5. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with COR to review and resolve conflicts on the coordination drawings.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format:

- a. Same digital data software program, version, and operating system as original Drawings.
 - b. DWG, Version 2019, operating in Microsoft Windows operating system.
2. File Submittal Format: Submit or post coordination drawing files using PDF format.
 3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
 - a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by COR.
 4. FAA will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. FAA makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in AutoCAD 2021.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to FAA.
- E. Deliverables: All drawings must be full-Size (ANSI D), suitable for half-size (11"x17") scaled reproduction uploaded to the FAA's KSN website and to the project's Cloud Computing site. On a monthly basis deliver a CD-ROM containing the updated Computer Aided Design (CAD) files, BIM model files, Coordination Drawings, Record Documents, Navisworks files, IFC files, and Facility Data COBie spreadsheets.
1. The Construction Contract Drawings utilize Revit 2012 BIM files. The Contractor shall convert the Government Furnished Equipment (GFE) BIM files to the latest version of Revit. The Contractor shall use the BIM files to electronically reconfigure, modify, and update them with as-built information to satisfy Coordination Drawings, Record Documents, and Facility Data requirements.
 2. Middleware: Cloud services Autodesk® BIM 360™ Glue and Field, or as equal, shall be used by the Contractor to provide collaborative online access to the BIM files throughout the entire project duration. The contractor shall demonstrate middleware compatibility with desktop computers and hand-held devices provided for the FAA Construction Trailer as per DIV 01-50-10.
 - a. Updated Coordination Drawings, BIM files, Facility Data COBie files, Navisworks files, and IFC files shall be submitted to the FAA no later than 90 days after issuance of Notice-to-Proceed. Thereafter, all Coordination Drawings, BIM files, Facility Data Cobie files, Navisworks files, and IFC files shall provide each month to the FAA on DVD and be continuously maintained on the cloud computing based shared server approved by the COTR.

- b. The BIM files on the cloud computing shared server shall be maintained to the latest as built conditions daily (live) to incorporate and coordinate approved submittals and the as-built installation of products and materials. Actual product dimensions shall be shown to plan maximum utilization of space for efficient installation of different components as they are submitted for approval.
- c. Incorporate the relationship of components shown on approved Shop Drawing submittals.
- d. Indicate required installation sequences.
- e. Each update shall include a description/table of revisions made for the respective monthly update such as, references to changes made due to recently submitted and/or approved products, field as-built adjustments, etc.
- f. If the Contractor fails or refuses to provide Coordination Drawings conforming to this specification the COR may issue an order stopping all or part of the work until the Contractor complies with this specification. No part of time lost due to such stop orders must be made the subject of claim for extension of time or excess cost or damages by the Contractor.

1.9 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. COR will return without response those RFIs submitted by other entities controlled by Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Name of COR.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. RFI number, numbered sequentially.
 - 6. RFI subject.
 - 7. Specification Section number and title and related paragraphs, as appropriate.
 - 8. Drawing number and detail references, as appropriate.
 - 9. Field dimensions and conditions, as appropriate.
 - 10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 11. Contractor's signature.
 - 12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

- a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Form bound in Project Manual or Software-generated form with substantially the same content as indicated above, acceptable to CORRefer Section 01 10 12 Construction Administration Forms.
 - 1. Attachments shall be electronic files in PDF format.
- D. COR's Action: COR will review each RFI, determine action required, and respond. Allow 14 calendar days for COR's response for each RFI. RFIs received by COR after 1:00 p.m. will be considered as received the following working day.
 - 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of COR's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 - 2. COR's action may include a request for additional information, in which case COR's time for response will date from time of receipt by COR of additional information.
 - 3. COR's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal .
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify COR in writing within 4 calendar days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software or a software log with not less than the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. RFI number, including RFIs that were returned without action or withdrawn.
 - 4. RFI description.
 - 5. Date the RFI was submitted.
 - 6. Date COR's response was received.
 - 7. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 - 8. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

- F. On receipt of COR's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify COR within three calendar days if Contractor disagrees with response.

1.10 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's and/or CAD drawings will be provided by COR for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 2. OwnerArchitect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 - a. Subcontractors and other parties granted access by Contractor to ArchitectOwner's digital data files shall execute a data licensing agreement in the form of AIA Document C106 Agreement acceptable to Owner and Architect.
- B. PDF Document Preparation: Where PDFs are required to be submitted to COR, prepare as follows:
1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.11 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify COR of scheduled meeting dates and times a minimum of seven days prior to meeting.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including COR, within three days of the meeting.
- B. Preconstruction Conference: COR will schedule and conduct a preconstruction conference before starting construction, at a time convenient to FAA and COR, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of COR; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Sustainable design requirements.
 - o. Preparation of Record Documents.
 - p. Use of the premises and existing building.
 - q. Work restrictions.
 - r. Working hours.
 - s. FAA's occupancy requirements.
 - t. Responsibility for temporary facilities and controls.
 - u. Procedures for moisture and mold control.
 - v. Procedures for disruptions and shutdowns.
 - w. Construction waste management and recycling.
 - x. Parking availability.
 - y. Office, work, and storage areas.
 - z. Equipment deliveries and priorities.
 - aa. First aid.
 - bb. Security.
 - cc. Progress cleaning.
 - dd. Environmental requirements and procedures, including but not limited to:
 - 1) Erosion and Sediment control.
 - 2) Solid Waste Management Plan.
 - 3) IAQ Management Plan.
 - 4) Procedures for noise and acoustics management.
 - 5) Environmental Management Plan.
 - ee. Commissioning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise COR of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to FAA and COR, but no later than 60 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of COR; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - l. Coordination of separate contracts.
 - m. FAA's partial occupancy requirements.
 - n. Installation of FAA's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of COR, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Status of sustainable design documentation.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of Proposal Requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
 - 20) Commissioning efforts.
 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to COR, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

- a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site use.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of RFIs.
 - 14) Proposal Requests.
 - 15) Change Orders.
 - 16) Pending changes.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS

2.1 DRAWINGS

- A. Coordination Drawings and Record Documents shall comply with the latest version of FAA-STD-002, in addition to, the United States National CAD Standard® (NCS) with the FAA-STD-002 having precedence. Contractor shall notify the FAA of any discrepancies between these standards and obtain approval of the Contractor's proposed resolution. Plans, elevations, sections, schedules, and details shall be generated solely from the contract drawings.

PART 3 - EXECUTION

3.1 GENERAL PROVISIONS

- A. The FAA furnished Drawing files included in the systems described below reflect the design intent. The model shall be updated by the Contractor for each approved submittal to include as many of the systems described in this section as are necessary and appropriate at that construction stage for Coordination Drawings, Record Documents, and Facility Data requirements.

3.2 ARCHITECTURAL/INTERIOR DESIGN

- A. The Architectural systems drawings may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Drawings requirements include:
1. Roof. The Drawings must include the roof configuration, drainage system, major penetrations, specialties, and the necessary intelligence to produce accurate plans, building sections and generic wall sections where roof design elements are depicted.

3.3 MECHANICAL

- A. The mechanical systems Drawings may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Drawings requirements include:
1. HVAC. All necessary heating, ventilating, air-conditioning and specialty equipment, including air distribution ducts for supply, return, and ventilation and exhaust ducts, including control system, registers, diffusers, grilles, ducts access doors, gauges, thermometers, and hydronic baseboards with necessary intelligence to produce accurate plans, elevations, building/wall sections and schedules. All piping must be modeled. Contractor must take in consideration space for insulation as required.
 2. Mechanical Piping. All necessary piping, valves, gauges, thermometers, and fixture layouts, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, and schedules. All piping must be modeled.
 3. Plumbing. All necessary plumbing piping, valves and fixture layouts, floor and area drains, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules. All piping must be modeled. Contractor must take in consideration space for insulation as required.
 4. Equipment Clearances. All HVAC and Plumbing equipment clearances must be modeled for use in interference management and maintenance access requirements.

3.4 ELECTRICAL/TELECOMMUNICATIONS

- A. The electrical systems Drawings may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Drawings requirements include:
1. Interior Electrical Power and Lighting. All necessary interior electrical components (i.e., lighting, receptacles, special and general purpose power receptacles, lighting fixtures, panelboards, transformers, disconnects, pull boxes, control systems, raceways and supports), including necessary intelligence to produce accurate plans, details and schedules. All Cable trays and conduits routing must be modeled without detail of cable contents. Lighting and power built into furniture/equipment must be modeled.
 2. Grounding Systems. All necessary grounding components (i.e., lightning protection systems, static grounding systems, and communications grounding systems, bonding), including necessary intelligence to produce accurate plans, details and schedules.
 3. Equipment Clearances. All lighting, power, security, and communications equipment clearances and no-fly zones must be modeled for use in interference management and maintenance access requirements.

END OF SECTION **01 31 00**

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1. U.S. ARMY CORPS OF ENGINEERS (USACE)

- a. ER 415-1-15 (1989) Construction - Time Extensions for Weather

1.3 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Site condition reports.
5. Unusual event reports.

B. Related Requirements:

1. Section 01 40 00 "Quality Requirements" for schedule of tests and inspections.

1.4 SOFTWARE

- A. The software used to produce and update the required schedules shall meet the requirements of this Section.

1. The FAA intends to use Primavera P6.
2. Scheduling software used by the Contractor shall be commercially available from the software vendor for purchase with vendor software support agreements available. The software routine used to create the required "SDEF" file shall be created and supported by the software manufacturer.

- B. If Primavera P6 is being used, request a backup file template (.xer) from the FAA, if one is available, prior to building the schedule. The following settings are mandatory and required in all schedule submissions to the COR:
1. Activity Codes shall be Project Level, not Global or EPS level.
 2. Calendars shall be Project Level, not Global or Resource level.
 3. Activity Duration Types shall be set to "Fixed Duration & Units".
 4. Percent Complete Types shall be set to "Physical"
 5. Time Period Admin Preferences shall remain the default "8.0 hr./day, 40 hr./week, 172 hr./month, 2000 hr./year". Set Calendar Work Hours/Day to 8.0 Hour days.
 6. Set Schedule Option for defining Critical Activities to "Longest Path".
 7. Set Schedule Option for defining progressed activities to "Retained Logic".
 8. Set up cost loading using a single lump sum resource. The Price/Unit shall be \$1/hr., Default Units/Time shall be "8h/d", and settings "Auto Compute Actuals" and "Calculate costs from units" selected.
 9. Activity ID's shall not exceed 10 characters.
 10. Activity Names shall have the most defining and detailed description within the first 30 characters.
- C. The Contractor shall provide for the FAA's use:
1. 2 licenses of scheduling software throughout duration of contract.
 2. 2 computers (see Section 01 50 10 for detailed requirements).
 3. Training for 2 FAA employees in the use of the software (if software other than Primavera P6, that is compliant with this Section, is approved and used).
 4. These computers shall be stand-alone and not connected to FAA network.
 5. Scheduling software licenses will be returned at project completion.

1.5 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
1. Working electronic copy of schedule file.
 2. PDF file.
 3. Two paper copies, of sufficient size to display entire period or schedule, as required.
- B. Startup construction schedule.
1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 3. Total Float Report: List of activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Qualification Data: For scheduling consultant.

1.6 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: Authorize a representative to prepare the schedule and update and produce reports. The authorized representative shall have experience scheduling construction projects similar in size and nature to this project with scheduling software that meets the requirements of this Section. Representative shall have a comprehensive knowledge of CPM scheduling principles and application.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial FAA occupancy.
 4. Review delivery dates for FAA-furnished products.
 5. Review schedule for work of FAA's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 9. Review time required for Project closeout and FAA startup procedures, including commissioning activities.
 10. Review and finalize list of construction activities to be included in schedule.
 11. Review procedures for updating schedule.

- C. Weekly Progress Meetings: Except for the provisions in Paragraph IMPACT TO EARLY COMPLETION SCHEDULE, float available in the schedule shall not be considered for the exclusive use of either the FAA or the Contractor, including activity and project float. Activity float is the number of work days that an activity can be delayed without causing a delay to the "End Project" finish milestone. Project float (if applicable) is the number of work days between the projected early finish and the Contract completion date milestone.

1.7 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.8 TRANSFER OF SCHEDULE DATA INTO FAA SHAREPOINT SITE (KSN)

- A. Import the schedule data into the FAA SharePoint site (KSN). This data is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to AMS 3.3.1-2 "Payments under Fixed-Price Construction Contracts". The receipt of a proper payment requests pursuant to AMS 3.3.1-19 "Prompt Payment for Construction Contracts" is contingent upon the FAA receiving both acceptable and approvable hard copies and matching electronic files of the application for progress payment. Submission of Contractor Periodic Schedule Update shall be required for periodic progress payments.

1.9 GENERAL REQUIREMENTS

- A. Prepare for approval a Project Schedule, as specified herein, pursuant to AMS Clause 3.2.2.3-56, SCHEDULES FOR CONSTRUCTION CONTRACTS. Show in the schedule the proposed sequence to perform the work and dates contemplated for starting and completing the schedule activities. The scheduling of the entire project, including the design and construction sequences, is required. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers' designers, subcontractors, and suppliers working on the project shall also contribute in developing and maintaining an accurate project schedule. Provide a schedule that is a forward planning as well as a project monitoring tool. Use the Critical Path Method (CPM) of network calculation to generate all Project Schedules. Prepare each Project Schedule using the Precedence Diagram Method (PDM).

1.10 BASIS FOR PAYMENT AND COST LOADING

A. The schedule is the basis for determining contract earnings during each update period and therefore the amount of each progress payment. The aggregate value of the activities coded to a Contract Line Item Number (ASSET) shall equal the value of the ASSET.

1. Activity Cost Loading;

a. Activity cost loading shall be reasonable and without front-end loading. Provide additional documentation to demonstrate reasonableness if requested by the Contracting Officer.

2. Withholdings / Payment Rejection

a. Failure to meet the requirements of this Section may result in the disapproval of the schedules or updates and subsequent rejection of payment requests until requirements are met.

1.11 If the Contracting Officer directs schedule revisions and those revisions have not been included in subsequent Project Schedule revisions or updates, the Contracting Officer may withhold 10 percent of pay request amount for each payment period until such revisions to the project schedule have been made.

1.12 PROJECT SCHEDULE DETAILED REQUIREMENTS

A. Level of Detail Required

1. Develop the Project Schedule to the appropriate level of detail to address major milestones and to allow for satisfactory project planning and execution. Failure to develop the Project Schedule to an appropriate level of detail will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail.

B. Activity Duration

1. Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities shall have Original Durations (OD) greater than 20 work days or 30 calendar days.

C. Procurement Activities

1. Include activities associated with the critical submittals and their approvals, procurement, fabrication, and delivery of long lead materials, equipment, fabricated assemblies, and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days.

D. Mandatory Tasks

1. Include the following activities/tasks in the initial project schedule and all updates.
 - a. Submission, review, and acceptance of Preconstruction Submittals (individual activity for each).
 - b. Submission, review, and acceptance of major shop/fabrication drawings and submittals (individual activity for each).
 - c. Submission of mechanical/electrical/information systems layout drawings.
 - d. Long procurement activities
 - e. Submission and approval of O & M manuals.
 - f. Submission and approval of as-built drawings.
 - g. Submission and approval of testing and air balance (TAB).
 - h. Submission of TAB specialist design review report.
 - i. Submission and approval of fire protection specialist.
- 1) Submission and approval of Building Commissioning Plan, test data, and reports. Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the Contract commissioning requirements.
- 2) Building testing and commissioning tasks shall be completed prior to submission of building commissioning report and subsequent Contract completion.
- j. Air and water balancing.
- k. Building commissioning - Functional Performance Testing.
- l. Controls testing plan submission.
- m. Controls testing.
- n. Performance Verification testing.
- o. Other systems testing, if required.
- p. Contractor's pre-final inspection.
- q. Correction of punch list from Contractor's pre-final inspection.
- r. Government's inspection for Substantial Completion (Contractor Acceptance Inspection).
- s. Correction of punch list from Government's inspection for Substantial Completion (Contractor Acceptance Inspection).
- t. Final Cleaning.
- u. Final Completion.

E. FAA Activities

1. Show FAA and other agency activities that could impact progress. These activities include, but are not limited to:
 - a. Approvals
 - b. Environmental permit approvals by State regulators
 - c. Inspections
 - d. Utility tie-in
 - e. Government Furnished Equipment (GFE)

- f. Notice to Proceed (NTP) for phasing requirements.

F. Standard Activity Coding Dictionary

1. Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11. This exact structure is mandatory. Develop and assign the Activity Codes to activities as detailed herein. A template SDEF compatible schedule backup file is available on the USACE QCS web site: <http://rms.usace.army.mil>.

G. The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per day
2	RESP	4	Responsible party
3	AREA	4	Area of work
4	MODF	6	Modification Number
5	BIDI	6	Government Asset Code (ASSET)
6	PHAS	2	Phase of work
7	CATW	1	Category of work
8	FOW	20	Feature of work*

- a. *Some systems require that FEATURE OF WORK (FOW) values be placed in several activity code fields. The notation shown is for Primavera P6. Refer to the specific software guidelines with respect to the FEATURE OF WORK field requirements.

2. Workers Per Day (WRKP)

- a. Assign Workers per Day for the field construction and direct work activities, if directed by the Contracting Officer. Workers per day shall be the average number of workers expected each day to perform a task for the duration of that activity.

3. Responsible Party Coding (RESP)

- a. Assign responsibility code for activities to the Prime Contractor, subcontractor, or Government agency responsible for performing the activity.
 - 1) Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Property/Equipment (GFP) and NTP) for phasing requirements.

- 2) Activities cannot have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for FAA).

4. Area of Work Coding (AREA)

- a. Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or place constraints that would preclude a resource, such as a particular trade or craft work crew, from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex. Activities cannot have more than one Work Area Code.
- b. Some activities do not require a Work Area code. A lack of Work Area coding indicates the activity is not resource or space constrained.

5. Modification Number (MODF)

- a. Assign a Modification Number Code to an activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer. Key the Code values to the Government's modification numbering system. An activity can have only one Modification Number Code.

6. Bid Item Coding (BIDI)

- a. Assign a Bid Item Code to the activities, using the ASSET to which the activity belongs, even when an activity is not cost loaded. An activity can have only one BIDI Code.
- b. Progress payments shall be coded as per the following typical Government Assets:

- 1) Air Traffic Control Tower- Asset 2010A
- 2) Base Building – Asset 2011
- 3) Road – Asset 3010A
- 4) Fencing – Asset 3200A
- 5) Parking Areas – Asset 3500A
- 6) Fiber Optic Cabling – Asset 4500A
- 7) Expense – Asset 00A
- 8) Sidewalk – Asset 3400A
- 9) Fire Protection System – 3900A
- 10) Field Cables – 4500A
- 11) Underground Utilities – 5020A

7. Category of Work Coding (CATW)

- a. Assign a Category of Work Code to all activities. Category of Work Codes include, but are not limited to permits, construction submittals, procurement, fabrication, weather sensitive installation, non-weather sensitive installation, start-up, and testing activities. Each activity can have only one Category of Work Code.

8. Feature of Work Coding (FOW)

- a. Assign a Feature of Work Code to appropriate activities based on the Definable Feature of Work to which the activity belongs based on the approved quality control plan.
- b. Definable Feature of Work is defined in Section 01 40 00 QUALITY REQUIREMENTS. An activity can have only one Feature of Work Code.

H. Contract Milestones and Constraints

1. Milestone activities shall be used for significant project events including, but not limited to, project phasing, project start and end activities, and interim completion dates. The use of artificial float constraints such as "zero free float" or "zero total float" are prohibited.
2. Mandatory constraints that ignore or affect network logic are prohibited. No constrained dates are allowed in the schedule other than those specified herein. Submit additional constraints to the Contracting Officer for approval on a case-by-case basis.
3. Include, as a minimum the following milestones in the schedule.
 - a. Project start and mobilization to site
 - b. Roofing Tear-off Start/ Completion for each roof segment
 - c. Roofing Start/ Completion for each roof segment
 - d. Start Replacement of mechanical fans
 - e. Start Replacement of Lightning Protection System
 - f. Start Installation of Guardrail systems
 - g. CAI Complete
 - h. CAI Punch List Complete
4. Project Start Date Milestone and Constraint
 - a. The first activity in the project schedule shall be a start milestone titled "NTP Acknowledged," which shall have a "Start On" constraint date equal to the date that the NTP is acknowledged.
5. End Project Finish Milestone and Constraint
 - a. The last activity in the schedule shall be a finish milestone titled "End Project".

- b. The project schedule shall be constrained to the Contract Completion Date in such a way that if the schedule calculates an early finish, then the float calculation for "End Project" milestone reflects positive float on the longest path. If the project schedule calculates a late finish, then the "End Project" milestone float calculation reflects negative float on the longest path. The FAA is under no obligation to accelerate FAA activities to support a Contractor's early completion.

6. Interim Completion Dates and Constraints

- a. Constrain contractually specified interim completion dates to show negative float when the calculated late finish date of the last activity in that phase is later than the specified interim completion date.

1) Start Phase

- a) Use a start milestone as the first activity for a project phase. The start milestone shall be called "Start Phase X" where "X" refers to the phase of work

2) End Phase

- a) Use a finish milestone as the last activity for a project phase. Call the finish milestone "End Phase X" where "X" refers to the phase of work.

I. Calendars

1. Schedule activities on a calendar to which the activity logically belongs. Develop calendars to accommodate Contract-defined work periods, such as a 7-day calendar for FAA. Acceptance activities, concrete cure times, etc. Develop the default calendar to match the physical work plan with non-work periods identified including weekends and holidays. Develop and assign seasonal calendars to seasonally affected activities.
2. If an activity is weather-sensitive, assign it to a calendar showing non-work days on a monthly basis, using the anticipated non – work days that shall be calculated by the Contractor based upon the procedures defined in USACE ER415-1-15, Appendix A & B. The non-work days shall be selected at random across the weeks of the calendar. The assignment of the non-work days should be over a 7-day week since weather records are compiled on 7-day weeks, which will cause some of the weather related non-work days to fall on weekends.
3. If an activity is subject to interruption during an established FAA moratorium period, as specified in Section 01 10 00, assign it to a calendar showing the moratorium dates, as specified in Section 01 10 00, as non-work days.

J. Open Ended Logic

1. Only two (2) open ended activities are allowed: the first activity "NTP Acknowledged" shall have no predecessor logic, and the last activity "End Project" shall have no successor logic.

2. Predecessor open-ended logic may be allowed in a time impact analysis upon the Contracting Officer's approval.

K. Default Progress Data Disallowed

1. Actual Start and Finish dates shall not automatically update with default mechanisms included in the scheduling software. Updating of the percent complete and the remaining duration of an activity shall be independent functions. Disable program features that calculate one of these parameters from the other. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process shall match those dates provided in the Contractor Quality Control Reports. Failure to document the AS and AF dates in the Daily Quality Control report will result in disapproval of the Contractor's schedule.

L. Out-of-Sequence Progress

1. Activities that have progressed before the preceding logic has been satisfied (Out-of- Sequence Progress) will be allowed only on a case-by-case basis, subject to Government approval. Propose logic corrections to eliminate Out-of-Sequence Progress or justify not changing the sequencing for approval prior to submitting an updated project schedule. Address Out-of-Sequence Progress and logic changes in the Narrative Report and in the periodic schedule update meetings.

M. Added and Deleted Activities

1. Do not delete activities from the project schedule or add new activities to the schedule without approval from the Contracting Officer. Activity ID and description changes are considered new activities and shall not be changed without Contracting Officer approval.

N. Original Durations

1. Activity Original Durations (OD) shall be reasonable to perform the work item. OD changes are prohibited unless justification is provided to and approved by the Contracting Officer.

O. Leads, Lags, and Start to Finish Relationships

1. Lags shall be reasonable as determined by the FAA and not used in place of realistic original durations, shall not be in place to artificially absorb float, or to replace proper schedule logic. Leads (negative lags) and Start to Finish (SF) relationships are prohibited.

P. Retained Logic

1. Schedule calculations shall retain the logic between predecessors and successors ("retained logic" mode) even when the successor activity starts and the predecessor activity has not finished (out-of-sequence progress). Software features that, in effect, sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") shall not be allowed.

Q. Percent Complete

1. Update the percent complete for each activity started, based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be declared 100 percent complete to allow for proper schedule management.

R. Remaining Duration

1. Update the remaining duration for each activity based on the number of estimated work days necessary to complete the activity. Remaining duration may not mathematically correlate with percentage found under Paragraph "Percent Complete", above.

S. Cost Loading of Closeout Activities

1. Cost load the "Correction of punch list items from FAA pre-final inspection" activities not less than 1 percent of the present Contract value. Activities may be declared 100 percent complete upon the FAA's verification of completion and correction of the punch list work identified during FAA pre-final inspection(s).

a. As-Built Drawings

- 1) If there is no separate ASSET for as-built drawings, cost load the "Submission and approval of as-built drawings" activity not less than \$35,000 or 1 percent of the present Contract value, whichever is greater, up to \$200,000. Activity will be declared 100 percent complete upon the FAA's approval.

b. O & M Manuals

- 1) Cost load the "Submission and approval of O & M manuals" activity not less than \$20,000. Activity will be declared 100 percent complete upon the FAA's approval of all O & M manuals.

T. Anticipated Adverse Weather

1. Reflect the number of anticipated adverse weather delays allocated to a weather-sensitive activity in the activity's calendar. The Contractor shall calculate the number of the anticipated non-work days using the procedures defined in USACE ER415-1-15, Appendix A & B.

U. Early Completion Schedule and the Right to Finish Early

1. An Early Completion Schedule is an Initial Project Schedule (IPS) that indicates the scope of the required contract work will be completed before the contractually required completion date.
 - a. No IPS indicating an Early Completion will be accepted. The time, in calendar days, between the IPS 'NTP Acknowledged' start milestone and its 'End Project' finish milestone shall match the contract's Period of Performance. The 'End Project' finish date, as a consequence, shall be the same as the contractually required completion date.
 - b. The FAA is under no obligation to accelerate its own work items if early completion occurs, nor is it responsible to modify incremental funding (if applicable) for the project to meet the Contractor's accelerated work.

FAA

1.13 PROJECT SCHEDULE SUBMISSION

- A. Provide the submissions as described below. The data files, reports, and network diagrams required for each submission are contained in Paragraph SUBMISSION REQUIREMENTS. If the Contractor fails or refuses to furnish the information and schedule updates as set forth, the Contractor will be deemed not to have provided an estimate upon which a progress payment can be made. Review comments made by the FAA on the schedules do not relieve the Contractor from compliance with the Contract.

1. Preconstruction Project Schedule

- a. As one of the project's Initial Submittals (as listed in Section 01 00 00 - 8), prepare a detailed Preconstruction Project Schedule for the duration of the project. The schedule shall be coordinated with the Contracting Officer's Representative (COR) and include all milestone activities. The scheduling of construction is the responsibility of the Contractor, and Contractor management personnel shall actively participate in its development.
- b. Submit the Preconstruction Project Schedule to the Contracting Officer (CO) within 10 calendar days after contract award.
- c. Format - The Preconstruction Project Schedule shall consist of a diagram or a bar chart showing the start and the finish dates of construction, as well as the major items to be constructed, what work is occurring, length of time anticipated for the activity and the flow of construction.
- d. Diagram(s) shall show the order and interdependence of activities and the sequence in which the diagram will be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.

- e. Diagram activities shall include, in addition to construction activities, the submittal, review and approval of samples of materials and shop drawings, the procurement of critical materials and equipment, fabrication of special materials and equipment and their installation and testing. All activities of the FAA and others that affect progress, and contract required dates for completion of all parts of the work shall also be shown.
- f. The Preconstruction Project Schedule shall consist of a minimum of 20 activities. The selection of activities shall be subject to the Contracting officer's approval. Scheduling software may be used to produce this schedule.

2. Preliminary Project Schedule Submission

- a. Within 15 calendar days after the NTP is acknowledged, submit the Preliminary Project Schedule defining the planned operations detailed for the first 90 calendar days for approval. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the ASSETS shown on the Price Schedule. The Preliminary Project Schedule may be summary in nature for the remaining performance period. It shall be early start and late finish constrained and logically tied as specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and shall include all of the required plan and program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan).

3. Initial Project Schedule Submission

- a. Submit the Initial Project Schedule for approval within 42 calendar days after NTP is issued. The schedule shall demonstrate a reasonable and realistic sequence of activities which represent the work through the entire Contract performance period. No payment will be made for work items not fully detailed in the Project Schedule.

