

PROJECT MANUAL



DENVER
INTERNATIONAL
AIRPORT

**Runway 7-25 Complex
Lighting and Pavement
Rehabilitation**

CONTRACT NO. 201737338

PART I

GENERAL REQUIREMENTS

Issued for Bid November 28, 2017

CITY & COUNTY OF DENVER
DEPARTMENT OF AVIATION

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SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY AND DESCRIPTION

- A. The Work specified in this contract consists of furnishing all management, supervision, labor, materials, tools, equipment, services, testing and incidentals for the construction of the Work indicated in the contract documents including lump sum items and unit price items.
- B. The Work in this Contract may affect operations at DEN. The Contractor shall bid, plan and execute the Work to minimize disruption of operations and inconvenience to the public.
- C. Change Notice:
 - 1. The Contractor will be required to submit a proposal for each Change Notice
 - 2. The Contractor shall submit a proposal for the complete scope of the Work within the specified duration identified by the Notice. Where there is no time requirement identified by the notice documents, the Contractor shall submit a proposal within 20 days of receiving the notice or as allowed in Title 11 - Changes in the Work, Contract Price, or Contract Time of the General Contract Conditions, 2011 Edition.
 - 3. The proposal could contain both competitive bid and estimated costs and shall adhere to the requirements of Title 11 of the General Contract Conditions.
 - 4. The Contractor shall not proceed on any change notice work until a change order is issued.
- D. Change Directives:
 - 1. The DEN Project Manager may issue Change Directive(s) for a Scope of Work. The Contractor shall keep all Time and Material record for any Change Directive(s) issued until a final settlement for the task is settled and finalized in a Change Order.
 - 2. The Contractor shall keep records and approvals for all Time and Material impacts of a Change Directive until a final settlement is reached and fully executed by the DEN Project Manager.
 - 3. The Contractor may invoice for a Change Directive in accordance with Title 11 of the General Contract Conditions, 2011 Edition.
- E. Guaranteed Maximum Price (GMP): For Contracts assigned as GMP the Contractor

shall follow the Special Conditions issued for the Contract.

- F. This Project will be administered using the current Project Information Management System (PMIS). The application will be supplied by DEN at no cost to the Contractor. DEN will provide PMIS training for up to two (2) of the contractor's personnel.
- G. The Contractor shall participate in a preconstruction coordination meeting and update the existing BIM Project Execution Plan or prepare a BIM Project Execution Plan if one does not exist based upon the DEN BIM Project Execution Plan (BXP) template included as provided by the DEN BIM group and the coordination meeting instructions.
- H. DEN utilizes several programs as part of the Asset Management System. Keeping accurate as-built record and operation and maintenance data are essential in the integrity and the validity of the airport operation. The Contractor is required to make every effort to keep the airport data informed, updated and accurate in the format required by DEN Project Manager:
 - 1. The Contractor shall provide and implement BIM Project Execution Plan based on the DEN BIM Project Execution Plan. The Contractor shall employ or contract a consultant to provide all the requirements to produce the Project model in the latest edition of the AutoCAD Civil 3D.
 - 2. The Contractor shall comply with all the requirements of DEN BIM Project Execution Plan and provide the data to DEN to produce the complete record of the BIM model of the Project
- I. Inspection Requirements:
 - 1. Special Inspection and Testing required by the building official or the Engineer of Record in the Contract Documents or in the Statement of Special Inspections will be performed by DEN contracted Agencies.
 - 2. Contractor shall subcontract Qualified Material Testing Agency(s) to perform all necessary Quality Control, processing control and any additional Testing required by the Contract Documents.
 - 3. DEN Quality Assurance Manager may audit all material tests performed by the Contractor Quality Control at any time. Testing and Inspections for structural elements not identified as special inspection will be performed by the Contractor Quality Control Program and Contractor Material Testing Agency and audited and confirmed by DEN Quality Assurance Manager. DEN will perform 100% visual inspection on all weldments. DEN will perform Quality Assurance testing at a frequency of approximately 10% of the Quality Control test and inspection frequencies. The testing frequencies by DEN may escalate to higher percentages and the Contractor will be responsible for all costs associated with failing tests of the same pay item elements. The Contractor may not hire the DEN contracted or testing agency in any capacity on this Project.
- J. DEN Quality Assurance will perform all quality assurance pull and adhesion tests on all airfield joint sealants. Contractor shall perform all quality control tests for the same items.
- K. DEN Quality Assurance is required to submit a letter indicating that all Work performed

on the project complies with all applicable codes. The Contractor shall make sure that all required test frequencies and all deficiencies has been corrected to comply with all applicable codes standards and the requirements of the Contract Documents.

1.3 WORK BY OTHERS AND FUTURE WORK

- A. Refer to Title 7 – Cooperation, Coordination and Rate of Progress of the General Contract Conditions, 2011 Edition

1.4 SITE CONDITIONS

- A. Refer to Title 14 – Site Conditions of the General Contract Conditions, 2011 Edition

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTOR'S DUTIES

- A. Refer to Title 3 – Contractor Performance and Services of the General Contract Conditions, 2011 Edition
- B. Execute the Work as specified and in a timely manner. Submit a schedule of Work that will be performed at times other than during the eight-hour working day of Monday through Friday, daylight hours. Submit this schedule five (5) working days prior to the beginning of Work to the DEN Project Manager for review and acceptance. Approval to work at night may be obtained after Contractor presents a written program outlining special precautions to be taken to control the extraordinary hazards presented by night work. That program shall include, but not limited to, supplementary lighting of work areas, availability of medical facilities, security precautions, and noise limitations.

3.2 COORDINATION

- A. Coordinate execution of the Work with those public utilities, governmental bodies, private utilities and other contractors performing work on and adjacent to the worksites. Eliminate or minimize delays in the Work and conflicts with those utilities, bodies, and contractors. Schedule governmental, private utility and public utility work that relies upon survey points, lines and grades established by the Contractor to occur immediately after those points, lines and grades have been established. Confirm coordination measures for each individual case with the DEN Project Manager in writing.
- B. In the coordination effort of work by others, the Contractor shall obtain and refer to equipment locations and other layouts, as available, to avoid interface problems.

- C. The City reserves the right to permit access to the site of the Work for the performance of work by other contractors and persons at such times that the City deems proper. The exercise of such reserved right shall in no way or to any extent relieve the Contractor from liability for loss and damage to the Work due to or resulting from its operations or from responsibility for complete execution of the Contract. The Contractor shall cooperate with other contractors and persons in all matters requiring common effort.

3.3 CONTRACTOR USE OF WORK SITE

- A. Confine work site operations to areas permitted by law, ordinances, permits, and the Contract.
- B. Consider the safety of the Work and that of the people and property on and adjacent to the work site when determining amount, location, movement, and use of materials and equipment on work site.
- C. Do not load work site with equipment and products that would interfere with the Work. Only equipment, tools, or materials required for this Work may be stored at the work site.
- D. Protect products, equipment, and materials stored on work site.
- E. Relocate stored products, equipment, and materials that interfere with operations of City, government bodies, public, and private utilities, and other contractors.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.
- END OF SECTION **011100**

SECTION 011400 - WORK SEQUENCE AND CONSTRAINTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 OTHER WORK

- A. Other concurrent construction contracts with which the Contractor must interface are described elsewhere in the Contract Documents. Refer to Section 013210 "Schedule" and the Special Conditions for specific work constraints and milestones.

1.3 WORK SEQUENCE

- A. The work sequence shall comply with Phasing, Sequencing, and Milestones as indicated in the Contract Documents and in accordance with the approved Construction Schedule developed by the Contractor. The schedule shall comply with requirements indicated in the Special Conditions and Section 011400 "Work Sequence and Constraints". The Construction Schedule is described in Section 013210 "Schedule".

1.4 WORK CONSTRAINTS

- A. Site Constraints:
 - 1. Access to the Project shall be generally as indicated in the Contract Documents. Access shall be organized and planned by the Contractor to ensure no disruption of airline or DEN operations.
 - 2. Access to work sites will be strictly monitored and must comply with DEN Airport Operations and FAA Regulations. The Contractor shall provide monitoring and escorts as required by DEN Operations in the area of the Work.
 - 3. The Contractor's staging area will be as indicated in the Construction Documents.
 - 4. Contractor employee parking will not be allowed within the existing revenue control system. Parking facilities will be as indicated in the Construction Documents.
 - 5. The Contractor shall use the haul routes specified in the Construction Documents.
 - 6. If required, the Contractor shall provide a bus and driver to transport the Contractor's employees between the designated employee parking area and the work sites. No separate payment will be made for this bus and driver. The cost shall be included in the bid item "Mobilization". The bus driver shall be provided

at all times when Contractor employees are working on the Project.

B. System Interruptions:

1. DEN is a 24/7/365 facility. Construction activity that requires any system shutdown must be coordinated with the project manager and DEN AIM MCC.
2. The Shutdown cannot proceed unless all approver groups have approved the request. If any of the groups rejects the request, you may not proceed with the Shutdown. If a Shutdown is determined to be an emergency due to pending health issues or the risk of additional damage, this process may be bypassed. If the Shutdown is an emergency, proceed with the shutdown without the approvals. Approvals must be obtained as follows
 - a. Airfield Shutdowns must be submitted at least 72 hours prior to the shutdown start date.
 - b. All other Shutdowns must be submitted at least five (5) business days prior to the shutdown start date.
 - c. All Shutdown Requests must be submitted using the Shutdown Request form, which can be accessed via the Home page of the DEN intranet.

C. Airfield Operations at Denver International Airport:

1. Full airport and aircraft operations are underway adjacent to this Project. Contractors are required to become a Participant of the Airport Security Program and comply with 49 CFR Part 1542 Regulations, Security Directives, Denver Municipal Airport System Rules and Regulations.
 - a. If any Work contains requirements for Work activities or access through or in the secured area, reference Section 011420 "Security Requirements & Sensitive Security Information (SSI)" for requirements.
 - b. If not in a secured area, the Contractor personnel still must be badged; reference Section 011420 "Security Requirements & Sensitive Security Information (SSI)".

D. Conduct of persons using the Denver Municipal Airport system:

1. Contractor activities shall comply with Airport Operations and Regulation 130 "Operating Vehicles in the Secured Area" and Regulation 20 "Security" shall be followed at all times. These regulations are available from Airport Security at Denver International Airport.

E. Operational safety on airports during construction:

1. All Work shall be accomplished in accordance with FAA Advisory Circular AC150/5370-2F, "Operational Safety on Airports during Construction", FAR Part 139 and TSR Part 1542 except as herein modified.

F. Welding Equipment, Procedures and Constraints:

1. Natural gas-powered portable welders or inverter single- and three-phase electric

- portable welders are the only acceptable welding equipment to be used inside the building basement or tunnel areas. Acceptability of equipment other than the equipment noted above shall be at the sole discretion of the DEN Project Manager.
2. Welding activities inside buildings require submittal of a System Interruption Request (See paragraph "System Interruptions" above). Prior to welding in any area, the Contractor shall locate smoke detectors and shall request interruption of the fire alarm system. Subsequent to the interruption of the fire alarm system and prior to welding activities, the Contractor shall cover and protect smoke detectors until work is complete. Prior to expiration of each interruption of the system, the Contractor shall uncover the smoke detectors.
 3. Electrical Service: The Contractor shall be responsible for verifying with the DEN Project Manager or representatives locations acceptable for accessing electrical power for welders and other electrical equipment feeders. The Contractor shall be responsible for all work and equipment required to install temporary or permanent electrical modifications for construction power and lighting.
 - a. Temporary Hook-up: In addition to the requirements of paragraph "Temporary Power and Lighting for Construction" below, comply with the following:
 - 1) Provide wiring sized to accommodate full load of welding equipment, accounting for voltage drop.
 - 2) Provide appropriate NEMA twist-lock or ANSI receptacle for welder hook-up.
 - 3) 480V, 3 phase, 3 pole, 4-wire twist lock ground line.
 - 4) NEMA L16-20 or ANSI C73.87.
 - b. The Contractor may not begin operation of the equipment prior to request for inspection by DEN representatives and acceptance of the installation.
 - c. Permanent installation of electrical branch circuiting for welding equipment shall be made in accordance with all Division 26 Specification Sections
 4. Welding Practices: All standard safe welding practices must be followed, including but not limited to the following:
 - a. Flash protection for surrounding areas.
 - b. Contractor fire extinguisher in area.
 - c. One person in each welding area solely designated as fire watch for each welder.
 - d. Protect all equipment, cable trays and contents, etc., in area.
 - e. Use fire blankets and other appropriate materials to confine sparks and molten metal from the welding, cutting, and/or grinding activities.
 - f. All welders shall have been qualified through welding tests in accordance with applicable welding code, such as but not limited to AWS, ASME, API, within one year prior to welding taking place. Evidence of qualification shall be through Welding Performance Qualification Records (WPQR).
 - g. All welder qualifications test shall be or shall have been administered and witnessed by an Independent Testing Agency (ITA), AWS Certified Welding Inspector (CWI).

work in the tunnel or basements by use of cell phone and/or radio. Radio and cell phone coverage in the tunnels and basements varies in signal strength throughout the campus. An RF Application must be submitted for the Radio equipment intended for use at least 14 days prior to intended use. Include the following radio information:

- a. Make
 - b. Model
 - c. Frequency
 - d. Effective Radiated Power (ERP)
2. Contractors must receive an approval letter from the RF Systems Manager prior to use of the radio equipment on the DEN campus.

K. Keys:

1. The Contractor shall be required to contact DEN Maintenance Control to procure keys for access to all rooms having locks in order to gain access. Keys may be checked out at the beginning of each work shift by the Contractor and shall be returned to DEN Maintenance Control at the end of each work shift

1.5 COORDINATION

- A. The Contractor will designate a contact person for coordination with the DEN Project Manager and airline tenants. The contact person shall have the authority to make decisions for the Contractor firm and shall have binding signatory power for changes in work. The contact person shall be on site at all times during work activity.
- B. No additional costs shall be considered for coordination activities throughout this project. The Contractor shall include in the Contractor's bid costs for coordination of all activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DUST/PROTECTION BARRIERS

- A. HVAC system containment. The Contractor shall submit to DEN Maintenance HVAC and Fire Alarm shutdown requests prior to modifications to the area of work for dust containment. The HVAC system shall be interrupted, re-routed, or blocked off to prevent dust from entering return or supply ducts.
- B. Debris and Protection Barriers:. The Contractor shall construct code-approved and DEN-approved dust and debris barriers on both sides of walls and doors that are to be modified. Barriers shall be constructed to allow emergency ingress and egress to and from equipment and spaces. Barriers shall be constructed to allow continual

uninterrupted function of building equipment and spaces.

1. Return all removed door hardware to DEN. Label each hardware set correlating the door number of the original hardware set. Coordinate with the DEN Project Manager for storage and return of hardware.

3.2 EQUIPMENT

- A. Equipment: CNG-powered equipment is allowed within the buildings. No other fossil fuel equipment may be used within the buildings unless the equipment is directly vented to the building exterior.
- B. Electric: Electric powered equipment is acceptable in the Work area.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 011400

SECTION 011420 - SECURITY REQUIREMENTS & SENSITIVE SECURITY INFORMATION (SSI)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Each Contractor is required to become a "Participant" in the DEN Airport Security Program (ASP), and must remain in good standing in order to retain Airport Security privileges.
- B. All Contractor employees and all vehicles requiring access to the Secured Area, Sterile Area, and/or any other Controlled Areas shall be required to obtain the proper access authorizations for Airport ID badges and vehicle permits.

1.3 PARTICIPANT OF AIRPORT SECURITY PROGRAM

- A. Contractors are required to become a "Participant" of the ASP. In order to become a "Participant", your company must attend a Participant meeting within the Airport Security Office.
- B. The Contractor shall comply with all Denver Municipal Airport System Rules and Regulations and all Transportation Security Administration (TSA) regulations. Special emphasis should be paid to Denver Municipal Airport System Rules and Regulations Part 20 – Airport Security Rules and Regulations and Part 130 – Operating Vehicles In The Secured Area" and Part 35 – Operations Infraction Accountability Program". The Denver Municipal Airport System Rules and Regulations can be found on the flydenver.com website.
- C. The TSA and DEN has the authority to issue civil penalties for failure to adhere to their rules and regulations.
- D. It is the responsibility of the Airport Operations to ensure all fences and gates are secure. If a Contractor's operations necessitate the frequent use of a particular gate, the Contractor shall place, at the Contractor's expense, two (2) contract security guards at the gate that shall have been trained and certified by the Airport Operations Division to facilitate access to its Work. The Contractor assumes full responsibility for maintaining security once this is done. Any fines levied against the Airport as a result of the failure by the Contractor to provide adequate security shall be passed on to the Contractor.

1. If the Contractor provides guards or monitors, the Contractor must also supply a shelter for the guards/monitors. The shelter must meet the following requirements:
 - a. One 10 x 12 Tuff Shed or similar type structure with a window, 24-inch convex mirror mounted outside for vehicle inspection, sufficient HVAC capability, generator, light plant, and sanitary services, which are maintained by the Contractor.
 - E. Contractors will be required at all times to have a supervisor or foreman at each work location in Secured, Sterile, and Controlled Areas.
 - F. All Work shall be accomplished in accordance with the most current FAA Advisory Circular (AC) 150/5370-2, "Operational Safety on Airports during Construction", 49 Code of Federal Regulations (CFR) Part 1542 and 14 CFR Part 139 except as modified herein.
 - G. All Work shall be accomplished in accordance with the most current TSA Security Directives applicable to DEN, except as modified herein.
 - H. This Section intends to supplement, modify, change, delete from, or add to the most current FAA AC150/5370-2. Where any paragraph, subparagraph, or clause of the AC is modified or deleted by these supplements, the unaltered provisions of that paragraph, subparagraph, or clause shall remain in effect.
- 1.4 SENSITIVE SECURITY INFORMATION (SSI)
- A. If the Contract involves SSI information or procedures, the Contractor must contact the Assistant Director of Airport Security or designee, for disclosure information, as well as protocols that must be followed with SSI distribution.
 - B. This Section governs the maintenance, safeguarding, and disclosure of records and information that the TSA has determined to be SSI as defined by 49 CFR Part 1520, "Protection of Sensitive Security Information". SSI is information that the TSA has determined to be detrimental to the security of Denver International Airport if disclosed to unauthorized persons. This is a process for the documentation, use, and recovery of SSI of a specific origin.
 - C. Applicability:
 1. For all management staff, all authorized departments, all contractors, and subcontractors handling documents or materials containing SSI information.
 2. Each person employed by, contracted to, or acting on behalf of the Department of Aviation at Denver International Airport is subject to the requirements of this Section.
 3. SSI disclosure is limited to persons or entities under criteria identified in federal regulations, subject to strict "need-to-know" standard, and as otherwise determined by TSA or the Department of Homeland Security (DHS).

- D. Except as otherwise provided in this Section, records containing SSI are not available for public inspection or copying. Denver International Airport will not release such records to persons without a need to know. Prime contractors will not release SSI records to any subcontractor without a need to know. An employee or contractor has a "need to know" SSI if access to the information is necessary for performance of his or her official duties.
- E. Unauthorized disclosure of SSI is a Federal violation of 49 CFR Part 1520 and violation is grounds for a civil penalty and other enforcement action by DHS. In addition to the civil penalties, corrective action may include issuance of an order requiring retrieval of SSI to remedy unauthorized disclosure, an order to cease future unauthorized disclosure, and dismissal from the work site.
- F. Except as otherwise provided in writing by the TSA in the interest of public safety or airport security, the following information and records containing such information constitute SSI:
1. Information that would be detrimental to the security of Denver International Airport and aviation transportation.
 2. Any performance specification, including a description of devices and procedures used by Denver International Airport, for the detection of any weapon, explosive, incendiary, or destructive substance.
 3. Any performance specification, including a description of devices and procedures, for any communications equipment used by Denver International Airport in carrying out any aviation transportation security requirements.
 4. Details of any security inspection or investigation of an alleged violation of aviation transportation security requirements of Federal law that could reveal security vulnerability.
 5. Specific details of aviation transportation security measures including those recommended by the Federal government.
 6. The following information regarding security screening under aviation transportation security requirements of Federal law:
 - a. Procedures for screening of persons, property, checked baggage, U.S. mail, and cargo.
 - b. Information used by a passenger or property-screening program or system, including an automated screening system.
 - c. Detailed information, if determined by the TSA to be SSI, about the locations at which particular screening methods or equipment are used.
 - d. Performance or test data from security equipment or screening systems.
 7. Identifying information of certain aviation transportation security personnel including lists of the names or other identifying information that identify persons as having unescorted access to a secure area of the airport.
 8. Critical aviation asset information identifying systems so vital to the airport that the incapacity or destruction of such assets would have a debilitating impact on aviation security.
 9. Any information involving the security of operational or administrative data systems identified by the Department of Transportation or DHS as critical to the

- safety or security of Denver International Airport.
10. Solicited or unsolicited proposals, pursuant to a grant or contract, to perform work that relates to security measures.
- G. Restrictions on the Disclosure of SSI:
1. Employees and contractors working onsite have a duty to protect sensitive security information and must take reasonable steps to safeguard SSI in that person's possession from unauthorized disclosure. When a person is not in physical possession of SSI, the person must store it in a secure container such as a locked desk, a locked file cabinet, or in a locked room. SSI is to be disclosed only to persons having a need to know as stated in CFR 1520. Requests for SSI are to be referred to City Project Manager.
 2. Prior to receiving SSI records, contractors must sign the "Confidentiality and Non-Disclosure Agreement", Form PS-17, stating that SSI will be guarded from unauthorized persons, that records will be controlled while in use and secured when not in use, and that all SSI plans and records will be returned to the airport or destroyed following the completion of the Project.
 3. Return or destruction of SSI documents must be done in a timely manner and documented on the SSI Return or Destruction Compliance Form, Form PS-20. Companies under contract to the City must return or destroy all SSI material following the completion of the Work. Companies not selected during the bidding process must return or destroy all SSI material immediately following the announcement of bid results.
- H. If a record containing SSI is received that is not marked as specified in this Section below, the following steps must be taken:
1. Mark the record as specified in paragraph Part 1 of this Section.
 2. Inform the sender of the record that the record must be marked as specified in Part 1 of this Section.
- I. If a person becomes aware that SSI has been released to unauthorized persons, promptly inform the Communication Center Supervisor at 303-342-4020 and request to speak to the on-call Airport Security Coordinator
- J. Marking SSI:
1. In the case of paper records containing SSI, a covered person must mark the record by placing the PROTECTIVE MARKING conspicuously on the top, and the DISTRIBUTION LIMITATION STATEMENT on the bottom, of following parts of the document:
 - a. The outside of any front and back cover, including a binder cover or folder, if the document has a front and back cover.
 - b. Any title page
 - c. Each page of the document
 2. Protective Marking:

- a. SENSITIVE SECURITY INFORMATION
 - b. Distribution Limitation Statement:
 - c. WARNING: This record contains Sensitive Security Information that is controlled under 49 CFR parts 15 and 1520. No part of this record may be disclosed to persons without a "need to know", as defined in 49 CFR parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration or the Secretary of Transportation. Unauthorized release may result in civil penalty or other action. For U.S. government agencies, public disclosure is governed by 5 U.S.C. 552 and 49 CFR parts 15 and 1520
3. In the case of non-paper records that contain SSI, including motion picture films, videotape recordings, audio recording, and electronic and magnetic records, a covered person must clearly and conspicuously mark the records with the protective marking and the distribution limitation statement such that the viewer or listener is reasonably likely to see or hear them when obtaining access to the contents of the record.
- K. Destruction of SSI:
1. When the employee or contractor no longer needs the SSI to carry out their work requirements, the SSI must be returned to the issuing entity or completely destroyed by burning or cross-shredding to preclude recognition or reconstruction of the information.
 2. The Contractor shall comply with all the requirements of the Department of Aviation Standards and Procedures, Protection of Sensitive Security Information (SSI) No. 10003 Revised 08/01/15 regarding Contractor Protection of Sensitive Security Information (SSI).
- 1.5 MISCELLANEOUS
- A. Dumpster Security Requirements:
1. The following procedures must be followed to provide maximum security with all construction projects in public areas unless an exception has been made by the Airport Security Coordinator (ASC) or designee:
 - a. Roll-off dumpsters must have the ability to be covered (hard side) and locked when not in use.
 - b. When unlocked and in use, the Contractor shall provide an employee, or a subcontractor's employee, to stand by the dumpster to prevent unauthorized placement of prohibited items
 2. If the Contractor is not able to have a roll-off dumpster with the ability to be locked, the dumpster shall be removed from the public area when the construction site is inactive.
- B. Contractor Fences (Not Perimeter Fence):

1. If required, the Contractor shall establish and maintain a secure (fenced) perimeter at its primary operations area to include its field offices, staging and storage areas, and maintenance facilities. The responsibility for security within its operations area shall rest solely with the Contractor. Entrance gates to operations areas shall be equipped with a combination of locks to include a lock provided by the City for its use in accessing emergency equipment, should that need arise. The location, size and other physical characteristics of the Contractor's operations area must be approved by the DEN Project Manager prior to its installation.
2. Unless specifically required by the Contract Documents and with the exception of the fenced operations area described above, the Contractor shall install no fences or other physical obstructions on or around the Project work area without the written approval of the DEN Project Manager.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SUBMITTAL FOR AIRPORT ID BADGES

- A. By submitting information for the individual requesting or requiring an Airport ID badge that would permit unescorted access to the Sterile and/or Secured Areas must be fingerprinted and pass a Criminal History Records Check (CHRC) and Security Threat Assessment (STA). Passing a CHRC means the employee shall not have been convicted, given a deferred sentence, found not guilty by reason of insanity or have been arrested and are awaiting judicial proceedings of any felony charge during the ten (10) years before the date of the individual's application for unescorted access authority. For an individual to obtain driver authorization to drive within the Secured Area, the individual must have a valid driver license that allows them to drive their contractor vehicle.
- B. An employee requesting an Airport ID badge must resolve all pending or valid violations before being allowed to proceed in the airport ID badging process. If the employee no longer works for the company and is attempting to be employed by a different company, a management representative from the "new" company must attend the Violation Notice Hearing along with the employee.
- C. Airport ID Badges are obtained as follows:
 1. The Contractor shall meet with the City Project Manager to review the procedures and required access points at DEN. The Contractor and the DEN Project Manager shall visit the site to verify the access points. Access points shall be listed and submitted by the Contractor to the DEN Project Manager for review and comment prior to Contractor's application for badging.
 2. The Contractor shall designate an Authorized Signatory who must attend an annual class with Airport Security. The Authorized Signatory must be an employee of the Contractor, have a valid Denver International Airport ID badge.

- The Authorized Signatory will be authorized to sign for the Contractor on the Fingerprinting and Badge Application Form and will be the primary designation contact for Airport Security related business.
3. The Contractor's Authorized Signatory shall schedule a Participant Meeting with the DEN Airport Security Office to review DEN security procedures and receive training on how to ensure that all Participants remain in compliance with Part 20 of the Denver Municipal Airport System Rules and Regulations. A second meeting will be scheduled for the Authorized Signatory to learn how to successfully complete the required forms for Airport ID badges and vehicle permits.
 4. A CHRC and STA are required for each employee requesting unescorted access to the Secure and/or Sterile Area. The employee will complete the Fingerprinting and Badge Application (two-sided form) and schedule an appointment with the Airport Security Office to have the form reviewed and to be fingerprinted. For the fee for the Fingerprinting, please see the flydenver.com website.
 5. When the Authorized Signatory is notified by Airport Security that the CHRC and STA have cleared, the applicants must come to the Airport Security Office to receive regulated security and driver training. The initial training will take approximately two (2) hours for security and driving tests and renewals are approximately one (1) hour duration.
 6. All applicants must watch and pass all concepts of a computer based security training module for a Security Identification Display Area (SIDA) Airport ID badge. All individuals requesting driver authorization in the non-movement area must also view an interactive computer based driver training module and complete a test by passing all concepts. In addition, the individual must receive non-movement driver orientation training by the Contractor's driver representative before being allowed to drive on the airfield. Non-Movement Orientation training must be conducted annually.
 7. All Airport ID badges must be immediately terminated upon employee separation from the Contractor or when a need for DEN access no longer exists.
 8. The Airport ID badges must be returned to the Airport Security Office prior to final payment. All Airport ID badges are issued with an annual expiration date. The expiration date is determined by the birthday of the Airport ID badge holder. Contractors shall notify the DEN Project Manager as soon as possible but in no case less than four (4) weeks in advance of any requirement to extend the Sponsorship status.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 011420

SECTION 011430 - VEHICLE AND EQUIPMENT PERMITTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Contractor shall comply with the Airport Security Program. Vehicle permits are required for all vehicles operating in the Secured Area. The DEN vehicle permit is required for vehicles operating in the Secured Area but limited to above grade, outdoor activity. Vehicles or machinery operating within buildings shall be required to acquire a DEN emissions permit as well as a DEN vehicle permit.
- B. Special emphasis should be paid to Denver Municipal Airport System Rules and Regulations Part 20 – Airport Security Rules and Regulations and Part 130 – Operating Vehicles In The Secured Area" and Part 35 – Operations Infraction Accountability Program". The Denver Municipal Airport System Rules and Regulations can be found on the flydenver.com website.
 - 1. All Work shall be accomplished in accordance with the most current FAA Advisory Circular (AC) 150/5370-2, "Operational Safety on Airports during Construction", 49 Code of Federal Regulations (CFR) Part 1542 and 14 CFR Part 139 except as modified herein.
 - 2. All Work shall be accomplished in accordance with the most current TSA Security Directives applicable to DEN, except as modified herein.
 - 3. Access to the runways, taxiways, and aprons shall be gained by the Contractor after establishing radio communications with Airport Operations through the DEN Inspector. No personnel or equipment will be allowed on the runways until radio contact has been made with Airport Operations and permission given.
 - 4. Access to the Movement Area will be limited in order to allow the maximum efficient movement of aircraft. As part of this limitation, the Contractor may be required to only use these areas late at night when there is less aircraft traffic
 - 5. Once admitted into the Secured Area, the Contractor shall proceed directly to the work location by way of a route assigned by Airport Security. At no time shall a Contractor or any of its personnel enter onto a taxiway, runway, or ramp without proper clearance from the Airport Operations Manager or Assistant Airport Operations Manager. Contractors or individuals violating these requirements for driving in the Secured Area may be subject to fines, suspension, or permanent revocation of their driver authorization and/or Airport ID badge privileges.
 - 6. The Transportation Security Administration (TSA) requires that all operating airports be secured from the general public and has the authority to issue citations for violations of these requirements. It is the responsibility of the Airport

to ensure all fences and gates are secure. If a Contractor's operations necessitate the frequent use of a particular gate, the Contractor shall place guards at the gate. Refer to 011420 – Security Requirements and SSI for details regarding the placement of guards.

C. General Safety Regulations When in Aircraft Operations Areas May Include the Following:

1. At all times, the Contractor shall coordinate its Work with the requirements of the Airport site and operations. All Work, movement of personnel, materials, supplies and equipment in areas used by aircraft shall be subject to regulations and restrictions established by the City. The Contractor shall take special precautions and be fully responsible for the prevention of damage to materials and equipment in the areas affected by the jet blast of taxiing aircraft. No work shall proceed until necessary protective devices are placed as required to protect the public, airport operations, property, and personnel from the hazards of the Work. The Contractor shall proceed with the Contractor's Work, including temporary work and storage of tools, machinery, and materials, to cause no interference with or hazards to the operation of the Airport.
2. Landings, takeoffs, and taxiing shall take precedence over all Contractors' operations. In the event that the Contractor is notified that an emergency landing or a takeoff is imminent, the Contractor shall stop all operations immediately, regardless of the sequence of events in progress and shall immediately evacuate the Contractor's personnel and equipment from the runway and taxiway areas as directed.
3. The Contractor shall remove its personnel and equipment to the distance specified below for the prevailing conditions:
 - a. For emergencies, the Contractor shall move all personnel and equipment as directed by Airport Operations or the DEN Project Manager.
 - b. At the end of a work day in areas where aircraft are operating, all equipment shall be moved to a location that is not less than 750 lineal feet measured from the near edge of the runway, taxiway or ramp area or to the location designated by the City.
4. If the Contractor is asked to leave part of its work site to allow aircraft operation, the Contractor shall clean the area to allow safe aircraft movement. Cleaning may include sweeping the area to prevent damage to aircraft.

D. Vehicle Permitting:

1. Refer to the Denver Municipal Airport System Rules and Regulations Part 20 – Airport Security Rules and Regulations and Part 130 – Operating Vehicles In The Secured Area" and Part 35 – Operations Infraction Accountability Program" for information regarding vehicle permitting. These Denver Municipal Airport System Rules and Regulations can be found on the flydenver.com website.
2. For additional information regarding permitting, the Contractor must contact DEN Security.

E. Equipment Permitting

1. Fossil fuel powered equipment to be used in the interior of buildings and/or in basement/tunnel areas shall require inspection by DEN Maintenance and the Denver Fire Department.
 - a. Only CNG fossil fuel powered equipment may be used; gasoline powered, propane powered, or diesel powered equipment will not be acceptable unless identified and operated per Section 011400 "Work Sequence and Constraints".

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PERMITS

- A. Vehicle permits shall not be issued prior to Notice to Proceed. The Contractor may, at the Contractor's own risk, submit required information prior to Notice to Proceed to the following:
 1. Vehicle permit: DEN Engineering Group or DEN Airport Security.
 2. Equipment and vehicle emissions permit. DEN Engineering or DEN Maintenance Group.

3.2 SCHEDULE

- A. The Contractor shall allow in the Contractor's schedule five (5) days for DEN review of submittals for permits. Testing of equipment and review by the Denver Fire Department shall be scheduled by the Contractor. By submitting information for permits, the Contractor certifies that equipment and vehicles comply with Contract documents and with all City, state and federal regulations including but not limited to emissions, licensing and safety requirements.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 011430

SECTION 011810 - UTILITIES INTERFACE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Various utilities are located within the limits of work in the Project area. The owners of these utilities hereinafter noted may require that the Contractor is to work around their existing facilities until such alterations, relocation, or abandonment have been completed. All known existing utilities are shown; however, the Contractor shall verify and satisfy himself that there are no other existing utilities that may not be shown.
- B. The owners of known utilities within the project area and corresponding representatives include, but are not limited to:
 - 1. Century Link Telephone
 - 2. DEN Telephone
 - 3. Xcel Energy Natural Gas
 - 4. Xcel Energy Elec. Services
 - 5. DEN Storm Water
 - 6. DEN Sanitary Sewer
 - 7. Denver Water Department
 - 8. Inland Technologies
 - 9. Fuel System (ASI)
 - 10. Premise Wiring System- DEN IT Section
 - 11. FAA Duct Bank
 - 12. Oil/Gas Wells
 - 13. DEN Electrical Department
 - 14. Fire Alarm System
 - 15. Paging System
- C. The location and establishment of each construction vehicle crossing shall be at sites mutually agreed upon in writing by the Contractor and the owner of the utility.
- D. At the locations where the Contractor needs to establish a construction vehicle crossing over any of the operating pipelines, the furnishing and placing of a crossing shall be by the Contractor. The crossing shall allow the normal operation of the pipeline at all times. Each crossing shall be adequately marked and signed for safe passage of vehicles over the crossing. Construction vehicles shall not be allowed to cross over operating pipelines at any place other than an established crossing.
- E. These utility locations are based upon information provided by the utility companies or

previous construction contractors that were the basis for determining utility coordinates. The Contractor is responsible for confirming the accuracy of the provided coordinates.

- F. The Contractor shall control the Contractor's operations in order to avoid creating any obstacles for the utility owner's access for maintaining or operating their equipment.

1.3 REFERENCE DOCUMENTS

- A. Section 312323.33 "Flowable Backfill (Controlled Low-Strength Material)"

1.4 REGULATORY REQUIREMENTS

- A. The Contractor shall obtain and pay for all utility company permits, fees, and licenses necessary for the execution of this work. The Contractor shall give all notices and shall comply with all laws, ordinances, rules, and regulations of all authorities having jurisdiction.