4. Periodic Schedule Updates

- a. Update the Project Schedule on a regular basis, monthly at a minimum. Provide a draft Periodic Schedule Update for review at the schedule update meetings as prescribed in Paragraph PERIODIC SCHEDULE UPDATE MEETINGS, below. These updates will enable the FAA to assess Contractor's progress.
 - 1) Update information, including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD), and Percent Complete, is subject to the approval of the FAA at the meeting.
 - 2) AS and AF data shall match the dates reported on the Contractor's Quality Control Report for an activity start or finish.

1.14 PROJECT SCHEDULE DETAILED REQUIREMENTS

A. Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

1. Data Files

a. Upload to FAA's SharePoint Knowledge Sharing Network (KSN) site data files containing the current project schedule, previously submitted schedule in the format of the scheduling software (e.g. .xer) and a pdf file, the Narrative Report, and the required Schedule Reports. Include in the name of each file the type of schedule (Preliminary, Initial, Update), full contract number, data date, and file name. Each schedule shall have a unique file name and use project-specific settings.

2. Narrative Report

a. Provide a Narrative Report with each schedule submission. The Narrative Report is expected to communicate to the FAA the thorough analysis of the schedule output and the plans to compensate for problems, either current or potential, which are revealed through that analysis. At a minimum:

- 1) Identify and discuss the work scheduled to start in the next update period.
- 2) Describe activities along the 2 most critical paths where the total float is less than or equal to 20 work days.
- 3) Describe current and anticipated problem areas, delaying factors, their impact, and an explanation of corrective actions taken or required to be taken.
- 4) Identify and explain why activities based on their calculated late dates should have either started or finished during the update period but did not.
- 5) Identify and discuss the schedule changes by activity ID and activity name, including what specifically was changed and why the change was needed. At a minimum, include new and deleted activities, logic changes, duration changes, calendar changes, lag changes, resource changes, and actual start and finish date changes.
- 6) Identify and discuss out-of-sequence work.

3. Schedule Reports

a. Formatting, filtering, organizing, and sorting each schedule report shall be as directed by the Contracting Officer. Typically, reports shall contain Activity Numbers, Activity

b.

- c. Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. Provide the reports electronically in .pdf format. Provide 10 set(s) of hardcopy reports. Typical reports that will be requested include:
- d. Activity Report
 - 1) List of the activities sorted according to activity number.
- e. Logic Report
 - 1) List of detailed predecessor and successor activities for every activity in ascending order by activity number.
- f. Total Float Report
 - 1) A list of the incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.
- g. Earnings Report by ASSET
 - 1) A compilation of the Total Earnings on the project from the NTP to the data date. This report shall reflect the earnings of activities based on the agreements made in the schedule update meeting. If a complete schedule update has been furnished, this report serves as the basis of determining progress payments. Group activities by ASSET number and sort by activity number. This report shall also provide a total ASSET percent earned value, ASSET percent complete, and project percent complete. The printed report shall contain the following for each activity: Activity Number, Activity Description, Original Budgeted Amount, Earnings to Date, Earnings this period, Total Quantity, Quantity to Date, and Percent Complete (based on cost).
- h. Schedule Log
 - 1) Provide a Scheduling/Leveling Report generated from the current project schedule being submitted.
- i. Network Diagram
 - 1) The Network Diagram is required for the Preliminary, Initial, and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work shall be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

- a) Continuous Flow: Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.
- b) Project Milestone Dates: Show dates on the diagram for start of project, Contract- required interim completion dates, and Contract completion dates.
- c) Critical Path: Show all activities on the critical path. The critical path is defined as the longest path.
- d) Banding: Organize activities using the WBS or as otherwise directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by major elements of work, category of work, work area, and/or responsibility.
- e) Cash Flow / Schedule Variance Control (SVC) Diagram: With each schedule submission, provide a SVC diagram showing: Cash Flow S-Curves indicating planned project cost based on projected early and late activity finish dates, and Earned Value to-date

1.15 PERODIC SCHEDULE UPDATE

A. Periodic Schedule Update Meetings

- 1. Conduct periodic schedule update meetings, to review the proposed Periodic Schedule Update, Narrative Report, Schedule Reports, and progress payment. Conduct meetings at least monthly, within 5 days of the proposed schedule data date. Provide a computer with the scheduling software loaded and a projector which allows the meeting participants to view the proposed schedule during the meeting. The Contractor's authorized scheduler shall organize, group, sort, filter, perform schedule revisions as needed and review functions as requested by the Contractor and/or FAA. The meeting is a working interactive exchange which allows the FAA and Contractor the opportunity to review the updated schedule on a real-time and interactive basis. The meeting will last no longer than 8 hours. Provide a draft of the proposed narrative report and schedule data file to the FAA at least 2 workdays in advance of the meeting. The Contractor's Project Manager and scheduler shall attend the meeting with the authorized representative of the Contracting Officer. Superintendents, foremen, and major subcontractors shall attend the meeting as required to discuss the project schedule and work. Following the periodic schedule update meeting, make corrections to the draft submission. Include only those changes approved by the FAA in the submission and invoice for payment.
- 2. Update Submission Following Progress Meeting
 - a. Submit the complete Periodic Schedule Update, containing the approved progress, revisions, and adjustments, pursuant to Paragraph SUBMISSION REQUIREMENTS not later than 4 work days after the periodic schedule update meeting.

1.16 REQUEST FOR TIME EXTENSION

- A. Provide a justification of delay to the Contracting Officer, in accordance with the Contract provisions and clauses, for approval within 10 days of a delay occurring. Also prepare a time impact analysis for each FAA request for proposal (RFP) to justify time extensions.

1. Justification of Delay

- a. Provide a description of the event(s) that caused the delay and/or impact to the work. As part of the description, identify the schedule activities impacted. Show that the event that caused the delay/impact was the responsibility of the FAA. Provide a time impact analysis that demonstrates the effects of the delay or impact on the project completion date or interim completion dates. Multiple impacts shall be evaluated chronologically; each with its own justification of delay. With multiple impacts, consider concurrency of delay. A time extension and the schedule fragnet becomes part of the project schedule and future schedule updates upon approval by the Contracting Officer.

2. Time Impact Analysis (Prospective Analysis)

- a. Prepare a time impact analysis for FAA approval based on industry standard AACE 52R-06. Use a copy of the last approved schedule prior to the first day of the impact or delay for the time impact analysis. If the FAA determines the time

3. Forensic Schedule Analysis (Retrospective Analysis)

- a. Prepare an analysis for FAA approval based on industry standard AACE 29R- 03.

4. Fragmentary Network (Fragnet)

- a. Prepare a proposed fragnet for time impact analysis. The proposed fragnet shall sequence new activities into the project schedule to demonstrate the influence of the delay or impact to the project's contractual dates. Clearly show how the proposed fragnet shall be tied into the project schedule, including the predecessors and successors to the fragnet activities. Obtain FAA approval of the proposed fragnet before incorporating it into the project schedule.

5. Time Extension

- a. Time extensions will not be granted until after the FAA has approved the Justification of Delay, including the time impact analysis. No time extension will be granted unless the delay consumes the available Project Float and extends the projected finish date ("End Project" milestone) beyond the Contract Completion Date. The time extension will be in calendar days.
- b. Actual delays that the FAA determines are caused by the Contractor's own actions and result in a calculated schedule delay will not be a cause for an extension to the performance period, completion date, or interim milestone date.

6. Impact to Early Completion Schedule

- a. No extended overhead will be paid for delay prior to the original Contract Completion Date for an Early Completion IPS.

1.17 FAILURE TO ACHIEVE PROGRESS

- A. If the progress falls behind the approved project schedule for reasons other than those that are excusable within the terms of the Contract, the Contracting Officer may require submittal of a written recovery plan for approval. The plan shall detail how progress shall be recovered, including which activities will be accelerated by adding additional crews, longer work hours, extra work days, etc.

1. Artificially Improving Progress

- a. Artificially improving progress by means such as, but not limited to, revising the schedule logic, modifying or adding constraints, shortening activity durations, or changing calendars in the project schedule is prohibited. Indicate assumptions made and the basis for logic, constraint, duration, and calendar changes used in the creation of the recovery plan. Additional resources, manpower, and daily and weekly work hour changes proposed shall be evident at the work site and documented in the daily report along with the Schedule Narrative Report.

2. Failure to Perform

- a. Failure to perform work and maintain progress in accordance with the supplemental recovery plan may result in an interim and final unsatisfactory performance rating and/or may result in corrective action directed by the Contracting Officer pursuant to AMS 3.2.2.3-56 "Schedules for Construction Contracts", AMS 3.10.6-6 "Default (Fixed-Price Construction)", and other Contract provisions.

1.18 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Testing and inspection.
 8. Accidents.
 9. Meetings and significant decisions.
 10. Unusual events.
 11. Stoppages, delays, shortages, and losses.
 12. Meter readings and similar recordings.
 13. Emergency procedures.
 14. Orders and requests of authorities having jurisdiction.
 15. Change Orders received and implemented.
 16. Construction Change Directives received and implemented.
 17. Services connected and disconnected.
 18. Equipment or system tests and startups.
 19. Partial completions and occupancies.
 20. Substantial Completions authorized.
- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise FAA in advance when these events are known or predictable.
1. Submit unusual event reports directly to FAA within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **01 32 00**

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SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Final Completion construction photographs.

- B. Related Requirements:

1. Section 01 77 00 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of FAA's personnel.
3. Section 02 41 19 "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

- B. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos on CD-ROM or thumb-drive and by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of COR.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.

- g. Unique sequential identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.
- B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C. Metadata: Record accurate date and time and GPS location data from camera.
- D. File Names: Name media files with date and Project area and sequential numbering suffix.

1.6 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by COR.
1. Flag construction limits before taking construction photographs.
 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 3. Take 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
 2. Underslab services.
 3. Piping.
 4. Electrical conduit.
 5. Waterproofing and weather-resistant barriers.
- E. Periodic Construction Photographs: Take 20 photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.
- F. Time-Lapse Sequence Construction Photographs: Take 20 photographs as indicated, to show status of construction and progress since last photographs were taken.
1. Frequency: Take photographs weekly, on the same day each week.
 2. Vantage Points: Following suggestions by COR and Contractor, photographer shall select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time, to create a time-lapse sequence as follows:
 - a. Commencement of the Work, through completion of subgrade construction.
 - b. Above-grade structural framing.
 - c. Exterior building enclosure.
 - d. Interior Work, through date of Substantial Completion.
- G. Final Completion Construction Photographs: Take 50 photographs after date of Substantial Completion for submission as Project Record Documents. COR will inform photographer of desired vantage points.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **01 32 33**

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 01 31 00 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 01 32 33 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
4. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 01 77 00 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require COR's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require COR's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by COR and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for COR's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
1. Project name.
 2. Date.
 3. Name of COR.
 4. Name of Construction Manager.
 5. Name of Contractor.
 6. Name of firm or entity that prepared submittal.
 7. Names of subcontractor, manufacturer, and supplier.
 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.

9. Category and type of submittal.
 10. Submittal purpose and description.
 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 12. Drawing number and detail references, as appropriate.
 13. Indication of full or partial submittal.
 14. Location(s) where product is to be installed, as appropriate.
 15. Other necessary identification.
 16. Remarks.
 17. Signature of transmitter.
- B. Options: Identify options requiring selection by COR.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by COR on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Paper Submittals: All submittal shall be digital. Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by COR.
- E. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using the form included at the end of Section 01 10 12 CONSTRUCTION ADMINISTRATION FORMS transmittal form.
- F. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- G. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Transmittal form associated with submittals received from sources other than Contractor will be returned without review. Submittal itself may be returned at the COR discretion.
1. Transmittal Form: Provide locations on form for the following information:

- a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number, numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by COR on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- I. Request For Variations: Variations from contract requirements require FAA approval pursuant to contract clause entitled "Specifications and Drawings for Construction" and will be considered where advantageous to the FAA. Where variations are proposed for consideration, submit a written request, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to the FAA and must include cost savings to the FAA. The proposed variation shall be identified separately and included along with the required submittal for the item. When a variation is submitted for approval, the Contractor warrants the following.
- 1. The Contract has been reviewed to establish that the variation, when incorporated, will be compatible with other elements of the work.
 - 2. The Contractor shall take action and bear the additional cost, including review costs by the FAA, necessary because of the proposed variation.
 - 3. The Contractor shall bear the cost of employing a registered professional engineer to provide stamped calculations certifying that the variation meets the project criteria.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals with mark indicating that no exceptions are taken by COR.

1.5 SUBMITTAL PROCEDURES

- A. General: Electronic copies of the CAD files of the Contract Drawings will be provided by COR for Contractor's use to comply with Section 01 31 00 Project Management and Coordination.

- B. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Email: Prepare submittals as PDF package and transmit to COR by sending via email. Include PDF transmittal form. Include information in email subject line as requested by COR.
 - a. COR will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 - 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 - 3. Paper: Prepare submittals in paper form and deliver to COR.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. COR reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on COR's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 21 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. COR will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 14 calendar days for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by COR's consultants, FAA, or other parties is indicated, allow 21 calendar days for initial review of each submittal.
- E. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from COR's action stamp.
 4. Resubmittals previous marked "no exception taken" or resubmittals not specifically marked "revise and resubmit" will not be reviewed.
- F. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- G. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from COR's action stamp.

1.6 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on COR's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 - a. Two opaque (bond) copies of each submittal. COR, through Construction Manager, will return one copy(ies).
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as FAA's property, are the property of Contractor.

- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.

2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.7 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S USE OF CAD FILES

- A. General: Contract document CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
1. While every effort has been made to ensure the accuracy of the information contained in the CAD drawing files, the FAA shall not be responsible for any mistake or inaccuracy that may be contained herein and all such liability and responsibility are expressly disclaimed by the FAA.

- B. The Contractor shall comply with the requirements of Section 01 31 00, "Project Management and Coordination."

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to COR.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
1. COR will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

- A. General: COR will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: COR will review each submittal, indicate corrections or revisions required, and return.
1. PDF Submittals: COR will indicate, via markup on each submittal, the appropriate action, as follows:
- a. Approved as Submitted
 - b. Approved as Noted
 - c. Not Approved
 - d. Revise and Resubmit
 - e. For Information Only.

2. The FAA may retain a construction support contractor for submittal review and other engineering support functions. The construction contractor acknowledges that no submittal, RFI, or any other information will be received directly from the construction support contractor. All information received from the construction support contractor must be validated by the FAA COR before it is considered an official response to the submittal RFI, or information inquiry.
 3. Paper Submittals: COR will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as indicated above:
 4. Submittals by Web-Based Project Management Software: COR will indicate, on Project management software website, the appropriate action.
- C. Informational Submittals: COR will review each submittal and will not return it, or will return it if it does not comply with requirements. COR will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from COR.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- F. COR will return without review submittals received from sources other than Contractor.
- G. Submittals not required by the Contract Documents will be returned by COR without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **01 33 00**

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SECTION 01 35 16 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the COR's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by COR.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- K. Retain: To keep an element or detail secure and intact.
- L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 COORDINATION

- A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.
1. Schedule construction operations in sequence required to obtain best Work results.
 2. Coordinate sequence of alteration work activities to accommodate the following:
 - a. FAA's continuing occupancy of portions of existing building.
 - b. Tests and inspections.
 3. Detail sequence of alteration work, with start and end dates.
 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
 5. Use of elevator and stairs.
 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns and adjacent to restricted areas. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Access to restricted areas may not be obstructed. Plan and execute the Work accordingly.

1.4 PROJECT MEETINGS FOR ALTERATION WORK

- A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.
1. Attendees: In addition to representatives of FAA, COR, and Contractor, testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
 2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
 - a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Fire-prevention plan.
 - c. Governing regulations.
 - d. Areas where existing construction is to remain and the required protection.

- e. Hauling routes.
 - f. Sequence of alteration work operations.
 - g. Storage, protection, and accounting for salvaged and specially fabricated items.
 - h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
 - i. Qualifications of personnel assigned to alteration work and assigned duties.
 - j. Requirements for extent and quality of work, tolerances, and required clearances.
 - k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.
3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
- B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
- 1. Attendees: In addition to representatives of FAA, COR COR, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
 - 2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
 - a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
 - b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:
 - 1) Interface requirements of alteration work with other Project Work.
 - 2) Status of submittals for alteration work.
 - 3) Access to alteration work locations.
 - 4) Effectiveness of fire-prevention plan.
 - 5) Quality and work standards of alteration work.

- 6) Change Orders for alteration work.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- 1.5 MATERIALS OWNERSHIP
- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to FAA that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain FAA's property.
1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to FAA where directed at Project site.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Alteration Work Subschedule:
1. Submit alteration work subschedule within seven days of date established for commencement of alteration work.
- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.
- 1.7 QUALITY ASSURANCE
- A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
- a. Construct new mockups of required work whenever a supervisor is replaced.
- B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.

- C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
 - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with FAA's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- E. Safety and Health Standard: Comply with ANSI/ASSP A10.6.

1.8 STORAGE AND HANDLING OF SALVAGED MATERIALS

- A. Salvaged Materials:
 - 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 - 3. Store items in a secure area until delivery to FAA.
 - 4. Transport items to FAA's storage area designated by COR.
 - 5. Protect items from damage during transport and storage.
- B. Salvaged Materials for Reinstallation:
 - 1. Repair and clean items for reuse as indicated.
 - 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by COR, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 2. Secure stored materials to protect from theft.
 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.
- E. Storage Space:
1. FAA will arrange for limited on-site location(s) for free storage of salvaged material. This storage space includes security and climate control for stored material.
 2. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.9 FIELD CONDITIONS

- A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of measured drawings and preconstruction photographs.
1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
- B. Discrepancies: Notify COR of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
1. Use only proven protection methods, appropriate to each area and surface being protected.
 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.

3. Erect temporary barriers to form and maintain fire-egress routes.
 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
 8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.
- B. Temporary Protection of Materials to Remain:
1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
1. Notify FAA, COR, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify COR immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Existing Roofing: Prior to the start of work in an area, install roofing protection as indicated on Drawings.

3.2 PROTECTION FROM FIRE

- A. General: Follow fire-prevention plan and the following:
 1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "FAA's Responsibility for Fire Protection."
 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
 - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
 1. Obtain FAA's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify FAA at least 72 hours before each occurrence, indicating location of such work.
 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
 6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
 - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
 - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
 - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
 - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
 - e. Maintain fire-watch personnel at each area of Project site until 60 minutes after conclusion of daily work.

- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
 - 1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off FAA's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs. Comply with requirements in Section 01 32 33 "Photographic Documentation."
- D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.

E. Notify COR of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by COR.

END OF SECTION 01 35 16

SECTION 01 35 29 – HEALTH, SAFETY AND EMERGENCY RESPONSE PROCEDURES

PART 1 - GENERAL

1.1 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications listed below are referenced as the latest edition published as of the date of this document. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.32	Personal Fall Protection - Safety Requirements for Construction and Demolition Operations
ANSI Z359.1	Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
ANSI/ASSE A10.34	Protection of the Public on or Adjacent to Construction Sites
ASME B30.3	Construction Tower Cranes

ASME INTERNATIONAL (ASME)

ASME B30.22	Articulating Boom Cranes
ASME B30.5	Mobile and Locomotive Cranes
ASME B30.8	Floating Cranes and Floating Derricks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	Portable Fire Extinguishers
NFPA 241	Safeguarding Construction, Alteration, and Demolition Operations
NFPA 51B	Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	National Electrical Code
NFPA 70E	Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE EM 385-1-1	Safety and Health Requirements Manual
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

1. CFR 1910	Occupational Safety and Health Standards
2. CFR 1910.146	Permit-required Confined Spaces

- | | | |
|----|--------------|---|
| 3. | CFR 1915 | Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment |
| 4. | CFR 1919 | Gear Certification |
| 5. | CFR 1926 | Safety and Health Regulations for Construction |
| 6. | CFR 1926.500 | Fall Protection |

1.2 SUBMITTALS

A. Preconstruction Submittals

1. Accident Prevention Plan (APP)
2. Activity Hazard Analysis (AHA)
3. Crane Critical Lift Plan
4. Proof of qualification for Crane Operators

B. Test Reports

1. Reports
2. Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."
3. Accident Reports
4. Monthly Exposure Reports
5. Crane Reports
6. Regulatory Citations and Violations

C. Certificates

1. Confined Space Entry Permit
2. Hot work permit
3. Contractor Safety Self-Evaluation Checklist
4. Submit one copy of each permit/certificate attached to each Daily Report.

1.3 DEFINITIONS

- A. Competent Person for Fall Protection. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.
- B. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.
- C. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.

- D. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers and crane walkers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).
- E. Qualified Person for Fall Protection. A person with a recognized degree or professional certificate, and with extensive knowledge, training and experience in the field of fall protection; who is capable of performing design, analysis, and evaluation of fall protection systems and equipment.
- F. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:
 - 1. Death, regardless of the time between the injury and death, or the length of the illness;
 - 2. Days away from work (any time lost after day of injury/illness onset);
 - 3. Restricted work;
 - 4. Transfer to another job;
 - 5. Medical treatment beyond first aid;
 - 6. Loss of consciousness; or
 - 7. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.
- G. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.
- H. Weight Handling Equipment (WHE) Accident. A WHE accident occurs when any one or more of the six elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; and/or collision, including unplanned contact between the load, crane, and/or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.).

1.4 CONTRACTOR SAFETY SELF-EVALUATION CHECKLIST

- A. Contracting Officer will provide a "Contractor Safety Self-Evaluation checklist" to the Contractor at the pre-construction conference. The checklist will be completed monthly by the Contractor and submitted with each request for payment voucher. An acceptable score of 90 or greater is required. Failure to submit the completed safety self-evaluation checklist or achieve a score of at least 90, will result in a retention of up to 10 percent of the voucher.

1.5 PERSONNEL QUALIFICATIONS AND DUTIES

- A. Site Safety and Health Officer (SSHO)

1. Site Safety and Health Officer (SSHO) shall be provided and present at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The SSHO shall be present at the project site, located so they have full mobility and reasonable access to all major work operations during the shift. An alternate SSH, shall be provided if/when the SSHO cannot be on site at a particular time. The Contractor Quality Control (QC) person cannot be the SSHO or alternate SSHO on this project, even though the QC has safety inspection responsibilities as part of the QC duties.
 2. The SSHO shall report to a senior project (or corporate) official.
 3. The SSHO, as a minimum, must produce a copy of their instructor-signed OSHA 30 hour training card (or course completion if within 90 days of having completed the training and card has not yet been issued). They will have completed:
 - a. The 30-hour OSHA General Industry safety class (may be web-based training if the student is able to directly ask questions of the instructor by chat or phone) or
 - b. The 30-hour OSHA Construction Industry safety class (may be web-based training if the student is able to directly ask questions of the instructor by chat/phone), or
 - c. As an equivalent, formal construction or industry safety and health training covering the subjects of the OSHA 30-hour course and the EM 385-1-1.
 4. SHOs shall maintain competency through having taken 8 hours of documented formal on-line, or self-study safety and health related coursework every year. Examples of continuing education activities that meet this requirement are: writing an article, teaching a class, reading/writing professional articles, attendance/participation in professional societies/meetings, etc.
- B. Alternate SSHO:
1. As identified in the AHA will be assigned to insure SSHO coverage for the project at all times work activities are conducted. The Alternate SSHO must meet the same requirements and assume the responsibilities of the project SSHO. Qualifications for an Alternate SSHO shall be included on the submitted APP for approval.
 2. If the SSHO is off-site for a period longer than 24 hours, an Alternate SSHO shall be provided and shall fulfill the same roles and responsibilities as the primary SSHO.
- C. Competent Person for Confined Space Entry
1. Provide a competent person for confined space meeting the definition and requirements of EM 385-1-1.
- D. Crane Operators

1. Crane operators shall meet the requirements in USACE EM 385-1-1, Section 16 and Appendix G. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacities of 50,000 pounds or greater, crane operators shall be designated as qualified by a source that qualifies crane operators (i.e., union, a government agency, or an organization that tests and qualifies crane operators). Proof of current qualification shall be provided.

E. Personnel Duties

1. Site Safety and Health Officer (SSHO)
 - a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Safety inspection logs shall be attached to the Contractors' daily quality control report.
 - b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.
 - c. Maintain applicable safety reference material on the job site.
 - d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.
 - e. Implement and enforce accepted APPS and AHAs.
 - f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. A list of unresolved safety and health deficiencies shall be posted on the safety bulletin board.
 - g. Ensure sub-contractor compliance with safety and health requirements.
2. Failure to perform the above duties will result in dismissal of the superintendent and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

1.6 MEETINGS

A. Pre-construction Conference

1. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).
2. The Contractor shall discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, a schedule for the preparation, submittal, review, and acceptance of AHAs shall be established to preclude project delays.

3. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Work shall not begin until there is an accepted APP.
4. The functions of a Preconstruction conference may take place at the Post-Award Kickoff meeting for Design Build Contracts.

B. Safety Meetings

1. Shall be conducted and documented as required by EM 385-1-1. Minutes showing contract title, signatures of attendees and a list of topics discussed shall be attached to the Contractors' daily report.

1.7 ACCIDENT PREVENTION PLAN (APP)

- A. The Contractor shall use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Accident Prevention Plan". Specific requirements for some of the APP elements are described below. The APP shall be job-specific and shall address any unusual or unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.
- B. Submit the APP to the Contracting Officer 30 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.
- C. Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

- D. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any hazard become evident, stop work in the area, secure the area, and develop a plan to remove the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, all necessary action shall be taken to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ANSI/ASSE A10.34.) and the environment.
- E. Copies of the accepted plan will be maintained at the resident engineer's office and at the job site.
- F. The APP shall be continuously reviewed and amended, as necessary, throughout the life of the contract. Unusual or high-hazard activities not identified in the original APP shall be incorporated in the plan as they are discovered.

1.8 ACTIVITY HAZARD ANALYSIS (AHA)

- A. The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHAs as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
- B. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
- C. The activity hazard analyses shall be developed using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the Contracting Officer.

1.9 DISPLAY OF SAFETY INFORMATION

- A. Within one calendar days after commencement of work, erect a safety bulletin board at the job site. The safety bulletin board shall include information and be maintained as required by EM 385-1-1, section 01. A06. Additional items required to be posted include:
 1. Confined space entry permit.
 2. Hot work permit.

1.10 SITE SAFETY REFERENCE MATERIALS

- A. Maintain safety-related references applicable to the project, including those listed in the article "References". Maintain applicable equipment manufacturer's manuals.

1.11 EMERGENCY MEDICAL TREATMENT

- A. Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.12 REPORTS

A. Accident Reports

1. For recordable injuries and illnesses, and property damage accidents resulting in at least \$2,000 in damages, the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the Navy Contractor Significant Incident Report (CSIR) USACE Accident Report Form 3394 and provide the report to the Contracting Officer within 5 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.
2. For any weight handling equipment accident (including rigging gear accidents) the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the WHE Accident Report (Crane and Rigging Gear) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Crane operations shall not proceed until cause is determined and corrective actions have been implemented to the satisfaction of the contracting officer. The Contracting Officer will provide a blank copy of the accident report form.

B. Accident Notification

1. Notify the Contracting Officer as soon as practical, but not later than four hours, after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$2,000, or any weight handling equipment accident. Information shall include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted.

C. Monthly Exposure Reports

1. Monthly exposure reporting to the Contracting Officer is required to be attached to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. The Contracting Officer will provide copies of any special forms.

D. Crane Reports

1. Submit crane inspection reports required in accordance with USACE EM 385-1-1, Appendix H and as specified herein with Daily Reports of Inspections.

E. Certificate of Compliance

1. The Contractor shall provide a Certificate of Compliance for each crane entering an activity under this contract (see Contracting Officer for a blank certificate). Certificate shall state that the crane and rigging gear meet applicable OSHA regulations (with the Contractor citing which OSHA regulations are applicable, e.g., cranes used in construction, demolition, or maintenance shall comply with 29 CFR 1926 and USACE EM 385-1-1 section 16 and Appendix H. Certify on the Certificate of Compliance that the crane operator(s) is qualified and trained in the operation of the crane to be used. The Contractor shall also certify that all of its crane operators working on the DOD activity have been trained in the proper use of all safety devices (e.g., anti-two block devices). These certifications shall be posted on the crane.