1.5 QUALITY CONTROL

- A. When the Contractor performs any operations that will affect a utility owner, the Contractor shall give timely notice to the utility owner and the DEN Project Manager so that the Contractor's operations may be observed by the utility owner or their representative.

1.6 WORK INCLUDED

- A. The Work of this Section includes furnishing all materials, equipment, and labor necessary to provide utility crossings as required and as specified herein and subject to approval by the associated utility owner.
- B. North American Resources has a line passing through airport property. The Contractor shall contact the utility prior to beginning earthwork operations to ascertain any special requirements or conditions required to maintain and protect this service during construction activities.
- C. FAA Underground Duct lines: The FAA has duct lines passing under the site. The Contractor shall contact the FAA prior to beginning earthwork operations to ascertain any special requirements or conditions required to maintain this service during construction activities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Suitable cover material shall be in accordance with Colorado Department of Transportation Standard Specifications. Wet, soft, or frozen material, asphalt chunks, or other deleterious substances shall not be used for cover.
- B. Aggregate for road base material shall consist of clean, sound and durable particles of crushed stone, crushed gravel or crushed slag, shall be free from coatings of clay, silt and organic matter, and shall contain no clay balls. Material shall conform to the State of Colorado Standard Specifications for Road and Bridge Construction Class 6 aggregate base unless otherwise specified.
- C. The materials for the load distribution system on top of the cover shall conform to the specification of the American Institute of Steel Construction, the American Institute of Timber Construction, or the American Concrete Institute, as applicable, depending upon the system agreed upon between the Contractor and utility owner.
- D. Materials for the sleeving of the pipelines shall be purchased by the utility owner at the Contractor's expense.
- E. Comply with utility backfill requirements for the use of flowable backfill in Section 312323.33 "Flowable Backfill (Controlled Low-Strength Material)" and Division 26 and Division 33 requirements.

PART 3 - EXECUTION

3.1 NOTIFICATION OF UTILITIES FOR LOCATING AND POTHOLING

- A. The Contractor shall verify the location of all utilities prior to any operations including physically uncovering the utility to verify location as required by the utility owner.
- B. The Contractor shall notify the Utility Notification Center of Colorado at (303) 534-6700 or 811, as a minimum for location of utilities.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **011810**

SECTION 012510 - SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. All material and equipment substitutions must comply with Title 4, Article 406: Substitution of Materials and Equipment in the General Contract Conditions, 2011 Edition.
- B. The Work specified in this Section consists of submitting form CM-09, Request for Substitution for the approval of a different material, equipment, or process than is described in the Contract Documents.
- C. If the substitution changes the Scope of Work, Contract cost, or Contract time, a Change Order is required.
- D. As-built drawings and specifications must include all substitutions even if a Change Order is not issued.

1.3 REFERENCE DOCUMENTS

- A. Form CM-09, Request for Substitution
- B. Section 013300 "Submittal Procedures"
- C. Section 013325 "Shop and Working Drawings, Product Data and Samples"

1.4 QUALITY CONTROL

- 1. The substitution shall provide as a minimum, the same performance as specified.

1.5 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
- B. A completed Form CM-09 shall be submitted at least 60 days prior to when an order needs to be placed or a method needs to be changed.

- C. The submittal shall contain all the data required to be submitted for acceptance of the originally specified item or process, including, as appropriate:
1. Detailed product data sheets for the specified items and the substitution.
 2. Samples and shop drawings of the substitution.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SUBSTITUTION PROCESS

- A. Provide the information as required on Form CM-09.

3.2 SUBSTITUTION REQUEST

- A. The formal Request for Substitution will be evaluated by the DEN Project Manager and the Designer of Record based on the following criteria:
1. Compatibility with the rest of the project.
 2. Reliability, ease of use and maintenance.
 3. Both initial and long term cost.
 4. Schedule impact.
 5. The willingness of the Contractor to share equally in any cost savings.
 6. The ability of the item or process to meet all applicable governing regulations, rules, and laws along with funding agency requirements.
 7. The cost of evaluating the substitution.
- B. Based upon the above evaluation, the Sr. Director of AIM Development will make a final determination of what is in the best interest of the City and either approve, disapprove or approve as noted the requested substitution.

3.3 CONDITIONS

- A. As a condition for submitting a Request for Substitution the Contractor waives all rights to claim for extra cost or change in Contract time other than those outlined in the request and approved by the Deputy Manager of Aviation. The Contractor, by submitting a Request for Substitution, also accepts all liability for cost and scheduling impact on other contractors or the City due to the substitution.
- B. Included with the Request for Substitution shall be the following statement:
1. "The substitution being submitted is equal to or superior in all respects to the Contract-required item or process. All differences between the substitution and the Contract-required item or process are described in this request along with all required information, cost, and scheduling data."

- C. The statement shall be signed and dated by the Contractor's Superintendent.
- D. Replacement of Substitution Found to be Not Equal:. The Contractor shall be responsible for all aspects and conditions of the substitution that are not clearly identified in the substitution submittal, and shall be liable for the appearance, function, performance or other aspects of the substitution that are found not to be equal to the originally specified item.
 - 1. The Contractor shall incur all labor and costs associated with replacement of any substitution that is found to be not equal to the originally specified item or process and rejected by the DEN Project Manager.
 - 2. The replacement of any rejected substitution shall either be with the originally specified item or process, or a substitution approved by the DEN Project Manager

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **012510**

SECTION 012910 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 RELATED REQUIREMENTS

- A. The Work specified in this Section consists of preparing and submitting the Schedule of Values ("Schedule") as referenced in the General Conditions. Use the Project Specifications Table of Contents or Bid Tabs, if applicable, as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section. The Work also includes the preparing and submitting of updated copies of the Schedule if the Schedule is affected by change orders.
- B. A Schedule of Stored Material is a detailed cost breakdown for permanent materials that will be temporarily stored prior to their being installed and for which the Contractor seeks partial payments. The Schedule of Stored Material will be incorporated as a part of the Schedule of Values.
- C. Within 14 calendar days of issuance of the Notice to Proceed (NTP), the Contractor shall submit the Schedule of Values including the Schedule of Stored Material if applicable. The Schedule of Values and Schedule of Stored Material used to prepare the work/cost breakdown for the Schedule will be used for the Contractor's billings.
- D. Any Contract allowances shall be included in the Schedule. Expenditure of allowances shall be done using the Allowance Authorization form. Use of this form does not increase or decrease the Contract value.

1.3 RELATED DOCUMENTS

- A. Title 9 – Compensation of the General Contract Conditions, 2011 Edition
- B. Section 013300 "Submittal Procedures"
- C. Section 013325 "Shop and Working Drawings, Product Data and Samples".
- D. Form CM-89, Schedule of Values
- E. Form CM-91, Schedule of Values for Unit Price Contracts

1.4 SUBMITTALS

- A. The Schedule of Values shall be formally approved by the DEN Project Manager.
- B. The Schedule shall identify each item of work. Work items in the Schedule shall represent all Work and shall be referenced with the Technical Specifications section numbers, specification subparagraph, specification section title and the bid item number used for the Schedule of Prices and Quantities when applicable.
- C. Upon request by the City, the Contractor shall support values given with the data that will substantiate the correctness of the values.
- D. The Schedule will be utilized only as a basis for review of the Contractor's application for progress payment.

1.5 REVIEW AND RESUBMITTAL

- A. If review by the DEN Project Manager indicates that changes to the Schedule are required, the Contractor shall revise and resubmit the Schedule.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARING SCHEDULE OF VALUES

- A. Provide a breakdown of the Contract Price in enough detail to facilitate continued evaluation of Applications for Payment and progress reports.
- B. Breakdown of the items used in the Schedule shall include the following item costs. Ensure each item is complete:
 - 1. Delivered cost of product with applicable taxes paid.
 - 2. Total installation cost with overhead and profit.
 - 3. Breakdown costs of each lump sum item with a list of products and major operations for which the Contractor seeks to receive progress payments to recover the Contractor's costs for that bid Item.
 - 4. Each unit price item as listed in the bid Schedule of Prices and Quantities shall list products and major operations for which the Contractor seeks to receive progress payments for that bid item.

3.2 PREPARING SCHEDULE OF STORED MATERIAL

- A. The Contractor shall submit with the Schedule an indication of whether products will be stored on or off the work site. The Schedule of Stored Material shall show all quantities and types of products that will be stored.

- B. Material allowances consist of only the net cost of the product, the cost of delivery and unloading at the storage site, the cost of applicable sales taxes, and all discounts.
- C. In no case will the cost paid for a permanent material be greater than 90 percent of the Contract price for the Work in which they are included.

3.3 PAYMENT FOR STORED MATERIALS

- A. Only materials that are described in the specifications and on the drawings will be considered permanent materials. Permanent materials are materials that will be left in the Work after the Contract is completed.
- B. Nothing in these specifications shall be interpreted as requiring the City to pay for stored materials. The DEN Project Manager shall decide on a case-by-case basis whether stored materials shall be paid for. No payment will be made for stored materials that have not been submitted and accepted.
- C. The Contractor must, at all times, store permanent materials in accordance with manufacturer's recommendations. Any material not properly stored will not be paid for. Amounts will be deducted from payments for any stored permanent material previously paid for and subsequently found to be improperly stored or not present, based upon a physical inventory of stored permanent material.
- D. Only the neat line quantity of material needed for the finished product may be paid for.
- E. All requests for stored permanent material payment must be accompanied by paid invoices clearly showing the quantity of permanent material, the type of permanent material and discounts or rebates and the net amount paid to the supplier along with a certificate stating that the permanent material is free of any liens or judgments preventing its use by the City.
- F. If the permanent material is stored outside the Denver area the Contractor must pay for the City representative's transportation and lodging to see the stored material as needed. Acceptable lodgings must, as a minimum, have a Mobil Travel Guide Rating Criteria® rating of Two-Star or the American Automobile Association Lodging Listing Requirements & Diamond Rating Guidelines® rating of Two Diamonds. The minimum transportation shall be by regularly scheduled commercial air carrier at coach rates. The DEN Project Manager will determine if an overnight stay is required.
- G. All permanent material stored off site, for which payment is being requested, must be insured and stored in bonded, insured warehouses. The Contractor shall provide proof of insurance for all material stored off site, and specific address and storage conditions of storage location.
- H. Any permanent material on which payment is requested must be in such a form that it cannot be used on work other than this Contract, or stored in a manner acceptable to the DEN Project Manager to ensure that the permanent material cannot be used on work other than this Contract.

3.4 ALLOWANCE AUTHORIZATION AND PAYMENT

- A. Contractor shall request written approval for expenditure of any Contract allowances PRIOR TO performing the Work involved. List work to be performed and estimated cost in the requesting correspondence.
- B. Original copies of all invoices and receipts must be submitted with the Allowance Authorization as part of the request for payment.
- C. Using the format provided by the City, the Contractor's request for payment of all Contract allowances shall be included in the Schedule of Values.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **012910**

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations and coordination with other stakeholders and adjacent Contractors on the Project including,

1. Subcontractor's Acceptance Certification and Subcontractors List.
2. General Coordination Procedures.
3. Contract Administration Procedures.
4. Current Project Management Information Systems (PMIS)
5. Coordination drawings.
6. Current DEN Asset Management Systems
7. Requests for Information (RFIs).

- B. Related Requirements:

1. Section 011100, " Summary of Work" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 011400 "Work Sequence and Constraints" for shutdown requests and coordinating with airport operational activities.
3. Section 011420 "Security Requirements and Sensitive Security Information (SSI)".
4. Section 013210 "Schedule" for preparing and submitting Contractor's Construction Schedule.
5. Section 013223 "Construction Layout, As-built and Quantity Surveys" for coordinating, survey activities and survey related record documents.
6. Section 013300 "Submittal Procedures. "
7. Section 013325 "Shop and Working Drawings, Product Data and Samples".
8. Section 017720 "Contract Closeout" for coordinating closeout of the Contract.
9. Section 017419 "Construction Waste Management and Recycling".
10. DEN Building Information Modeling (BIM) Design Standards Manual (DSM)

1.3 DEFINITIONS

- A. RFI: Request from the DEN Contractor DEN Project Manager seeking information required by or clarifications of the Contract Documents.

1.4 SUBMITTALS - SUBCONTRACTORS ACCEPTANCE CERTIFICATION AND SUBCONTRACTORS LIST

- A. To comply with Section 502.2 in the General Contract Conditions, 2011 Edition, the Contractor must complete and submit form CM-02 Subcontractor Acceptance Certification for each Subcontractor working on the project. Additionally, the Contractor must prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.
- B. Provide emergency contacts list to the DEN Project Manager prior to any site activities. List must contain project name, number, location, company name and address, name and title of emergency contacts in order and time and assigned responsibilities. Keep list current and accurate at all times. Include any specific security arrangements or special projects requirements.
- C. Within two (2) days of Notice to Proceed, the Contractor shall submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identifying individuals and their duties and responsibilities listing addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Providing names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of the accepted list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination with other Contractors:
 - 1. For details on coordinating with other Contractors, refer to Article 701 Cooperation with Other Work Forces, Article 702 Coordination of the Work, and Article 703 Coordination of Public Contact in the General Contract Conditions, 2011 Edition.
- B. Minimum cooperation requirements with other contractors include the following, unless directed by the DEN Project Manager in writing:
 - 1. Regular meetings, minimum weekly.
 - 2. Construction schedule coordination.
 - 3. Staging area and access planning (to include employee shuttle routes).
 - 4. Deliveries.
 - 5. Traffic control.
 - 6. When and where required or specified, the Contractor shall develop appropriate coordination drawings for use by interfacing adjacent parties using the Denver International Airport site.
- C. The following is a list that includes, but is not limited to, all of the contractors that will be working in the area of the project limits:

- D. Coordination with DEN entities shall include but is not limited to the following:
1. Coordinate with Owner Contracted Communication Contractor.
 2. Coordinate with Utility Companies for utilities that are single source.
 3. Coordinate with Airport Security and DEN Maintenance for all security related services.
 4. Coordinate with DEN Life Safety Team for all issues related to fire alarm, fire protection systems in addition to compliance with all regulatory agencies.
 5. Coordinate all shutdowns and system interruptions in accordance with section 011400 "Work Sequence and Constraints."

1.6 Contract Administration Procedures:

- A. This Project will be administered in part using the current Project Management Information System (PMIS). Any processes necessary to properly administer the Contract and not included in the list below shall be addressed as acceptable to the DEN Project Manager. DEN Project Manager may modify the list below in serialized correspondence without constituting a change to the Contract. Administrative tools and processes shall not in any form waive any contractual or legal requirements of the law or the Contract. The Contractor shall attend all coordination meetings with the DEN Project Manager and the DEN Project Control Administrators to arrange for staff training, and technical support to facilitate the execution of electronic data management and control.
- B. Project Management Information Systems (PMIS): Oracle Unifier Enterprise Project Portfolio Manager (EPPM), or the Oracle Primavera P6.
- C. All submittals, RFIs, Pay Applications, Correspondence, change requests, and pricing proposals and settlement agreements shall be recorded and submitted using the current PMIS:
1. The Contractor shall follow the specified PMIS Access Request Procedure and adhere to all user license conditions.
 2. The Contractor shall sign the Information Technology Agreement (ITA) to comply with the DEN computer system security requirements and any contractual obligation to the software and service providers for the current PMIS software
 3. DEN will train the Contractor's staff on the use of the PMIS.
 4. At a minimum, the Contractor shall provide computer hardware and software to meet the following requirements and to run the following programs, as required for the project:
 - a. Internet connectivity that provides the necessary high-speed connection to perform all activities indicated in this Contract.
 - b. Internet Explorer version 8 or higher.
 - c. Based on the project, a specific Java JRE application may be required, which can be downloaded from the Internet. If needed, the revision and update number will be provided at NTP.
 - d. Other files capability pre-approved by the DEN Project Manager or as required by the DEN BIM Execution Plan

- e. Most current version of Revit, as per DEN requirements.

1.7 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, BIM Design Standards Manual and BIM Project Execution Plan (BPXP), and additionally where installation is not completely shown 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. Coordination drawings will be the result of a Contractor driven Spatial Coordination effort as spelled out in the BPXP.
 1. Field verify all existing dimensions and any as-built dimensions, whether built by the Contractor or others, necessary to produce accurate coordination and working drawings.
 2. 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 Models/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 the coordination drawings by multiple contractors 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 the Models/Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to DEN Project Manager indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Using software as in the BPXP, the Contractor shall coordinate these systems per floor or zone per BPXP, and 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. Plenum Space: Indicate subframing for support of ceiling and wall systems,

- mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. 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.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit.
 - 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 centerlines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: DEN Project Manager will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If DEN Project Manager determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, DEN Project Manager will so inform Contractor, who shall make changes as directed and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings, unless approved otherwise by DEN Project Manager.
 2. File Preparation Format: Provided in the Project BIM Execution Plan operating in Microsoft Windows operating system.

3. File Submittal Format: Submit or post coordination drawing files as required in the Project BIM Execution Plan.
 4. The submittal must be logged in accordance with the submittal procedure
 5. For Fire Protection system; provide shop drawing and design calculations as approved by the building department. Submit as-built drawings in format as outline in BXP.
 6. For all projects, receiving official variance from the BIM requirements not utilizing BIM, coordination drawings must be submitted in acceptable digital format shall be in an industry recognized 3D AutoCAD model.
 7. BIM File Incorporation: DEN Project Manager will incorporate Contractor's coordination drawing files into Building Information Model for Revit as established for Project.
 - a. Contractor shall lead 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 Architect or other sub-consultants.
 8. DEN Project Manager will furnish Contractor one (1) set of digital data files of Models and/or Drawings for use in preparing coordination digital data files.
 - a. The Design consultants and Contractors and Sub Contractors acknowledge and represent the following Right Of Reliance regarding Electronic Models and/or Drawing deliverables:
 - 1) Models may be transferred for allowing the recipients to develop derivative models to develop the means and methods by which to construct the project.
 - 2) It must be clear that each party be able to rely on the fact that the model furnished by others "match the 2D Contract Documents or shop drawings in their equivalent state of development"
- 1.8 Coordination with DEN Asset Management System:
- A. The full intent is to produce comprehensive record documents integrating existing data in the form of digital files and models, reconciled to actual field conditions, modifications or additions facilities or components of existing facilities according to new Contract Documents, and to produce record documents that could be incorporated into DEN asset management system.
 - B. Utilize the BIM to link all necessary data content to the model and follow the BXP as collaboratively modified by the Contractor, Designer, and DEN BIM Administrators and approved by DEN Project Manager
 - C. Provide the following information through the execution of the Contract for all elements and element types that DEN has designated as assets. The information shall include but is not limited to:
 1. Project title, number, project manager contact information, contractor and

- subcontractor contact information
- 2. Pertaining shop drawings
- 3. Operational Manuals and safety information, MSDS and cut sheets, and any pertinent technical information.
- 4. Details of all components' maintenance procedures and requirements.
- 5. Details of all applicable warranties including but not limited to; warranty providers, manufacturers information, warranty start and finish dates, contacts , bonding company name, consent of surety,
- 6. Equipment location (by room number and location description or grid location format acceptable to DEN Project Manager, for civil projects), equipment make, model, serial number, and other asset information as outlined in the DEN BIM DSM
- 7. List of all spare parts including but not limited to; equipment make and model, location, submittal number or link, and suppliers reordering information
- 8. Commissioning results, acceptance criteria, test reports, and Tab reports

1.9 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI through the PMIS
 - 1. DEN Project Manager will distribute the RFIs to the proper entities.
 - 2. DEN Project Manager will coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's Work or work of subcontractors
- B. DEN Project Manager has the right to reject-RFIs or those that do not contain proper information and required data to properly evaluate the request and respond in a timely manner.
- C. RFIs: Use PMIS to generate RFIs.
 - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
 - 2. 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.
- D. For projects not using Unifier to create the RFI, the RFI must include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of DOR **and DEN Project Manager**.
 - 6. RFI number, numbered sequentially.

7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- E. DEN Project Manager will review each RFI, determine action required, and respond. RFIs received by DEN Project Manager after 1:00 p.m. will be considered as received the following working day. Direct responses by any entity other than DEN Project Manager shall not be binding to the City and County of Denver. E-mails, and verbal conversations must be followed by an official RFI or proper contractual vehicle before it is considered for any additional compensation or time impact to the project terms and conditions.
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 DEN Project Manager's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. DEN Project Manager's action may include a request for additional information, in which case DEN Project Manager's time for response will date from time of receipt of additional information.
 3. DEN Project Manager'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 according to Title 11 - Changes In the Work, Contract Price, or Contract Time in the General Contract Conditions, 2011 Edition as amended by Special Conditions.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify DEN Project Manager in writing within five (5) days of receipt of the RFI response or the time required by Title 11 - Changes In the Work, Contract Price, or Contract Time in the General Contract Conditions, 2011 Edition
- F. RFI Log: For projects not utilizing the PMIS application, prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. The log shall include but not limited to the following data:
1. Project name.

2. Name and address of Contractor.
3. Name and address of DEN Project Manager.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date DEN Project Manager's response was received.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT:

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT:

- A. No additional Payment will be made for compliance with the requirements of this section.

END OF SECTION 013100

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section requires the Contractor's Project Manager, Superintendent, and Quality Control representative to attend meetings scheduled by the DEN Project Manager for the collection and dissemination of information related to the subject Contract.
- B. The DEN Project Manager will prepare the minutes of each meeting and distribute them to each of the participants.

1.3 REFERENCE DOCUMENTS

- A. Form CM-01, Preconstruction Meeting Agenda
- B. Form CM-62, Construction Meeting Agenda/Minutes

1.4 OTHER MEETINGS

- A. The Contractor shall attend all other project related meetings as directed by the DEN Project Manager.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MEETING

- A. A Preconstruction Meeting will be scheduled by the DEN Project Manager after the Contract has been signed by all parties. The purpose of this meeting is to introduce the City's Representatives to their counterparts in the Contractor's organization and to establish lines of communication between these representatives and outline some Contract requirements. The Contractor's key personnel shall attend this meeting.

- B. The DEN Project Manager will distribute a notice of this meeting, along with an agenda of the subjects to be addressed. Refer to form CM-01, Preconstruction Meeting Agenda.
- C. The DEN Project Manager will explain and discuss the responsibilities and authorities of the City, the Designer of Record, and the DEN Project Manager's organization.
- D. The Contractor shall introduce the Contractor's key personnel, subcontractors, and representatives and briefly describe each person's responsibilities.
- E. Explanations provided by the DEN Project Manager will not amend, supersede, or alter the terms or meaning of any Contract document, and the Contractor shall not claim reliance on such explanations as a defense to any breach or failure by the Contractor to perform as specified in the Contract.

3.2 CONSTRUCTION PROGRESS MEETINGS

- A. Progress meetings will be scheduled weekly and more often as necessary by the DEN Project Manager to promote the competent and timely execution of the Contract.
- B. The meetings will be held at the work site or at a location selected by the DEN Project Manager. Meetings will be chaired by the DEN Project Manager or the DEN Project Manager's representative.
- C. The Contractor's key personnel shall attend unless otherwise agreed by the DEN Project Manager.
- D. At a minimum, and as directed by the DEN Project Manager, the items detailed in CM-62, Construction Meeting Agenda/Minutes shall be addressed at each meeting. The items addressed in the meeting do not waive notification or submittal requirements as required elsewhere in the Contract.
- E. The DEN Project Manager will be responsible for publishing minutes of the meetings. Refer to form CM-62, Construction Agenda/Meeting Minutes.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment shall be made for work under this Section.

- B. All payments for any Work done under this contract shall be in accordance with Title 9
- Compensation of the General Contract Conditions, 2011 Edition.

END OF SECTION **013119**

SECTION 013210 - SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section describes the procedures and requirements for scheduling and documenting the progress of the project.

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Contractor's Monthly Construction Schedule update.
4. As-built Schedule.
5. Three-Week Look-Ahead Schedule.
6. Daily Construction Reports.
7. Submittal Schedule.
8. Fabrication Schedule.
9. Material Delivery Schedules, cranes, special equipment and staging status.
10. Special reports:
 - a. Weather impacts and mitigations.
 - b. Recovery Schedule and alternatives.

- B. Reference Documents

1. Article 1105 – Time Extensions in the General Contract Conditions, 2011 Edition.
2. Section 011100 "Summary of Work"
3. Section 011420 "Work Sequence and Constraints".
4. Section 012910 "Schedule of Values".
5. Section 013119 "Project Meetings"
6. Section 013300 "Submittal Procedures"

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a Construction Schedule consume time and resources:
 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 2. Predecessor Activity: An activity that precedes another activity in the network.

3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation given in the Schedule of Values for the completion of an activity as scheduled. The sum of costs loaded for all scheduled activities must equal the total Contract Value unless otherwise approved by DEN Project Manager. All project costs, including those for stored materials and allowances, shall be loaded into the schedule and shall be balanced to where no activity is unfunded.
- C. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based upon defined relationships. Defined relationships determine when activities can be performed and the critical path for completing the Work.
- D. Critical Path: The longest chain of interdependent activities through the network sequence that establishes the shortest duration for completing the work and contains no float. The critical path shall be calculated as total float equal to but not less than zero days.
- E. Float: The amount of time that an activity in a network sequence can be delayed without causing a delay to subsequent activities and/or the completion date of the Work:
1. Float is not for the exclusive use or benefit of either the City or the Contractor but is jointly owned. Liability for delay to the Substantial Completion of the Work rests with the party whose actions, last in time, actually cause a delay to the Substantial Completion date.
 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of its successor activity.
 3. Total float is the amount of time that an activity may be delayed from early start without adversely affecting the Substantial Completion date.
- F. Resource Loading: The allocation of direct man-hours by trade, material, equipment, subcontractors, and all other resources required to complete each activity. The contractor shall account for the indirect man-hours in the cost. The indirect labor hours could be tracked and reported separately, if agreed upon between the Contractor and the DEN Project Manager prior to the start of the Work.
- G. Direct Man-hours: Man-hours related only to the physical construction of the Work, i.e., masonry, mechanical, electrical, drywall, carpeting, etc.
- H. Indirect Man-hours: Man-hours related to support of the physical construction of the Work, i.e., cleanup, mobilization, traffic control, temporary activities, badging, supervision and overhead, etc.
- I. Work Breakdown Structure (WBS): A hierarchical arrangement of the activities that allows for the roll-up and summarization to a predetermined level. The level of breakdown shall be agreed upon by the Contractor and the DEN Project Manager prior to the start of Work.

1.4 SUBMITTALS

A. Scheduler Qualifications

1. Scheduling Consultant Qualifications: A professional specialist, experienced in CPM scheduling and reporting with capability of producing CPM reports and diagrams who can quickly produce these reports/diagrams within 24 hours of the DEN Project Manager's request. Review methods and procedures related to the set-up in the PMIS of Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - a. Review content and format for reports.
 - b. Verify availability of qualified personnel needed to develop and update schedule.
 - c. Discuss constraints, including phasing, area separations, interim milestones, and partial Owner occupancy.
 - d. Review delivery dates for Owner-furnished products.
 - e. Review submittal requirements and procedures.
 - f. Review time required for review of submittals and resubmittals.
 - g. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - h. Review time required for Project closeout and Owner start-up procedures, including commissioning activities.
 - i. Review procedures for updating schedule.
 - j. Review requirements for content and input of direct man-hour resources in activities.
 - k. Review requirements for cost loading of activities.

B. Format for Submittals: All schedules shall be submitted in the following format:

1. The Contractor shall develop Critical Path Method (CPM) Schedule utilizing the applicable PMIS. The schedule shall utilize the Precedence Diagram Method (PDM) and be depicted in Gantt Chart view.
2. All schedules shall be submitted to the DEN Project Manager electronically in a PDF format that enables the fields, rows, and columns to be expanded, as required. Additionally, the PDF format used must allow import/export, manipulation, and generation of reports to evaluate and review any part of the schedule.
3. Export file shall use the following naming convention. For example, 161510 BL – Parking Structure MOD4E Baseline
 - a. Project ID: To be assigned at Schedule Conference Meeting, i.e., 161510
 - b. Project Name: Reference Project Manual for Project Name, i.e., Parking Structure MOD 4E
 - c. Identify schedule type: Baseline, Update or Revision, i.e., BL, U, and R
4. All schedules shall contain a title block showing:
 - a. Project name.
 - b. Contractor number.

- c. Contractor's name.
 - d. Data date.
 - e. Symbol legend.
5. All schedules shall contain a time-scale at the top showing month and weeks.
6. The activity table layout shall include, but not limited to, the following columns:
 - a. Activity ID.
 - b. Activity name.
 - c. Original duration.
 - d. Schedule percent complete.
 - e. Start date
 - f. Finish date
 - g. Total Float.
7. A narrative report shall accompany all schedules.
8. A mitigation report shall be required when at the discretion of either party it becomes apparent that the project is not progressing on time regardless of the cause of delays and impacts, or issued construction changes have negative impact and require a mitigation effort through several viable alternatives. The mitigation report shall detail the measures proposed by the Contractor to mitigate the impacts of the delay in order to meet the planned project completion date.

1.5 PRELIMINARY CONSTRUCTION SCHEDULE:

A. Gantt Chart Schedule

1. Submit Gantt chart-type CPM Construction Schedule at the pre-construction meeting.

B. Preparation

1. Indicate each significant construction activity separately.
2. Identify first workday of each week with a continuous vertical line.
3. Outline significant construction activities for first sixty (60) days of construction.
4. Include skeleton diagram for the remainder of the Work.
5. The Preliminary Schedule shall show all significant work tasks that occur in the first sixty (60) days, including planning, mobilization, shop drawings and technical submittals and approval time, procurement, fabrication and construction.
6. It shall identify work items or milestones that affect or are affected by City, other Contractor's work, utilities, and other third parties and it shall list major submittals required by the Contract.

C. Narrative

1. The Preliminary Schedule shall be accompanied by a narrative describing the Contractor's approach to mobilization, procurement, and construction during the first sixty (60) days.
2. The narrative shall elaborate based on durations, production rates, major

equipment to be used, and shall identify all major assumptions used to develop the schedule.

- D. Approval of Preliminary Construction Schedule will not constitute approval of Schedule of Values.
- E. The DEN Project Manager will respond within 14 days to the Preliminary Schedule submittal with either acceptance or direction to revise and resubmit.
- F. In lieu of the Preliminary Schedule, the Contractor may, at the Contractor's own discretion, submit the Construction Schedule at the Preconstruction Meeting. If the Construction Schedule is submitted in lieu of the Preliminary Schedule, the DEN Project Manager will respond within thirty (30) days with acceptance or direction to revise and resubmit within ten (10) days.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. The Contractor shall submit the Initial Construction Schedule thirty (30) days after the Notice to Proceed (NTP). Upon acceptance from the DEN Project Manager and the DEN Scheduler, the Initial Construction Schedule shall become the Baseline Schedule for the duration of the project.
- B. The DEN Project Manager will respond within 14 days with acceptance or direction to revise and resubmit.
- C. Failure of the contractor to have a Construction Schedule accepted by DEN Project Manager will be considered cause for withholding progress payment.
- D. The acceptance of the schedule is for general conformity to the Contract requirements and shall not constitute any relief of any Contract requirements.
- E. Failure to include any work item required for performance of this Contract shall not excuse the Contractor from completing all Work within applicable completion dates, regardless of the City's acceptance of the schedule.
- F. Preparation:
 - 1. Project Duration
 - a. Extend schedule from date of established for the NTP to date of Substantial Completion and Final Completion.
 - b. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically amended by Change Order.
 - 2. Activities
 - a. Treat each building floor or separate area as a separate numbered activity for each main element of the Work. Prepare a list of all activities required to complete the Work and indicate the estimated time duration, sequence

requirements, and relationships of each activity in relation to the other activities.

3. Activity Duration:
 - a. Define activities so no construction activity is longer than twenty (20) days, unless specifically allowed by DEN Project Manager. Include estimated time frames for the following activities:
 - 1) Preparation and processing of submittals.
 - 2) Mobilization and demobilization.
 - 3) Purchase of materials.
 - 4) Delivery of materials.
 - 5) Fabrication of materials
 - 6) System shutdown request and approval
 - 7) Utility/system interruptions
 - 8) Installation
 - 9) Work by City, other contractors, utilities and other third parties that may affect or be affected by Contractor's activities.
 - 10) Startup, Testing and Commissioning
 - 11) Punch list and Final Completion.
4. Critical Path Activities:
 - a. No more than twenty-five (25) percent of the activities may be on the critical path, unless approved IN WRITING by DEN Project Manager.
 - b. Identify critical path activities, including those for interim completion dates.
 - c. Scheduled start and completion dates shall be consistent with Contract milestone dates.
5. Procurement Activities:
 - a. Include procurement activities for long lead items and major items as separate activities in schedule.
 - b. Procurement cycle activities including, but are not limited to, submittals, approvals, purchasing, fabrication and delivery.
6. Submittal Review Time:
 - a. Include review and re-submittal times indicated in Technical Specification 013300 "Submittal Procedures" in schedule unless time frame is reduced by approval of the DEN Project Manager.
 - b. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
7. Substantial Completion:
 - a. Indicate date established for Substantial Completion.
8. Constraints:

- a. Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1) Phasing:
 - a) Arrange list of activities in schedule by phase or Work Breakdown Structure (WBS).
 - b) Coordinate phasing and constraint with those established in Technical Specification Section 011400 "Work Sequence and Constraints".
 - 2) Products Ordered in Advance:
 - a) Include separate activity for each product.
 - b) Include delivery date indicated in Technical Specification Section 011100 "Summary of Work".
 - c) Delivery dates indicated stipulate the earliest possible delivery data.
 - 3) Owner-furnished Products:
 - a) Include separate activity for each product.
 - b) Include delivery date indicated in Technical Specification Section 011100 "Summary of Work".
 - c) Delivery dates indicated stipulate the earliest possible delivery date.
9. Milestones:
 - a. Include milestone indicated in the Contract Documents in schedule, including, but not limited to, the NTP, phasing requirements, Substantial Completion and Final Completion.
 - 1) Resource Loading of Construction Schedule:
 - a) Coordinate with DEN Project Control Staff and DEN Project Manager for the requirements below
 - b) Activities shall be resource loaded with direct man-hours required to perform the physical construction of the project. Indirect man-hours shall not be included as resources to activities.
 - 2) Contract Modifications:
 - a) For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change to the overall project schedule

1.7 CONSTRUCTION SCHEDULE MONTHLY UPDATES

- A. The Contractor shall submit a monthly progress schedule at the end of each month following the NTP. At the end of each month, the Contractor and DEN Project Manager shall agree on the progress of the work and the Contractor shall update the Construction Schedule accordingly. This review does not constitute an acceptance of the Construction Schedule and shall not be used for the purpose of modifying the initially accepted Construction Schedule.
- B. Failure of the Contractor to have a Construction Schedule accepted by the DEN Project Manager will be considered cause for withholding progress payment per Article 306 - Working Hours and Schedules and Article 909 - Additional Withholding of Progress Payments of the General Contract Conditions, 2011 Edition.
- C. The Contractor's monthly progress schedule shall include a written narrative describing the overall progress of the Work, provide a critical path analysis, discuss significant problems with proposed corrective action, and how the status of major changes and any other changes are affecting the project schedule.
- D. Concurrent with making revision to the schedule, prepare a tabulated report showing the following and include in the narrative report:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations-for remaining work activities only.
 5. Changes in critical path.
 6. Change in total float
 7. Changes in contract duration.
- E. Changes to the Schedule:
1. The Construction Schedule may be changed when one or more of the following events occur:
 - a. When a Change Order significantly affects the contract completion date or sequence of work.
 - b. When the Contractor elects to change the sequence or duration of work items affecting the critical path.
 - c. When the City directs a change that affects a milestone dates specified in the Special Conditions or alters the length of a critical path.
 2. Minor revisions submitted at monthly progress review meeting are not considered as changes in this context.
- F. If, after submitting a request for change to the Construction Schedule, the DEN Project Manager does not agree with the request, the DEN Project Manager will schedule a meeting with the Contractor to discuss the differences. If a settlement cannot be reached on the change in the Construction Schedule, or if the Contractor has failed to submit revisions to the network, the DEN Project Manager has the option of providing

suggested logic or duration changes in all subsequent update schedules. The suggested logic and/or duration times will remain in effect until the change in the Construction Schedule is settled or until the logic and duration are superseded.