1.13 LOCKOUT/TAG OUT PROCEDURES

- A. Contractor shall prepare graphical Lock out/Tag out Procedures for all electrical, hydraulic and mechanical equipment having more than one source of energy.
- B. Perform a zero energy state assessment.
- C. Develop graphical lockout/tag out procedures.
- D. Install lockout/tag out procedures on equipment.
- E. Create and install energy source tags.
- F. Provide electronic files and templates of procedures and one binder of additional copies of the procedures.

1.14 FALL HAZARD PREVENTION PROGRAM

- A. Scaffolds: A competent person shall delineate the fall protection requirements necessary during the erection and dismantling operation of scaffolds used on the project in the fall protection plan and activity hazard analysis for the phase of work.
- B. Training: A competent person shall institute a fall protection program. As part of the Fall Protection Program, contractor shall provide training for each employee who might be exposed to fall hazards

1.15 DRUG PREVENTION PROGRAM

- A. Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employees either use illegal drugs or consume alcohol during work hours. Ensure that no employees are under the influence of drugs or alcohol during work hours. After accidents, collect blood, urine or saliva specimens and test injured employee influence. A copy of the test shall be made available to the Resident Engineer upon request.

1.16 HIGH HAZARD WORK AND LONG DURATION

- A. Work under this contract is potentially hazardous. Pursuant to contract clause "AMS 52.236-13, Accident Prevention, Alternate I," submit in writing additional proposals for effecting accident prevention under hazardous conditions. Meet in conference with COR to discuss and develop mutual understanding relative to the administration of the overall safety program.

PART 2 - PRODUCTS

2.1 FALL PROTECTION ANCHORAGE

- A. Fall protection anchorages, used by contractors to protect their people, will be left in place and so identified for continued customer use.

2.2 CONFINED SPACE SIGNAGE

- A. Provide permanent signs integral to or securely attached to access covers for new confined spaces. Signs wording: "DANGER—PERMIT REQUIRED CONFINED SPACE – DO NOT ENTER – "on bold letters a minimum of one inch in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" and shall be red and readable from 5 feet.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Comply with COE EM-385-1-1, NFPA 241, the accident prevention plan, the activity hazard analysis and other related submittals and activity fire and safety regulations.

- B. Hazardous Material Exclusions: Not withstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocynates, lead-based paint are prohibited. Exceptions to the use of any of the above excluded materials may be considered by COR upon written request by Contractor.
- C. Unforeseen Hazardous Material: If material that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the COR immediately. Within 14 calendar days the COR will determine if the material is hazardous. If material is not hazardous or poses no danger, the COR will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the COR will issue a modification pursuant to "AMS 52.243-4, Changes" and "AMS 52.236-2, Differing Site Conditions".

3.2 PRE-OUTAGE COORDINATION MEETING

- A. Contractors are required to apply for utility outages a minimum of 15 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Once approved and prior to beginning work on the utility system requiring shut down, the Contractor shall attend a pre-outage coordination meeting with the COR to review the scope of work and the lock out/tag out procedures for work protection.

3.3 PERSONNEL PROTECTION

- A. Hazardous Noise: Provide hazardous noise signs, and hearing protection, wherever equipment and work procedures produce sound-pressure levels greater than 85 dBA steady state or 140 dBA impulse, regardless of the duration of the exposure.
- B. Fall Protection: Enforce use of the fall protection device named for each activity in the AHA all times when an employee is on a surface 4 feet or more above lower levels. Personal fall arrest systems are required when working from an articulating or extendible boom, scissor lifts, swing stages, or suspended platform. Fall protection must comply with ANSI A10.14.
 1. Personal Fall Arrest Device: Equipment, subsystems and components shall meet ANSI Z359.1, Personal Fall Arrest Systems. Only with a shock absorbing lanyard is an acceptable personal fall arrest device. Full Body Harness may only be used as positioning devices only such as for steel reinforcing assembly. Body belts are not authorized as a personal fall arrest device. Harnesses must have upper middle back "D" rings for proper body suspension during a fall. Lanyard must be fitted with a double locking snap hook attachment. Webbing, straps, and ropes must be of synthetic fiber or wire rope.
 2. Fall Protection for Roofs:

- a. For work within 6 feet of an edge, on low pitched roofs, personnel shall be protected by use of personal fall arrest systems, guardrails, safety nets. Safety monitoring system is not adequate fall protection and is not authorized.
 - b. For work greater than 6 feet from an edge, warning lines shall be erected and installed in accordance with 29 CFR 1926.502(f).
 - c. Safety Nets: Safety nets shall be provided in unguarded workplaces more than 25 feet above surface.
- C. Scaffolding: Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing on any scaffold braces or supports not specifically designed for access is prohibited. Contractor shall ensure that scaffold erection is performed by employees that are qualified. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection plan. Minimum platform size shall be based on the platform not being greater in height than four times the dimension of the smallest width dimension for rolling scaffold. Some Baker type scaffolding has been found not to meet these requirements. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward. The first tie-in shall be at the height equal to 4 times the width of the scaffold base.
- D. Excavations: The competent person for excavation shall be on site when work is being performed in excavation and shall inspect excavations prior to entry by workers. Individual must evaluate for all hazards, including atmospheric, necessary to correct hazards promptly.
- E. Conduct of Electrical Work: Underground electrical spaces must be certified safe for entry before entering to conduct work. Cable intended to be cut must be positively identified and de-energized prior to performing each cut. Perform all high voltage cutting remotely. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personnel protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. Insulating blankets, hearing protection, and switching suits may be required, depending on the specific job and as delineated in the Contractor AHA.
- F. Work in Manholes: Contractor shall provide mechanical ventilation for all work accomplished in manholes, unless other hazards are present like friable asbestos.
- G. Work in Confined Spaces: Comply with the requirements in Section 06.I of COE EM-385-1-1. Any potential for a hazard in the confined space requires a permit system to be used.

1. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.05 of COE EM-385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.
 2. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained.
 3. Ensure the use of rescue and retrieval devices in confined spaces greater than 5 feet in depth. Conform to Sections 06.I.09, 06.I.10 and 06.I.11 of COE EM-385-11.
 4. Include training information for employees who will be involved as entrant attendants for the work. Conform to Section 06.I.06 of COE EM-385-1-1.
 5. Entry Permit. Use ENGFORM 5044-R or other form with the same minimum information for the Daily Confined Space Entry Permit, completed by the qualified person. Post the permit in a conspicuous place close to the confined space entrance.
- H. Crystalline Silica: Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA regulations, such as 29 CFR 1910.94, and COE EM-385-1-1, (Appendix C). The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

3.4 ACCIDENT SCENE PRESERVATION

- A. For serious accidents, ensure the accident site is secured and evidence is protected remaining undisturbed until released by the COR. After release is issued, promptly replace used, damaged, or worn equipment.

3.5 EQUIPMENT

A. Material Handling Equipment

1. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.
2. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.
3. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

3.6 EXCAVATIONS

- A. The competent person shall perform soil classification in accordance with 29 CFR 1926.
- B. Utility Locations
 - 1. Excavations: The competent person for excavation shall be on site when work is being performed excavation and shall inspect excavations prior to entry by workers. Individual must evaluate for all hazards, including atmospheric, necessary to correct hazards promptly. Prior to digging, the appropriate digging permit must be obtained. All underground utilities in the work area must be positively identified by a private utility locating service in addition to any station locating service and coordinated with the station utility department. Any markings made during the utility investigation must be maintained throughout the contract.

3.7 UTILITIES WITHIN CONCRETE SLABS

- A. Utilities located within concrete slabs or pier structures, bridges, and the like, are extremely difficult to identify due to the reinforcing steel used in the construction of these structures. Whenever contract work involves concrete chipping, saw cutting, or core drilling, the existing utility location must be coordinated with station utility departments in addition to a private locating service. Outages to isolate utility systems shall be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.
- B. Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

END OF SECTION **01 35 29**

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.

- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by COR, FAA, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- a. ASTM D 3740 Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- b. ASTM E 329 Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.4 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by COR.

1.5 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to COR.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the COR regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to COR for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to COR for a decision before proceeding.

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
 2. Entity responsible for performing tests and inspections.
 3. Description of test and inspection.
 4. Identification of applicable standards.
 5. Identification of test and inspection methods.
 6. Number of tests and inspections required.
 7. Time schedule or time span for tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For FAA's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 GENERAL REQUIREMENTS

- A. The Contractor is responsible for quality control and must establish and maintain an effective quality control system. The quality control system must consist of plans, procedures, and organization necessary to produce an end product that complies with the contract requirements. The system must cover all construction operations, both onsite and offsite, and must be keyed to the proposed construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the COR for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context must be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent must maintain a physical presence at the site at all times, except as otherwise acceptable to the COR, and must be responsible for all construction and construction related activities at the site. Similar requirements apply to the quality control manager.

1.9 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 15 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to COR. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate FAA's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Content of the CQC Plan
1. The CQC Plan must include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority.
 - b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
 - c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager must issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters must also be furnished to the COR.
 - d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures must be in accordance with Section 01 33 00, "SUBMITTAL PROCEDURES".
 - e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities must be approved by the COR.)
 - f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
 - g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures must establish verification that identified deficiencies have been corrected.
 - h. Reporting procedures, including proposed reporting formats.
 - i. A list of the definable features of work. A definable feature of work is a task that is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there is frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.
2. Acceptance of Plan: Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The FAA reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.
- C. Notification of Changes: After acceptance of the CQC Plan, the Contractor must notify the COR in writing of any proposed change. Proposed changes are subject to acceptance by the COR.
- D. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager does not have other Project responsibilities.

- E. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- F. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 - 3. FAA-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.
- G. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- H. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work COR has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.10 COORDINATION MEETING

- A. After the Preconstruction Conference, before start of construction, and prior to acceptance by the FAA of the CQC Plan, the Contractor must meet with the COR and discuss the Contractor's quality control system. The CQC Plan must be submitted for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the FAA's Quality Assurance. Minutes of the meeting will be prepared by the Contractor and signed by both the Contractor and the COR. The minutes must become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures that may require corrective action by the Contractor.

1.11 INDEPENDENT QUALITY CONTROL ORGANIZATION (CQC)

- A. Personnel Requirements: The requirements for the Independent CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. QCQ Manager is required to complete the 16 hour "Construction Quality Management (CQM) for Contractors" course as offered by the Corps of Engineers. Personnel identified in Part D Experience Matrix requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff must maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff must be subject to acceptance by the COR. The Contractor must provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation must be promptly furnished to the CQC organization by the Contractor. The CQC organization must be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the COR.
- B. Third Party CQC Firm/Agency: The proposed QC firm/Agency shall have a minimum of 8 years' experience in managing quality control of construction projects similar in size and complexity to the GSO project. The Third Party QC firm shall assign a point of contact within the company who shall be identified as the QC System Manager.
- C. The CQC System Manager will be an individual within the onsite work organization who must be responsible for overall management of the contractor's QC and have the authority to act in all QC matters for the Contractor. The individual must have a minimum of 8 years' experience as a superintendent, inspector, QC Manager, project manager, project engineer or construction manager on similar size and type construction contracts which included the major trades that are part of this Contract. The Third Party QC System Manager must attend all weekly and coordination meetings as required by the project. The Third Party QC Systems Manager shall coordinate quality control for all disciplines as required per the contract documents. The Third Party QC Systems Manager must be an employee of the Third Party QC firm/agency. The Third Party QC Systems Manager will interact directly with the Prime Contractor's QC manager and with the FAA to implement the QC plan. The Third Party QC System Manager must be assigned no other duties. An alternate for the QC System Manager must be identified in the plan to serve in the event of the QC System Manager's absence. The requirements for the alternate must be the same as for the designated QC System Manager. The Third Party QC System Manager shall not be a direct employee of the Prime Contractor nor have any business relationships with any subcontractors involved in this project; nor any equipment divide manufacturers; suppliers nor installers for any such equipment as part of this project.
- D. Additional CQC Personnel: In addition to CQC personnel specified elsewhere in this specification, the Contractor must provide as part of the CQC organization specialized personnel to assist the CQC System Manager in the following areas: civil, architectural, structural, mechanical, electrical, and fire protection. These individuals must:

1. Be responsible to the CQC System Manager
2. Be on site once a week minimum to support construction activities in their areas of responsibility
3. Have the necessary education and/or experience in accordance with the experience matrix listed herein.
4. These individuals must review all submittals in their areas of responsibility prior to submission to the FAA
5. Witness testing of the activities in their areas of responsibility.
6. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.
7. All personnel are subject to FAA approval.
8. Personnel must not be a direct employees of the Prime Contractor nor have any business relationships with any subcontractors involved with this project; nor with any equipment device manufacturers, suppliers nor installers for any such equipment provided as part of this project.

E. EXPERIENCE MATRIX

Area	Qualifications
1. Concrete, Pavements, Utilities and Soils	US Registered Civil Engineer with 2 years related experience
2. Architectural	US Registered Architect with 2 years related experience
3. Structural (Foundations and Structures)	US Registered Structural Engineer with 2 years related experience
4. Mechanical	US Registered Mechanical Engineer with 2 years related experience. Required knowledge of HVAC TAB, HVAC DDC and HVAC commissioning.
5. Electrical	US Registered Electrical Engineer with 2 years related experience
6. Fire Protection	US Registered Fire Protection Engineer (FPE) with 2 years related experience

1.12 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement of whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.13 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.14 QUALITY CONTROL

- A. Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control must be conducted by the CQC System Manager for each definable feature of work as follows:
 - B. Preparatory Phase: This phase must be performed prior to beginning work on each definable feature of work; after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase must include:

1. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field must be made available by the Contractor at the preparatory inspection. These copies must be maintained in the field and available for use by FAA personnel until final acceptance of the work.
 2. A review of the contract drawings.
 3. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
 4. Review of provisions that have been made to provide required control inspection and testing.
 5. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
 6. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
 7. A review of the appropriate activity hazard analysis to assure safety requirements are met.
 8. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
 9. A check to ensure that the portion of the plan for the work to be performed has been accepted by the COR.
 10. Discussion of the initial control phase.
 11. The COR must be notified at least 48 hours in advance of beginning the preparatory control phase. This phase must include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions must be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor must instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.
- C. Initial Phase: This phase must be accomplished at the beginning of a definable feature of work. The following must be accomplished:
1. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
 2. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
 3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
 4. Resolve all differences.
 5. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
 6. The COR must be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase must be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase must be indicated for future reference and comparison with follow-up phases.

7. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
- D. Follow-up Phase: Daily checks must be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks must be made a matter of record in the CQC documentation. Final follow-up checks must be conducted and all deficiencies corrected prior to the start of additional features of work that may be affected by the deficient work. The Contractor must not build upon nor conceal non-conforming work.
- E. Additional Preparatory and Initial Phases: Additional preparatory and initial phases must be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.
- F. Contractor Responsibilities: Tests and inspections are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor will not employ same entity engaged by FAA, unless agreed to in writing by FAA.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- G. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- H. Testing Agency Responsibilities: Cooperate with COR, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify COR, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- I. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."
- J. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- K. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspection equipment at Project site.
- L. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- M. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and FAA-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to FAA, COR, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.15 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying COR, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to COR and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected Work.
- B. Testing Procedure: The Contractor must perform specified or required tests to verify that control measures are adequate to provide a product that conforms to contract requirements. Upon request, the Contractor must furnish to the COR duplicate samples of test specimens for possible testing by the FAA. Testing includes operation and/or acceptance tests when specified. The Contractor must procure the services of an approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor must perform the following activities and record and provide the following data:
1. Verify that testing procedures comply with contract requirements.
 2. Verify that facilities and testing equipment are available and comply with testing standards.
 3. Check test instrument calibration data against certified standards.
 4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

5. Results of all tests taken, both passing and failing tests, must be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test must be given. If approved by the COR, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility must be provided directly to the COR. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

C. Testing Laboratories

1. Capability Check: The FAA reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel must meet criteria detailed in ASTM D 3740 and ASTM E 329.
2. Capability Recheck: If the selected laboratory fails the capability check, the Contractor will be assessed a charge of \$500 to reimburse the FAA for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

D. Onsite Laboratory: The FAA reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the FAA.

E. Furnishing or Transportation of Samples for Testing: Costs incidental to the transportation of samples or materials must be borne by the Contractor. Samples of materials for test verification and acceptance testing by the FAA must be delivered to the Contracting Officer's Representatives office unless otherwise coordinated.

F. Coordination for each specific test, exact delivery location, and dates will be made through the Contracting Officer's Representative.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to COR.
 4. Identification of testing agency or special inspector conducting test or inspection.

- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for COR's, Commissioning Authority's, and authorities' having jurisdiction reference during normal working hours.
 - 1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION **01 40 00**

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.

COR

- B. "Approved": When used to convey COR's action on Contractor's submittals, applications, and requests, "approved" is limited to COR's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by COR. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Abbreviations and Acronyms specific to FAA projects in the Special Provisions, this specification, drawings, specifications, or documents pertaining to this contract, the following terms are used; the intent and meaning shall be as specified herein.
 - 1. AMS - Acquisition Management System
 - 2. AMSL - Above Mean Sea Level
 - 3. AOA - Air Operations Area
 - 4. ARCHITECT - Architectural Engineering Firm of Record
 - 5. ATCT - Airport Traffic Control Tower
 - 6. CAI - Contractors Acceptance Inspection or Substantial Completion
 - 7. CFM - Contractor-Furnished Material
 - 8. CO - FAA Contracting Officer
 - 9. Contr. - Contractor
 - 10. COR - FAA Contracting Officer Representative (Fulltime Onsite Representative of the FAA and is also referred to as the COTR) Contracting Officer's Technical Representative
 - 11. DESIGNER - Architectural Engineering Firm of Record
 - 12. ENGINEER - Architectural Engineering Firm of Record
 - 13. FAA - Federal Aviation Administration (FAA)
 - 14. GFE - Government-Furnished Equipment
 - 15. GFM - Government-Furnished Material
 - 16. GOVERNMENT – FAA
 - 17. LGB – Long Beach Airport
 - 18. IAW - In Accordance With
 - 19. MSL - Mean Sea Level
 - 20. NEC - National Electric Code
 - 21. NTP - Notice to Proceed
 - 22. OSHA - Occupational Safety and Health Administration
 - 23. FAA - FAA
 - 24. RE - FAA Contracting Officer Representative (Fulltime Onsite Representative of the FAA and is also referred to as the COR).
 - 25. RWY - Runway
 - 26. Sponsor - Airport FAA or Airport Authority

27. TWY - Taxiway
28. U/L or UL - Underwriters Laboratories
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. AABC - Associated Air Balance Council; www.aabc.com.
 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 7. ABMA - American Boiler Manufacturers Association; www.abma.com.
 8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
 9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 11. AF&PA - American Forest & Paper Association; www.afandpa.org.
 12. AGA - American Gas Association; www.again.org.
 13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
 14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 15. AI - Asphalt Institute; www.asphaltinstitute.org.
 16. AIA - American Institute of Architects (The); www.aia.org.
 17. AISC - American Institute of Steel Construction; www.aisc.org.
 18. AISI - American Iron and Steel Institute; www.steel.org.
 19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
 20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
 21. ANSI - American National Standards Institute; www.ansi.org.
 22. AOSA - Association of Official Seed Analysts, Inc.; www-aosaseed.com.
 23. APA - APA - The Engineered Wood Association; www.apawood.org.
 24. APA - Architectural Precast Association; www.archprecast.org.
 25. API - American Petroleum Institute; www.api.org.
 26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
 27. ARI - American Refrigeration Institute; (See AHRI).
 28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltreroofing.org.
 29. ASCE - American Society of Civil Engineers; www.asce.org.
 30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).

31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASSP - American Society of Safety Professionals (The); www.assp.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; wwwatis.org.
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); www.soundandcommunications.com.
38. AWEA - American Wind Energy Association; www.awea.org.
39. AWI - Architectural Woodwork Institute; www.awin.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
50. CDA - Copper Development Association; www.copper.org.
51. CE - Conformite Europeenne; www.ec.europa.eu/growth/single-market/ce-marking.
52. CEA - Canadian Electricity Association; www.electricity.ca.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.compositepanel.org.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa-group.org.
65. CSI - Construction Specifications Institute (The); www.csiresources.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTA - Consumer Technology Association; www.cta.tech.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.coolingtechnology.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.

71. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); www.decorativehardwoods.org.
72. DHI - Door and Hardware Institute; www.dhi.org.
73. ECA - Electronic Components Association; (See ECIA).
74. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
75. ECIA - Electronic Components Industry Association; www.ecianow.org.
76. EIA - Electronic Industries Alliance; (See TIA).
77. EIMA - EIFS Industry Members Association; www.eima.com.
78. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
79. EOS/ESD Association; (Electrostatic Discharge Association); www.esda.org.
80. ESTA - Entertainment Services and Technology Association; (See PLASA).
81. ETL - Intertek (See Intertek); www.intertek.com.
82. EVO - Efficiency Valuation Organization; www.evo-world.org.
83. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
86. FM Approvals - FM Approvals LLC; www.fmglobal.com.
87. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
88. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
89. FSA - Fluid Sealing Association; www.fluidsealing.com.
90. FSC - Forest Stewardship Council U.S.; www.fscus.org.
91. GA - Gypsum Association; www.gypsum.org.
92. GANA - Glass Association of North America; (See NGA).
93. GS - Green Seal; www.greenseal.org.
94. HI - Hydraulic Institute; www.pumps.org.
95. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
96. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
97. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
98. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
99. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
100. IAS - International Accreditation Service; www.iasonline.org.
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; www.iccsafe.org.
103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
104. ICPA - International Cast Polymer Association; www.theicpa.com.
105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
106. IEC - International Electrotechnical Commission; www.iec.ch.
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.

112. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
113. II - Infocomm International; (See AVIXA).
114. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
115. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
116. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
117. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
118. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
119. ISO - International Organization for Standardization; www.iso.org.
120. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
121. ITU - International Telecommunication Union; www.itu.int.
122. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
123. LMA - Laminating Materials Association; (See CPA).
124. LPI - Lightning Protection Institute; www.lightning.org.
125. MBMA - Metal Building Manufacturers Association; www.mbma.com.
126. MCA - Metal Construction Association; www.metalconstruction.org.
127. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
128. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
129. MHI - Material Handling Industry; www.mhi.org.
130. MIA - Marble Institute of America; (See NSI).
131. MMPA - Moulding & Millwork Producers Association; www.wmmqa.com.
132. MPI - Master Painters Institute; www.paintinfo.com.
133. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
134. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
135. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
136. NADCA - National Air Duct Cleaners Association; www.nadca.com.
137. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
138. NALP - National Association of Landscape Professionals; www.landscapelprofessionals.org.
139. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
140. NBI - New Buildings Institute; www.newbuildings.org.
141. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
142. NCMA - National Concrete Masonry Association; www.ncma.org.
143. NEBB - National Environmental Balancing Bureau; www.nebb.org.
144. NECA - National Electrical Contractors Association; www.necanet.org.
145. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
146. NEMA - National Electrical Manufacturers Association; www.nema.org.
147. NETA - InterNational Electrical Testing Association; www.netaworld.org.
148. NFHS - National Federation of State High School Associations; www.nfhs.org.
149. NFPA - National Fire Protection Association; www.nfpa.org.
150. NFPA - NFPA International; (See NFPA).
151. NFRC - National Fenestration Rating Council; www.nfrc.org.

152. NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
153. NHLA - National Hardwood Lumber Association; www.nhla.com.
154. NLGA - National Lumber Grades Authority; www.nlga.org.
155. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
156. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
157. NRCA - National Roofing Contractors Association; www.nrca.net.
158. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
159. NSF - NSF International; www.nsf.org.
160. NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
161. NSPE - National Society of Professional Engineers; www.nspe.org.
162. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
163. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
164. NWFA - National Wood Flooring Association; www.nwfa.org.
165. NWRA - National Waste & Recycling Association; www.wasterecycling.org
166. PCI - Precast/Prestressed Concrete Institute; www pci.org.
167. PDI - Plumbing & Drainage Institute; www pdionline.org.
168. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
169. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
170. RFCI - Resilient Floor Covering Institute; www.rfci.com.
171. RIS - Redwood Inspection Service; www.redwoodinspection.com.
172. SAE - SAE International; www.sae.org.
173. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
174. SDI - Steel Deck Institute; www.sdi.org.
175. SDI - Steel Door Institute; www.steeldoor.org.
176. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
177. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
178. SIA - Security Industry Association; www.siaonline.org.
179. SJI - Steel Joist Institute; www.steeljoist.org.
180. SMA - Screen Manufacturers Association; www.smainfo.org.
181. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www smacna.org.
182. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
183. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
184. SPIB - Southern Pine Inspection Bureau; www.spib.org.
185. SPRI - Single Ply Roofing Industry; www.spri.org.
186. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
187. SSINA - Specialty Steel Industry of North America; www.ssina.com.
188. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
189. STI - Steel Tank Institute; www.steeltank.com.
190. SWI - Steel Window Institute; www.steelwindows.com.
191. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
192. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
193. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
194. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.

195. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
 196. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
 197. TMS - The Masonry Society; www.masonrysociety.org.
 198. TPI - Truss Plate Institute; www.tpinst.org.
 199. TPI - Turfgrass Producers International; www.turfgrasssod.org.
 200. TRI - Tile Roofing Institute; www.tileroofing.org.
 201. UL - Underwriters Laboratories Inc.; www.ul.com.
 202. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
 203. USAV - USA Volleyball; www.usavolleyball.org.
 204. USGBC - U.S. Green Building Council; www.usgbc.org.
 205. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
 206. WA - Wallcoverings Association; www.wallcoverings.org.
 207. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 208. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 209. WDMA - Window & Door Manufacturers Association; www.wdma.com.
 210. WI - Woodwork Institute; www.wicnet.org.
 211. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
 212. WWPA - Western Wood Products Association; www.wwpa.org.
- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 3. ICC - International Code Council; www.iccsafe.org.
 4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
 2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 4. DOD - Department of Defense; www.quicksearch.dla.mil.
 5. DOE - Department of Energy; www.energy.gov.
 6. EPA - Environmental Protection Agency; www.epa.gov.
 7. FAA - Federal Aviation Administration; www.faa.gov.
 8. FG - Federal Government Publications; www.gpo.gov/fdsys.
 9. GSA - General Services Administration; www.gsa.gov.
 10. HUD - Department of Housing and Urban Development; www.hud.gov.
 11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.

12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 13. SD - Department of State; www.state.gov.
 14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
 15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
 16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
 17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
 18. USP - U.S. Pharmacopeial Convention; www.usp.org.
 19. USPS - United States Postal Service; www.usps.com.
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.
 2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 3. DSCL - Defense Supply Center Columbus; (See FS).
 4. FED-STD - Federal Standard; (See FS).
 5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
 6. MILSPEC - Military Specification and Standards; (See DOD).
 7. USAB - United States Access Board; www.access-board.gov.
 8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. LIS; Code of Virginia; Office of Administrative Law; <https://law.lis.virginia.gov/vacode>.
 2. VDH; Virginia Department of Health .
 3. VDEQ; Virginia Department of Environmental Quality; Indoor Air Quality Program;<https://www.deq.virginia.gov/get-involved/the-environment-you/your-air/indoor-air-quality>.
 4. VSSC; Virginia State Corporation Commission; <https://scc.virginia.gov/pages/Utility-Regulation>.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **01 42 00**

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, COR, testing agencies, and authorities having jurisdiction.
- B. Water from Existing System: Water from FAA's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from FAA's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.
- G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the FAA. Include the following:
 - 1. Methods used to meet the goals and requirements of the FAA.
 - 2. Concrete cutting method(s) to be used.
 - 3. Location of construction devices on the site.
 - 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
 - 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the FAA.
 - 6. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by FAA. Indicate means for complying with FAA's requirements.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before FAA's acceptance, regardless of previously assigned responsibilities.
- B. The Contractor shall apply for and obtain all construction permits and required inspections for this and any other temporary facilities.
- C. The Field Representatives' office shall be installed on the site at the time construction begins. It shall remain on site and usable until Final Construction Acceptance Inspection unless an earlier removal date is requested and approved by the COR.
- D. Maintenance of Traffic
 - 1. The Contractor shall provide, install, and maintain the temporary traffic control devices, furnish flaggers, and perform all work required to conform to the provisions of this Section.
 - 2. The Contract Documents show the general location of signs, lights, markings, delineators, special lighting, guardrails, barricades, temporary pavements, flagger stations, and other temporary devices and work required to control traffic at each work sequence area. These and any other measures shall be provided by the contractor to ensure proper traffic control.
 - 3. Before commencing work in any area, the Contractor shall install the temporary traffic control devices, stations, etc., at the work site, and he shall obtain the approval of the COR before commencing any work that affects, in any way, the existing traffic flow.
 - 4. At least one lane of traffic shall be maintained at all times on Employee Lot Road and South Terminal Road.