1.8 AS-BUILT CONSTRUCTION SCHEDULE:

- A. After all Contract Work items are complete, the contractor shall submit an as-built Construction Schedule showing actual start and finish dates for all work items and milestones.

1.9 SCHEDULE NARRATIVES

- A. In addition to the schedule, the Contractor shall submit a narrative that explains the basis for the Contractor's determination of construction logic.
- B. It shall include estimated quantities and production rates, hours per shift, workdays per week, and types, number and capacities of major construction equipment to be used and whether the Contractor plans to work weekends.

1.10 SUBCONTRACTOR COORDINATION

- A. The Contractor shall schedule and coordinate the work of all of its subcontractors and suppliers including their use of the worksite.
- B. The contractor shall keep the subcontractors and suppliers informed of the project Construction Schedule to enable the subcontractors to plan and perform their work properly.

1.11 THREE WEEK LOOK-AHEAD SCHEDULE

- A. The Contractor shall provide the DEN Project Manager an electronic copy prior to and a minimum of four (4) hard copies of the Contractor's Three (3) Week Look-Ahead Schedule for review at the DEN Project Manager's weekly progress meeting.
- B. The schedule shall be in bar chart format based on the approved accepted CPM Baseline Schedule and shall include dates of testing activities, anticipated dates of inspection by DEN and other agencies, activities in progress, percentage of completion of activities, and responsible subcontractor for the activities.

1.12 RECOVERY SCHEDULE

- A. If the latest completion time date for any work item does not fall within the time allowed by the Construction Schedule, the sequence of work or duration shall be revised by the Contractor through concurrent operations, additional manpower, additional shifts or overtime, additional equipment, or alternative construction methods until the schedule produced indicates that all significant contract completion dates, occupancy dates and

milestones will be met.

- B. No additional costs will be allowed if such expediting measures are necessary to meet the agreed completion date or dates except as provided elsewhere in the Contract Documents.
- C. When periodic update indicates the Work is behind the current approved schedule, submit a separate Recovery Schedule indicating means by which Contractor intends to regain compliance with the schedule.
- D. Provide a narrative indicating changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished. The narrative shall be submitted in accordance with Article 1105 – Time Extensions in the General Contract Conditions, 2011 Edition.

1.13 CONTRACT EXTENSIONS

- A. If the Contractor is granted an extension of time for completion of any milestone or contract completion date under the provisions of the Contract, the determination of the total number of extended days will be based upon the current analysis of the schedule and upon all data relevant to the extension. Such data shall be incorporated into the next monthly update of the schedule.
- B. The Contractor acknowledges and agrees that delays in work items that, according to schedule analysis, do not affect any milestone dates or the Contract completion date shown on the CPM Network Schedule at the time of the delay will not be the basis for a Contract extension.

1.14 COORDINATION

- A. Pre-scheduling Conference: Schedule conference at Pre-Construction meeting to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to setting up the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, area separations, interim milestones, and partial Owner occupancy.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review submittal requirements and procedures.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review time required for Shutdown request and approval.
 - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.

10. Review procedures for updating schedule.
 11. Review requirements for content and input of direct man-hour resources in activities.
 12. Review requirements for cost loading of activities.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values.
- C. Work items in the Construction Schedule shall be identified in a Work Breakdown Structure (WBS) format that corresponds with the technical specifications.
- D. At a minimum WBS shall correspond to the first tier level of the Master Format.
- E. Secure time commitments for performing critical elements of the Work from entities involved.
- F. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 013210

SECTION 013223 - CONSTRUCTION LAYOUT, AS-BUILT AND QUANTITY SURVEYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section covers Denver International Airport (DEN) procedures and accuracy requirements for survey services for construction layout, as-built, and quantity surveys.
- B. Before commencing any field surveys on DEN property, the Contractor shall coordinate a pre-survey preparation activities meeting. This meeting is to be arranged through the Denver International Airport (DEN) Project Manager's Office with the attendance of the Contractor, the Contractor's surveyor and the DEN Survey Section. The Contractor is responsible for obtaining DEN related survey guidance, National Geodetic Survey (NGS) control stations, projection parameters, and training materials from the DEN Survey Section prior to beginning any survey work.
- C. Reference Contract General Conditions.
- D. Survey Project Checklist, provided after the end of this Section, will be reviewed at the pre-survey preparation activities meeting.

1.3 REFERENCE DOCUMENTS:

- A. Section 013300 "Submittal Procedures"
- B. Section 013325 "Shop and Working Drawings, Product Data and Samples".
- C. Federal Aviation Administration Advisory Circular 150/5300-16A - "General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey".
- D. Federal Aviation Administration Advisory Circular 150/5300-17C - "Standards for Using Remote Sensing Technologies in Airport Surveys".
- E. Federal Aviation Administration Advisory Circular 150/5300-18B - "General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards".
- F. DEN Building Information Modeling (BIM) Design Standards Manual (DSM) and

Construction Plan Manual, Technical Specifications Division 1.

G. Colorado Department of Transportation (CDOT) Survey Manual.

1.4 SUBMITTALS

A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for the submittal process.

B. Survey Statement of Work (SSOW):

1. The Contractor must develop a complete SSOW and submit it to the DEN Project Manager. The SSOW is the Contractor's written description of the Contractor's methodology for surveying services that will be provided as part of the Project, including specific features that will be surveyed, action items, timelines necessary airport resources and general information.
2. SSOW must be submitted within ten (10) working days of the Notice to Proceed (NTP) and prior to commencement of any survey or layout work on the site.
3. The SSOW will be reviewed and approved by the DEN Survey Section. Under no circumstances will work begin until the SSOW has been accepted. Review comments and/or approval will be sent to the DEN Project Manager within three (3) working days of the delivery of such document to the DEN Survey Section.

C. Survey and layout data must be submitted in the format indicated below. The data must be submitted immediately after completion and shall be certified and/or stamped by a current Colorado Registered Professional Land Surveyor where it is required by the Contract Documents.

1. All Raw Data files, either GPS, digital levels or conventional total station must use a Trimble format.
2. All copies of original pages of field notes or electronic field notes must be in Adobe Portable Document Format (PDF).
3. All original field notebooks used for this Project must be submitted at the end of Contract.
4. All as-built points files must be in either CSV or TXT format.
5. All CAD drawings must be in Autodesk Civil 3D format.
6. CAD layers are specified in DEN Design Standards Manual Volume 12.
7. DEN will provide the Autodesk Civil 3D drawing template.

D. Survey and Quality Control Plan (SQCP):

1. The Contractor must develop a complete SQCP and submit it to the DEN Project Manager. The SQCP is the Contractor's written description detailing the Contractor's methodologies for data collection, data safeguarding and quality assurance. Provide insight on how the Contractor will completely check all data to ensure it is complete, reliable, and accurate. Identify data safeguards used to protect this sensitive and safety critical data. Utilize a checklist based quality control process with definable and repeatable standards for each element ensuring consistency of work between different personnel within an organization.

Submit the plan in a non-editable format such as Adobe Portable Document Format (PDF).

2. The SQCP must be submitted within ten (10) working days of the NTP and prior to commencement of any survey or layout work on the site.
3. The SQCP will be reviewed and approved by the DEN Survey Section.
4. Under no circumstances will Survey work begin until the SSOW has been accepted. Review comments and/or approval will be sent to the DEN Project Manager within three (3) working days of the delivery of such document to the DEN Survey Section.

E. Weekly Project Status Report:

1. Submit a project status report via email DEN Project Manager every Monday by 2:00 P.M. Mountain Time, from the date of the task order until the date of Substantial Completion. Include in the reports the percentage complete for each of the major portions of the Work with the estimated completion date or completion date. Provide the status of ongoing work, with expected completion dates, and any unusual circumstances and/or deviations from this guidance. Status reports should be brief and contain the current information in the text of the email. See the example of a Project Status Report as provided after the end of this Section.

F. Final Project Survey Report:

1. The Final Project Survey Report, if required, use format from AC 150/5300-18B 2.6.4.
2. Final Project Survey Report must be stamped and signed by a current Colorado Registered Professional Land Surveyor.

1.5 EQUIPMENT

A. Equipment Calibration:

1. Equipment must be regularly checked, and calibrated for accuracy at the beginning of any survey project to ensure that the equipment is operating appropriately. Errors due to poorly maintained or malfunctioning equipment will not be accepted. If any equipment errors are found to exist, they must be reported to the DEN Survey Section prior to the start of any surveying. These errors will need to be verified and eliminated prior to performing any survey work. For projects lasting longer than six (6) months, the checking, and calibration of equipment shall be repeated. Furthermore, documentation must verify such equipment has met acceptable tolerances.
2. The Contractor MUST submit to the DEN Project Manager written proof that survey equipment, as listed in the SQCP plan has been checked and calibrated before commencing any survey work. This could be in the form of field notes. If repairs are made, documentation of such repairs from an authorized equipment vendor is required

B. See CDOT Survey Manual for acceptable procedures for calibrating equipment

electronic survey instruments adjustments, calibration or repairs:

1. All electronic survey instruments shall be repaired, adjusted, or calibrated only by an authorized equipment vendor or manufacturers service department.
2. A calibration check on all types of electronic survey instrumentation is essential to obtain and maintain the tolerances required for any DEN project. At the beginning of any DEN project, all survey equipment utilized to perform the survey shall be calibrated by the surveyor in charge of the Project.
3. See CDOT Survey Manual for acceptable procedures for calibrating equipment.

C. Baseline Calibration Requirements:

1. See CDOT Survey Manual for the procedures to check the survey equipment and the method of reporting the findings to the DEN Project Manager and the DEN Survey Section.
2. The Contractor MUST submit to the DEN Project Manager written proof that survey equipment has been checked and calibrated before commencing any survey work. This could be in the form of field notes. If repairs are made, documentation of such repairs from an authorized equipment vendor is required.

1.6 SURVEY CONTROL

- A. All airport construction project surveys MUST USE the most current coordinate system. No prior coordinate systems are supported. Surveys MUST utilize the most current coordinate system for collecting construction as-built information.
- B. Since the DEN LDP utilized the NAD83 (2007) data, all NGS horizontal points MUST use the NAD83 (2007) data. The DEN Survey Section will provide this data during the mandatory pre-survey preparation activities meeting. The DEN Survey Section will also provide coordinates for all NGS Control Points in DEN LDP based upon the location of the Project.
- C. Since DEN has established NGS horizontal control points, the Contractor MUST use the published latitudes, longitudes, and heights with the projection parameters for these control points that are received and NOT the DEN LDP rectangular coordinates for base station setups for the Geodetic Verification Survey. The Contractor must verify each NGS Horizontal and Vertical primary control point stations by:
1. Physically visiting each control station to determine its usability and checking its identity.
 2. Ascertaining its unmoved position.
 3. Determining its condition, stability, visibility.
 4. The submission of a recovery report to NGS if one has not been recently recorded.
- D. Geodetic Verification Survey Instructions and Procedures:
1. The geodetic verification survey is created to insure the stable position of the DEN control points that are used to reference the temporary design/construction

control points to the National Spatial Reference System (NSRS). Acceptable monuments will be identified by the DEN Survey Section and will be limited to monuments of the NSRS with permanent identifiers (PIDS) and published positions and elevations. Temporary design/construction control points established for such project will be referenced by direct measurement to at least two (2) separate NGS control stations

- a. The Contractor will attempt to recover each identified monument and determine its condition, stability, and suitability for the intended use. A location sketch and visibility diagram will be prepared for each station. A minimum of three (3) digital photographs, one of each type described in AC 150/5300-18B, Section 1.5.2.1, will be captured, captioned, and properly named. A recovery note will be filed with NGS if no current recovery is shown in the NSRS database.
- b. After recovering the identified NSRS NGS control stations that are located on DEN property, the procedure to verify the control points are as follows:
 - 1) When using a remote GPS base station on the airfield, the Contractor must occupy the Primary Airport Control Station (PACS) and observe the Secondary Airport Control Station (SACS) for a duration of at least ten (10) minutes (600 epochs), along with a five (5) second collection interval. Then reverse the setup, occupy the SACS and observe the PACS for a duration of at least ten (10) minutes (600 epochs), along with a five (5)-second collection interval. The end results are two (2) independent GPS observations. Compare the newly measured distances or inverse distances (from new observations) against the distances determined from the published positions. Submit results to the DEN Survey Manager and DEN Survey Section in Microsoft Excel format.
 - 2) When using a Virtual Reference Station (VRS) on the airfield, the Contractor must observe the PACS and the SACS for a duration of at least ten (10) minutes (600 epochs), along with a five (5)-second collection interval. Then reverse the setup, occupy the SACS and observe the PACS for a duration of at least ten (10) minutes (600 epochs), along with a five (5)-second collection interval. The end results are two (2) independent GPS observations. Compare the newly measured distances or inverse distances (from new observations) against the distances determined from the published positions. Submit results to the DEN Survey Manager and DEN Survey Section in Microsoft Excel format.
 - 3) When using conventional methods on the airfield, measure the distance between the PACS and SACS using a calibrated electronic distance meter instrument (EDMI). Compute either the inverse using the NGS program INVERS3D (available on the NGS website at <http://www.ngs.noaa.gov/TOOLS/>) or a comparable commercial product. Compare the newly measured distances or inverse distances, from new observations, against the distances determined from the published positions. Submit results to the DEN Survey Manager and DEN Survey Section in Microsoft Excel format.

- 4) Obtain elevation checks either from GPS observations or from digital levels. The distances must agree within, plus or minus, three (± 3) cm; the difference in ellipsoidal height must agree within, plus or minus, four (± 4) cm, and the difference in orthometric height must agree within, plus or minus, five (± 5) cm. If the tolerances are not met, the data must be recollected.
- 5) Provide the results or the comparisons as part of the observational data in a report to the DEN Project Manager to be reviewed and approved by the DEN Survey Section prior to the start of construction and include this approved report in the final report.
- 6) Submit a recovery report for the NGS horizontal control stations to the NGS.

E. The Following are Limitations and Additional Information on NGS Control Stations and NGS Benchmarks (Refer to the NGS website.):

1. The use of control monuments and projection parameters for construction layout other than those shown on the Contract Drawings or furnished by or approved by the DEN Survey Section is STRICTLY PROHIBITED. Use of other monuments is solely at the risk of the Contractor.
2. The DEN Survey Section will provide the contractor with the projection parameters and any assistance in implementing the current coordinate system. It is up to the Contractor to use the correct methodology in performing any survey task that shall be submitted to the DEN Project Manager and reviewed during the pre-survey preparation activities meeting.
3. The DEN Survey Section will need all pertinent data from the contractor to check and verify that the Contractor implemented the current coordinate system correctly.

F. Modifications to AC 150/5300-18B, Section 2.6.10.1.1, Verification of Survey Marks:

1. DEN is modifying the requirement for verification of PACS and SACS and is replacing it with a requirement to verify the unmoved position and elevation of both the PACS and SACS for any airside projects and any two (2) DEN approved NGS horizontal control stations for any landside project.
2. The surveyor must follow the same verification procedure as stated in paragraph 1.6.C of this Section.

G. Reporting Damage or Errors of NGS Control Stations:

1. Report damaged or destroyed airport control points, benchmarks, and section corner monuments promptly to the DEN Project Manager.
 - a. If section corner monuments are damaged or destroyed during construction activities, such points shall be re-established pursuant to Laws of the State of Colorado Regulating the Practice of Land Surveying by a Registered Professional Land Surveyor in the State of Colorado.
 - b. If NGS control stations or NGS benchmarks are damaged, moved, altered, or destroyed by the Contractor, the City's cost of reestablishing such points

- shall be borne by the Contractor.
- c. The City will not be responsible for any increased costs or delays to the Contractor relating to reference points, airport control points, or benchmarks that are damaged, moved, altered, or destroyed by the Contractor or its subcontractors, suppliers, agents or employees or other Contractors working on the site.
2. Report alleged errors in NGS control stations or NGS benchmarks promptly to the DEN Project Manager.
 - a. Discontinue use of NGS control stations or NGS benchmarks alleged to be in error until the accuracy of points can be verified or as directed.
 - b. Claims for extra compensation for alteration or reconstruction allegedly due to errors in NGS control stations or NGS benchmarks will not be allowed unless original NGS control stations and NGS bench marks still exist or substantiating evidence proving error is furnished by the Contractor, and unless the Contractor has reported such errors to the DEN Project Manager as specified herein.
- ### 1.7 TEMPORARY SURVEY CONTROL
- A. The Contractor MUST set a minimum of 1" copper plug; a PK (surveying) nail in asphalt or a 5/8" rebar with cap stamped "Control Point" and the Surveyor's Professional Land Surveyors' number, in natural ground. Any other type of material used for control points MUST be approved first.
 - B. When a contractor establishes temporary control points for DEN survey work the Contractor MUST follow FAA guidelines. All temporary control points must be referenced to the NSRS using the NGS control stations provided by the DEN Survey Section. Temporary control may be necessary based on project site location. Below are the acceptable means to establish temporary geodetic control for DEN design or construction projects:
 1. Temporary control must be established under close cooperation with the DEN Survey Section following the procedures outlined in AC150/5300-16 "General Guidance and Specifications for Aeronautical Surveys.
 2. Establishment of Geodetic Control and Submission to National Geodetic Survey" shall be required only in the following cases:
 - a. Large airport airfield construction project that significantly changes the airport geometry and would trigger the need to acquire new Digital Stereo Imagery following AC 150/5300-17 "General Guidance and Specification for Aeronautical Survey Airport Imagery Acquisition and Submission to the National Geodetic Survey". Examples include a new runway and taxiway complex, significant modification of existing runway or taxiway system, development of new outboard deice pad complex or establishment of new mid airfield concourse and terminal complex. The size and complexity of the Project will dictate the need to acquire new digital stereo imagery for significant construction.

- b. Construction that establishes a new ILS CAT II/III Operations.
 - c. New Instrument Development Procedure.
 - d. New Airport Layout Plan Survey Update.
 - e. New Airport Obstruction Chart Update.
 - f. New Airport Mapping Database.
3. On DEN construction projects, the Contractor, excluding large airport airfield construction projects, may use temporary control points on their project site. These temporary control points must be referenced to the nearest DEN primary control points and **MUST BE** referenced vertically to two (2) different benchmarks. Also, all surveyors **MUST** obtain permission to establish temporary control points on DEN property by means of communicating with the DEN Survey Section.
4. In addition, all vertical control **MUST BE** established only using a digital level and collected using the digital software to reduce transposition errors unless otherwise authorized by the DEN Survey Section.
5. Minimum Construction Horizontal and Vertical Accuracy Tolerance:
 - a. Adjustments:
 - 1) No Horizontal adjustment of the survey field data will be permitted without the written consent of the DEN Project Manager and the DEN Survey Section. If it is determined that an adjustment is necessary, a weighted least squares adjustment method is recommended.
 - b. Primary Control Benchmark Minimum Vertical Accuracy Tolerance:
 - 1) Setting of primary control benchmarks shall meet the Minimum Vertical Accuracy Tolerance of a NGS Second Order Class II as the square root of the total horizontal distance of the level loop in miles multiplied by 0.035 feet.
 - 2) The Primary Control Benchmarks must be NGS Published Vertical Points.
 - c. Secondary Control Benchmark Minimum Vertical Accuracy Tolerance:
 - 1) Setting of secondary control benchmarks for construction shall meet the Minimum Construction Vertical Accuracy Tolerance of the square root of the total horizontal distance of the level loop in miles multiplied by 0.035 feet.
6. Whether establishing temporary control points or not, the Contractor must set up a pre-survey preparation activities meeting with the DEN Project Manager and DEN Survey Section to discuss Geodetic Control Verification, obtain pertinent survey data, and projection parameters before the commencement of any survey work.
7. If temporary control points are needed, the Contractor can set and collect temporary control while performing as outlined in Part 1 of this Section. This procedure requires a ten (10) minute (600 epochs) for each temporary control point set. Once the data is collected the Contractor is required to submit to the

DEN Project Manager all GPS raw data in a Trimble format with a spreadsheet that displays the comparison from each observation of the NGS control stations and the Contractor's temporary control points. Only the redundant values of the temporary control points should be averaged. The results must be reviewed and approved by the DEN Survey Section, allowing at least seventy-two (72) hours to review and either approve or reject the temporary control. All temporary control points MUST BE accepted before any survey construction work can commence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONSTRUCTION LINES AND GRADES

- A. The Contractor's surveyor shall make surveys and layouts as necessary to delineate the Work. As a part of such surveys, the Contractors Surveyor shall furnish, establish, and maintain in good order, survey control points that may be required for the completion of the Work
- B. The DEN Project Manager shall have the right to check surveys and layouts made by the Contractor prior to approving any of the Work. The Contractor shall give advance notice of not less than forty-eight (48) hours to the DEN Project Manager to enable such checking prior to placing any work. The Contractor shall furnish assistance as may be required for checking purposes when so requested by the DEN Project Manager.
- C. The Contractor shall furnish skilled labor, instrument platforms, ladders, and such other temporary structures as may be necessary for making and maintaining points and lines in connection with the surveys required.
- D. DEN may draw the Contractor's attention to errors or omissions in lines or grades, but the failure to point out such errors or omissions shall not give the Contractor any right or claim nor shall in any way relieve the Contractor of obligations according to the terms of this Contract
 - 1. The Contractor's Surveyors instruments and other survey equipment shall be accurate, suitable for the surveys required in accordance with recognized professional standards and in proper operating condition and adjustment at all times. Surveys shall be performed under the direct supervision of a current Colorado Registered Licensed Surveyor.
- E. Field Notes:
 - 1. The Contractor shall record surveys in field notebooks or as electronic field notes, whichever is more appropriate to the type of survey work. Copies of the original pages of field notebooks shall be furnished to the DEN Project Manager and the DEN Survey Section at intervals required by the DEN Project Manager.

Each field notebook shall be furnished to the DEN Project Manager when filled or at completion of project. No erasures are allowed on the data entered in the field book. Cross out errors, and write correct entries above. The person that makes correction in the field book should initial above corrections made. An explanatory note shall be made for all corrections to original figures. All editing of computer records shall be done on a copy of the original with all changes initialed. Electronic data from data collectors shall be provided in formats in accordance with DEN Design Standards Manual Volume 12 and Construction Plan Manual Technical Specifications Division 1. These will be used to supplement field books and shall be supplied to the DEN Project Manager and DEN Survey Section on Compact Disk (CD).

2. If the DEN Project Manager or DEN Survey Section finds errors in the field notes DEN will have the Contractor correct and resubmit the notes. This review does not relieve the Contractor from the responsibility of maintaining accurate survey data. Whichever method of note taking the Contractor starts with, the Contractor must use the same method throughout the Contract duration.

3.2 SUBSURFACE UTILITIES ENGINEERING (SUE)

- A. Refer to Section 011810 "Utilities Interface" for information related to underground utilities.

3.3 QUANTITY SURVEYS FOR PAYMENT

- A. When the specifications or the DEN Project Manager requires items in the Schedule of Prices and Quantities to be measured by surveying methods, the Contractor shall perform the surveys. All such surveys, including Horizontal and Vertical control surveys run for establishing the measurement values shall be performed in the presence of the DEN Project Manager and the DEN Surveyor may witness the surveying operation. The Contractor will reduce the field notes and calculate final quantities for payment purposes. The note reductions and calculations shall be submitted to the DEN Project Manager.

3.4 SURVEYING ACCURACIES AND TOLERANCES IN CONTROL SURVEYS, CONSTRUCTION LAYOUTS AND QUANTITY CALCULATIONS

- A. See CDOT Survey Manual or FAA Specifications for acceptable tolerances.

3.5 CAD DRAWINGS PER DEN GIS LAYER STANDARDS

- A. Where CAD drawings are required, follow DEN BIM DSM.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. Measurement for Construction As-built Survey (BIM) shall be per lump sum. This item shall include as-built survey of all construction items associated with the contract. All as-built survey will be submitted to the DEN Project Manager for approval. This item includes and revisions and resubmittals necessary to meet the DEN Building Information Modeling (BIM) Design Standards Manual (DSM) and Construction Plan Manual, Technical Specifications Division 1.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. Payment for Construction As-built Survey (BIM) will be made at the contract unit price per lump sum. This price will be full compensation for the Construction As-built Survey (BIM) and all associated items necessary for approval as provided in the DEN Building Information Modeling (BIM) Design Standards Manual (DSM) and Construction Plan Manual, Technical Specifications Division 1.

Payment Shall Be Made Under:

013223a Construction As-built Survey (BIM) Per Lump Sum

PART 6 - Survey Checklist

Step	Yes	No	N/A	Project Kickoff Phase
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did Consultant/Contractor meet with DEN PM obtain the data standards and general requirements for data gathering?
2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did Consultant/Contractor meet with Airport Survey Office to obtain airport survey control points, projection parameters, and airport survey training materials?
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did Consultant/Contractor provide Survey Statement of Work to DEN PM?
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did Consultant/Contractor provide Geodetic Verification Survey to DEN PM?
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did Consultant/Contractor provide Survey Control Plan to DEN PM?
6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did Consultant/Contractor provide Imagery Plan to DEN PM? (Only required if collecting aerial imagery)?
7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did the FAA accept survey plans?
Step	Yes	No	N/A	Construction Phase (As-Built)
8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did Consultant/Contractor perform field survey of project site to collect accurate as-built data?
9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did the Consultant/Contractor provide DEN PM with subsurface utility data?
10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Each week, did the Consultant/Contractor provide DEN PM with Project Status Reports?
11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did the Consultant/Contractor provide DEN PM with 30% as-built data in both CADD and GIS formats including all attribute information and metadata?
12a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did DEN PM report 30% QA findings via email to Consultant/Contractor?
12b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If required, did the Consultant/Contractor provide DEN PM with 60% as-built data in both CADD and GIS formats including all attribute information and metadata?
12c	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If applicable, did DEN PM report 60% QA findings via email to Consultant/Contractor?
12d	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If required, did the Consultant/Contractor provide the DEN PM with 90% as-built data in both CADD and GIS formats including all attribute information and metadata?
12e	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If applicable, did DEN PM report 90% QA findings via email to Consultant/Contractor?
13	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did the Consultant/Contractor provide DEN PM with 100% as-built data in both CADD and GIS formats including all attribute information and metadata?
14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did Consultant/Contractor provide DEN PM with a completed Final Survey Report?
15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Did DEN PM report QA findings via email to Consultant/Contractor?

PART 7 - SAMPLE OF A WEEKLY PROJECT STATUS REPORT:

Anywhere Field/Anywhere International Airport

AIP X-XX-XXXX-XXX-20XX

Survey progress update #1

July XX to July XX

Eagle Eye Surveying completed a second week of ground surveying. The first week verified PACS and SACS control, collected runway centerline, and primary surface topographic information.

To date we have surveyed for Runway 12-30:
Airport Control (PACS, SACS, ANY B540) 100%
Runway and Stop way Ends 100%
NAVAIDS (VOR, NDB, Airport Beacon, VASI, PAPI, and REILs) 100%
Runway and Stop way Obstructions (Primary surface, approaches, transitional surfaces) 100%
Aircraft Movement and apron areas 75%
Prominent airport buildings / potential close-in obstructions 42%

This week we will be analyzing the collected obstruction survey data relative to the object identification surfaces. We will check both the required points for each obstruction zone and the navigational aids, and generate the appropriate field documentation. We completed subcontract negotiations with aerial photography sub consultant SkyCamera, Inc. and are submitting the proposed flight map with ground reference points for review and approval before completing our final week of field surveying. This week we will be setting aerial targets and surveying in the targets and Photo ID points, and collecting final outlying obstruction data. Aerial photography is promised to us 2 to 4 days after our targets are in place.

Sincerely,

Any Surveyor, P.S.
Eagle Eye Surveying

END OF SECTION 013223

TECHNICAL SPECIFICATIONS
01 GENERAL REQUIREMENTS
013223
CONSTRUCTION LAYOUT, AS-BUILT AND QUANTITY
SURVEYS

DENVER INTERNATIONAL AIRPORT
DEN TECH SPECS 2016
CONTRACT NO.201737338

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special 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. Periodic construction photographs.
 - 3. Final Completion construction photographs.
 - 4. Preconstruction video recordings.
 - 5. Periodic construction video recordings.
 - 6. Web-based construction photographic documentation.

1.3 REFERENCE DOCUMENTS:

- A. Section 013300 "Submittal Procedures"
- B. Section 017720 "Contract Closeout"
- C. Section 017900 "Demonstration and Training"
- D. Section 024116 "Structure Demolition"
- E. Section 024119 "Selective Demolition"
- F. Section 311000 "Site Clearing"

1.4 ALTERNATES

- A. Refer to Section 012300 "Alternates"

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor will document construction progress using these general specifications listed below. Contractor will coordinate with the DEN Project Manager on the specific media requirements for documentation prior to commencing construction.
- B. Qualification Data: For photographer
- C. 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.
- D. Digital Photographs: Submit image files within three (3) days of taking photographs.
 - 1. Digital Camera: Minimum sensor resolution of 10 megapixels.
 - 2. File Format: Minimum 3200 by 2400 pixels, in unaltered .RAW original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
 - 3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Project title and Project number.
 - b. Name and contact information for photographer.
 - c. Name of DEN Project Manager.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - 1) Include work order number or change order number if applicable.
 - g. Unique sequential identifier keyed to accompanying key plan.
 - h. Photograph number.
- E. Construction Photographs: Submit two (2) prints of each photographic view within seven (7) days of taking photographs.
 - 1. Format: 8-by-10-inch. smooth-surface matte prints on single-weight, commercial-grade photographic paper; punched for standard three-ring binder.
 - 2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of DEN Project Manager.
 - d. Name of Contractor.
 - e. Date photograph was taken if not date stamped by camera.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

- g. Unique sequential identifier keyed to accompanying key plan.
- F. Video Recordings: Submit video recordings within seven (7) days of recording.
- 1. Submit video recordings in an electronic format acceptable to DEN Project Manager. Recordings shall be high-resolution 4k with a minimum framerate of 60Hz
 - 2. Identification: With each submittal, provide the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of DEN Project Manager.
 - d. Name of Contractor.
 - e. Date video recording was recorded.
 - f. Description and key plan of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Weather conditions at time of recording.

1.6 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.
- B. Web-Based Photographic Documentation Service Provider: A firm specializing in providing photographic equipment, Web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project for not less than three years.

1.7 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to City and County of Denver for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 10 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
- B. Digital Video Recordings: Provide high-resolution 4k with a minimum framerate of 60Hz in electronic format acceptable to DEN Project Manager.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to show clearly the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software. Provide commercial quality, digital color photographs in PDF format. PDF file shall be security-free, bookmarked by date with all photos rotated to the correct orientation. Identify the following information on each photograph on the lower right corner.
 - 1. Subject description (include work order number or change order number if applicable)
 - 2. Station point of camera and direction of view. Include letter size diagram of project indicating Station point
 - 3. Date and time each photo was taken
 - 4. Name of Contractor.
 - 5. Photograph number
 - 6. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to DEN Project Manager.
- D. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by DEN Project Manager.
 - 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.
 - 5. Haul route, laydown yard, and other locations as directed by DEN Project Manager.
- E. Periodic Construction Photographs: Take 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- F. DEN Project Manager-Directed Construction Photographs: From time to time, DEN Project Manager will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- G. 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 monthly, coinciding with the cutoff date associated with each Application for Payment.
 2. Vantage Points: Following suggestions by DEN Project Manager and Contractor, photographer to 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.
- H. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as project record documents. DEN Project Manager will inform photographer of desired vantage points.
1. Do not include date stamp.
- I. Additional Photographs: DEN Project Manager may request photographs in addition to periodic photographs specified. Additional photographs shall be paid for by Change Order and are not included in the Contract Sum.
1. Three days' notice shall be given, where feasible.
 2. In emergency situations, take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. DEN's request for special publicity photographs.

3.2 CONSTRUCTION VIDEO RECORDINGS

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.

- B. Recording: Mount camera on tripod before starting recording unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
- C. Narration: Describe scenes on video recording by audio narration by microphone while or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
1. Confirm date and time at beginning and end of recording.
 2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.
- D. Preconstruction Video Recording: Before starting construction, record video recording of Project site and surrounding properties from different vantage points, as directed by DEN Project Manager.
1. Flag construction limits before recording construction video recordings.
 2. Show existing conditions adjacent to Project site before starting the Work.
 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of construction.
 4. Show protection efforts by Contractor.
- E. Periodic Construction Video Recordings: Record video recording monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 30 minutes(s).
- F. Time-Lapse Sequence Construction Video Recordings: Record video recording to show status of construction and progress.
1. Frequency: During each of the following construction phases, set up video recorder to automatically record one frame of video recording every five (5) minutes, from same vantage point each time, to create a time-lapse sequence of 30 minutes in length as follows:
 - a. Commencement of the Work, through completion of subgrade construction.
 - b. Above-grade structural framing.
 - c. Exterior building enclosure.
 2. Timer: Provide timer to automatically start and stop video recorder so recording occurs only during daylight construction work hours.
 3. Vantage Points: Following suggestions by DEN Project Manager and Contractor, photographer shall select vantage points.

3.3 WEB-BASED CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

- A. Live Streaming Construction Site Images: Provide Web-accessible image of current site image from fixed location camera(s), updated at 15 minute intervals during daytime operation.
- B. Time-Lapse Sequence Construction Site Recordings: Provide video recording from a fixed-location camera to show status of construction and progress.
 - 1. Frequency: Record one frame of video recording every 15 minutes, from same vantage point each time, to create a time-lapse sequence of construction activities.
 - 2. Timer: Provide timer to automatically start and stop video recorder so recording occurs only during daylight construction work hours.
- C. Maintain cameras and Web-based access in good working order according to Web-based construction photographic documentation service provider's written instructions until Final Completion. Provide for service of cameras and related networking devices and software.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **013233**

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section summarizes the requirements for the submittal of documents to the DEN Project Manager that are defined in these Specifications. It also describes the procedures for "supplemental" submittals.
- B. The Contractor must follow all the requirements of the procedures and the product details and keep all the submittals current and approved prior to any placement of work.

1.3 SUBMITTAL SCHEDULE

- A. The Contractor shall provide a submittal schedule within 14 days after Notice to Proceed. The Submittal Schedule shall be directly related to the CPM schedule, shall identify all the submittals, and shall include the following information for each submittal item
 1. Specification section, Contract article, or special condition.
 2. Specification Subparagraph.
 3. Item description.
 4. Date the submittal shall be submitted.
 5. Name of subcontractor or supplier.
- B. The submittal schedule shall be kept current by the Contractor and submitted with the progress payment requests.
- C. For large files that cannot be loaded or e-mailed through the electronic Project Manager application (Unifier), submit the files on a CD, DVD, or USB flash drive media.

1.4 ELECTRONIC SUBMITTALS

- A. Before the initiation of the submittal process, coordinate and insure that all submittals comply and follow the requirements of the DEN Building Information Modeling (BIM) Design Standards Manual (DSM) and the DEN BIM PXP.