1.7 POSTING OF NOTICES

- A. Schedule of Wage Rates and Benefits

1. The Contractor and each subcontractor under him shall post in a conspicuous place on the site (1) the schedule of the specified overall hourly rate for each applicable classification; (2) the amount of liquidated damages for any failure to pay such rates; and (3) the name and address of the responsible official in the County or the U.S. Department of Labor (whichever is applicable) to whom complaints should be given.
2. Copy of this Notice will be provided to the Contractor by the FAA.

B. Non-Discrimination Clause

1. In accordance with AMS Clause No. 3.6.2-9 Equal Opportunity, the Contractor shall post the non-discrimination clause as required by Executive Order 11246.
2. The following is a statement of the required clause: Equal Employment Opportunity is the Law -- Discrimination is prohibited by the Civil Rights Act of 1964 and by Executive Order No. 11246. Title VII of the Civil Rights Act of 1964 -- Administered by: The Equal Employment Opportunity Commission. Prohibits discrimination because of Race, Color, Religion, Sex, or National Origin by Employers with 25 or more employees, by Labor Organizations with a hiring hall of 25 or more members, by Employment Agencies, and by Joint Labor-Management Committees for Apprenticeship or Training. Any person who believes he or she has been discriminated against should contact: The Equal Employment Opportunity Commission. 2401 E Street, NW, Washington, DC 20506.
3. EXECUTIVE ORDER NO. 11246--Administered by: The Office of Federal Contract Compliance Programs prohibits discrimination because of Race, Color, Religion, Sex, or National Origin, and requires affirmative action to ensure equality of opportunity in all aspects of employment by all Federal Government Contractors and Subcontractors, and by Contractors Performing Work Under a Federal Assisted Construction Contract, regardless of the number of employees in either case. Any person who believes he or she has been discriminated against should contact: The Office of Federal Contract Compliance Programs, U.S. Department of Labor, Washington, DC 20210.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

- C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by COR from manufacturer's standard colors.
- D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- E. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- G. Traffic control devices, warning devices and barriers shall meet the applicable requirements of the current edition of the Department of Transportation Standard Specifications for Road and Bridge Construction and the FHWA Manual or Uniform Traffic Control Devices (MUTCD); subject to COR's approval.

2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as FAA's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 01 10 00 "Summary."
 - 2. Provide well drained, graded and paved, or at least well compacted gravel surface for use by the FAA's staff. Provide not less than five parking spaces dedicated for FAA use.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, FAA, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to FAA's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to FAA. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.

- b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- 1. Install electric power service overhead unless otherwise indicated.
 - 2. Connect temporary service to FAA's existing power source, as directed by FAA.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
- 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
- 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 - 2. Utilize designated area within existing building for temporary field offices.
 - 3. Maintain support facilities until COR schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to FAA.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
- 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- D. Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 "Execution."
- F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- G. Existing Elevator Use: Use of FAA's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to FAA. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
 - 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- H. Existing Stair Usage: Use of FAA's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to FAA. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.
- I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 01 10 00 "Summary."
- C. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to FAA.
- D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- F. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- H. Construction Project Signage: Furnish a construction project sign package, maintain the signs during construction, and remove the signs from the job site upon completion of the project. The construction project sign package consists of : one sign for project identification, directional signage for deliveries and construction employee site access. Locate signage as directed by the COR.
 1. Project Identification Signage must show the name of the project, address, FAA representative and Contractor with access numbers.

3.6 TEMPORARY TRAFFIC CONTROL DEVICES, PAVEMENTS, AND FACILITIES

- A. The Contractor shall maintain all traffic control devices in proper repair and working order. The Contractor shall also maintain all pavements constructed or utilized for temporary traffic movement, and shall maintain all other traffic service facilities such as guardrail, area lighting, etc., necessary for the efficient and orderly movement of traffic within the construction area.

- B. In the event of the Contractor's failure to properly maintain any of these devices, pavements or facilities, the FAA may cause such maintenance, as it deems necessary, to be performed by its own or another Contractor's forces and the costs of such maintenance shall be deducted from monies due the Contractor for work performed under this Contract.
- C. Interference with Traffic
 - 1. The Contractor shall conduct his work so as to cause no unnecessary interference with traffic and it shall comply with all requirements governing its employee parking, areas prohibited to his operation, and access routes to authorized work areas.
 - 2. The Contractor shall not permit its workers and equipment to interfere with the movement of traffic in those areas adjacent to its work areas. The Contractor shall not obstruct sight lines, create obstructions to lighting nor create hazards or nuisance by allowing spills or wind transported materials to accumulate in traffic areas.
 - 3. Traffic control personnel shall be provided at all times that any travel lane is obstructed. These personnel shall be stationed at each end of the obstructed area and shall provide safe passage of vehicles through the obstructed area.
 - 4. All lanes of travel shall be unobstructed at night and at all times when traffic directors are not present. Metal plates shall be provided and secured in place if pavement is not provided.
 - 5. The Contractor shall promptly remove any spills or wind transported debris occurring on traveled roadways.
- D. After work has been completed, the Contractor shall remove all temporary traffic control devices, temporary pavements and other temporary work and devices installed for traffic control. The Contractor shall restore the site to its original condition or to the revised condition shown on the Plans.

3.7 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

- a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
- b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to COR.
- c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.8 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Daily janitorial service for temporary construction offices including the FAA Office; periodic cleaning and maintenance for storage areas. Weekly trash collection.
 - a. The Contractor is responsible for cleaning and maintaining all temporary offices and storage sheds in proper condition acceptable to the COR. All exposed surfaces on the outside and inside of field offices and temporary toilet enclosures and outside of storage sheds shall be painted and maintained with exterior enamel paint. Colors are subject to approval by the COR. All temporary facilities shall be maintained by the Contractor and shall be kept in usable condition at all times until completion of the work and/or their removal is authorized by the COR
 3. Maintain approach walks free of mud and water.
 - a. The Contractor assumes full responsibility for all costs associated with equipment and services provided for the Field Representative's office (including costs for equipment and/or services which are provided by the Contractor, but which are not specifically required by this Article).
 4. Maintain lighting. Promptly replace worn or defective parts and non-working bulbs.
 5. Maintain temporary water system: Maintain system to provide continuous service with adequate pressure to outlets. Maintain connections, pipes, fittings, and fixtures and conserve use of all utilities. Failure to stop leaks or other waste of water will be cause for revocation of permit for the use of said water from the airport system.

6. Maintain temporary toilet facilities: Clean facilities and surrounding areas daily. Provide toilet paper, paper towels and soap in suitable dispensers
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. FAA reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. Remove temporary erosion, sedimentation and pollution control measures upon final stabilization of site.
 4. Remove temporary lighting material and equipment when permanent system is operational.
 5. Remove temporary toilet facilities when permanent facilities are available for use, but no later than Substantial Completion.
 6. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION **01 50 00**

SECTION 01 57 23 - TEMPORARY STORMWATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Temporary stormwater pollution controls.

- a. This Section consists of temporary control measures during the life of the Contract to control water pollution, soil erosion, and siltation through the use of berms, dikes, dams, sediment basins, erosion control mats, geotextile fabric, gravel, hay bales, mulches, grasses, slope drains, rip rap, turbidity screens (barriers), and other erosion control devices or methods; and to control air pollution through the use of water sprinkling or other approved methods. The work shall be performed in accordance with these specifications, local requirements and as directed by the COR.

2. Handling of Incidental Petroleum Products Spillage During Construction.

1.3 INCIDENTAL PETROLEUM PRODUCTS SPILLAGE

- A. Procedures to be followed in handling material contaminated with petroleum products (hydrocarbons including petroleum, petroleum derivatives, hydraulics and like products) caused by incidental spillage (including leaks) from the Contractor's equipment.

1. Incidental spillage shall mean spillage of a quantity not greater than 25 gallons per incident, of vehicular or mechanical equipment petroleum products, onto open ground and absorbed or not absorbed by the soils.
2. Spillage or leakage of petroleum products in quantities in excess of 25 gallons or spillage that reaches surface water shall be immediately remediated by the Contractor using procedures as directed by the Virginia Department of Environmental Quality. Whenever such spillage or leakage occurs, the Contractor shall immediately notify the Contracting Officer's Representative (COR) and shall employ the appropriate corrective actions as directed.

- B. The provisions of this Section are limited to incidental petroleum products spillage on ground surfaces and it excludes petroleum products spillage onto surface waters.

- C. Clean-ups are costly and delay progress. They can be avoided if leaks or spillages are eliminated and in case they occur, are managed efficiently and quickly.

1.4 DEFINITIONS

A. Temporary Control Measures

1. The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this Contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

B. Temporary Control

1. Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

C. Control Features or Methods

1. Due to unanticipated conditions, the COR may direct the use of control features or methods other than those included in the Contract Documents.

D. Control of Contractor's Operations

1. The Contractor shall take sufficient precautions to prevent pollution of streams, canals, lakes, reservoirs, and other water impoundments, with fuels, oils, bitumens, calcium chloride, or other harmful materials. Also, the Contractor shall conduct and schedule operations so as to avoid or otherwise minimize pollution or siltation of such water. No residue from dust collectors, stripping towers, or washers shall be dumped into any live stream or storm drain.
2. Where pumps are used to remove turbid waters from enclosed construction areas such as cofferdams, sheet piles, or forms, the water shall be discharged into sediment basins, or confined by an appropriate enclosure such as turbidity barriers prior to discharge into rivers, streams, canals or impoundments, in accordance with all applicable dewatering regulations.
3. The contractor shall not disturb lands or waters outside the limits of construction as staked, or shown on plans, except as may be found necessary and authorized by the COR.
4. The location of, and method of operation in, borrow pits, material pits, stockpiles, and disposal areas furnished by the Contractor for waste material from the project (other than commercially operated sources) shall meet the approval of the COR as being such that erosion during and after completion of the work will not result in probability of detrimental siltation or water pollution.

1.5 STORMWATER POLLUTION PREVENTION PLAN

- A. The Stormwater Pollution Prevention Plan (SWPPP) is part of the Contract Documents and is bound into this Project Manual.

1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
1. Meet with COR and earthwork subcontractor.
 2. Review requirements of the SWPPP, including permitting process, worker training, and inspection and maintenance requirements.

1.7 ACTION SUBMITTALS

- A. Submit the proposed plans and schedules for construction of the project and the accomplishment of temporary and permanent erosion, sedimentation, and pollution control work, all in accordance with the requirements of the Contract Documents. The schedule shall be based on an analysis of project conditions and shall be in written form. This schedule shall specifically indicate the proposed uses of temporary erosion control features, the sequence of clearing and grubbing, earthwork operations and construction of permanent erosion control features. It shall also include proposed methods to prevent pollution of streams, lakes, reservoirs, canals, and other impoundments, as the result of construction operations. The Contractor shall also outline his proposed methods of controlling erosion, dust control and preventing pollution on haul roads and in borrow pits, material pits, stockpiles, and a plan for disposal of waste materials from the project.
- B. No work shall be started until the aforementioned plans, schedules and methods of operation have been approved by FAA and any additional authorities having jurisdiction. The Contractor shall be responsible for accomplishment of the work in accordance with the approved plans and schedules. The COR may approve changes made necessary by unforeseen circumstances. Any changes to the approved plan which may have a significant effect on the hydraulic components of the plan shall be reviewed by the COR prior to implementation.

1.8 INFORMATIONAL SUBMITTALS

- A. Stormwater Pollution Prevention Plan (SWPPP): Within 15 days of date established for commencement of the Work, submit completed SWPPP.
- B. EPA authorization under the EPA's "2017 Construction General Permit (CGP)."
- C. Stormwater Pollution Prevention (SWPP) Training Log: For each individual performing Work under the SWPPP.
- D. Inspection reports.

1.9 PERMITS

- A. Comply with all local requirements. Pay for and obtain all required permits.
- B. National Pollutant Discharge Elimination System (NPDES) Permit. The contractor is responsible for applying for and obtaining the required NPDES permit. The contractor shall prepare all drawings and associated documents as required to obtain the NPDES permit. All permitting fees shall be paid by the contractor. The contractor shall re-file the NCDEQ permit at the beginning of construction to become the financially responsible party for the project.
- C. The prime contractor is responsible for maintaining and complying with the approved erosion control plans and NPDES permit. The prime contractor shall follow the erosion control plans as approved during construction. Any deviations or changes the prime contractor or any subcontractor makes to the erosion control plans will require a new NPDES permit to be filed. All costs to re-submit a new permit will be the responsibility of the contractor. Any fees resulting from violations or non-compliance to erosion control plans during construction will be paid by the prime contractor without any reimbursement from the government.

1.10 QUALITY ASSURANCE

- A. Stormwater Pollution Prevention Plan (SWPPP) Coordinator: Experienced individual or firm with a record of successful water pollution control management coordination of projects with similar requirements.
 - 1. SWPPP Coordinator shall complete and finalize the SWPPP form.
 - 2. SWPPP Coordinator shall be responsible for inspections and maintaining of all requirements of the SWPPP.
- B. Installers: Trained as indicated in the SWPPP.

PART 2 - PRODUCTS

2.1 TEMPORARY STORMWATER POLLUTION CONTROLS

- A. Provide temporary stormwater pollution controls as required by the SWPPP.

2.2 TEMPORARY STORMWATER POLLUTION MATERIALS

- A. Testing of Materials
 - 1. No testing of materials used in construction of temporary erosion control features will be required except as specified for geotextile fabric unless such materials are to be incorporated into the completed Work. Acceptance will be on the basis of visual inspection by the COR when no testing is required.

2. Materials used for the construction of temporary silt fence, not to be incorporated into the completed project may be new or used subject to the approval of the COR.

B. Materials

1. Grass

- a. Grass that will not compete with the grass sown later for permanent cover shall be a quick-growing species suitable to the area providing a temporary cover.

2. Mulches

- a. Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials.

3. Fertilizer

- a. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

4. GEotextile Fabric

- a. Geotextiles shall be as per contract drawings and local requirements.

5. Other

- a. All other materials shall meet commercial grade standards and shall be approved by the COR before being incorporated into the project.

2.3 ABSORBENT MATERIALS

- A. Equip crews or machinery with the most efficient type of petroleum absorbent materials. These materials are available at petroleum equipment suppliers and must be readily accessible so that spillages can be contained and prevented from becoming greater incidents.
- B. Fiber material, sand or cat litter may be used as an absorbent material. Sufficient quantity of absorbent material capable of absorbing up to 25 gallons of petroleum products shall be stocked at the job site at all times.

PART 3 - EXECUTION

3.1 GENERAL

- A. In the event of conflict between these requirements and pollution control laws, rules, or regulations of Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.
- B. The Contractor shall be responsible for full compliance with the applicable control pollution laws, rules or regulations.

3.2 AUTHORITY OF THE COR

- A. The COR may limit the surface areas of unprotected erodible earth exposed by clearing and grubbing, excavation or filling operations and may direct the Contractor to provide immediate permanent or temporary erosion or pollution control measures to prevent contamination of any water course or to prevent detrimental effects on property outside the airport limits and damage to the work. The limitation of area in which excavation and filling operations may be underway shall be commensurate with the Contractor's capability and progress in keeping the finish grading, grassing, sodding, and other such permanent erosion control measures current in accordance with the accepted plans and schedules.

3.3 CONSTRUCTION DETAILS

- A. The Contractor shall incorporate all permanent erosion control features into the Project at the earliest practicable time as outlined in the accepted plans and schedules. Except where future construction operations will damage slopes, the Contractor shall perform the permanent sprigging and seeding or sodding and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary air pollution, erosion and water pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.
- B. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled and performed so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, temporary erosion control measures may be required between successive construction stages.

- C. The COR will limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, sprigging and seeding or sodding, and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justify.
- D. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or are ordered by the COR, such work shall be performed by the Contractor at its own expense.
- E. The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.
- F. Pollutants such as fuels, lubricants, bitumens, raw sewage, calcium chlorides, wash water from concrete mixing operations, and other harmful materials shall not be discharged into or near rivers, streams, canals and other impoundments or into natural or manmade channels leading thereto.

3.4 SCHEDULING OF SUCCESSIVE OPERATIONS

- A. The Contractor shall schedule his operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposed, uncompleted construction to the elements shall be as short as practicable.
- B. Clearing and grubbing shall be so scheduled and performed that grading operations can follow immediately thereafter, and grading operations shall be so scheduled and performed that permanent erosion control features can follow immediately thereafter if conditions on the project permit.

3.5 INSTALLATION

- A. Comply with all best management practices, general requirements, performance requirements, reporting requirements, and all other requirements included in the SWPPP.
- B. Locate stormwater pollution controls in accordance with the SWPPP.
- C. Conduct construction as required to comply with the SWPPP and that minimize possible contamination or pollution or other undesirable effects.
 1. Inspect, repair, and maintain SWPPP controls during construction.
 - a. Inspect all SWPPP controls not less than every seven days, and after each occurrence of a storm event, as outlined in the SWPPP.

- D. In the event of a severe storm warning or as directed by the COR, the Contractor shall:
1. Secure outside equipment and materials and place materials subject to possible damage in protected locations.
 2. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.
 3. Secure cranes.
 4. Ensure that temporary erosion controls are adequate.
 5. After the storm, the Contractor may be directed by the COR to assist in the restoration of the existing facility. Any restoration shall take precedence over the construction contract. Any additional costs will be claimed under the "changes" clause of the contract.
- E. Remove SWPPP controls at completion of construction and restore and stabilize areas disturbed during construction.

3.6 DETAILS FOR TEMPORARY EROSION CONTROL FEATURES

- A. General: Temporary pollution and erosion control features shall consist of, but not be limited to, temporary grassing, temporary sodding, temporary mulching, sand bagging, slope drains, sediment basins, berms, baled hay or straw, floating turbidity barrier, temporary rip rap and staked silt fence. The COR may direct use of temporary erosion control features or methods other than those included in the original Contract Documents and payment therefore will be made under a change order.
- B. Temporary Grassing: Certain areas of sprigging and seeding may be designated by the COR as temporary erosion control features. The COR may direct that permanent type grass seed be omitted and the specified rate of spread for fertilizer used in conjunction with grassing operations be reduced when such work is designated as temporary erosion control feature.
- C. Temporary Mulching: This work shall consist of furnishing and applying a two-inch to four-inch thick blanket of straw or hay mulch to designated areas and then mixing or forcing the mulch into the top two inches of the soil in order to temporarily control erosion. Only approved undecayed straw or hay, which can readily be cut into the soil shall be used. Other measures for temporary erosion control such as hydromulching, chemical adhesive soil stabilizers, etc., may be substituted for mulching with straw or hay if approved by the COR. When permanent grassing operations begin, temporary mulch materials shall be plowed under in conjunction with preparation of the ground. Mulching shall not be used on surfaces to be subsequently paved.
- D. Sandbagging: This work shall consist of furnishing and placing sandbags in configurations, so as to control erosion and siltation.
- E. Sediment Basins: Sediment basins shall be constructed to adequately perform the intended function. Sediment basins shall be cleaned out as necessary in accordance with plan details or as directed by the COR.

- F. Baled Hay or Straw: This work shall consist of construction of baled hay or straw dams to protect against downstream accumulations of silt. The baled hay or straw dams shall be constructed in accordance with the details shown in the plans or as directed by the COR.
- G. The dam shall be placed so as to effectively control silt dispersion under conditions present on this project. Alternate solutions and usage of materials may be used if approved by the COR.
- H. Temporary Silt Fences
 - 1. Description: This work shall consist of furnishing, installing, maintaining, and removing temporary silt fences, consisting of geotextile fabric installation, installed in accordance with the manufacturer's written instructions, these specifications, and the details as shown on the plans or as directed by the COR.
 - 2. Materials and Installation: The type and size of posts, wire mesh reinforcement (if required) and method of installation shall be as per contract drawings and local requirements.
 - a. Installation of all sediment control devices shall be done in a timely manner to insure the control of sediment and the protection of water courses, and to any adjacent property outside the airport limits as may be required.
 - b. After installation of sediment control devices, the Contractor shall be required to repair portions of any devices damaged by his equipment and such repair will be at his expense.
 - c. Temporary silt fence shall be erected at upland locations across ditch lines and at temporary locations as shown on the plans or approved by the COR where continuous construction activities change the natural contour and drainage runoff. The attachment to existing trees will not be permitted.
 - 3. Inspection and Maintenance: The Contractor shall inspect all temporary silt fences immediately after each rainfall, at the beginning and at the end of each working shift and at least once each non-work day. Any deficiencies shall be immediately corrected by the Contractor. In addition, the Contractor shall make a daily review of the location of silt fences in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, additional silt fences shall be installed when directed by the COR.
 - a. Sediment deposits shall be removed when the deposit reaches approximately one-half of the volume capacity of the temporary silt fence as directed by the COR. Any sediment deposits remaining in place after the temporary silt fence is no longer required shall be legally disposed of by the Contractor away from the job site.

3.7 TEMPORARY AIR POLLUTION (DUST) CONTROL

- A. Air pollution (dust) shall be controlled using water sprinkling methods. Water shall be clean, uncontaminated and obtained from sources approved by the COR.
- B. The use of calcium chlorides, salts or other chemicals to control air pollution (dust) is not permitted.

3.8 MAINTENANCE OF EROSION CONTROL FEATURES

- A. General: The Contractor shall, at his expense, provide routine maintenance of permanent and temporary erosion control features until the project is completed and accepted. If such erosion control features must be reconstructed due to the Contractor's negligence or carelessness or, in the case of temporary erosion control features, failure by the Contractor to install permanent erosion control features as scheduled, such replacement shall be at the Contractor's expense. If reconstruction of permanent or temporary erosion control features is necessary due to factors beyond the control of the Contractor, payment for replacement will be made under the appropriate contract pay item or items.
- B. Mowing: The COR may direct mowing of areas of permanent or temporary grass constructed on the project. The Contractor shall mow these designated areas within seven days of receiving such order. Mowing of slopes which are steeper than four horizontal to one vertical will not be required.

3.9 PROTECTION DURING SUSPENSION OF CONTRACT TIME

- A. In the event that it is necessary that the construction operations be suspended for any appreciable length of time, the Contractor shall shape the top of the earthwork in such a manner as to permit runoff of rainwater. The COR may direct the Contractor to perform, during such suspensions of time, any other erosion control work deemed necessary.

3.10 SPILLAGE PROCEDURES

- A. Personnel handling waste materials must have a minimum of 40 hours training as defined in 29 CFR 1910.120 and in accordance with certified OSHA course.
- B. No payment will be made to the Contractor for the cost of handling and disposing of leaks, spillages and materials contaminated by such leaks or spillages.
- C. The steps outlined below are minimum requirements and serve as a guide in preventing a minor incident from turning into a major event. They do not constitute a complete compliance procedure.

1. STEP 1:
 - a. If a petroleum products contamination to open ground has been discovered, check for the origin of that leak or spillage. Then stop the spillage or leak or positively contain it and then use absorbents to collect the discharged liquid.
 - b. Immediately notify Airport Authority Environmental Services.
2. STEP 2:
 - a. Sand may be used to absorb ground surface spills while absorbent materials may be used to absorb ground spills as well as surface water spills.
 - b. Once absorption of spilled petroleum products is complete, the impacted (contaminated) absorbent materials shall be stored in 55 gallon steel drums (100-150 lbs.).
 - c. If leaked or spilled petroleum products has been absorbed into the soils, excavate and containerize the impacted (contaminated) soils. Soils may be stored in 55-gallon steel drums.
3. STEP 3:
 - a. The contaminated materials must be collected, containerized and otherwise properly stored and labeled prior to transport to a pre-approved storage, disposal or treatment facility.
 - b. All drums used to store impacted (contaminated) absorbent material and/or contaminated soils shall be properly sealed and labeled with the following information:
 - 1) Name of company (Contractor):
 - 2) Contract or Project No.:
 - 3) Location of origin:
 - 4) Type of contents:
 - 5) Type of contaminant:
 - 6) Quantity: (eg 1 of 1)
 - 7) Date:
 - 8) Containerized by:
4. STEP 4:
 - a. Provide proper characterization and disposal of waste.

3.11 REMOVAL OF TEMPORARY EROSION CONTROL FEATURES

- a. In general, any temporary erosion control features existing at the time of construction of the permanent erosion control features in an area of the project shall be removed or incorporated into the soil in such a manner that no detrimental effect to the work or the environment will result therefrom. The COR may direct that temporary features be left in place.

END OF SECTION **01 57 23**

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

- B. Related Requirements:

1. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
2. Section 01 42 00 "References" for applicable industry standards for products specified.
3. Section 01 77 00 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 33 00 "Submittal Procedures."
- F. Substitution: Refer to Section 01 25 00 "Substitution Procedures" for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
3. See individual identification Sections in Divisions 21, 22, 23, 26, and 28 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.

4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by FAA's construction forces. Coordinate location with FAA.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the FAA or endorsed by manufacturer to FAA.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for FAA and issued in the name of the FAA or endorsed by manufacturer to FAA.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. FAA reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," COR will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect through Construction Manager in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the COR, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience be considered .
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."

- b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
 - 5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience be considered.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
 - 6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
 - 7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match COR's sample," provide a product that complies with requirements and matches COR's sample. COR's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by COR from manufacturer's full range" or a similar phrase, select a product that complies with requirements. COR will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: COR will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, COR may return requests without action, except to record noncompliance with the following requirements:
 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. COR's Action on Comparable Products Submittal: If necessary, COR will request additional information or documentation for evaluation, as specified in Section 01 33 00 "Submittal Procedures."
 1. Form of Approval of Submittal: As specified in Section 01 33 00 "Submittal Procedures."
 2. Use product specified if COR does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the COR of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

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SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
1. Construction layout.
 2. Field engineering and surveying.
 3. Installation of the Work.
 4. Progress cleaning.
 5. Starting and adjusting.
 6. Protection of installed construction.
 7. Correction of the Work.
- B. Related Requirements:
1. Section 01 33 00 "Submittal Procedures" for submitting surveys.
 2. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of FAA-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 3. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.
 4. Section 07 84 13 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 INFORMATIONAL SUBMITTALS

- A. Certified Surveys: Submit two copies signed by professional engineer.
- B. Certificates: Submit certificate signed by professional engineer, certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.4 QUALITY ASSURANCE

CORCOR

- A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to COR for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and COR that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to COR in accordance with requirements in Section 01 31 00 "Project Management and Coordination."

3.3 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of COR. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to COR before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.4 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb, and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by COR. Maintain conditions required for product performance until Substantial Completion.

- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by COR.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by COR. Fit exposed connections together to form hairline joints.

3.5 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris at the end each day.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - b. Provide covered containers for deposit of waste materials, debris and rubbish.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
 3. Clean interior areas daily to provide suitable conditions for work and to prevent fire or accidents.
 4. Broom clean interior areas prior to start of surface finishing and continue cleaning on a daily basis
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- K. Control cleaning operations so that dust and other particulates will not adhere to wet or newly-coated surfaces.
- L. Control cleaning operations so that dust and other particulates will not adhere to wet or newly-coated surfaces.

3.6 CONTRACTOR'S FAILURE TO CLEAN

- A. If the Contractor fails to maintain levels of cleanliness in work areas, satisfactory to the COR, then the FAA shall have the right to cause such areas to be cleaned by others. The costs to the FAA for such cleaning, plus 25% for administration, shall be the obligation of the Contractor and shall be deducted from any money due the Contractor hereunder.

3.7 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.
- D. Provide protective coverings at walls, projections, corners and jambs, sills and soffits of openings in and adjacent to traffic areas.
- E. Cover walls and floors of elevator cabs and jambs of cab doors with 3/4 inch plywood, when elevators are used by construction personnel.
- F. Protect finished floors and stairs from dirt, wear and damage:
 1. Secure heavy sheet goods or similar protective materials in place, in areas subject to foot traffic.

2. Lay planking or similar rigid materials in place, in areas subject to movement of heavy objects.
3. Lay planking or similar rigid materials in place, in areas where storage of products will occur.

G. Protect waterproofed and roofed surfaces:

1. Restrict use of surfaces from traffic of any kind and from storage of products.
2. When an activity is mandatory, obtain recommendations for protection of surfaces from manufacturer. Install protection and remove on completion of activity. Restrict use of adjacent unprotected areas.

H. Restrict traffic of any kind across planted lawn and landscape areas.

1. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the COR has witnessed or otherwise referenced their location and shall not move them until directed.
2. The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in its manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the work is completed and accepted.
3. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the nonexecution thereof by the Contractor, the Contractor shall restore, at its own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner, at no additional cost to the government.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.

- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

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SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition construction waste.
2. Recycling nonhazardous demolition construction waste.
3. Disposing of nonhazardous demolition construction waste.

1.3 |DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to FAA that may be uncovered during demolition remain the property of FAA.

1. Carefully salvage in a manner to prevent damage and promptly return to FAA.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

- G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- H. Refrigerant Recovery: Comply with requirements in Section 02 41 19 "Selective Demolition" for refrigerant recovery submittals.

1.7 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.
 - 1.
 - 2.
- B. Refrigerant Recovery Technician Qualifications: Comply with requirements in Section 02 41 19 "Selective Demolition."
- C. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work in compliance with Section 02 41 19 "Selective Demolition."
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings in transportation and tipping fees by donating materials.
 7. Savings in transportation and tipping fees that are avoided.
 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

2.1 RECYCLING RECEIVERS AND PROCESSORS

- A. Subject to compliance with requirements, use licensed locally available recycling receivers and processors.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

- a. Wood studs.
- b. Wood joists.
- c. Plywood and oriented strand board.
- d. Structural and miscellaneous steel.
- e. Roofing.
- f. Metal studs.
- g. Equipment.
- h. Electrical conduit.
- i. Copper wiring.

2. Construction Waste:

- a. Lumber.
- b. Wood sheet materials.
- c. Wood trim.
- d. Metals.
- e. Roofing.
- f. Insulation.
- g. Piping.
- h. Electrical conduit.
- i. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

- 1) Paper.
- 2) Cardboard.
- 3) Boxes.
- 4) Plastic sheet and film.
- 5) Polystyrene packaging.
- 6) Wood crates.

- 7) Wood pallets.
- 8) Plastic pails.

j. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:

- 1) Paper.
- 2) Aluminum cans.
- 3) Glass containers.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- E. Waste Management in Historic Zones or Areas: Transportation equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches or more.

3.2 SALVAGING DEMOLITION WASTE

- A. Comply with requirements in Section 02 41 19 "Selective Demolition", for salvaging demolition waste.
- B. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- C. Salvaged Items for Sale and Donation: Not permitted on Project site.
- D. Salvaged Items for FAA's Use: Salvage items for FAA's use and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to FAA.
 4. Transport items to FAA's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- E. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- F. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- G. Plumbing Fixtures: Separate by type and size.
- H. Lighting Fixtures: Separate lamps by type and protect from breakage.
- I. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by FAA and Contractor.

- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from FAA's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.4 RECYCLING DEMOLITION WASTE

- A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- B. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- C. Conduit: Reduce conduit to straight lengths and store by material and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Paint: Seal containers and store by type.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.
- D. Burning: Burning of waste materials is permitted only at designated areas on FAA's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

3.7 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.
- C. Form CWM-3 for construction waste reduction work plan.
- D. Form CWM-5 for cost/revenue analysis of construction waste reduction work plan.
- E. Form CWM-7 for construction waste reduction progress report.

END OF SECTION **01 74 19**

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FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION

MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

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FORM CWM-2: DEMOLITION WASTE IDENTIFICATION

MATERIAL DESCRIPTION	EST. QUANTITY	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

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FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

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FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

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FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Completion of Asbestos and Lead Free Certification as per Division 1
6. Completion of Lock Out/Tag Out (LOTO) Procedures as per Division 26
7. Final Punch List

- B. Related Requirements:

1. Section 01 32 33 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
2. Section 01 78 23 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
3. Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Section 01 79 00 "Demonstration and Training" for requirements to train the FAA's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the COR's use prior to COR's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting FAA unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by COR. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain COR's signature for receipt of submittals.
 5. Submit testing, adjusting, and balancing records.
 6. Submit sustainable design submittals not previously submitted.

7. Submit changeover information related to FAA's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise FAA of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to FAA. Advise FAA's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct FAA's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
 6. Advise FAA of changeover in utility services.
 7. Participate with FAA in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, COR will either proceed with inspection or notify Contractor of unfulfilled requirements. COR will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by COR, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 01 29 00 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of COR's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by COR. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, COR will either proceed with inspection or notify Contractor of unfulfilled requirements. COR will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of COR.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. MS Excel Electronic File: COR will return annotated file.
 - b. PDF Electronic File: COR will return annotated file.
 - c. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of COR for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit FAA's rights under warranty.

- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by FAA during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit on digital media acceptable to COR.
- E. Warranties in Paper Form:
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

**2.2 EQUIPMENT WARRANTY TAGS AND GUARANTEE LOCAL
REPRESENTATIVES**

- A. The Contractor shall furnish with each guarantee, the name address, and telephone number of the guarantor, the name, address, and telephone number of the guarantor's representative nearest to the site, who, upon request of the FAA representative, will honor the guarantee during the guaranty period and will provide the service prescribed by the terms of the guarantee. At the time of installation, the Contractor shall tag each item of warranted equipment with a durable, oil and water resistant tag approved by the Contracting Officer's Representative (COR). Tag shall be attached with copper wire and sprayed with a clear silicone, waterproof coating. Leave the date of acceptance and inspectors signature blank until project is accepted for Substantial Completion.
- B. Equipment warranty tags must show the following information:
1. Type of Equipment
 2. Accepted Date
 3. Warranted Until
 4. Under Contract Number
 5. Inspector's Signature

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.

- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.
 - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.
 - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 01 73 00 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

- B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 01 91 13 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Contractor and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.

- B. Format: Submit operation and maintenance manuals in the following format:

1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.
 2. Submit three paper copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Contractor and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Contractor and Commissioning Authority will return copy with comments.
1. Correct or revise each manual to comply with Contractor's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Contractor's and Commissioning Authority's comments and prior to commencing demonstration and training.
- E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

- b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of FAA.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for COR.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the COR that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by FAA's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.

- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of FAA's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by FAA's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.

7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by FAA's operating personnel.

- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.

5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **01 78 23**

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SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

- B. Related Requirements:

1. Section 01 73 00 "Execution" for final property survey.
2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

- C. General

1. This section describes the requirements for the creation and maintenance of "As Built Drawings;" referred to herein as Record Documents.
2. The Contractor shall use the Government furnished CAD files to electronically reconfigure, modify, and update the Construction Contract Drawings with as-built information so as to develop Record Documents. Government furnished CAD files shall be updated by the Contractor to include as built layout and facility data shown on Shop Drawings, product submittals, and material submittals approved in accordance with Section 01 33 00.
3. Maintenance of Record Documents.
4. Submittal of Record Documents.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

- a. Final Submittal:

- 1) Submit three paper-copy sets of marked-up record prints.
 - 2) Submit PDF electronic files of scanned Record Prints and three sets of file prints.
 - 3) Print each drawing, whether or not changes and additional information were recorded.
- b. Final Submittal:
- 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit Record Digital Data Files and three sets of Record Digital Data File plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files and three paper copies of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories and three paper copies of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories and three paper copies of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.

- d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Work Change Directive.
 - k. Changes made following COR's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Contractor and Project Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
 2. Format: DWG, Microsoft Windows operating system.
 3. Format: Annotated PDF electronic file with comment function enabled.
 4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 5. Refer instances of uncertainty to Contractor through Project Manager for resolution.
 6. COR will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."

1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

- C. Format: Submit Record Product Data as annotated PDF electronic file.
1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Contractor's reference during normal working hours.
- B. Keep Record Documents and Samples available for inspection by FAA.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 39

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SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning activities.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of commissioning process test equipment, instrumentation, and tools.
5. Commissioning tests and commissioning test demonstration.
6. Adjusting, verifying, and documenting identified systems and assemblies.

B. Related Requirements:

1. Section 01 10 00 "Summary of Work".
2. Section 01 33 00 "Submittal Procedures" for submittal procedure requirements for commissioning process.
3. Section 01 78 23 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal requirements.
4. Section 22 08 00 "Commissioning of Plumbing" for technical commissioning requirements for plumbing.
5. Section 23 08 00 "Commissioning of HVAC" for technical commissioning requirements for HVAC.
6. Section 26 00 02 "Documentation, Testing and Training Requirements for Government Furnished Equipment (GFE)" for technical commissioning requirements for GFE.
7. Section 26 00 03 "Electrical Testing" for technical commissioning requirements of electrical systems.

1.3 ALLOWANCES

A. Labor and management costs for the performance of commissioning process.

B. The following are excluded from the commissioning allowance:

1. Test equipment, instrumentation, and tools (including, but not limited to, proprietary test equipment, instrumentation, and tools) required to perform tests.
2. Work to correct commissioning issues.
3. Work to repeat tests when equipment and systems fail acceptance criteria.

1.4 UNIT PRICES (Not Used)

1.5 DEFINITIONS

- A. Commissioning Authority: An entity engaged by FAA.
- B. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation of commissioning requirements.
- C. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with owner's project requirements per the Contract Documents.
- D. Construction-Phase Commissioning-Process Completion: The stage of completion and acceptance of commissioning process when resolution of deficient conditions and issues discovered during commissioning process and retesting until acceptable results are obtained has been accomplished. FAA will establish in writing the date construction-phase commissioning-process completion is achieved. See Section 01 77 00 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
 - 1. Commissioning process is complete when the Work specified of this Section and related Sections has been completed and accepted, including, but not limited to, the following:
 - a. Completion of tests and acceptance of test results.
 - b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
 - c. Completion and acceptance of submittals and reports.
- E. FAA's Project Requirements: The owner's project requirements are defined in the Contract Documents.
- F. FAA's Witness: Commissioning Authority, Contractors' Project Manager, RE and/or or FAA-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.
- G. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.
- H. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- I. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.6 COMPENSATION

- A. If FAA, Commissioning Authority, other FAA's witness, or FAA's staff perform additional services or incur additional expenses due to actions of Contractor listed below, compensate FAA for such additional services and expenses.
 - 1. Failure to provide timely notice of commissioning activities schedule changes.
 - 2. Failure to meet acceptance criteria for test demonstrations.
- B. Subcontractor shall compensate Contractor for such additional services and expenses for personnel travelling more than 200 miles, plus per diem allowances for meals and lodging according to current U.S. General Services Administration (GSA) Per Diem Rates.

1.7 COMMISSIONING TEAM

- A. Members Appointed by Subcontractor:

COR

- 1. Commissioning Coordinator: A person or entity employed by Subcontractor to manage, schedule, and coordinate commissioning process.
 - 2. Project superintendent and other employees that Subcontractor may deem appropriate for a particular portion of the commissioning process.
 - 3. Lower tier Subcontractors, installers, suppliers, and specialists that Subcontractor may deem appropriate for a particular portion of the commissioning process.
 - 4. Appointed team members shall have the authority to act on behalf of the entity they represent.
- B. Members Appointed by FAA:
 - 1. Commissioning Authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning process.
 - 2. FAA representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that FAA may deem appropriate for a particular portion of the commissioning process.
 - 3. COR, plus employees and consultants that COR may deem appropriate for a particular portion of the commissioning process.
 - 4. Resident Engineer (RE) and/or representatives.

1.8 INFORMATIONAL SUBMITTALS

- A. Comply with requirements in Section 01 33 00 "Submittal Procedures" for submittal procedure general requirements for commissioning process.
- B. Commissioning Plan Information:

1. List of Subcontractor-appointed commissioning team members to include specific personnel and subcontractors performing the various commissioning requirements.
 2. Schedule of commissioning activities, integrated with the Construction Schedule. Comply with requirements in Section 01 32 10 "Construction Progress Documentation" for the Construction Schedule general requirements for commissioning process.
 3. Subcontractor personnel and lower tier subcontractors participating in each test.
 4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.
- C. Commissioning schedule.
- D. Two-week look-ahead schedules.
- E. Commissioning Coordinator Letter of Authority:
1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Subcontractor's firm. Letter shall authorize Commissioning Coordinator to do the following:
 - a. Make inspections required for commissioning process.
 - b. Coordinate, schedule, and manage commissioning process of Subcontractor, subcontractors, and suppliers.
 - c. Obtain documentation required for commissioning process from Subcontractor, lower tier subcontractors, and suppliers.
 - d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.
- F. Commissioning Coordinator Qualification Data: For entity coordinating Subcontractor's commissioning activities to demonstrate their capabilities and experience.
1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- G. List test instrumentation, equipment, and monitoring devices. Include the following information:
1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
 2. Brief description of intended use.
- H. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issue Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit printout of log of alarms that occurred since the last log was printed.

I. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.9 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction-Phase Commissioning Completion, include the following:
 - a. Pre-startup reports.
 - b. Approved test procedures.
 - c. Test data forms, completed and signed.
 - d. Progress reports.
 - e. Commissioning issue report log.
 - f. Commissioning issue reports showing resolution of issues.
 - g. Correspondence or other documents related to resolution of issues.
 - h. Other reports required by commissioning process.
 - i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction-Phase Commissioning Completion.
 - j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction-Phase Commissioning Process Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.10 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:

1. Documented experience commissioning systems of similar complexity to those contained in these documents on at least three projects of similar scope and complexity.
 2. Certification of commissioning-process expertise. The following certifications are acceptable. FAA reserves the right to accept or reject certifications as evidence of qualification.
 - a. Certified Commissioning Authority, by AABC Commissioning Group (ACG).
 - b. Commissioning-Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.
 - c. Certified Commissioning Professional, by Building Commissioning Association.
 - d. Accredited Commissioning-Process Authority Professional, by University of Wisconsin.
 - e. Accredited Commissioning-Process Manager, by University of Wisconsin.
 - f. Accredited Green Commissioning-Process Provider, by University of Wisconsin.
- B. Calibration Agency Qualifications: Certified by The American Association for Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Test equipment and instrumentation required to perform the commissioning process shall remain the property of Contractor unless otherwise indicated.
- B. Test equipment and instrumentation required to perform commissioning process shall comply with the following criteria:
 1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
 2. Calibrated and certified.
 - a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags shall be permanently affixed.
 - b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.

3. Maintain test equipment and instrumentation.
4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.
1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
 2. Proprietary test equipment, instrumentation, and tools shall become the property of FAA at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

- A. General Format and Organization:
1. Bind report in three-ring binders.
 2. Label the front cover and spine of each binder with the report title, volume number, project name, Subcontractor's name, and date of report.
 3. Record report on compact disk.
- B. Commissioning Report:
1. Include a table of contents and an index to each test.
 2. Include major tabs for each Specification Section.
 3. Include minor tabs for each test.
 4. Within each minor tab, include the following:
 - a. Test specification.
 - b. Pre-startup reports.
 - c. Approved test procedures.
 - d. Test data forms, completed and signed.

PART 3 - EXECUTION

3.1 CONSTRUCTION CHECKLISTS

- A. Construction checklists cannot modify or conflict with the Contract Documents.
- B. Create construction checklists based on actual systems and equipment to be included in Project.

- C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment if applicable.
 - 1. Service connection requirements, including configuration, size, location, and other pertinent characteristics.
 - 2. Included optional features.
 - 3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness, and lack of damage.
 - 4. Installation Checks:
 - a. Location according to Drawings and approved Shop Drawings.
 - b. Configuration.
 - c. Compliance with manufacturers' written installation instructions.
 - d. Attachment to structure.
 - e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
 - f. Utility connections are of the correct characteristics, as applicable.
 - g. Correct labeling and identification.
 - h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.
- D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum.
- E. Performance Tests:
 - 1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
 - 2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
 - 3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
 - 4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
 - 5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

- F. Deferred Construction Checklists: Obtain FAA approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, deferred construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:
1. Identify deferred construction checklists by number and title.
 2. Provide a target schedule for completion of deferred construction checklists.
 3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.
- G. Delayed Construction Checklists: Obtain FAA approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, delayed construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:
1. Identify delayed construction checklist by construction checklist number and title.
 2. Provide a target schedule for completion of delayed construction checklists.
 3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.2 GENERAL EXECUTION REQUIREMENTS

- A. Schedule and coordinate commissioning process with the Construction Schedule.
- B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.
- C. Perform test demonstrations for FAA's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies.
- D. Report test data and commissioning issue resolutions.
- E. Schedule personnel to participate in and perform Commissioning-Process Work.
- F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:
 1. Operating the equipment and systems they install during tests.
 2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.3 COMMISSIONING COORDINATOR RESPONSIBILITIES

- A. Management and Coordination: Manage, schedule, and coordinate commissioning process, including, but not limited to, the following:
 - 1. Coordinate with lower tier subcontractors on their commissioning responsibilities and activities.
 - 2. Obtain, assemble, and submit commissioning documentation.
 - 3. Conduct periodic on-site commissioning meetings. Comply with requirements in Section 01 31 13 "Project Coordination."
 - 4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the Construction Schedule. Update Construction Schedule at specified intervals.
 - 5. Review and comment on preliminary test procedures and data forms.
 - 6. Report inconsistencies and issues in system operations.
 - 7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
 - 8. Direct and coordinate test demonstrations.
 - 9. Coordinate witnessing of test demonstrations by FAA's witness.
 - 10. Coordinate and manage training. Be present during training sessions to direct video recording, present training, and direct the training presentations of others.
 - 11. Prepare and submit specified commissioning reports.
 - 12. Track commissioning issues until resolution and retesting is successfully completed.
 - 13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide FAA's representative access to these records on request.
 - 14. Assemble and submit commissioning report.

3.4 COMMISSIONING TESTING

- A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Subcontractor's quality-control process.
- B. FAA's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Contractor's project manager will coordinate attendance by FAA's witness with Subcontractor's published Commissioning Schedule. FAA's witness will provide no labor or materials in the commissioning work. The only function of FAA's witness will be to observe and comment on the progress and results of commissioning process.
- C. Construction Checklists:
 - 1. Complete construction checklists as Work is completed.
 - 2. Distribute construction checklists to installing contractors before they start work.
 - 3. Installers:

- a. Verify installation using approved construction checklists as Work proceeds.
 - b. Complete and sign construction checklists daily for work performed during the preceding day.
4. Provide Commissioning Authority access to construction checklists.
- D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.
- E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.
- F. Test Procedures and Test Data Forms:
1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
 2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
 3. Completed test data forms are the official records of the test results.
 4. Commissioning Authority will provide to Subcontractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
 5. Review preliminary test procedures and test data forms, and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:
 - a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
 - b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.
 6. After Subcontractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."
 7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.
- G. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
2. Perform and complete each step of the approved test procedures in the order listed.
3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.
5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent unless otherwise indicated in the individual test specification.
2. Notify FAA's witness at least three days in advance of each test demonstration.
3. Perform and complete each step of the approved test procedures in the order listed.
4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to FAA's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of FAA's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Subcontractor and FAA's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.
 - a. Exception for Failure of FAA's Witness to Attend: Failure of FAA's witness to be present for agreed-on schedule of test demonstration shall not delay Subcontractor. If FAA's witness fails to attend a scheduled test, Subcontractor shall proceed with the scheduled test. On completion, Subcontractor shall sign the data form for Subcontractor and for FAA's witness, and shall note the absence of FAA's witness at the scheduled time and place.
7. False load test requirements are specified in related sections.

- a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Contractor's written approval.

I. Deferred Tests:

1. Deferred Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction-Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction-Phase Commissioning Process Completion as follows:
 - a. Identify deferred tests by number and title.
 - b. Provide a target schedule for completion of deferred tests.
2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Contractor and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where deferred tests are specified, coordinate participation of necessary personnel and of COR, Commissioning Authority, and FAA's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Contractor's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed delayed tests. Obtain FAA approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. Include the following in the request for Certificate of Construction-Phase Commissioning Process Completion:
 - a. Identify delayed tests by test number and title.
 - b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.
2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Contractor and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where delayed tests are approved, coordinate participation of necessary personnel and of Contractor, Commissioning Authority, and FAA's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain COR's approval of the proposed schedule.

K. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.
3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Subcontractor work or materials, reimburse Contractor for billed costs for the participation in the repeated demonstration.
4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:
 - a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
 - b. Submit commissioning compliance issue report form within 24 hours of the test.
 - c. Determine the cause of the failure.
 - d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.
5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.
 - a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.)
 - b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
 - c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
 - d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.
6. Diagnose and correct failed test demonstrations as follows:
 - a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
 - b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
 - c. Record the results of each step of the diagnostic procedure.

- d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
 - e. Determine and record corrective measures.
 - f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.
7. Retest:
- a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of FAA's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Subcontractor's responsibility, compensate Contractor for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
 - b. For each repeated test demonstration, submit a new test data form, marked "Retest."
8. Do not correct commissioning compliance issues during test demonstrations.
- a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.5 COMMISSIONING MEETINGS

- A. Commissioning Authority will schedule and conduct commissioning meetings. Comply with requirements in Section 01 31 13 "Project Coordination."

3.6 SEQUENCING

- A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:
 - a. Material checks.
 - b. Installation checks.
 - c. Startup, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
 - d. Performance Tests:
 - 1) Static tests, as appropriate.

- 2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
 - 3) Equipment and assembly performance tests.
 - 4) System performance tests.
 - 5) Intersystem performance tests.
2. Commissioning tests.
- B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.
- C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify COR if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.
- D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.
- 3.7 SCHEDULING
- A. Commence commissioning process as early in the construction period as possible.
- B. Commissioning Schedule: Integrate commissioning activities into Construction Schedule. See Section 01 32 10 "Construction Progress Documentation."
1. Include detailed commissioning activities in monthly updated Construction Schedule and short-interval schedule submittals.
 2. Schedule the start date and duration for the following commissioning activities:
 - a. Submittals.
 - b. Preliminary operation and maintenance manual submittals.
 - c. Installation checks.
 - d. Startup, where required.
 - e. Performance tests.
 - f. Performance test demonstrations.
 - g. Commissioning tests.
 - h. Commissioning test demonstrations.
 3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
 4. Determine milestones and prerequisites for commissioning process. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short-interval schedule submittals.
- C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning process.
2. Two-week look-ahead schedules shall identify the date, time, beginning location, Subcontractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of FAA's witnesses.

D. FAA's Witness Coordination:

1. Coordinate FAA's witness participation via Contractor.
2. Notify Contractor of commissioning schedule changes at least two work days in advance for activities requiring the participation of FAA's witness.

3.8 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:
 - a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
 - b. Pre-installation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.
 - c. Pre-installation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
 - d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
 - e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to FAA completion of equipment model verification, pre-installation physical condition checks, pre-installation component verification checks, and completion of corrective actions for installation compliance issues.
2. Test data reports include the following:
 - a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.

- b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
 - c. Signatures of individuals performing and witnessing tests.
 - d. Data trend logs accumulated overnight from the previous day of testing.
3. Commissioning Compliance Issue Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by FAA. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:
 - a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
 - b. Action distribution list.
 - c. Report date.
 - d. Test number and description.
 - e. Equipment identification and location.
 - f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
 - g. Diagnostic procedure or plan to determine the cause (include in initial submittal)
 - h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
 - i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.
 - j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
 - k. Schedule for retesting.
4. Weekly progress reports include information for tests conducted since the preceding report and the following:
 - a. Completed data forms.
 - b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
 - c. Activities scheduled but not conducted per schedule.
 - d. Commissioning compliance issue report log.
 - e. Schedule changes for remaining Commissioning-Process Work, if any.
5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

- a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
 - b. Attach to the data form printed trend log data collected during the test or test demonstration.
 - c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.
6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."
 - a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.9 CERTIFICATE OF CONSTRUCTION-PHASE COMMISSIONING PROCESS COMPLETION

- A. When Subcontractor considers that construction-phase commissioning process, or a portion thereof which FAA agrees to accept separately, is complete, Subcontractor shall prepare and submit to Contractor and Commissioning Authority through Contractor a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Subcontractor's responsibility to complete commissioning process.
- B. On receipt of Subcontractor's list, Commissioning Authority will make an inspection to determine whether the construction-phase commissioning process or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Subcontractor's list, which is not sufficiently complete as defined in "Construction-Phase Commissioning Process Completion" Paragraph in the "Definitions" Article, Subcontractor shall, before issuance of the Certificate of Construction-Phase Commissioning Process Completion, complete or correct such items on notification by Commissioning Authority. In such case, Subcontractor shall then submit a request for another inspection by Commissioning Authority to determine construction-phase commissioning process completion.

- C. Subcontractor shall promptly correct deficient conditions and issues discovered during commissioning process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Contractor's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.
- D. When construction-phase commissioning process or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction-Phase Commissioning Process Completion that shall establish the date of completion of construction-phase commissioning process. Certificate of Construction-Phase Commissioning Process Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION **01 91 13**

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to COR that may be uncovered during demolition remain the property of FAA.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to COR.
 - 2. Coordinate with COR delivery of undamaged exterior, porcelain red tile removed as part of the work.

1.3 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.
 - 6. Review demolition work with Construction Waste Management requirements.
 - 7. Review roof demolition work, roof work and compliance with safety requirements.

1.4 ACTION SUBMITTALS

- A. Hot Work Permit: Prepare and submit the FAA Hot Work Permit or Contractor's equivalent to the COR. The Contractor shall coordinate all project-related Hot Work with the COR.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property and for environmental protection . Indicate proposed locations and construction of barriers.
- C. Predemolition Photographs or Video: Digital photographs or video, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations. Coordinate photography restrictions and required photography permit prior to capturing photographs or video. Submit before Work begins.
- D. Record drawings at Project closeout.
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Handle waste materials as specified in Section 01 74 00 "Cleaning and Waste Management".

1.7 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by FAA as far as practical.
- B. Notify COR of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work other than where identified elsewhere in the Contract Documents.
 - 1. Hazardous materials encountered and not identified elsewhere in the Contract Documents will be removed by COR before start of the Work.
- D. If suspected hazardous materials are encountered, do not disturb; immediately notify COR and COR. Hazardous materials will be removed by COR under a separate contract.
- E. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - Maintain fire-protection facilities, including sprinkler and fire alarm systems, in service during selective demolition operations or provide approved alternate procedures such as a fire watch

2.1 PEFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

2.2 REPAIR MATERIALS

- A. Use repair materials identical to existing materials, except as follows:
 1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 2. Use materials whose installed performance equal or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to core drilling reinforced concrete, locate reinforcing and utilities embedded within concrete with a magnetic steel locator such as one of the following:
 1. PS 300 Ferroscan Steel Reinforcement Detection System manufactured by Hilti, Tulsa, OK (Phone: 800-879-8000 to get a local field representative).
 2. "Profometer 600-Series" rebar locators and concrete cover meters manufactured by Proceq. (North American Headquarters: 117 Corporation Drive, Aliquippa, PA, 15001 (Phone: 800-839-7016).

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 01 10 00 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. COR will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to FAA.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 01 50 00 "Temporary Facilities and Controls."

- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling as indicated herein and on the Drawings.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 - 4. Maintain adequate ventilation when using cutting torches.
 - 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 8. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 00 "Cleaning and Waste Management"

9. The edges of pavement to be removed shall be saw-cut with neat, straight lines.
10. Protect existing vegetation (trees and shrubs) from damage using orange construction fencing set at the drip line of the vegetation.