- B. Submit request for progress payment applications utilizing TEXTURA software as instructed by DEN Project Manager.
- C. Submit Subcontractor's Contract information required by the City and County of Denver Small Business Office as instructed by DEN Project Manager.
- D. Submit original electronic copies of all City and County of Denver Development Department/ Building Inspection Department Approved drawings including all approvals of Deferred Submittals; including but not limited to shoring plans, Fire Protection distribution plans, and structural shop drawings to DEN Project Manager as Informational Submittals. The lack of approval of the Denver Development Services on any document shall be basis for rejection of Work and non-compliance.
 - 1. NOTE: Only original copies shall be accepted. Scans will not be accepted.
- E. Submit electronically scanned copies of all documents required by Chapter 17 "Special Inspection and Testing" of the International Building Code 2009 as amended by City and County of Denver 2011. Keep scale and clarify dimension where electronic copies are not as originally scaled and dimensioned.
- F. All submittals shall be delivered to the DEN Project Manager utilizing the Primavera Construction Manager program (PCM) as attachments and as separate file when files are too large to attach or of an electronic media that is not supported by PCM or Utilizing the EPPM Unifier software uploaded to the share drive Unifier's project site when directed by DEN Project Manager.
 - 1. Acceptable electronic formats
 - a. Print document format (pdf) shall have no security and bookmark every applicable submittal. All pages shall be completely legible and oriented to correct reading view.
 - 2. Formats are acceptable only with written permission of the DEN Project Manager or required by the BIM PXP. For files in any of the following formats, the corresponding stringency will apply:
 - a. Microsoft Office 2007 or newer. All files shall be fully compatible with Microsoft Office 2007.
 - 1) AutoCAD files shall be self-contained with no external x-references.
 - b. BIM files shall conform to the standards and formats outlined in the BIM PXP and DEN BIM DSM.
 - c. Other files pre-approved by the DEN Project Manager.

1.5 INITIAL SUBMITTAL

- A. Each submittal document shall include a title block showing the following information:
 - 1. Date of submittal and revision dates.

2. Contract title and number.
 3. The names of Contractor, subcontractor, supplier, manufacturer and when applicable, the seal and signature of an Engineer registered in the State of Colorado, for the involved discipline.
 4. Identification of product by either description, model number, style number or lot number.
 5. Subject identification by Contract Drawing or specification reference.
- B. On each submitted drawing, include a blank space on each sheet, three inches by four inches, in the lower right corner, just above the title block, in which the DEN Project Manager or the Designer of Record may indicate the action taken.
- C. Make submissions sufficiently in advance so that the DEN Project Manager Review may be completed not less than 30 days before Work represented by those submittals is scheduled to be performed.
- D. Allow a minimum cycle of 30 days for review of each submittal by the DEN Project Manager.
- E. Accompany submittal documents with DEN transmittal form CM-30, Submittal, which shall contain the following information:
1. Contractor's name, address and telephone number.
 2. Submittal number and date.
 3. Contract title and number.
 4. Supplier's, manufacturer's, or subcontractor's name, address and telephone number.
 5. Identification of variations from Contract Documents.
 6. Contractor's stamp and signature certifying the Contractor's review.
 7. Identification of submittal:
 - a. If the submittal is being made on a General Condition or Special Condition, reference the General or Special Condition number the first two digits of the specification section shall be 00XXXX.
 - b. If the submittal is being made under a specification section, reference the specification number, paragraph number, and subparagraph number.
 - c. If the submittal is being made under a drawing, reference the drawing(s) number and sub-number.
- F. The Contractor shall describe, at the time of submission, variations from the Contract documents in writing, separate from the submittal document. If the DEN Project Manager approves any such variations, an appropriate Contract change order shall be issued, except that if the variation is minor and does not involve a change in price or in time of performance, a modification need not be issued. If a submission contains variations and the variation column is not marked on the transmittal form, it will not be considered for review and acceptance. Along with marking the transmittal as a variation, a description must be included which outlines all the differences including maintenance and utility services along with any cost savings from an item not containing the variation.

- G. Changes in accepted submittal documents will not be permitted unless those changes have been accepted, in writing, by the DEN Project Manager.
- H. The form and quality of submittal documents shall comply with Section 013325 "Shop and Working Drawings, Product Data, and Samples."

1.6 SUPPLEMENTAL SUBMITTALS

- A. Supplemental submittal documents initiated by the Contractor for consideration of corrective procedures shall contain sufficient data for review. Make supplemental submittals in the same manner as initial submittals with the appropriate primary transmittal referenced.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. The Contractor shall review all submittal documents, stamp, and sign as reviewed and approved as complying with Contract Documents prior to submission to the DEN Project Manager. Submittal documents that are submitted to the DEN Project Manager **THAT HAVE NOT BEEN REVIEWED BY THE CONTRACTOR** will not be reviewed and will be returned to the Contractor. Contractor is responsible for any delays in the Project due to improperly reviewed, stamped, and signed submittals.
- B. The Owner review period will be limited to ten (10) business days from the time complete submittal documents have been submitted.
- C. The Contractor is responsible to obtain all approvals for all deferred submittals, shop drawings, and significant changes from the CCD Development Service Department.
- D. All submittals must delineate any deviation from the intended design and must submit request for substitution to address any significant variation. Refer to Title 4, Article 405 – Shop Drawings, Product Data, and Samples, and Article 406 – Substitution of Materials and Equipment of the General Contract Conditions, 2011 Edition.

3.2 REVIEW BY DEN PROJECT MANAGER

- A. Submittal documents will be reviewed by the DEN Project Manager, the DEN Project Manager Team, and/or the DOR for conformance to requirements of the Contract Documents. Review of a separate item will not constitute review of an assembly in which the item functions. The DEN Project Manager will withhold approval of submittals that depend on other submittals not yet submitted. Review and acceptance will not relieve the Contractor from the Contractor's responsibility for accuracy of submittals, for conformity of submittal document to requirements of Contract Drawings

and specifications, for compatibility of described product with contiguous products and the rest of the system, or for protection and completion of the Contract in accordance with the Contract Drawings and specifications.

- B. The City, the DOR, and/or the DEN Project Manager will review the submittal documents for general conformance with the Contract Documents and mark the Action Code, sign, and date the transmittal.
- C. The Action Codes have the following meanings:
 - 1. Accepted (ACC)
 - a. The submittal conforms to the respective requirements of the contract documents.
 - 2. Accepted as Noted (AAN)
 - a. The submittal conforms to the respective requirements of the Contract Documents after changes are made in accordance with reviewer's comments. AAN submittals do not need to be resubmitted.
 - 3. Revise and Resubmit (R&R)
 - a. The submittal is unacceptable and must be revised and resubmitted.
 - 4. Rejected (REJ)
 - a. The submittal is not approved and a new submittal in accordance with the Contract Documents must be prepared and submitted.
 - 5. For Information Only (FIO)
 - a. An item is received by the DEN Project Manager but is not reviewed.

3.3 CONTRACTOR'S RESPONSIBILITIES

- A. Coordinate each submittal document with the requirements of the Work. Place particular emphasis upon ensuring that each submittal of one trade is compatible with other submittals of that trade and submittals of other trades including producing as needed drawings showing the relationship of the Work of different trades.
- B. Contractor's responsibility for errors and omissions in submittal documents and associated calculations is not relieved by the DEN Project Manager's review, correction, and acceptance of submittals.
- C. Contractor's liability to the City, in case of variations in the submittal document from the requirements of the Contract Documents, is not relieved by the DEN Project Manager's review and acceptance of submittals containing variations unless the DEN Project Manager expressly approves the deviation in writing, in which the DEN Project Manager describes the variation.

- D. The Contractor shall maintain a file of all approved submittal documents at the work site. The complete file of approved submittal documents shall be turned over to the DEN Project Manager with the as-built documents at the end of the job.
- E. Schedule impact due to resubmittal requirements is the responsibility of the Contractor.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **013300**

SECTION 013325 - SHOP AND WORKING DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section consists of preparing and submitting shop and working drawings, product data, samples, and record documents required by other specifications Sections.
 - 1. The Contractor shall submit all shop drawings, working drawings, product data, and samples, as defined in the General Conditions, to the DEN Project Manager in accordance with the requirements in the technical specifications. The DEN Project Manager will return one (1) copy of the shop drawings, working drawings and product data to the Contractor with a written transmittal.
- B. The Contractor shall not submit as shop drawings, copies or reproductions of drawings issued to the Contractor by DEN.
- C. Related Requirements
 - 1. Section 013300 "Submittal Procedures
 - 2. Section 012510 "Substitutions"
 - 3. Section 017720 "Contract Closeout"

1.3 SUBMITTALS

- A. All submittals shall be delivered to the DEN Project Manager in electronic format. All submittals must be of a consistent format (all PDF). No combination of electronic file types will be allowed unless required by a specific specification section.
 - 1. Acceptable electronic formats: Comply with the electronic file formats approved by DEN Building Information Modeling (BIM) Design Standards Manual If any of the files are in any of the formats listed below then the version of the software shall be no less than identified below:
 - a. Adobe Acrobat 8.0 or newer. All files shall be fully compatible with Adobe Acrobat 8.0.
 - b. Microsoft Office 2007 or newer. All files shall be fully compatible with Microsoft Office 2007.

- c. AutoDesk AutoCAD 2007 or newer. All files shall be fully compatible with AutoDesk AutoCAD 2007.
 - d. AutoCAD files shall be self-contained with no external x-references.
 - e. BIM format outlined in the BIM Project Execution Plan (PXP)
 - f. Other files pre-approved by the DEN Project Manager.
2. Adobe Acrobat Requirements:
- a. Drawings shall have security set to "No Security." Commenting, printing, adding photos, form fields and document signing must be allowed.
 - b. PDF submittals shall be one continuous file or Portfolio. No external links are allowed.
 - c. All individual components of submittals shall be bookmarked inside the PDF file.
 - d. All original documents shall be directly converted from the original electronic format to PDF. Scanning of files shall only be allowed by the DEN Project Manager when the original electronic information is not obtainable.
 - e. Failure to comply with these requirements will result in a return of file to the Contractor for immediate revision.
3. Electronic files submitted shall correspond with DEN File Control Numbering System available from the DEN Project Manager.

B. Quantities

1. One (1) electronic submittal in Unifier containing electronic files of each shop or working drawing.
2. One (1) electronic submittal in Unifier containing electronic files of manufacturer's standard schematic drawings.
3. One (1) electronic submittal in Unifier containing electronic files of manufacturer's calculations and manufacturer's standard data.
4. One (1) electronic submittal in Unifier containing electronic files of manufacturer's printed installation, erection, application, and placing instructions.
5. Nine (9) samples of each item specified in the various specification sections, unless otherwise specified.
6. One electronic submittal in Unifier containing electronic files of inspection, test reports, and certificates of compliance.
7. Note: If manufacturer's printed information is in color, all copies of submittals must be in color.

C. Review:

1. Submittal review comments by the DEN Project Manager will be in electronic form and incorporated into the electronic submittal file.
2. Resubmittals of electronic documents shall modify the original electronic file with new information and include the DEN Project Manager's comments with appropriate responses and additional information.

1.4 CHANGES

- A. Changes in products for which shop or working drawings, product data or samples have been submitted will not be permitted unless those changes have been accepted and approved in writing by the Deputy Manager of Aviation as provided in Section 012510 "Substitutions."

1.5 QUALITY CONTROL

- A. Shop drawings and record documents shall be prepared to the standards of quality outlined in the specifications, DSM and BIM PXP, prepared and printed from Revit and checked in the spatial coordination format specified in the BIM PXP.
- B. Refer to DEN BIM DSM for other requirements that may be applicable to this Article.

PART 2 - PRODUCTS.

2.1 SHOP AND WORKING DRAWINGS

- A. Prepare shop and working drawings in an electronic format that is current and approved by DEN to a scale large enough to easily depict and annotate each of the various items.
- B. Comply per other BIM requirements for Shop and Working Drawings as established in the DEN BIM DSM.
- C. Include the following as they apply to the subject:
 - 1. Contract title, work order, and number.
 - 2. Respective Contract drawing numbers.
 - 3. Applicable specification section numbers.
 - 4. Relation to adjacent structure or materials.
 - 5. Field dimensions clearly identified as such.
 - 6. Applicable standards such as ASTM or Federal Specification number, FAA, AASHTO, and pertinent authority specifications or standards.
 - 7. Identification of deviations from the Contract Drawings and specifications.
 - 8. Drawing name, number, and revision.
 - 9. Contractor's stamp, initialed or signed, certifying:
 - a. Verification of field measurements.
 - b. Review of submittals for compliance with Contract requirements.
 - c. Compatibility of the Work shown thereon with that of affected trades.
 - 10. Blank space on each sheet per Technical Specifications Section 013300 "Submittal Procedures."
- D. Drawings of equipment and other items that contain multiple parts shall include

exploded views showing the relationship of parts and the description of the parts into the smallest units that may be purchased or serviced.

- E. Comply with all submittal requirements of Section 013300 "Submittal Procedures."

2.2 PRODUCT DATA

- A. Modify manufacturer's standard and/or schematic drawings to delete information that is not applicable to the Contract. Supplement standard information with additional information applicable to this Contract.
- B. Modify manufacturer's standard(s), diagrams, schedules, performance charts, illustrations, calculations, and other descriptive data to delete information that is not applicable to the Contract. Indicate dimensions, clearances, performance characteristics, and capacities. Include with the submittal electrical, plumbing, HVAC, and any other diagrams, as applicable.
- C. Modify erection, application, and placing instructions to delete information that is not applicable to the Contract or work order.
- D. Include the following:
 - 1. Contract title, work order, and number.
 - 2. Respective Contract drawing numbers.
 - 3. Applicable Contract technical specification section numbers.
 - 4. Applicable standards such as ASTM or Federal Specification number, FAA, AASHTO and pertinent authority specifications or standards.
 - 5. Identification of deviations from the Contract Drawings and specifications.
 - 6. Contractor's stamp, initialed or signed, certifying:
 - a. Dimensional compatibility of the product with the space in which it is intended to be used.
 - b. Review of submittals for compliance with Contract requirements.
 - c. Compatibility of the product with other products with which it is to perform or which will be next to it.
 - d. The products electrical, plumbing, control and HVAC requirements conform to Contract Documents and the necessary utilities are provided for in the Contract Documents.
- E. Comply with all submittal requirements of Section 013300 "Submittal Procedures."

2.3 SAMPLES

- A. Submit samples of sizes and quantities to clearly illustrate full color range and functional characteristics of products and materials including attachment devices.
- B. Erect field samples and mockups at the work site as specified in specification Sections and at locations acceptable to the DEN Project Manager. All field samples shall be

erected in a location that will be readily visible throughout the life of the Contract to allow comparison of the Work as it progresses to the field sample. Field samples and mockups may be incorporated into the Work at Contractor's risk if approved by DEN Project Manager.

- C. The Contractor shall verify, through appropriate inspections and tests, that the samples submitted meet the specifications and shall provide inspection and test data with the samples. The review and comments on the sample shall not relieve the Contractor of the Contractor's responsibility for completion of the Contract.
- D. Show the following information:
 - 1. Contract title and number.
 - 2. Respective Contract drawing numbers.
 - 3. Applicable technical specification section numbers.
 - 4. Applicable standards such as ASTM or Federal Specification number.
 - 5. Identification of deviations from the Contract Drawings and specifications
 - 6. Contractor's stamp, initialed or signed, certifying:
 - a. Dimensional compatibility of the product with the space in which it is intended to be used
 - b. Review of submittals for compliance with Contract requirements
 - c. Compatibility of the product with other products with which it is to perform or which will be next to it
 - 7. If multiple samples are submitted and the DEN Project Manager is requested to make a choice, each sample shall have a unique identification number attached to it so the returned transmittal can state the identification number of the accepted sample and the Contractor will know which one it is.
- E. Comply with all submittal requirements of Section 013300 "Submittal Procedures."

PART 3 - EXECUTION

3.1 CONTRACTOR RESPONSIBILITIES

- A. Verify field measurements, catalog numbers, and similar data.
- B. The Contractor shall not start work for which submittals are required until a transmittal has been received by the Contractor marked with the Action Code ACCEPTED or ACCEPTED AS NOTED by the DEN Project Manager.
- C. Before making submittals, ensure that the products will be available in the quantities and at the times required by the Contract.
- D. Submit final, corrected, electronic copies of Contract and shop and working drawings showing the Work as actually installed, placed, erected, and applied. Refer to Section 017720 "Contract Closeout."

3.2 REVIEW BY THE DEN PROJECT MANAGER

- A. One (1) electronic copy of the marked-up shop and working drawing and one (1) electronic copy of the product data will be returned to the Contractor by the DEN Project Manager. Only the transmittal form appropriately marked with the Action Code and comments, if any, will be returned on sample submittals.
- B. Contractor's responsibility for errors and omissions in submittals for compatibility will not be reduced, waived or otherwise limited by the review and acceptance of submittals by the DEN Project Manager.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section. .

END OF SECTION **013325**

SECTION 013510 - CONSTRUCTION SAFETY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Work specified in this Section includes construction safety precautions and programs by the Contractor and the basis for reviews by the DEN Project Manager.
- B. For projects enrolled under DEN Rolling Owner Controlled Insurance Program (ROCIP) reference the Contract Special Conditions for all safety requirements.
- C. For projects enrolled under DEN Owner Controlled Insurance Program (OCIP) reference the Contract Special Conditions for all safety requirements.

1.3 RESPONSIBILITY

- A. The Contractor is responsible for the health and safety of the Contractor's personnel, agents, subcontractors and their personnel, and other persons on the worksite, for the protection and preservation of the Work and all materials and equipment to be incorporated therein, and for the worksite and the area surrounding the worksite. The Contractor shall take all necessary and reasonable precautions and actions to protect all such persons and property.
- B. This Section shall be interpreted in its broadest sense for the protection of persons and property by the Contractor and no action or omission by the DEN Project Manager or the DEN Project Manager's authorized representatives shall relieve the Contractor of any of its obligations and duties hereunder.

1.4 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for the submittal process. The Contractor's Site Specific Safety Plan shall be submitted and approved under the general Contract prior to commencing any Work. If a Task Order or Change Order is issued where the Work is not covered by the approved Contractor's Site Specific Safety Plan, then a revision to the Safety Plan specific for the Work in the Task Order shall be resubmitted for approval.

1. No progress payment shall be approved until the Contractor's Site Specific

Safety Plan has been accepted by the DEN Project Manager.