B. Removed and Reinstalled Items:

1. Pack or crate items after cleaning and repairing. Identify contents of containers.
2. Protect items from damage during transport and storage.
3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by COR, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 HOT WORK AND CUTTING

- A. Hot Work is any activity that creates heat, flame, sparks, or smoke. Examples of Hot Work include but are not limited to: Hot Work (gas or arc), Cutting, Grinding, Brazing, Soldering, use of Open Flame Heaters in Buildings, and Hot Tar Operations.
- B. The Contractor shall obtain a Hot Work Permit prior to any activity involving hot work. A fire guard shall remain on station one hour following the cessation of hot work activities to extinguish any incipient stage fires that may develop.
- C. Contractor shall submit a Hot Work and Torch Cutting Plan for approval prior to beginning Hot Work and cutting activities. The Plan shall identify the portions of work where Hot Work and cutting will be performed, locations of the work, types of Hot Work and cutting being proposed, schedule for the proposed Hot Work and cutting activities, and Contractor's plan for protecting the facility and its occupants, operations, and equipment during the Hot Work and cutting activities. Special attention is required for procedures and protection for Hot Work and cutting around or adjacent to existing electronic equipment.
- D. Building electrical power SHALL NOT be used for arc Hot Work. Building components, including structural or miscellaneous steel SHALL NOT be used as grounding return for Hot Work activities.
- E. Ventilation and exhaust to the outside shall be provided during Hot Work and cutting activities to keep the zone clear. Do not weld or cut unless ventilation and exhaust have been deemed acceptable to the Authorities Having Jurisdiction. Provide non-flammable shields to protect persons and property. Keep cylinders upright and chained or secured to their supports.
- F. Remove flammable materials from Hot Work and cutting areas prior to beginning Hot Work and cutting activities. Keep fire extinguishers in the Hot Work and cutting areas.

- G. Perform Hot Work and cutting in accordance with the American Society's Specifications and Safe Practice Codes criteria, and with OSHA Safety Requirements.
- H. Fire Watch: Provide Fire Watch Operations in accordance with requirements and policies of Authorities Having Jurisdiction.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain FAA's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolition.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

END OF SECTION **02 41 19**

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SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Clay face brick.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Ties and anchors.
6. Embedded flashing.
7. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.
3. Cavity wall insulation.

C. Related Requirements:

1. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
2. Section 07 21 00 "Thermal Insulation" for cavity wall insulation.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 ALLOWANCES

- A. Face brick is part of the Face Brick Allowance.

1.4 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
 - 3. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 - 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
 - 1. Clay face brick.
 - 2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 3. Weep holes and cavity vents.
 - 4. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 5. Grout mixes. Include description of type and proportions of ingredients.

6. Reinforcing bars.
 7. Joint reinforcement.
 8. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings.
 2. Build mockups for each type of exposed unit masonry construction in sizes approximately 96 inches long by 84 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
 - b. Include lower corner of louver opening, framed with stone trim, at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 - e. Include on one face of interior unit masonry wall mockup.

3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C216.
 - 1. Grade: MW or SW.
 - 2. Unit Compressive Strength: As required to meet compressive strength indicated on drawings.
 - 4. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C67 with no observable difference in the applied finish when viewed from 10 feet or shall have a history of successful use in Project's area.
 - 5. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
 - 6. Application: Use where brick is exposed unless otherwise indicated.
 - 7. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
 - 8. Color and Texture: Basis of Design; Cushwa #103 Georgian Wood Mould.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cemex S.A.B. de C.V.
 - b. Essroc.
 - c. Holcim (US) Inc.
 - d. Lafarge North America Inc.
 - e. Lehigh Hanson; HeidelbergCement Group.
- E. Mortar Cement: ASTM C1329/C1329M.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lafarge North America Inc.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 1. Manufacturers: Subject to compliance with requirements, Basis of Design; Amerimix or provide products by the following:
 - a. Davis Colors.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. Lanxess Corporation.
 - d. Solomon Colors, Inc.
- G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix:
 - a. Manufacturers: Subject to compliance with requirements, Basis of Design; Amerimix or provide products by the following:
 - 1) Essroc.
 - 2) Holcim (US) Inc.
 - 3) Lafarge North America Inc.
 - 4) Lehigh Hanson; HeidelbergCement Group.
 2. Colored Masonry Cement:
 - a. Manufacturers: Subject to compliance with requirements, Basis of Design; Amerimix or provide products by the following:
 - 1) Cemex S.A.B. de C.V.
 - 2) Essroc.
 - 3) Holcim (US) Inc.
 - 4) Lafarge North America Inc.
 - 5) Lehigh Hanson; HeidelbergCement Group.
 3. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 4. Pigments shall not exceed 10 percent of portland cement by weight.
 5. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
 6. Color: To match Architect's sample.
- H. Aggregate for Mortar: ASTM C144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Aggregate for Grout: ASTM C404.
- J. Epoxy Pointing Mortar: ASTM C395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Corp. - Construction Chemicals.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. GCP Applied Technologies Inc

L. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: As indicated on drawings.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dur-O-Wal; a Hohmann & Barnard company.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc.
 - d. Lock Rite.
 - e. Wire-Bond.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 1. Exterior Walls: Stainless steel.
 2. Provide in lengths of not less than 10 feet, with prefabricated continuous corner and tee units.
- D. Masonry-Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- diameter, hot-dip galvanized carbon stainless steel continuous wire.

2.7 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 1. Exterior Walls - Stainless Steel Wire: ASTM A580/A580M, Type 304 Type 316.

- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
 - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 - 2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 - 3. Wire: Fabricate from 1/4-inch- diameter, stainless steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, stainless steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
 - 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, stainless steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, stainless steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- F. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 - 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.078-inch- thick, stainless steel sheet.
 - 3. Fabricate wire ties from 0.187-inch- diameter, stainless steel wire unless otherwise indicated.
 - 4. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Heckmann Building Products, Inc.
 - 2) Hohmann & Barnard, Inc.
 - 3) Wire-Bond.

5. Stainless Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless steel shank.

2.8 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cheney Flashing Company.
 - 2) Hohmann & Barnard, Inc.
 - 3) Keystone Flashing Company, Inc.
4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
6. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
7. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
8. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
9. Solder metal items at corners.

- B. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
4. Where flashing is fully concealed, use metal flashing.

C. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B32, , with acid flux of type recommended by stainless steel sheet manufacturer.
2. Solder for Copper: ASTM B32, .
3. Elastomeric Sealant: ASTM C920, chemically curing sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
 1. Wicking Material: Absorbent rope, made from , 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity. Use only for weeps.
 2. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) Advanced Building Products Inc.
 - 2) Heckmann Building Products, Inc.
 - 3) Hohmann & Barnard, Inc.
 - 4) Wire-Bond.
 3. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, 2 1/2 inches and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
 - a. Manufacturers: Subject to compliance with requirements, Basis of Design MortarNet or provide products by the following:
 - 1) Advanced Building Products Inc.

- 2) CavClear/Archovations, Inc.
 - 3) Keene Building Products.
 - 4) Mortar Net Solutions.
4. Aluminum Weep Hole/Vent: Units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel, with louvers stamped in web and with a top flap to keep mortar out of the head joint; factory primed and painted before installation to comply with Section 09 91 13 "Exterior Painting" in color selected by Architect.
5. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.
- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- 1) Hohmann & Barnard, Inc.
 - 2) Williams Products, Inc.
 - 3) Wire-Bond.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
- 1. Manufacturers: Subject to compliance with requirements, Basis of Design MortarNet or provide products by one of the following:
 - a. Advanced Building Products Inc.
 - b. CavClear/Archovations, Inc.
 - c. Heckmann Building Products, Inc.
 - d. Hohmann & Barnard, Inc.
 - e. Mortar Net Solutions.
 - f. Wire-Bond.
 - 2. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.10 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
- b. EaCo Chem, Inc.
- c. PROSOCO, Inc.

2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use masonry cement mortar unless otherwise indicated.
3. For exterior masonry, use masonry cement mortar.
4. For reinforced masonry, use masonry cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S or Type N.
4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior nonload-bearing partitions, Type O may be used instead of Type N.

- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Clay face brick.

- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
 - b. Cast-stone trim units.
- F. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.
- G. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.

- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

- 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
- 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
- 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

- 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
- 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
- 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
- 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
- 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
- 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
- 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond . Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.

2. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay as follows:
 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Install clay flue liners to comply with ASTM C1283. Install flue liners ahead of surrounding masonry. Set clay flue liners in full bed of refractory mortar 1/16 to 1/8 inch (thick. Strike joints flush on inside of flue to provide smooth surface. Maintain expansion space between flue liner and surrounding masonry except where surrounding masonry is required to provide lateral support for flue liners.
- D. Set trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 2. Allow cleaned surfaces to dry before setting.
 3. Wet joint surfaces thoroughly before applying mortar.
 4. Rake out mortar joints for pointing with sealant.
- E. Rake out mortar joints at to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- G. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- H. Cut joints flush where indicated to receive waterproofing cavity wall insulation, or air barriers unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together as follows:
 - 1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use tab-type reinforcement.
 - 2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.
- E. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten seismic anchors to masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections, connector sections, and continuous wire in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as required to resist seismic and wind loads indicated on drawings, but not more than 18 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around
- B. Provide not less than 2 inches of airspace between back of masonry veneer and face of sheathing or insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 1. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
- C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch.
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under air barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
 3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 4. Interlock end joints of sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
 5. Install metal drip edges with sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 1. Use specified weep/cavity vent products to form weep holes.
 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 3. Space weep holes 24 inches o.c. unless otherwise indicated.
 4. Space weep holes formed from wicking material 16 inches o.c.
 5. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
 6. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches .

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5, as indicated on Schedule of Special Inspections.
 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.
- I. Prism Test: For each type of construction provided, according to ASTM C1314 at 7 days and at 28 days.

3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleared for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid stripable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 8. Clean stone trim to comply with stone supplier's written instructions.
 9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION **04 20 00**

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Trim units.
2. Mortar materials.
3. Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

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

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

C. Samples for Verification:

1. For each color and texture of cast stone required, 4 inches square in size.
2. For each trim shape required, 4 inches in length.
3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.

1.3 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C1364.

1. Provide test reports based on testing within previous six months.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by CSI or PCI for Group A, Category AT.

- B. Furnish cast stone for installation in mockups specified in Section 04 20 00 "Unit Masonry."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast stone units in suitable packs or pallets.
1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units if required, using dollies with wood supports.
 2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602.

PART 2 - PRODUCTS

2.1 CAST STONE MATERIALS

- A. General: Comply with ASTM C1364.
- B. Portland Cement: ASTM C150/C150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C114. Provide natural color or white cement as required to produce cast stone color indicated.
- C. Fine Aggregates: Natural sand or crushed stone complying with ASTM C33/C33M, gradation and colors as needed to produce required cast stone textures and colors.

- D. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- E. Reinforcement:
 - 1. Deformed steel bars complying with ASTM A615/A615M, Grade 40. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.
 - a. Galvanized Coating: ASTM A767/A767M.
- F. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666, Type 316.

2.2 CAST STONE UNITS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cast Stone Systems, Inc.
 - 2. Advanced Architectural Stone.
 - 3. Northern Virginia Cast Stone.
- B. Cast Stone Units: Comply with ASTM C1364.
 - 1. Units are manufactured using the vibrant dry tamp method.
 - 2. Trim units including copings.
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
 - 1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 - 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
 - 3. Provide drips on projecting elements unless otherwise indicated.

2.3 MORTAR MATERIALS

- A. Water: Potable.

2.4 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 316 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666.

- B. Dowels: 1/2-inch- diameter round bars, fabricated from Type 316 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666.

2.5 MORTAR MIXES

- A. Comply with requirements in Section 04 20 00 "Unit Masonry" for mortar mixes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

- A. Set cast stone as indicated in TMS 604.
- B. Install cast stone units to comply with requirements in Section 04 20 00 "Unit Masonry."
- C. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- D. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- E. Set units in full bed of mortar with full head joints unless otherwise indicated.
1. Set units with joints 3/8 to 1/2 inch wide unless otherwise indicated.
 2. Build anchors and ties into mortar joints as units are set.
 3. Fill dowel holes and anchor slots with mortar.
 4. Fill collar joints solid as units are set.
 5. Build concealed flashing into mortar joints as units are set.
 6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
 7. Keep joints at shelf angles open to receive sealant.

- F. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- G. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- H. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.
- I. Rake out joints for pointing with sealant to depths of not less than 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.
- J. Point joints with sealant to comply with applicable requirements in Section 07 92 00 "Joint Sealants."
 - 1. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- K. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.
 - 1. Keep joints free of mortar and other rigid materials.
 - 2. Build in compressible foam-plastic joint fillers where indicated.
 - 3. Form joint of width indicated, but not less than 3/8 inch.
 - 4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
 - 5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

3.3 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated in TMS 604.
- B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 - 2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
- C. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.
- D. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- E. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- F. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
 1. Form open joint of width indicated, but not less than 3/8 inch .
- G. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- H. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

3.4 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/4 inch in 10 ft., or 1/2 inch maximum.
- B. Variation from Level: Do not exceed 1/4 inch in 10 ft., or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 1. Remove mortar fins and smears before tooling joints.
 2. Remove excess sealant immediately, including spills, smears, and spatter.

- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample; leave one sample uncleansed for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 5. Clean cast stone by methods described in Cast Stone Institute Technical Bulletin #39.
 6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION **04 72 00**

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SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Exterior non-load-bearing wall framing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Contractor.
2. Steel Subcontractor.
3. COR.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Exterior non-load-bearing wall framing.

- B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

- C. Delegated-Design Submittal: For cold-formed steel framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs and tracks.
- D. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
- E. Research Reports:
 - 1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
 - 2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association or the Steel Stud Manufacturers Association.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AllSteel & Gypsum Products, Inc.
 2. CEMCO; California Expanded Metal Products Co.
 3. ClarkDietrich.
 4. Consolidated Fabricators Corp.; Building Products Division.
 5. Craco Manufacturing, Inc.
 6. Custom Stud.
 7. Design Shapes in Steel.
 8. Formetal Co. Inc. (The).
 9. Jaimes Industries.
 10. MarinoWARE.
 11. MBA Building Supplies.
 12. MRI Steel Framing, LLC.
 13. Nuconsteel, A Nucor Company.
 14. Olmar Supply, Inc.
 15. Southeastern Stud & Components, Inc.
 16. Steel Construction Systems.
 17. Super Stud Building Products Inc.
 18. The Steel Network, Inc.
 19. United Steel Deck, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: As indicated on Drawings.
 2. Space cold-formed framing members as indicated on drawings, or as required to meet structural performance requirements
 3. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
 - b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.

4. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 5. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 3/4 inch.
 6. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
1. Lateral Design: AISI S213.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 1. Grade: As required by structural performance.
 2. Coating: G90 or equivalent.
- B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: As required by structural performance.
 2. Coating: G90.

2.4 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0538 inch As indicated on drawings. If not indicated on drawings, as required by structural performance.
 2. Flange Width: 1-5/8 inches As required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 1. Flange Width: As required by structural performance.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 1. Anchor clips.
 2. Stud kickers and knee braces.
 3. Hole-reinforcing plates.
 4. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, Grade 36 Grade 55, threaded carbon-steel hex-headed bolts, headless, hooked bolts, headless bolts, with encased end threaded, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, ICC-ES AC58, or ICC-ES AC308 as appropriate for the substrate.
 1. Uses: Securing cold-formed steel framing to structure.
 2. Type: Torque-controlled expansion anchor, Torque-controlled adhesive anchor, or adhesives anchor.
 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
- D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M, MIL-P-21035B, or SSPC-Paint 20.
- B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.
- D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.
- F. Sill Sealer Gasket/Termite Barrier: Minimum 68-mil nominal thickness, self-adhering sheet consisting of 64 mils of rubberized asphalt laminated on one side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Polyguard Products, Inc.
 - b.
 - 2. Physical Properties:
 - a. Peel Adhesion: 17.0 lb/in of width when tested in accordance with ASTM D412.
 - b. Low-Temperature Flexibility: Pass at minus 25 deg F when tested in accordance with)ASTM D146/D146M.

2.8 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

- C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.
- E. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

- A. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

3.5 INSTALLATION OF INTERIOR NONLOADBEARING WALL FRAMING

- A. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

3.6 INSTALLATION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Testing: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
 1. Test and Inspect as required by the IBC, as indicated in the schedule of special inspections
- B. Field and shop welds will be subject to testing and inspecting.

- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION **05 40 00**

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Steel railings.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Fasteners.
3. Post-installed anchors.
4. Handrail brackets.
5. Shop primer.
6. Intermediate coats and topcoats.
7. Bituminous paint.
8. Nonshrink, nonmetallic grout.
9. Anchoring cement.
10. Metal finishes.
11. Paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.
- B. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 STEEL RAILINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hollaender Mfg. Co.
 - 2. Kee Safety, Inc.
 - 3. R & B Wagner, Inc.
 - 4. Trex Commercial Products, Inc.
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- E. Plates, Shapes, and Bars: ASTM A36/A36M.

2.3 FASTENERS

- A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.
- B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.4 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.

2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.
 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection, using an epoxy structural adhesive, if this is manufacturer's standard splicing method.
- J. Form changes in direction as follows:
1. As detailed.
 2. By radius bends of radius indicated.
 3. By bending to smallest radius that will not result in distortion of railing member.
- K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.
- P. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- Q. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.
 - 1. Provide socket covers designed and fabricated to resist being dislodged.
 - 2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.5 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 1. Fit exposed connections together to form tight, hairline joints.
 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends, using nonwelded connections.
- B. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets and railing end flanges to building construction as follows:
 1. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements, using self-tapping screws of size and type required to support structural loads .

3.5 CLEANING

- A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION **05 52 13**

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SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Wood furring.
4. Plywood backing panels.

- B. Related Requirements:

1. Section 06 16 00 "Sheathing" for sheathing.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Sustainable Design Submittals:

1. Environmental Product Declaration: For each product.
2. Health Product Declaration: For each product.
3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Environmental Product Declaration: For each product.
6. Third-Party Certifications: For each product.
7. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
8. Chain-of-Custody Qualification Data: For manufacturer and vendor.
9. Product Data: For installation adhesives, indicating VOC content.
10. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a moisture content less than 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood nailers, blocking, stripping, and similar members in connection with roofing, flashing, and waterproofing.
 - 2. Blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

- E. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
 2. Concealed blocking.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.5 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cleveland Steel Specialty Co.
 2. KC Metals Products, Inc.
 3. Phoenix Metal Products, Inc.
 4. Simpson Strong-Tie Co., Inc

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
- G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION **06 10 53**

SECTION 07 01 50.19 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Full tear-off of entire roof system.
2. Removal of flashings and counterflashings.

1.3 DEFINITIONS

- A. Full Roof Tear-off: Removal of existing roofing system down to existing structural deck.
- B. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.

1. Meet with FAA, COR, Construction Manager, FAA's insurer if applicable, testing and inspecting agency representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:
 - a. Reroofing preparation, including roofing system manufacturer's written instructions.
 - b. Temporary protection requirements for existing roofing system components that are to remain.
 - c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
 - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
 - e. Existing roof deck conditions requiring COR notification.
 - f. Existing roof deck removal procedures and FAA notifications.

- g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
- h. Structural loading limitations of roof deck during reroofing.
- i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
- j. HVAC shutdown and sealing of air intakes.
- k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
- l. Asbestos removal and discovery of asbestos-containing materials.
- m. Governing regulations and requirements for insurance and certificates if applicable.
- n. Existing conditions that may require COR notification before proceeding.

1.5 FIELD CONDITIONS

- A. Existing Roofing System: Modified Bitumin roof assembly roofing.
- B. FAA will occupy portions of building immediately below reroofing area.
 - 1. Conduct reroofing so FAA's operations are not disrupted.
 - 2. Provide FAA with not less than 72 hours' written notice of activities that may affect FAA's operations.
 - 3. Coordinate work activities daily with FAA so FAA has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
 - 4. Before working over structurally impaired areas of deck, notify FAA to evacuate occupants from below affected area.
 - a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.
- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- E. Conditions existing at time of inspection for bidding will be maintained by FAA as far as practical.
 - 1. A roof moisture survey of existing roofing system is available for Contractor's reference.
 - 2. The results of an analysis of test cores from existing roofing system are available for Contractor's reference.
 - 3. Construction Drawings for existing roofing system are provided for Contractor's convenience and information, but they are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.

- F. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed to 200 lbs for rooftop equipment wheel loads and 20 psf for uniformly distributed loads.
- G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
 - 1. Remove only as much roofing in one day as can be made watertight in the same day.
- H. Hazardous Materials: A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.
 - 3. Coordinate reroofing preparation with hazardous material remediation to prevent water from entering existing roofing system or building.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 PREPARATION

- A. Shut off rooftop utilities and service piping before beginning the Work.
- B. Test existing roof drains to verify that they are not blocked or restricted.
 - 1. Immediately notify COR of any blockages or restrictions.
- C. Coordinate with FAA to shut down air-intake equipment in the vicinity of the Work.
 - 1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
 - 1. Prevent debris from entering or blocking roof drains and conductors.
 - a. Use roof-drain plugs specifically designed for this purpose.
 - b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
 - a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

- A. Notify FAA each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- C. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing structural deck.
 1. Remove base flashings and counter flashings.
 2. Remove perimeter edge flashing and gravel stops.
 3. Remove copings.
 4. Remove expansion-joint covers.
 5. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
 6. Remove roof drains indicated on Drawings to be removed.
 7. Remove wood blocking, curbs, and nailers.
 8. Remove Bitumen and felts that are firmly bonded to decks.
 9. Remove existing fall protection systems.
 10. Remove fasteners from deck or cut fasteners off slightly above deck surface.
- D. Maintain water tightness throughout the work and provide all necessary temporary support for mechanical equipment and utilities/piping

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system with COR.
- B. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify COR.
 1. Do not proceed with installation until directed by COR.

3.4 BASE FLASHING REMOVAL

- A. Remove existing base flashings.
 1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

- B. Do not damage metal counterflashings that are to remain.
 - 1. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish as existing.
- C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage.
 - 1. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify COR.
- D. When directed by COR, replace parapet framing, wood blocking, curbs, and nailers to comply with Section 06 10 53 Miscellaneous Rough Carpentry."

3.5 FASTENER PULL-OUT TESTING

- A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to COR and roofing manufacturer before installing new roofing system.
 - 1. Obtain roofing manufacturer's approval to proceed with specified fastening pattern.
 - a. Roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.6 DISPOSAL

- A. Collect demolished materials and place in containers.
 - 1. Promptly dispose of demolished materials.
 - 2. Do not allow demolished materials to accumulate on-site.
 - 3. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off FAA's property.

END OF SECTION 07 01 50.19

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SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Polyisocyanurate foam-plastic board insulation.
2. Mineral-wool blanket insulation.

- B. Related Requirements:

1. Section 04 20 00 "Unit Masonry" for insulation installed in masonry cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Polyisocyanurate foam-plastic board insulation.
2. Mineral-wool blanket insulation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

- B. Research Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

- B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

- A. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Roofing Corporation.
 - b. Carlisle Coatings & Waterproofing Inc.
 - c. Firestone Building Products.
 - d. Hunter Panels.
 - e. Johns Manville; a Berkshire Hathaway company.
 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 MINERAL-WOOL BLANKET INSULATION

- A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Rockwool International.
 - c. Thermafiber, Inc.; an Owens Corning company.
 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.

2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
 - 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
 - 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Crawl spaces.
 - b. Ceiling plenums.
 - c. Attic spaces.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.
 - b. Gemco.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION **07 21 00**

SECTION 07 27 15 - NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Self-adhering, vapor-permeable, nonbituminous sheet air barriers.

1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will select and Contractor must engage a qualified testing agency to perform preconstruction testing on field mockups.
- B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
 1. Adhesion Testing: Mockups will be tested for required air-barrier adhesion to substrate according to ASTM D 4541.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
1. Protect substrates from environmental conditions that affect air-barrier performance.
 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 NONBITUMINOUS SHEET AIR BARRIER

- A. Vapor-Permeable Nonbituminous Sheet: Minimum 20-mil- thick, self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side and formulated for application with primer that complies with VOC limits.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cosella-Dorken Products, Inc.; Delta-Vent SA.
 - b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Perm-A-Barrier VPS.
 - c. VaproShield LLC; .
 2. Physical and Performance Properties:

- a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
- b. Puncture Resistance: Minimum 40 lbf; ASTM E 154/E 154M.
- c. Vapor Permeance: Minimum 15 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
- d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541 as modified by ABAA.
- e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- f. UV Resistance: Can be exposed to sunlight for 50 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
 - 1. Low-Emitting Materials: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 - 3. Verify that substrates are visibly dry and free of moisture.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 INSTALLATION

- A. Install materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
- B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic.
- C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
- D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
 - 1. Apply sheets in a shingled manner to shed water.
 - 2. Roll sheets firmly to enhance adhesion to substrate.

- E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.
- F. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch- wide, transition strip.
- G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- H. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
 - 1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
- I. Connect and seal exterior wall air-barrier sheet continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- J. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.
- K. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- L. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- M. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.
- N. Do not cover air barrier until it has been tested and inspected by testing agency.
- O. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Owner will select adn Contractor must engage a qualified testing agency to perform tests and inspections.

- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
1. Continuous structural support of air-barrier system has been provided.
 2. Site conditions for application temperature and dryness of substrates have been maintained.
 3. Maximum exposure time of materials to UV deterioration has not been exceeded.
 4. Surfaces have been primed.
 5. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
 6. Termination mastic has been applied on cut edges.
 7. Air barrier has been firmly adhered to substrate.
 8. Compatible materials have been used.
 9. Transitions at changes in direction and structural support at gaps have been provided.
 10. Connections between assemblies (air barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 11. All penetrations have been sealed.
- D. Tests: As determined by testing agency from among the following tests:
1. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.
- E. Air barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 2. Remove and replace deficient air-barrier components for retesting as specified above.
- F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- G. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION **07 27 15**

SECTION 07 54 23 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Induction welded thermoplastic polyolefin (TPO) roofing system.
2. Induction fastening system for (TPO) membrane roofing.
3. Accessory roofing materials.
4. Substrate board.
5. Air barrier
6. Roof insulation.
7. Insulation accessories and cover board.
8. Electronic leak detection (ELD) materials.
9. Walkways.

- B. Section includes installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 05 31 00 "Steel Decking."

- C. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 07 21 00 "Thermal Insulation" for insulation beneath the roof deck.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 22 14 23 "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with COR, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.
- B. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with the Contracting Officer's Representative (COR), FAA's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.
 10. Review mitigation procedures for noise and fumes.

1.5 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate odor aspects during installation, and to set quality standards for materials and execution.

1. Build mockup of typical Roof area on the ground away from the facility.
2. Build mockups 48 inches by 48 inches.
 - a. Include each type of building face connections.
 - b. Include each type of roof edge condition.
 - c. Include typical roof penetrations.
 - d. Use of all adhesives, cleaners, primers, sealants, or any other liquid chemical product (must be applied while observed by the COR).
3. Review the mockup directly after each material is installed with COR and roofing system manufacturer's representative to ensure odor levels are acceptable to the COR.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless COR specifically approves such deviations in writing.
6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Product Data: For adhesives and sealants, including VOC content information.
 2. Safety Data Sheets: For each material used.
 3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
 4. Induction fastening system: Installation instructions.
 5. Work Plan: Describing methods of installation, daily schedule, mitigation of fumes, mitigation of noise, layout areas, roof loading, material storage, temporary protection, site cleaning, tool storage, and other aspects of the project. This plan will be reviewed as part of the pre-installation conference.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 1. Layout and thickness of insulation.
 2. Base flashings and membrane termination details.
 3. Flashing details at penetrations.
 4. Tapered insulation layout, thickness, and slopes.
 5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
 6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 7. Tie-in with adjoining air barrier.
- C. Samples for Verification: For the following products:
 1. Roof membrane and flashings, of color required.

2. Walkway pads or rolls, of color required.
- D. Wind Uplift Resistance Submittal: For roofing system, signed and sealed by Registered Engineer licensed in the jurisdiction, showing calculations, FM Roofing System Designation, and indicating compliance with wind uplift performance requirements. Calculations should be done according to FM standards and include the following:
1. Roof Windspeed based on the local meteorological data and standard speed listed for the area in the ASCE 7.10.
 2. Zone calculation breakdown for all areas in the following format:
 - a. Zone 1 (Roof Area Field): Listed in lbf/sq.
 - b. Zone 2 (Roof Area Perimeter): Listed in lbf/sq.
 - 1) Location: Dimension from roof edge to inside roof edge.
 - c. Zone 3 (Roof Area Corners): Listed in lbf/sq.
 - 1) Location: The dimension in each direction from each building corner.
 3. Summary confirming that the standard roof meeting Fire/Windstorm Classification of Class 1A-90 will exceed the requirements. If the calculations indicate the Class 1A-90 would be exceeded then they should confirm the Class 1A-135 will meet the requirements. If the calculations confirm that both of the standard roofs are exceeded then a recommendation of a system to meet the requirements should be described along with the classification for COR approval.
- E. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.Roofing Maintenance Program Submittal: For Roofing Maintenance Program, documentation indicating program and term compliance including but not limited to the following:
1. Name, address, and contact information for roof consultant.
 2. Proposed Roofing Maintenance Program.
 3. Sample Contract: for Roofing Maintenance Program

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Manufacturer Certificates:
1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
- D. Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Field Test Reports:
 1. Concrete internal relative humidity test reports.
 2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
- F. Field quality-control reports.
- G. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.
- B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.
- C. Warranty Card: For roofing system to post in building at roof access.
 1. Remove old and outdated warranty cards.
 2. Install new warranty card at location directed by the COR.
 3. The warranty card shall include the following information at a minimum:
 - a. Manufacturer.
 - b. Manufacturer contact information.
 - c. Type of roof.
 - d. FM System Number.
 - e. Date of installation.
 - f. Warranty numbers if applicable.
 - g. Roof installer.
 - h. Roof installer contact information.
- D. The complete set of executed warranties as listed below in "Warranty" Paragraph.

1.9 QUALITY ASSURANCE

- A. Qualifications:

1. Manufacturers: A qualified manufacturer that is UL listed and listed in FM Approvals' RoofNav for roofing system identical to that used for this Project. The Manufacturer's Field Representative shall be onsite a minimum of three visits (beginning, middle, and end of each roof installation) to ensure the product is capable of warranty when complete.
 2. Installers: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty. The firm shall employ persons trained to operate induction fastening system for installation of thermoplastic membrane roofing.
 3. Inspector: Provide qualifications of a roofing consultant who shall be responsible for roofing system inspections to insure a quality installation. Inspector shall be an independent testing professional with a minimum 5 years' experience in similar project size, complexity and system to conduct testing indicated certified (by NRCIA, HAAG or other certifying organization specializing in roof inspector training). This inspector shall be present onsite a minimum of once a week during the roof installation process as scheduled by the General Contractor with approval by the COR. This should include the initial start of installation for each layer of material for the system.
- B. The Owner will select and the Contractor shall must engage the testing agency which employs the independent inspector with qualifications listed above. The Contractor is responsible for scheduling regular inspections during the application of the roofing materials and cover associated costs of the inspections.
- 1.10 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
 - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 - C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
 - D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.11 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, substrate board, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.
3. This warranty has no monetary limit for labor and materials during the time period indicated below.
4. This warranty should cover any damages occurring for the standard windspeed design criteria for the individual site as calculated by the Contractors Engineer.

- B. Puncture Resistance Warranty: In addition to Special Warranty, Contractor agrees to repair and replace all or part of components of membrane roofing system caused by accidental punctures.

1. This warranty has no monetary limit for labor and materials during the time period indicated below.
2. Warranty Period: 20 years from date of Substantial Completion.

- C. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings to remain watertight.

1. Accelerated Weathering: Roof to withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

2. Impact Resistance: Roof membrane to resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and are listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
 1. Fire/Windstorm Classification: Class 1A-135.
 2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.
- D. ENERGY STAR Listing: Roofing system to be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low -slope roof products.
- E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, fabric-backed TPO sheet.
 1. Manufacturers: Subject to compliance with requirements, provide Johns Manville; a Berkshire Hathaway company; JM TPO – 80 MIL or provide comparable products by one of the following
 - a. Firestone Building Products.
 - b. GAF.
 - c. Johns Manville; a Berkshire Hathaway company.
 2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
 3. Thickness: 80 mils, nominal.
 4. Exposed Face Color: White.
 5. Must be compatible with electromagnetic induction welding fastening system.

2.3 ACCESSORY ROOFING MATERIALS

- A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction if local jurisdiction requirements exceed those listed below.
2. Adhesives and sealants shall comply with the following limits for VOC content:
 - a. Contact Adhesives: 50 g/L.
 - b. Other Adhesives: 50 g/L.
 - c. Single-Ply Roof Membrane Sealants: 50 g/L.
 - d. Nonmembrane Roof Sealants: 50 g/L.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard, water based.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Fasteners: Factory-coated steel fasteners and induction welding plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
 1. Secures roof materials to 22-gauge minimum steel deck.
 - a. Steel deck penetration: 3/4" minimum.
 - b. Composite Deck penetration: 1 1/2" minimum.
 - c. Reinforced concrete deck penetration: 1 1/2" minimum.
 2. Head: #3 Phillips truss head.
 3. Diameter: 0.435 inch.
 4. Thread Diameter: 0.275 inch.
 5. Shank Diameter: 0.202 inch.
 6. Length: Sufficient length to penetrate steel deck at top flute the recommended depth.
 7. Drill point: Heat treated.
- G. Induction Welding Plate
 1. Secures roof insulation and TPO membrane roofing.
 2. Type: Use TPO-Type
 3. Plates: Coated with membrane formulated for TPO membrane roofing by membrane manufacturer.
 4. Color: Gold.
 5. Diameter: 3 inches.
 6. Thickness: 22 gauge.
 7. Material: Coated Galvalume.
 8. Coating Corrosion Resistance: Meets FM Approval Standard 4470 criteria.
 9. Profile: Recessed center and raised flat bonding surface.
 10. FM approved.

- H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 TOOLS

- A. Induction Welding Tools: One of the following may be used with the TPO Roofing Membrane Manufacturer's approval:

1. Rhinobond Induction Welding Tool.
2. Isoweld 300 Induction Welding Tool.

- B. Requirements:

1. Description: Portable, electromagnetic induction welder that bonds underside of thermoplastic membrane roofing to top of coated plates using microprocessor-controlled, electromagnetic induction welding.
2. Typical Weld Time: Approximately 5 seconds per plate, depending on ambient temperature, membrane roofing thickness, and power source.
3. Power: 5,000 Watt generator minimum, 110 to 125 V, 60 Hz, stable energy source.
4. Power Cord: 12 gauge, 100 feet maximum power cord.
5. Magnetic cooling clamps.

2.5 SUBSTRATE BOARD

- A. Glass-Mat Gypsum Roof Substrate Board: ASTM C1177/C1177M, water-resistant gypsum board.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Certainteed; SAINT-GOBAIN.
 - b. Georgia-Pacific Gypsum LLC.
 - c. National Gypsum Company.
 - d. USG Corporation.
2. Thickness: Type X, 5/8 inch thick.
3. Surface Finish: Unprimed.
4. Tape: Pressure-sensitive tape of type recommended by the substrate board manufacturer for sealing joints and penetrations in the substrate board.
5. Closed foam backer rod for larger gaps.

2.6 AIR BARRIER

- A. Refer to Section 07 27 15 "Nonbituminous Self-Adhering Sheet Air Barriers" For application of air barrier.

2.7 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Roofing Corporation - Polyiso.
 - b. Carlisle SynTec Incorporated.
 - c. Certainteed; SAINT-GOBAIN.
 2. Compressive Strength: 25 psi.
 3. Size: 48 by 96 inches.
 4. Thickness:
 - a. Base Layer: 1-1/2 inches.
 - b. Upper Layer: as required to meet listed R-Value.
 - c. Refer to section 07 21 00 "Thermal Insulation"
- B. Tapered Insulation: Provide factory-tapered insulation boards.
1. Material: Match roof insulation.
 2. Minimum Thickness: 1/4 inch.
 3. Slope:
 - a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.8 INSULATION ACCESSORIES AND COVER BOARD

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

- C. Induction-Welding Plates: Minimum 3-inch diameter with recessed center, 0.034-inch thick, aluminum-zinc-alloy-coated steel plates, factory-coated with adhesive formulated for roof membrane, with corresponding corrosion-resistant fasteners and thermal isolation spacers below plates.
- D. Glass-Mat Gypsum Cover Board: ASTM C1177/C1177M, water-resistant gypsum board.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Certainteed; SAINT-GOBAIN.
 - b. Georgia-Pacific Gypsum LLC.
 - c. National Gypsum Company.
 - d. USG Corporation.
 - 2. Thickness: 5/8 inch.
 - 3. Surface Finish: Fiberglass facer.

2.9 ELECTRONIC LEAK DETECTION (ELD) MATERIALS

- A. Conductive Medium: Materials providing less than 10^4 ohms per square as determined in accordance with ASTM D4496 and approved by roof membrane manufacturer.
 - 1. Grounding Screen: Welded, stainless steel mesh, for use with vector mapping system.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ILD International Leak Detection.

2.10 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
 - 1. Size: Approximately 36 by 60 inches.
 - 2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
 - 1. Submit test result within 24 hours after performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.
- D. Install sound-absorbing insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.
- D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 07 27 15 "Nonbituminous Self-Adhering Sheet Air Barriers."

3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
 - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 - 2. Tightly butt substrate boards together.
 - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 4. Loosely lay substrate board over roof deck.

3.5 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
 - 1. Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows.
 - a. Locate end joints over crests of decking.
 - b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.

- g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Loosely lay base layer of insulation units over substrate.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Loosely lay each layer of insulation units over substrate.
 - 3.

3.6 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 3. Cut and fit cover board tight to nailers, projections, and penetrations.
- B. Mechanically Fastened Cover Board: Secure to deck using mechanical fasteners specifically designed and sized for fastening the specified cover board and roof insulation to the deck type.
 1. Fasten cover board to top flanges of steel deck according to recommendations in FM Approvals' "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification to resist uplift pressure at corners, perimeter, and field of roof.

2. Fasteners should penetrate the cover board, insulation layers, vapor barrier (if present) the substrate board and into roof decking material as follows:
 - a. Steel deck penetration: 3/4" minimum.
 - b. Composite Deck penetration: 1 1/2" minimum.
 - c. Reinforced concrete deck penetration: 1 1/2" minimum.
3. Induction welded plates for membrane.
 - a. Place plates in grid pattern on roof insulation in accordance with thermoplastic membrane roofing section.
 - b. Install required number of plates and fasteners per 4-foot by 8-foot insulation/cover board or over purlins to achieve membrane roofing manufacturer's required FM rating.
 - c. Install plates in straight rows in at least 1 direction in accordance with membrane roofing manufacturer's prescriptive fastening patterns for roof field, perimeter, and corners. Plates may need to be adjusted slightly in order to hit top flutes of roof deck.
 - d. Secure plates in accordance with membrane roofing manufacturer's instructions using specified fasteners and in accordance to roofing manufacturer's prescriptive fastening patterns for roof field, perimeter, and corners.
 - e. Do not overdrive fasteners on plates.
 - f. Install plates and fasteners tight and flat to roof insulation with no dimpling of insulation board, or cover board surface.

3.7 INSTALLATION OF ELD COMPONENTS

- A. Install conductive medium over cover board in accordance with manufacturer's written instructions.
- B. Install sensors, conductive fabric, connections, and accessory items required for complete system in accordance with manufacturer's written instructions.
- C.

3.8 INSTALLATION OF INDUCTION-WELDED ROOF MEMBRANE

- A. Unroll roof membrane over cover board and allow to relax before installing.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel and the testing and inspection agency.
- C. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer, with side laps shingled with slope of roof deck where possible.
- D. Seams: Clean seam areas, overlap roof membrane, and hot-air-weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity.
 2. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- E. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.
- F. Induction-weld roof membrane to plates in accordance with roofing system manufacturer's written instructions, creating 100 percent bond between underside of membrane and top of plates; a partial bond is unacceptable.
1. Test welds to verify adhesion of roof membrane to top of plates in accordance with membrane manufacturer's instructions.

3.9 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.10 INSTALLATION OF WALKWAYS

- A. Flexible Walkways:
1. Install flexible walkways at the following locations:
 - a. Perimeter of each rooftop unit.
 - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - d. Top and bottom of each roof access ladder.
 - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
 - f. Locations indicated on Drawings.
 - g. As required by roof membrane manufacturer's warranty requirements.

2. Provide 6-inch clearance between adjoining pads.
3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
- 4.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: OEngagewner will select and Contractor must engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, Substrate board installation and sealing, vapor retarder (if required), insulation installation, cover board installation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports with photographs of work in progress and nonconformance issues weekly to the COR.
- B. Perform the following tests:
 1. Low-Voltage ELD Testing: Testing agency surveys entire roof area and flashings to locate discontinuities in the roof membrane using low-voltage horizontal membrane scanning or vertical membrane scanning in accordance with ASTM D8231.
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency to prepare survey report indicating locations of initial discontinuities, if any.
 2. High-Voltage Membrane Testing: Testing agency surveys entire roof area, flashings, and parapet walls to locate discontinuity in the roof membrane using an electrically charged metal "broom head."
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency to prepare survey report indicating locations of initial discontinuities, if any.
 3. Weld Tests:
 - a. Test welds to determine adhesion of underside of membrane roofing to top of plates.

- b. Test welds in accordance with membrane roofing manufacturer's instructions.
 - c. Notify COR of welds that do not have optimal bond.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of COR, and to prepare inspection report.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.
- F. Roofing Maintenance Program: Retain third-party roof consultant to perform visual inspections, housekeeping, preventative maintenance, cleaning, leak repair services, and retesting of the roof for a period of two years after Substantial Completion. Roof Maintenance Program to be included in project cost and schedule.
- 1. Roof consultant to be escorted while on-site. Escort to be coordinated with COR.
 - 2. Roof consultant to perform bi-annual visual inspections, housekeeping, and preventative maintenance.
 - a. One service is to be performed during the spring and one service to be performed during the fall. Service dates are to be coordinated with COR.
 - b. Roof consultant to perform up to one additional visual inspection in the event of severe weather with potential to damage the roofing.
 - 3. Visual Inspections: The roof consultant should make a complete visual survey of the roof of the existing conditions and record the findings in a report to the COR. The inspection shall include but is not limited to the following:
 - a. Debris left on the roof.
 - b. Roof mounted equipment.
 - c. Physical damage to the roof membrane to include:
 - 1) Punctures.
 - 2) Tearing of the membrane.
 - 3) Cracking.
 - 4) Surface wear condition.
 - 5) Blisters or fishmouths at the seams.
 - 6) Ponding or other issues with drainage.
 - d. Flashing conditions.
 - e. Sealant conditions.
 - f. Seam conditions.
 - g. Termination conditions.
 - h. Walkway condition.
 - i. Equipment curbs, vents, and other mechanical related penetrations.
 - j. Parapet walls and caps. Edge stops and fascia conditions.
 - k. Roof drains and/or gutter and downspout conditions.

1. Fall arrest anchors, ladders, railings, and other safety related equipment.
- m. Underside of structural roof deck.
- n. Adjacent trees or other foliage that could damage roofing system.
- o. Representative photographs of existing conditions and findings.
- p. Recommendations for additional maintenance and repair to be performed.
4. Housekeeping: The roof consultant should remove foreign material and/or items from the membrane that could cause damage to the membrane, leaving the roof with a neat and clean appearance. The housekeeping shall include but is not limited to the following:
 - a. Removing incidental debris from roofing system.
 - b. Removing loose organic matter from the membrane surface, drains, gutters, and downspouts.
 - c. Removing tree branches and leaves from the membrane surface, drains, gutters, and downspouts.
5. Preventative Maintenance: The roof consultant should perform minor preventative maintenance services. Preventative maintenance shall include but is not limited to:
 - a. Repairing splits in flashing assemblies.
 - b. Repairing minor splits and holes in membrane.
 - c. Replacing damaged sealants.
6. Cleaning: The roof consultant should clean membrane within three months of the end of the two year period. Cleaning methods shall be approved by the manufacturer of the roof membrane so as not to void the Warranty. Cleaning shall include but is not limited to:
 - a. Removing embedded dirt and other embedded organic matter from membrane and flashing in compliance with Warranty.
7. Leak Repair Services: The roof consultant should advise and provide recommended corrective measures for roof leaks not corrected under the Warranty. The roof consultant shall correct roof leaks not corrected under the Warranty at an additional cost to the FAA.
8. Retesting: The roof consultant should retest the roof annually.
 - a. Retesting dates are to be coordinated with COR.
 - b. Retesting of the roof shall include Infrared Thermography test listed above and if necessary the Electrical Capacity/Impedance Test.
 - c. If the testing indicates leaks, the repairs are to be made in accordance with the Warranty documents.
9. Follow-On Roofing Maintenance Program: Provide a proposal for a third-party roof consultant to perform visual inspections, housekeeping, preventative maintenance, cleaning, leak repair services, and retesting of the roof as described in the Roofing Maintenance Program for a period of five years after completion of the initial Roofing Maintenance Program.

- a. Cleaning: The roofing maintenance consultant should clean membrane twice during the five year period. Cleaning dates are to be coordinated with COR.

3.12 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to COR and FAA.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION **07 54 23**

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SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetrations flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates if applicable.
 - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Color: As selected by COR from Manufacturer's full range.
- B. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
 - 2. Finish: ASTM A480/A480M, No. 4 (polished directional satin).
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2.3 UNDERLayment MATERIALS

- A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Source Limitations: Obtain underlayment from single source from single manufacturer.
2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 2. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams:
1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.6 WALL SHEET METAL FABRICATIONS

Retain paragraphs in this article to suit Project. Although the most common fabrications are included, insert descriptions of others if required.

Examples of locations for continuous through-wall flashing include under masonry copings, at story-height shelf angles, and at sills and lintels of horizontal ribbon windows. Examples of locations for discontinuous through-wall flashing include sills and lintels for punched windows, doors, louvers, and wall-penetrating construction. Base-metal thicknesses cited for copper sheets, for copper-clad stainless steel sheet, and for zinc sheet are from manufacturer's literature.

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-(2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
1. Stainless Steel: 0.0156 inch thick.

Retain "Opening Flashings in Frame Construction" Paragraph below for nonmasonry-clad wood or cold-formed steel-framed walls. Claddings may include exterior insulation and finish systems (EIFS), siding, wood shingles, or shakes. Flashing is usually required to surround wall-opening components such as windows, doors, and louvers.

- B. Wall Expansion-Joint Cover: Fabricate from the following materials:
1. Aluminum: 0.040 inch thick.
 2. Stainless Steel: 0.0188 inch thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

Retain paragraphs in this article to suit Project. Although the most common fabrications are included, insert descriptions of others if required. Base-metal thicknesses cited for copper sheets and for copper-clad stainless steel sheet are from manufacturer's literature.

- A. Equipment Support Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.0188 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLayment

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
1. Lap joints not less than 2 inches.

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of .
 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 8. Do not field cut sheet metal flashing and trim by torch.
 9. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
 - a. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F.

3.4 INSTALLATION OF ROOF FLASHINGS

- A. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Lap counterflashing joints minimum of 4 inches.

3.5 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.6 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.8 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION **07 62 00**

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Copings.
2. Reglets and counterflashings.

- B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
3. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

- C. Preinstallation Conference: Conduct conference at Project site.

1. Meet with COR, COR's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 4. Detail termination points and assemblies, including fixed points.
 5. Include details of special conditions.
- C. Samples: For each type of roof specialty and for each color and texture specified.
- D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- E. Samples for Verification:
1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
 2. Include copings made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of roof specialty.
- C. Product Test Reports: For copings, for tests performed by a qualified testing agency.
- D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are SPRI ES-1 tested to specified design pressure.
- B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section 07 54 23 "THERMOPLASTIC POLYOLEFIN (TPO) ROOFING".
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.
 1. Build mockup of typical roof edge as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 07 54 23 "THERMOPLASTIC POLYOLEFIN (TPO) ROOFING".
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. FM Approvals' Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-105. Identify materials with FM Approvals' markings.
- D. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures:
 1. Design Pressure: As indicated on Drawings.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet , concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Architectural Products Company.
 - b. ATAS International, Inc.
 - c. Berridge Manufacturing Company.
 - d. Castle Metal Products.
 - e. Cheney Flashing Company.
 - f. Hickman Company, W. P.
 - g. Metal-Era, Inc.

- h. SAF (Southern Aluminum Finishing Company, Inc.).
2. Formed Aluminum Sheet Coping Caps: Aluminum sheet, thickness as required to meet performance requirements.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Three-coat fluoropolymer.
 - c. Color: As indicated on Drawings.
3. Corners: Factory mitered and .
4. Coping-Cap Attachment Method: face leg hooked to continuous cleat with back leg field formed hook to continuous cleat, fabricated from coping-cap material.
 - a. Face-Leg Cleats: Concealed, continuous stainless steel.

2.3 REGLETS AND COUNTERFLASHINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Cheney Flashing Company.
 2. Fry Reglet Corporation.
 3. Heckmann Building Products, Inc.
 4. Hickman Company, W. P.
 5. Keystone Flashing Company, Inc.
 6. Metal-Era, Inc.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
 1. Formed Aluminum: 0.050 inch thick.
 2. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
 1. Formed Aluminum: 0.032 inch thick.
- D. Accessories:
 1. Counterflashing Wind-Restrain Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- E. Aluminum Finish: Two-coat fluoropolymer.
 1. Color: As selected by Architect from manufacturer's full range.

2.4 MATERIALS

- A. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

2.5 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Residential; a division of Carlisle Construction Materials.
 - b. GCP Applied Technologies Inc.
 - c. Henry Company.
 - d. Owens Corning.
 - e. Protecto Wrap Company.
 2. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 deg F.
 3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F.

2.6 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
1. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- B. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Coil-Coated Aluminum Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply continuously under reglets and counterflashings.
 - 2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

3.3 INSTALLATION, GENERAL

- A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 INSTALLATION OF COPINGS

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with field interlock at manufacturer's required spacing that meets performance requirements.

3.5 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

- A. Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION **07 71 00**

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SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Roof curbs.
2. Roof hatches.

1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.
 1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.
- D. Delegated-Design Submittal: For roof curbs indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 1. Size and location of roof accessories specified in this Section.
 2. Method of attaching roof accessories to roof or building structure.
 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design roof curbs and equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Curbs Plus, Inc.
 - b. Kingspan Light + Air, North America.
 - c. Roof Curb Systems.
 - d. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch thick.
- D. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 - 3. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.

4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.
9. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
10. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 ROOF HATCHES

- A. Roof Hatches: Metal roof-hatch units with lids and insulated single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Babcock-Davis.
 - b. BILCO Company (The).
 - c. Nystrom, Inc.
- B. Type and Size: Single-leaf lid, .
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Aluminum sheet.
 1. Thickness: Manufacturer's standard thickness for hatch size indicated.
 2. Finish: Two-coat fluoropolymer.
 3. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
 1. Insulation:
 - a. R-Value: 12.0 according to ASTM C1363.
 2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
 3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.

4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
 6. Fabricate curbs to minimum height of above roofing surface unless otherwise indicated.
- F. Hardware: Spring operators, hold-open arm, stainless steel spring latch with turn handles, stainless steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
1. Provide two-point latch on lids larger than 84 inches.
 2. Provide remote-control operation.
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Height: 42 inches above finished roof deck.
 2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
 3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
 4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
 5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
 6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
 8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
 9. Fabricate joints exposed to weather to be watertight.
 10. Fasteners: Manufacturer's standard, finished to match railing system.
 11. Ladder extension rail.
 12. Finish: Manufacturer's standard.
 - a. Color: As selected by COR from manufacturer's full range.

2.4 METAL MATERIALS

- A. Aluminum Sheet: ASTM B209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
1. Mill Finish: As manufactured.
 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
 3. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

4. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
 5. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
 6. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 7. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- B. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.
- C. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.
- D. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.
- E. Steel Tube: ASTM A500/A500M, round tube.
- F. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.
- G. Steel Pipe: ASTM A53/A53M, galvanized.

2.5 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.
- C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

2. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
- E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- F. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- G. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install roof accessories according to manufacturer's written instructions.
 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

- B. Roof Curb Installation: Install each roof curb so top surface is level.
- C. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- D. Roof-Hatch Installation:
 - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 2. Attach safety railing system to roof-hatch curb.
 - 3. Attach ladder-assist post according to manufacturer's written instructions.
- E. Seal joints with elastomeric butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.
- B. Clean off excess sealants.
- C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION **07 72 00**

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Joint-Sealant Schedule: Include the following information:
 1. Joint-sealant manufacturer and product name.
 2. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 1. Joint-sealant location and designation.
 2. Manufacturer and product name.
 3. Type of substrate material.
 4. Number of samples required.

- D. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

- B. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by COR.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify COR seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 - 1. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
- C. Colors of Exposed Joint Sealants: As indicated on Drawings.

2.2 SILICONE JOINT SEALANTS JS-2, JS-6, JS-3, JS-1 (JS-# is a joint system, refer to Part 3 for Joint Sealant Schedule, typical).

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, Basis of Design; Sika Corporation U.S.; Sikasil WS-295 or provide one of the following:
 - a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 265 LTS.
 - b. Sika Corporation U.S.; Sikasil WS-295 Sikasil WS-295 FPS.
- B. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 100/50, Uses T and NT.

2.3 POLYSULFIDE JOINT SEALANTS

- A. Polysulfide, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:

- a. W.R. Meadows, Inc.; [Deck-O-Seal 125] [Deck-O-Seal 150].
- b. <Insert manufacturer's name; product name or designation>.

2.4 LATEX JOINT SEALANTS JS-5

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.5 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

PART 3 - EXECUTION

3.1 INSTALLATION OF JOINT SEALANTS

- A. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- B. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- C. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.2 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 - 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 - 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.3 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.4 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.5 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1.

1. Joint Locations:

- a. Control and expansion joints in brick pavers.
- b. Isolation and contraction joints in cast-in-place concrete slabs.
- c. Joints between different materials listed above.
- d. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, M, P, 50, T, NT.

- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-2.

1. Joint Locations:

- a. Construction joints in cast-in-place concrete.
- b. Control and expansion joints in unit masonry.
- c. Joints between metal panels.
- d. Joints between different materials listed above.
- e. Perimeter joints between materials listed above and frames of doors and louvers.
- f. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.

- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-3.

1. Joint Locations:

- a. Isolation joints in cast-in-place concrete slabs.

- b. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, S, P, 50, T, NT.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-2.
- 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Vertical joints on exposed surfaces of unit masonry walls and partitions.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, S, NS, 50, NT.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement JS-5.
- 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Acrylic latex
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-7.
- 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls and floors.
 - b. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
- G. Joint-Sealant Application: Concealed mastics JS-8.
- 1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Butyl-rubber based.

END OF SECTION **07 92 00**

SECTION 11 81 29 - FACILITY FALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes fall-protection equipment including:

- 1. Guardrail Systems.

- B. Related Requirements:

- 1. Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing and trim components.

- C. References

- 1. ANSI A10.32 - Personal Fall Protection Used in Construction and Demolition Operations.
 - 2. ANSI Z359.1 - Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
 - 3. ASTM A123 / A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A747/A747M - Standard Specification for Steel Castings, Stainless, Precipitation Hardening.
 - 5. ASTM A36 - Standard Specification for Carbon Structural Steel.
 - 6. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 7. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 8. AWS D1.1/D1.1M - Structural Welding Code - Steel.
 - 9. CSA Z259.16 - Design of Active Fall Protection Systems.
 - 10. OSHA 1926.502 - Fall Prevention Systems and Criteria and Practices.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at the Project site.

1.4 ACTION SUBMITTALS

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

1. Include manufacturer's data and product information indicating descriptions, material, dimensions, capacities, and test certifications for fall-protection equipment.
- B. Shop Drawings:
1. Include plans, elevations, sections, and details.
 2. Include details of equipment assemblies.
 3. Include layout drawings for each system in relation to the supporting structure. Indicate locations of components.
- C. Samples: For each type of fall-protection equipment specified.
- D. Product Schedule: For fall-protection equipment. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For fall-protection equipment.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
1. Provide certified proof of Installer's approval by manufacturer.
- B. Welding certificates.
- C. Product Certificates: For each type of fall-protection equipment indicating manufacturer's batch number on each individual component used in systems specified.
- D. Material Test Reports: For each material, by a qualified testing agency.
- E. Product Test Reports: For each material, for tests performed by manufacturer and witnessed by a qualified testing agency.
- F. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fall-protection equipment to include the following:
1. Parts lists and maintenance requirements.
 2. Proper use of equipment for safe operation.
 3. Manufacturer's catalog data indicating sizes, descriptions, capacities, and test certifications.
- B. Record Documentation: Include Record Drawings in the operation and maintenance manual.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 years experience manufacturing similar products.
- B. Installer Qualifications: An entity with a minimum of 2 years' experience that employs installers and supervisors who are authorized, trained, and certified by manufacturer.
- C. Engineer for Delegated-Design Qualifications: Structural engineer licensed in the jurisdiction and experienced in engineering fall-protection systems.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- E. Mockups: Provide a mockup for evaluation to set quality standards for fabrication and installation.
 - 1. Build mockup of typical counterweighted rail segment as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original unopened packaging.
- B. Store materials in original protective packaging.
- C. Protect from soiling, moisture, and physical damage.

1.9 FIELD CONDITIONS

- A. Coordinate layout and installation of framing and reinforcements for fall-protection equipment.
- B. Maintain environmental conditions within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of fall-protection equipment that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: 20 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of fall-protection equipment from single source from single manufacturer.

2.2 DESCRIPTION

- A. Regulatory Requirements: Products to meet or exceed OSHA and ASME A 120.1, as tested and certified by professional engineer.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design fall-protection systems.

B. Capacities and Characteristics:

1. Capable of sustaining a maximum fall-arresting force of 1800 lbf when wearing a body harness with a factor of two without any permanent deformation and to 5000 lbf against fracture or detachment.

2.4 GUARDRAIL SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Bluewater Manufacturing, Inc.: counterweighted guardrail system or comparable product by one of the following:

1. Rooftop Anchor, Inc.
2. Safeguard Industries
3. KEE Safety Group
4. Garlock Safety
5. Flexible Lifeline Systems
6. Engineered Fall Protection

B. General Properties:

1. Compliance: OSHA compliant system.
2. Minimum Height: 42 inches above finished walking surface.
3. Pipe Railing Minimum Nominal Diameter: 1-1/4 inch.
4. Post Spacing: Not to exceed 96 inches.

5. Anchoring of posts and framing of members for rails to be such that the completed structure shall be capable of withstanding a load of at least 200 lb applied in any direction at any point on the top rail.
 6. Material:
 - a. Pipe: ASTM A 53.
 - b. Brackets: Cast iron, galvanized.
- C. Counterweighted Guardrails:
1. Guardrail Style: Modular Component.
 2. Vertical Height: 42 inches.
 3. Rail Length: 90 inches.
- D. Counterweighted Guardrail Base Accessory:
1. Material: Cast iron.
 2. Weight: 85 lb.
 3. Footprint: 94.72 sq. in. .
 4. Roof Pressure: 0.90 psi.

2.5 FABRICATION

- A. Shop Assembly: Guardrails, uprights, counterweights.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate location of fall-protection equipment indicated to be attached to structural substrate or surface of roofing system and furnish anchoring devices with templates and diagrams.

3.3 INSTALLATION

- A. Install according to approved Shop Drawings and manufacturer's instructions. Coordinate with work of other trades.

- B. Install anchorage and fasteners in accordance with manufacturer's recommendations to obtain the allowable working loads published in the product literature and in accordance with this specification.
- C. Exposed work shall be true to line and level with accurate angles, surfaces, and with straight square edges. Coordinate anchorage system with supporting structure.
- D. Do not load or stress system until materials and fasteners are properly installed and ready for service.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-certified installer to inspect components, assemblies, and equipment installations, including connections.
- B. Ensure that system components operate as specified.

3.5 ADJUSTING

- A. Adjust fall-protection components to function smoothly and safely.

3.6 CLEANING

- A. Clean components of any deleterious coatings or compounds. Remove loose materials, crating, and packing materials from Project site.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to demonstrate operation of system to Owner's maintenance personnel.
 - 1. Describe function, operation, and maintenance of each component.

3.8 TRAINING

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel on operation and maintenance of system.
 - 1. Provide minimum of two hours of training.
 - 2. Provide training at fall-protection installation site.
 - 3. Training to take place at the completion of the installation.

3.9 MAINTENANCE

- A. OSHA and ANSI/IWCA I 14.1 require that anchors first be certified and subsequently inspected on an annual basis. Coordinate with the manufacturer and local inspectors as required to maintain compliance.

END OF SECTION **11 81 29**

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SECTION 22 14 23 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Metal roof drains.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

- A. Cast-Iron, Large-Sump, General-Purpose Roof Drains :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. WATTS.
 - e. Zurn Industries, LLC.
2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 14-to 16-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Outlet: Bottom.

7. Outlet Type: No hub.
8. Extension Collars: Required.
9. Underdeck Clamp: Required.
10. Dome Material: Cast iron (NO SUBSTITUTIONS ALLOWED)..
11. Vandal-Proof Dome: Required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install roof drains at low points of roof areas in accordance with roof membrane manufacturer's written installation instructions.
 1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 2. Install expansion joints, if indicated, in roof drain outlets.
 3. Position roof drains for easy access and maintenance.

3.2 INSTALLATION OF FLASHING

- A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

END OF SECTION 22 14 23

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
1. Motor controllers.
 2. Torque, speed, and horsepower requirements of the load.
 3. Ratings and characteristics of supply circuit and required control sequence.
 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
B. Efficiency: Premium efficient, as defined in NEMA MG 1.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 23 05 13

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

PART 2 - PRODUCTS

2.1 DUCT LABELS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Brady Corporation.
- B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- E. Fasteners: Stainless-steel rivets or self-tapping screws.
- F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
 - a. Marking Services Inc.
- 2. Stencil Material: Fiberboard or metal.
- 3. Stencil Paint: Exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
- 4. Identification Paint: Exterior, acrylic enamel. Paint may be in pressurized spray-can form.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.

3.4 DUCT LABEL INSTALLATION

- A. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION **23 05 53**

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Balancing Air Systems:
 - a. Constant-volume air systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.4 FIELD CONDITIONS

- A. Full FAA Occupancy: FAA will occupy the site and existing building during entire TAB period. Cooperate with FAA during TAB operations to minimize conflicts with FAA's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- I. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 1. Equipment and systems to be tested.
 2. Strategies and step-by-step procedures for balancing the systems.
 3. Instrumentation to be used.
 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Ceilings are installed.
 - h. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
 1. Existing equipment: Existing air handling unit serving the Priority One Space must remain in operation at all times. Verify operation and confirm airflow rates of air handling unit prior to start of construction. At the completion of construction, confirm that air handling unit is providing same airflow to areas outside the project work area.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 23 33 00 "Air Duct Accessories."

3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation," Section 23 07 16 "HVAC Equipment Insulation," and Section 23 07 19 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Phase and hertz.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter size and thermal-protection-element rating.

3.5 CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:
 1. Confirm that the sequences of operation are in compliance with Contract Documents.
 2. Verify that controllers are calibrated and function as intended.
 3. Verify the operation of lockout or interlock systems.
 4. Verify the operation of valve and damper actuators.
 5. Verify that controlled devices are properly installed and connected to correct controller.
 6. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.

3.6 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
 1. Measure and record the operating speed, airflow, and static pressure of each fan.
 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 3. Check bearings and other lubricated parts for proper lubrication.

4. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
 1. Fans are clean.
 2. Bearings and other parts are properly lubricated.
 3. Deficiencies noted in the preconstruction report are corrected.

3.7 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent or minus 5.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.8 PROGRESS REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Fan curves.
 2. Manufacturers' test data.

3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. COR's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Fan drive settings including settings and percentage of maximum pitch diameter.
 - b. Settings for supply-air, static-pressure controller.
 - c. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of exhaust airflows.
 2. Balancing stations.
 3. Position of balancing devices.
- E. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.

- f. Arrangement and class.
- g. Sheave make, size in inches, and bore.
- h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

- a. Motor make, and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.
- f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
- g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm.
- b. Total system static pressure in inches wg.
- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Suction static pressure in inches wg.

3.10 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Contracting Officer's Representative.
- B. Contracting Officer's Representative shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 2. If the second final inspection also fails, FAA may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.

3. If the second verification also fails, Owner may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.11 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.

1.2 ACTION SUBMITTALS

A. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of all duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

B. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."
- D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
- E. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
 - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
 - 2. For ducts exposed to weather, construct of Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
 - 2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.

- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
 - 2. For ducts exposed to weather, construct of Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.

2.4 SEALANT AND GASKETS

- A. Two-Part Tape Sealing System:
 - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Tape Width: 4 inches.
 - 3. Sealant: Modified styrene acrylic.
 - 4. Water resistant.
 - 5. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
 - 6. Service: Indoor and outdoor.
 - 7. Service Temperature: Minus 40 to plus 200 deg F.
 - 8. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 - 9. Sealant shall be water based and have a VOC content of 50 g/L or less.
 - 10. Sealant shall comply with the testing and product requirements of the Virginia Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 11. Sealant shall comply with the testing and product requirements of the Virginia Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

12. Sealant shall comply with the testing and product requirements of the Virginia Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 13. Sealant shall comply with the testing and product requirements of the Virginia Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Flanged Joint Sealant: Comply with ASTM C 920.
1. Type: S.
 2. Class: 25.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.
- J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
- K. Elbows: Use long-radius elbows wherever they fit.
 - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
 - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- D. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR TYPE 1 COMMERCIAL KITCHEN GREASE HOOD EXHAUST DUCT

- A. Install ducts in accordance with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operation"; SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; and SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines" unless otherwise indicated.
- B. Install all ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- C. All ducts exposed to view shall be constructed of stainless steel as per "Duct Schedule" Article. All ducts concealed from view shall be stainless steel as per "Duct Schedule" Article.

- D. All joints shall be welded and shall be telescoping, bell, or flange joint as per NFPA 96.
- E. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

END OF SECTION **23 31 13**

SECTION 23 34 16 - CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Forward-curved centrifugal fans.

1.3 ACTION SUBMITTALS

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

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Certified fan performance curves with system operating conditions indicated.
4. Certified fan sound-power ratings.
5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
6. Material thickness and finishes, including color charts.
7. Dampers, including housings, linkages, and operators.

- B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Design Calculations: Calculate requirements for selecting vibration isolators [and seismic restraints] and for designing vibration isolation bases.
5. Submit disconnect switch and motor controller for equipment that complies with appropriate Division 26 specification sections.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Fan room layout and relationships between components and adjacent structural and mechanical elements, drawn to scale, and coordinated with each other, using input from installers of the items involved.

- B. Seismic Qualification Data: For fans, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity, and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For centrifugal fans to include in normal operation, emergency operation, and maintenance manuals with replacement parts listing.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Belts: 2 set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Centrifugal fans shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 2. Component Importance Factor: 1.0.

2.2 BACKWARD-INCLINED CENTRIFUGAL FANS

- A. Description:

1. Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans, consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.

- B. Housings:

1. Housing Material: Aluminum.
- C. Wheels:
 1. Wheel and Blade Material: Aluminum.
- D. Shafts:
 1. Statically and dynamically balanced, and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
 2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
 3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
- E. Belt Drives:
 1. Factory mounted, with adjustable alignment and belt tensioning.
 2. Service Factor Based on Fan Motor Size: 1.5.
 3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions. Provide fixed pitch pulleys for use with motors larger than 5 hp.
 4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
- F. Motor Enclosure: Totally enclosed, fan cooled .
- G. Accessories:
 1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
 2. Discharge Dampers: Assembly with parallel blades constructed of two plates formed around, and to, shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
 3. Inlet Screens: Grid screen of same material as housing.
 4. Disconnect Switch: Manual disconnect switch provided by manufacturer. Switch to comply with NEMA designation.
 5. Motor Starter: Belt driven fans supplied will be supplied with motor starter from manufacturer. Motor starter to comply with NEMA and IEC designation.
 6. Fans supplied with ECM motor will be supplied with HOA controller for auto and hand operation. Indoor mounted dial/switch to be provided with motor. Manufacturer to provide contacts for fan start/stop connection.

2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

2.4 SOURCE QUALITY CONTROL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

PART 3 - EXECUTION

3.1 INSTALLATION OF CENTRIFUGAL HVAC FANS

- A. Install centrifugal fans level and plumb.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.
- D. Unit Support: Install centrifugal fans level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts.
- E. Install units with clearances for service and maintenance.
- F. Label fans according to requirements specified in Section 23 05 53 "Identification for HVAC Piping and Equipment."

3.2 ELECTRICAL CONNECTIONS

- A. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- B. Provide disconnects and/or controllers to electrical contractor for equipment not integrally mounted in/on equipment per NFPA 70 and NECA 1.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.3 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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SECTION 23 35 33 - LISTED KITCHEN VENTILATION SYSTEM EXHAUST DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Listed grease ducts.

1.3 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for listed grease ducts.

- B. Shop Drawings: For listed grease ducts.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of hangers and seismic restraints.

PART 2 - PRODUCTS

2.1 LISTED GREASE DUCTS

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

1. Heat-Fab, Inc.
2. McGill AirFlow LLC.
3. Metal-Fab, Inc.
4. Schebler Co. (The).
5. Selkirk Corporation.
6. Sisneros Bros Mfg., LLC.
7. Van-Packer Company, Inc.

8. Ventilation Direct.
- B. Description: Factory-fabricated, -listed, and -labeled, double-wall ducts tested according to UL 1978 and rated for 500 deg F continuously, or 2000 deg F for 30 minutes; with positive or negative duct pressure and complying with NFPA 211.
- C. Construction: Inner shell and outer jacket separated by at least a 2-inch annular space filled with high-temperature, ceramic-fiber insulation.
 1. Inner Shell: ASTM A 666, Type 316 stainless steel.
 2. Outer Jacket: Stainless steel where concealed. Stainless steel where exposed.
- D. Accessories: Tees, elbows, increasers, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly. Include unique components required to comply with NFPA 96 including cleanouts, transitions, adapters, and drain fittings.
- E. Grease Duct Supports: Construct duct bracing and supports from non-combustible material.
 1. Design bracing and supports to carry static and seismic loads within stress limitations of the International Building Code.
 2. Ensure that bolts, screws, rivets and other mechanical fasteners do not penetrate duct walls.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. Comply with requirements in Section 07 72 00 "Roof Accessories."
- B. Coordinate connections to exhaust fans with requirements in Section 23 34 16 "Centrifugal HVAC Fans."
- C. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211 and UL 2221, whichever is most stringent.
- D. Install airtight personnel and maintenance access doors where indicated.

- E. Seal between sections of grease exhaust ducts according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- F. Connections: Make grease duct connections according to the International Mechanical Code.
 - 1. Grease duct to exhaust fan connections: Connect grease ducts to inlet side of fan using flanges, gaskets, and bolts.
 - 2. Grease duct to hood connections:
 - a. Make grease duct to hood joints connections using internal or external continuously welded or brazed joints.
 - b. Make watertight grease duct to hood joints connections using flanges, gaskets, and bolts.
- G. Support ducts at intervals recommended by manufacturer to support weight of ducts and accessories, without applying loading on kitchen hoods.
 - 1. Securely attach supports and bracing to structure.
- H. Grease Duct Enclosures: Comply with requirements of the International Building Code and ASTM E 2336.
- I. Repair damage to adjacent materials caused by listed kitchen ventilation system exhaust ducts installation.

END OF SECTION 23 35 33

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SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Copper building wire.**

1.2 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Product Schedule:** Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.**

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description:** Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
- 1. American Bare Conductor.**
 - 2. Okonite Company (The).**
 - 3. Southwire Company.**
 - 4. WESCO.**
- C. Standards:**
- 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.**
 - 2. Conductor and Cable Marking:** Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors:** Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 ASTM B496 for stranded conductors.

E. Conductor Insulation:

1. Type THHN Type THWN-2: Comply with UL 83.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. 3M Electrical Products.
 2. ABB (Electrification Products Division).
 3. Atkore International (AFC Cable Systems).
 4. Emerson Electric Co. (Automation Solutions - Appleton - O-Z/Gedney).
 5. Hubbell Incorporated (Hubbell Power Systems).

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
 1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
 1. Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
- B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION, GENERAL

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables to match facility existing conductors color coding requirement.

3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.7 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 1. Perform each of the following visual and electrical tests:
 - a. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.

- 3) Thermographic survey.
 - b. Inspect compression-applied connectors for correct cable match and indentation.
 - c. Inspect for correct identification.
 - d. Inspect cable jacket and condition.
 - e. Insulation-resistance test on each conductor for ground and adjacent conductors (phase to phase, phase to ground, phase to neutral) that are being reused or new in this project. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration. A resistance of 30 megohms or greater indicates an acceptable installation.
 - f. Continuity test on each conductor and cable.
 - g. Uniform resistance of parallel conductors.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
 1. Procedures used.
 2. Results that comply with requirements.
 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION **26 05 19**

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Support, anchorage, and attachment components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

- a. Slotted support systems, hardware, and accessories.
- b. Clamps.
- c. Hangers.
- d. Sockets.
- e. Eye nuts.
- f. Fasteners.
- g. Anchors.
- h. Saddles.
- i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70.
- B. Electrical components shall be listed and labeled by UL.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB (Electrification Products Division).
 - b. Atkore International (Allied Tube & Conduit).
 - c. Atkore International (Unistrut).
 - d. Eaton (B-line).
 - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 4. Channel Width: Selected for applicable load criteria 1-5/8 inch.
 - 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following :
 - 1) Eaton (B-line).
 - 2) Hilti, Inc.
 - 3) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
5. Toggle Bolts: Stainless steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 SELECTION

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 1. NECA NEIS 101
- B. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceway and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as scheduled in NECA NEIS 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size must be 1/4 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.

- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 2. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 3. To Light Steel: Sheet metal screws.
 4. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

3.3 PAINTING

- A. Touchup:
1. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION **26 05 29**

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT-S raceways and elbows.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type LFMC raceways.
4. Fittings for conduit, tubing, and cable.
5. Threaded metal joint compound.

B. Related Requirements:

1. Section 26 05 19 "Low-Voltage for Electrical Power Conductors and Cables".

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. EMT raceways and elbows
2. ERMC raceways, elbows, couplings, and nipples
3. Fittings for conduit and tubing

PART 2 - PRODUCTS

2.1 TYPE EMT-S RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 797 and UL Category Control Number FJMX.

B. Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit; Atkore International.
 - b. Calconduit; Atkore International.
 - c. Emerson Electric Co.
2. Material: Steel.

3. Options:

- a. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.2 TYPE ERMC-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 6 and UL Category Control Number DYIX.

B. Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit; Atkore International.
 - b. Calconduit; Atkore International.
 - c. Crouse-Hinds; Eaton, Electrical Sector.
 - d. Killark; Hubbell Incorporated, Construction and Energy.
 - e. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
 - f. Topaz Lighting & Electric.
2. Exterior Coating: Zinc.
3. Options:
 - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.3 TYPE LFMC RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 360 and UL Category Control Number DXHR.

B. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Products Division.
 - b. Anaconda Sealite; Anamet Electrical, Inc.
 - c. Electri-Flex Company.
2. Material: Steel.
3. Options:

- a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
- b. JM Eagle; J-M Manufacturing Co., Inc.
- c. NAPCO; Westlake Chemical Corp.

2.4 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. Fittings for Type ERMC, Type IMC, Type PVC, Type EPEC, and Type RTRC Raceways:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Products Division.
 - b. Crouse-Hinds; Eaton, Electrical Sector.
 - c. Southwire Company.
- 2. General Characteristics: UL 514B and UL Category Control Number DWTT.
- 3. Options:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling.

C. Fittings for Type EMT Raceways:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Products Division.
 - b. Allied Tube & Conduit; Atkore International.
 - c. Southwire Company.
- 2. General Characteristics: UL 514B and UL Category Control Number FKAV.
- 3. Options:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling.

D. Fittings for Type LFMC and Type LFNC Raceways:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Liquid Tight Connector Co.
- 2. General Characteristics: UL 514B and UL Category Control Number DXAS.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

A. Outdoors:

1. Exposed and Subject to Physical Damage: ERMC-S-G.
2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC .

B. Indoors:

1. Exposed and Subject to Severe Physical Damage: ERMC-S. Subject to severe physical damage includes the following locations:
 - a. Loading docks.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gyms.
 - e. Insert designations of applicable spaces or locations.
2. Exposed and Subject to Physical Damage: ERMC-S. Subject to physical damage includes the following locations:
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - b. Stub-ups to above suspended ceilings.
3. Exposed and Not Subject to Physical Damage: EMT.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: ERMC.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

C. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC and IMC: Provide threaded type fittings unless otherwise indicated.

3.2 SELECTION OF BOXES AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult COR for resolution of conflicting requirements.

B. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:

1. Provide cast-metal boxes.

2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult COR for resolution of conflicting requirements.
2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
3. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
6. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
7. Raceway Terminations at Locations Subject to Moisture or Vibration:
 - a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG. Install insulated throat metal grounding bushings on service conduits.

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.
2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
3. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch of changes in direction.
4. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
6. Support conduit within 12 inch of enclosures to which attached.
7. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.

8. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:
 - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - b. Conduit extending from interior to exterior of building.
 - c. Conduit extending into pressurized duct and equipment.
 - d. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - e. Where otherwise required by NFPA 70.
9. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
10. Keep raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
11. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
12. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types ERMC:
 - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
2. Types FMC, LFMC:
 - a. Comply with NEMA RV 3. Provide a maximum of 72 inch of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

D. Raceways Embedded in Slabs:

1. Do not embed threadless fittings in concrete unless locations have been specifically approved by COR.

E. Stub-ups to Above Recessed Ceilings:

1. Provide EMT or ERMC for raceways.
2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

F. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

1. EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.
2. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

G. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

3.4 INSTALLATION OF SURFACE RACEWAYS

A. Install surface raceways only where indicated on Drawings.

3.5 INSTALLATION OF BOXES AND ENCLOSURES

- A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
- B. Locate boxes so that cover or plate will not span different building finishes.
- C. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
- D. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
- E. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
- F. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

G. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
2. Provide gaskets for wallplates and covers.

3.6 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.7 CLEANING

- A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION **26 05 33**

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Install disconnects and/or controllers provided by mechanical contractor that are not integrally mounted in/on equipment per NFPA 70 and NECA 1.

B. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
B. NO: Normally open.
C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Current and voltage ratings.
2. Short-circuit current ratings (interrupting and withstand, as appropriate).
3. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. SIEMENS Industry, Inc.; Energy Management Division.
 - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty:
 - 1. Single throw.

2. Three pole.
3. 240 600-V ac.
4. 200 A and smaller
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. SIEMENS Industry, Inc.; Energy Management Division.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 240 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) a brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel).

- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by FAA or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify FAA COR no fewer than ten days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without FAA COR written permission.
 - 4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 4X.
 - 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.4 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

- A. Comply with the following requirements
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.
 - 3. Label and nameplate material, color, text size shall match existing and suitable for outdoor environment.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that the unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.
 - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.

- a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
 - i. Verify correct phase barrier installation.
 - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
2. Electrical Tests:
 - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
 - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.
 1. Test procedures used.
 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.

3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 26 28 16

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SECTION 26 41 13 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Work requires systematic removal and replacement of existing Lightning Protection System (LPS) by phased roof replacement, while maintaining the LPS in adjacent roof areas. Ultimately, the entire roof will be provided with a new LPS. New system will be tied into existing EES ground loop.
- B. Section includes lightning protection system for the following:
1. Ordinary structures.
 2. FAA Terminal Radar Approach Control Facilities (TRACON).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include the following:

1. Roof adhesive data.
2. Air terminal illustrations.
3. Cable termination components.

- B. Shop Drawings:

1. Include layouts of the lightning protection system, with details of the components to be used in the installation.
2. Include raceway locations needed for the installation of conductors.
3. Details of air terminals, conductor supports, splices, and terminations, including concealment requirements.
4. Include roof attachment details, coordinated with roof installation.
5. Calculations required by NFPA 780 for bonding of metal bodies.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lightning protection cabling attachments to roofing systems and accessories.

2. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
 3. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.
- B. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by nationally recognized testing laboratory (NRTL) or trade association. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Product Certificates: For each type of roof adhesive for attaching the roof-mounted air terminal assemblies, approved by the roofing-material manufacturer.
- D. Field quality-control reports indicating compliance with specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For lightning protection system to include in maintenance manuals.
- B. Completion Certificate:
 1. UL Letter of Findings Limited Scope Inspection Report.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is certified by the Lightning Protection Institute as a Master Installer/Designer to install lightning protection system.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled by an organization concerned with product evaluations and that can determine compliance with appropriate standards for the current production of listed items.
 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 2. Listing and Labeling Agency Qualifications: A NRTL as defined in OSHA Regulation 1910.7.
- C. Conform to NFPA 780.
- D. Conform to UL 96A.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. ERICO International Corporation.
 - 2. Harger Lightning & Grounding.
 - 3. Thompson Lightning Protection, Inc.
 - 4. Hubbell Burndy.

2.2 PERFORMANCE REQUIREMENTS

- A. NFPA Lightning Protection Standard: Comply with NFPA 780 requirements for Class II buildings.
- B. UL Lightning Protection Standard: Comply with UL 96A requirements for Class II buildings.
- C. Lightning Protection Components, Devices, and Accessories: Listed and labeled by a qualified testing agency as complying with UL 96, and marked for intended location and application.
- D. All equipment shall be new and of a design and construction to suit the application in accordance with UL 96A requirements. Bronze and stainless steel may be used for some components. Aluminum material shall not be contact with copper material and bimetal connector shall be used for interconnecting copper and aluminum.

2.3 MATERIALS

- A. Air Terminals:
 - 1. Solid Copper, bronze or Aluminum unless otherwise indicated. Copper air terminals may be nickel plated.
 - 2. 1/2-inch diameter for solid copper air terminals and 5/8-inch in diameter for solid aluminum air terminals.
 - 3. Minimum 12 inches in height.
 - 4. Rounded or bullet tip.
 - 5. Threaded base support.
- B. Air Terminal Bracing:
 - 1. Stainless steel.
 - 2. 1/4-inch diameter rod.

- C. All lightning protection system conductor, jumper, bonding conductor must be Class II conductors:
 - 1. Stranded Copper: 115,000 circular mils in diameter.
 - 2. Aluminum: 192,000 circular mils in diameter.
- D. Conductor Splices and Connectors: UL 467 and UL 96 listed irreversible compression type bonding connection.
 - 1. Hydraulic compression tool system shall be capable of producing a 12-ton minimum force applied with a tool using matching dies.
- E. Hardware: Hardware shall meet the following requirements:
 - 1. Fasteners: Roof and down conductors shall be fastened at intervals not exceeding 3 feet. Fasteners shall be of the same material as the conductor base material or bracket being fastened, or other equally corrosion resistant material. Galvanized or plated materials shall not be used.
 - 2. Fittings: Bonding devices, cable splices, and miscellaneous connectors shall be suitable for use with the installed conductor with exothermic weld. Bolt pressure connections of secondary conductors may be acceptable where indicated on drawings. Cast or stamped crimp type fittings shall not be used.
- F. Guards: Guards shall be provided for down conductors located in or next to driveways, walkways or other areas where they may be displaced or damaged. Guards shall extend to 6 feet above grade level, and 1 foot below grade level. Guards shall be schedule 40 PVC.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lightning protection components and systems according to UL 96A.
- B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees, nor shall it have a bend radius less than 8 inches (203 mm).
- C. Route down conductors outside of building facade in PVC conduit.
- D. Air terminals shall be secure against overturning either by attachment to the object to be protected, or by means of braces that are permanently and rigidly attached to the building.

- E. Metallic bodies, on or below roof level, that are subject to induced charges from lightning, include roof drains, plumbing vents, metal coping, metal flashing gutters, downspouts, small metal wall vents, door and window frames, metal balcony railings, any isolated metallic body within 6 feet of an exposed lightning protection system element. These metallic bodies shall be bonded to the lightning protection system using UL approved fittings. Bonding conductors used shall be Class II conductor.
- F. Install conductors exposed on building exterior. Comply with UL 96A requirements .
 - 1. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.
- G. Route down conductors outside of building facade in PVC conduit. Submit system plan which indicates exact location of down conductors, as well as intended equipment locations, to COR for approval prior to installation.

3.2 CONNECTIONS

- A. Above ground concealed connections shall be done by high-compression fittings listed for the purpose.
- B. Above ground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: UL 467 and UL 96 listed irreversible compression type bonding connections; parallel connector / clamp that provide uniform pressure along the surface cables. Connector's bolt shall not create pinch point that would deform the cable.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
- D. Below grade connections shall be done using exothermic weld.

3.3 CORROSION PROTECTION

- A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
- B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector and FAA to perform the final inspections and approval.
- B. Prepare test and inspection reports and certificates.

END OF SECTION 26 41 13



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