- B. The Contractor shall provide six (6) copies of the Contractor's Site Specific Safety Plan to the DEN Project Manager for review at least ten (10) calendar days before on-site construction begins. The Contractor's program must meet, as a minimum, all applicable federal, state and local government requirements, and the following:
1. The Contractor shall provide the following information for acceptance by the DEN Project Manager prior to the commencement of construction activities. The Site Specific Safety Plan must address all aspects listed below. If an item is not applicable, then this must be noted in the plan.
 - a. Name of the Contractor's safety representative.
 - b. If the Contractor is running multiple shifts or working more than (40) hours per week, the name of an assistant safety representative who can act in the absence of the site safety representative.
 - c. Twenty-four (24) hours per day emergency phone numbers of Contractor site management to be used in case of injury or accident. Provide at least four contacts.
 - d. Means of protecting employees working in trenches and excavations, including sloping and shielding.
 - 1) Soil classification will be considered as Type C when designing protective systems, unless the Contractor can prove to the satisfaction of DEN that the soil classification is otherwise. Soil classification change request shall be provided to the DEN Project Manager in writing. The decision of the DEN Project Manager will be provided to the Contractor in writing.
 - e. The Contractor shall show how material shall be stored beside the excavation. Stored material shall include the excavated and backfilled material
 - f. Injury and accident handling, including samples of the reporting form.
 - g. How personnel will be handled who are unable to safely perform their duties, including how the Contractor will determine whether personnel are unable to safely perform duties. This may include the Contractor's disciplinary process and employee's physical capabilities to perform the work safely.
 - h. How and when equipment will be checked to see that it is safe, that all safety guards are in place, and that the equipment is being used for its designed purpose and within its rated capacity.
 - i. How and when all electric devices will be checked for proper grounding and insulation. Describe the methods that will be used to lock out electric systems that should not be energized.
 - j. How trash and human organic waste will be disposed of.
 - k. How snow and ice will be removed by the Contractor in the project area.
 - l. How concrete forms will be anchored to ensure their stability, including calculations showing that the forms will safely hold the maximum construction loads.
 - m. How flammable materials will be stored and handled, and how any spills will

- be cleaned up and removed for disposal.
- n. What system will be used to prevent fires and, if fires do occur, who will be trained to fight them. In addition, what firefighting equipment will the Contractor have available and how will this equipment's condition be monitored.
 - o. How materials will be received, unloaded, stored, moved, and disposed of.
 - p. How personnel working above ground level will be protected from falling.
 - q. How people working beneath the construction work will be protected.
 - r. What will be done to protect personnel in case of severe weather.
 - s. How adequate lighting will be provided and monitored.
 - t. How air quality will be monitored to ensure that chemical exposures are below current, established OSHA Permissible Exposure Limits. How personnel will be protected if these limits are exceeded.
 - u. How the safety of work platforms, man lifts, material lifts, ladders, shoring, scaffolding, etc., will be ensured relating to load capacity and the protection of personnel using or working around them.
 - v. The type of personal protective equipment that will be used to protect personnel from hazards.
 - w. The type of safety training that will be provided to personnel to inform them of safe work procedures.
 - x. How daily audits and inspections will be performed to ensure compliance with the Contractor's Site Specific Safety Plan and current, applicable OSHA regulations.
 - y. Procedures to ensure that welding and other hot work is performed safely.
 - 1) A hot work permit from the Denver Fire Department (DFD) will be required for all welding, soldering, cutting, and brazing and or other processes required by DFD on the project. Contractor will comply with all of the provisions in the permit.
 - z. How compressed gases will be safely stored, handled, and used.
 - aa. Methods to ensure that personnel safely enter, work in, and exit confined spaces.
 - 1) All confined spaces on DEN property are considered permit required. A permit must be obtained from the DFD before Contractor personnel may enter a confined space. Contractors will comply with all provisions and requirements of this permit.
 - bb. How the hazards of chemicals will be communicated to personnel, including the use of material safety data sheets and chemical labels.
 - cc. Methods to ensure that forklifts and other powered industrial trucks are operated in a safe manner.
 - dd. How an effective hearing conservation program will be used to protect personnel from high noise levels and prevent hearing loss.
 - ee. How personnel will be protected from the effects of jet blast.
 - ff. How hazards will be identified and corrected when reported.

1.5 DEN PROJECT MANAGER'S REVIEW

- A. Prior to the start of any work by contractor or subcontractor personnel, the Contractor shall provide the DEN Project Manager with a list of its personnel, subcontractor's personnel and other personnel the Contractor has requested to work at Denver International Airport, who have signified in writing that they have been briefed on, or have read and understand, the Contractor's Site Specific Safety Plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 IMPLEMENT CONTRACTOR'S OPERATIONAL SAFETY PLAN

- A. Implement the approved Contractor's Operational Safety Plan as described in Article 1 of this Section and in Section 011100 "Summary of Work."
- B. If the Contractor experiences lost time or an injury rate greater than 75 percent of the national average for all construction, the Contractor shall notify the DEN Project Manager and audit its safety procedures and submit a plan to reduce its rates.
- C. If at any time the lost time or injury rates experienced by the Contractor are 150 percent or more of the national average for construction, the Contractor shall notify the DEN Project Manager and immediately hire an independent safety professional who shall audit the Contractor's procedures and operations and make a report of changes that the Contractor should implement to reduce the rate including changing personnel.
 - 1. The report shall be submitted to the DEN Project Manager.
 - 2. The Contractor shall immediately begin implementing the recommendations of the independent safety professional.
 - 3. A weekly report shall be submitted by the Contractor to the DEN Project Manager on the status of the implementation of the recommendations.
 - 4. Failure to comply with these requirements is a basis to withhold a portion of progress payments.

3.2 ROLLING OWNER CONTROLLED INSURANCE PROGRAM (ROCIP)

- A. Implement Rolling Owner Controlled Insurance Program (ROCIP) as provided in the Project Manual issued for bid or proposal

3.3 OWNER CONTROLLED INSURANCE PROGRAM (OCIP)

- A. Implement Owner Controlled Insurance Program (OCIP) as provided in the Project Manual issued for bid or proposal

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 013510

SECTION 013520 - CONSTRUCTION SAFETY - AIRSIDE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Work specified in this Section includes construction safety precautions and programs by the Contractor for airside, and the basis for reviews by the DEN Project Manager.
- B. Related Specification Sections:
 - 1. Section 011420 "Security Requirements and Sensitive Security Information".
 - 2. Section 011430 "Vehicle and Equipment Permitting".
 - 3. Section 011810 "Utilities Interface".
 - 4. Section 013510 "Construction Safety".
- C. For projects enrolled under DEN Rolling Owner Controlled Insurance Program (ROCIP) reference the Contract Special Conditions for all safety requirements.
- D. For projects enrolled under DEN Owner Controlled Insurance Program (OCIP) reference the Contract Special Conditions for all safety requirements.

1.3 RESPONSIBILITY

- A. The Contractor is responsible for the health and safety of the Contractor's personnel, agents, subcontractors and their personnel, and other persons on the worksite, for the protection and preservation of the Work and all materials and equipment to be incorporated therein, and for the worksite and the area surrounding the worksite. The Contractor shall take all necessary and reasonable precautions and actions to protect all such persons and property.
- B. This Section shall be interpreted in its broadest sense for the protection of persons and property by the Contractor and no action or omission by the DEN Project Manager or the DEN Project Manager's authorized representatives shall relieve the Contractor of any of its obligations and duties hereunder.

1.4 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for the submittal process. The

Contractor's Operational Safety Plan shall be submitted and approved under the general Contract prior to commencing any Work. If a Task Order or Change Order is issued where the Work is not covered by the approved Contractor's Operational Safety Plan, then a revision to the Safety Plan specific for the Work in the Task Order shall be resubmitted for approval.

1. No progress payment shall be approved until the Contractor's Operational Safety Plan has been accepted by the DEN Project Manager.

B. Scope: The Contractor's Operational Safety Plan shall be developed and submitted by the contractor for the DEN Project Manager's review and approval. The Operational Safety Plan shall be developed according to the guidelines and requirements provided in FAA AC No. 150/5370-2F "Operational Safety on Airports During Construction" and will describe how the Contractor will comply with the requirements of the Construction Safety and Phasing Plan (CSPP). The Operational Safety Plan shall cover the actions of not only the construction personnel and equipment, but the actions of inspection personnel and airport staff for the duration of construction activities.

C. Definitions:

1. Approach Surface: A surface longitudinally centered on the extended runway centerline and extending outward and upward from either a runway threshold or 200 feet behind a threshold. This surface is needed to define where unobstructed airspace above the runway begins.
2. Notice To Airmen (NOTAM): A notice to the flying public (airmen) through FAA's NOTAM system. Normally initiated by message to the nearest FAA Flight Service Station. Issuance of the NOTAM will be coordinated through the DEN Project Manager and DEN Operations.
3. Object Free Area: A two-dimensional ground area surrounding runways, taxiways, and taxi lanes that is clear of objects, except for objects whose location is fixed by function.
4. Safety Area (see AC 150/5300-13A): A defined surface adjacent to runways, taxiways and taxi lanes prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot or excursion from the paved surface. Each safety area must be cleared and graded and have no potentially hazardous ruts, humps, depressions or other surface variations. Each safety area must be drained by grading or storm sewers to prevent water accumulation. East safety area must be capable under dry conditions of supporting snow removal and aircraft rescue and firefighting equipment and or supporting the occasional passage of aircraft without causing any damage to the aircraft. No objects may be located in any safety area, except for objects that need to be located in a safety area because of their function. These objects must be constructed, to the extent practical, on frangibly mounted structures of the lowest practical height, with the frangible point no higher than three (3) inches above grade.

D. Policy: Aviation safety is a primary consideration during airport construction. These activities shall be planned and scheduled to minimize disruption of normal aircraft activities. If the clearances and restrictions described in this plan cannot be maintained while construction is underway, action will be taken by the Contractor to perform Work

at night or during periods of minimal aircraft activity.

E. Safety Impacts: The Contractor shall take all necessary steps and precautions to mitigate the impact of hazardous conditions as they may relate to the Work. Potentially hazardous conditions which may occur during airport construction include, but are not limited to, the following:

1. Trenches, holes, or excavations on or adjacent to any active runway, taxiway, taxi lane, apron, or related safety areas.
2. Unmarked/unlighted holes or excavations on or adjacent to any active runway, taxiway, taxi lane, apron, or related safety areas.
3. Mounds or piles of earth, construction material, temporary structures, or other objects on or in the vicinity of any active runway, taxiway, taxi lane, apron or related safety, approach, or departure areas.
4. Pavement drop-offs that would cause, if crossed at normal operating speeds, damage to aircraft that normally use the airport. The maximum drop-off is 3 inches per FAA AC 150/5300-13A.
5. Vehicles or equipment (whether operating or idle) on any active runway, taxiway, taxi lane, apron or related safety, approach, or departure areas.
6. Vehicles, equipment, excavations, stockpiles, or other materials that could impinge upon NAVAID-critical areas and degrade or otherwise interfere with electronic NAVAIDS or interfere with visual NAVAIDS facilities.
7. Unmarked utility, NAVAIDS, weather service, runway lighting, underground power, or signal cables that could be damaged during construction.
8. Objects or activities anywhere on or in the vicinity of an airport which would be distracting, confusing, or alarming to pilots during aircraft operations.
9. Unflagged/unlighted low visibility items such as tall cranes, backhoes, scrapers, dump trucks, rollers, compactors, dozers and the ilk, in the vicinity of an active runway, taxiway, taxi lane, apron or related safety, approach, or departure areas.
10. Dirt, debris, or other transient accumulations that temporarily obscure pavement markings or pavement edges, or derogate the visibility of runway or taxiway markings or lighting or of construction and maintenance areas.
11. Trash or other materials with foreign object damage (FOD) potential, whether on runways, taxiways, taxi lanes, aprons or in related safety areas.
12. Failure to control vehicle, human and large animal access to, and nonessential nonaeronautical activities on, open aircraft movement areas.
13. Failure to maintain radio communication between construction vehicles and air traffic control or other on-field communications facilities.
14. Construction activities or material which could hamper Aircraft Rescue and Fire Fighting (ARFF) vehicle access from ARFF stations to all parts of the runway/taxiway system, runway approach and departure areas, or aircraft parking locations.
15. Inadequate fencing or other marking to separate construction areas from open aircraft operating areas.
16. Bird attractions such as edibles (food scraps, etc.), trees, brush, other trash, grass/crop seeding, or ponded water on or near the airport.

F. Safety Requirements:

1. General:

- a. During performance of this Contract, the airport runways, taxiways, taxi lanes, and aircraft parking aprons shall remain in use by aircraft to the maximum extent possible, consistent with continual safety. Aircraft use of areas near the Contractor's Work will be controlled to minimize disturbance to the Contractor's operation. However, AIRCRAFT HAVE THE RIGHT OF WAY AT ALL TIMES. The Contractor shall not allow employees, subcontractors, suppliers, or any unauthorized persons to enter or remain in any airport area that would be hazardous to persons or to aircraft operations.
 - b. Contractor personnel, airport staff and field inspectors directly involved in on-airport construction shall:
 - 1) Be aware of the types of conditions, safety problems, and/or hazards identified each day at the airport. To insure that all personnel are aware, daily meetings between management and supervisory personnel and their employees shall be scheduled prior to any work commencing on the shift.
 - 2) Inspect daily all work and/or storage areas for which the Contractor is responsible to be aware of current conditions.
 - 3) Promptly take all steps needed to remedy any unsafe or potentially unsafe condition. Coordinate with the DEN Project Manager to insure immediate corrective action is undertaken
 - c. Before commencement of construction activity the Contractor, through coordination with the DEN Project Manager and DEN Operations, shall give notice using the NOTAM system of construction on the airfield. In addition, a NOTAM shall be issued for the completion of construction on the airfield.
2. Construction Area Marking: Temporary lighting, barricades, flagging, and flashers are required as shown on the plans and per FAA AC 150/5370-2F Chapter 2 Section 220.b.(1)(2) Flag lines, traffic cones, flashers, edge lights, and/or signs shall be used as necessary:
- a. To clearly separate all construction from other parts of an air operations area
 - b. To identify isolated hazards, such as open manholes, excavations, areas under repair, stockpiled material, waste areas, etc.
 - c. Vehicle and pedestrian access routes used for airport construction shall be controlled to prevent any unauthorized entry of persons, vehicles, or animals.
 - d. Vehicle parking areas for Contractor employees shall be designated in advance to minimize traffic in open/active aircraft movement areas.
3. Cables and Utilities:
- a. Special attention shall be given to preventing unscheduled interruption of utility services and facilities. The location of all cables and utilities shall be identified prior to construction activities.
 - b. There shall be coordination among the Contractor, the DEN Project Manager, DEN Operations, the FAA, the National Weather Service, utility

- companies, and any other appropriate entity or organization. NAVAIDS, weather service facilities, electric cables, and other utilities must be fully protected during the entire construction time.
- c. Power, communication, and control cables leading to and from any FAA NAVAIDS, weather service, and other facilities will be marked in the field by the appropriate individuals as identified in Section 011810 "Utilities Interface" for the information of the Contractor before any work in their general vicinity is started. Thereafter, through the entire duration of construction, utilities shall be protected from any possible damage.
 - d. At the intersection of expansion joints and centerline lighting circuits on taxiways and runways, the electrical conduit may be within the 21" portion of the Portland cement concrete pavement. Coordination with the DEN Project Manager's representative and the DEN Electrical Department is of utmost importance for both the scheduling of an outage and the removal of conductors while cutting the joint.
4. Vehicle and Employee Identification:
- a. Contractor vehicles and equipment shall be flagged for high daytime visibility and if appropriate, lighted for nighttime operations. Vehicles that are not marked and lighted shall be escorted by a vehicle that is equipped with appropriate marking and lighting devices. Marking and lighting shall be in conformance with FAA AC 150/5210-5D, current edition, or as outlined in Section 011430 "Vehicle and Equipment Permitting" of the Contract Documents.
 - b. The Contractor will be required to conform to the specific requirements as outlined in Section 011420 "Security Requirements and Sensitive Security Information (SSI)" of the Contract documents.
5. Radio Communications:
- a. The Contractor's construction superintendent and flag personnel shall be required to coordinate directly with the DEN Project Manager or designated Representative. Only the DEN Project Manager or designated Representative shall monitor transceiver radios tuned to the frequency for communications with DEN Operations and B Tower Control. Radios shall be used to obtain the proper clearance concerning the movement of equipment, trucks, etc., on the airfield. Further, any unusual occurrences in the flight pattern of approaching or departing aircraft shall be acknowledged by all concerned so that operation of the airport and the construction work can be safely carried on at all times.
6. Haul Routes Crossing Active Aircraft Operation Areas:
- a. The Contractor shall provide a minimum of one (1) broom truck to continuously clean the surface of the active taxiway, taxi lane or apron of any foreign object damage (FOD) or other objectionable debris that may result from hauling activities. Additional broom trucks may be required to expedite the cleanup process. Opening the taxiway, taxi lane, or apron to aircraft operations shall only be approved after a visual inspection of the

- pavement surface by the DEN Airfield Operations Manager.
- b. The Contractor shall not work within the minimum of the following: 160 ft. of the centerline of an active taxiway, 310 ft. of the centerline of an active runway, or the minimum requirements of the FOD or Safety Zone unless otherwise noted in the Contract Documents and as approved in writing by the DEN Project Manager.
 - c. All construction equipment and vehicles shall be flagged for high daytime visibility and if appropriate, lighted for nighttime operations. Vehicles that are not marked and lighted shall be escorted by a vehicle that is equipped with appropriate marking and lighting devices. Marking and lighting shall be in conformance with FAA AC 150/5210-5D, current edition.
 - d. All Contractor and Subcontractor employees must be aware of the types of safety problems and hazards associated with aircraft operations and construction activities.

PART 2 - PRODUCTS

2.1 Contractor's Operational Safety Plan

- A. The Contractor shall provide six (6) copies of the Contractor's Operational Safety Plan to the DEN Project Manager for review at least ten (10) calendar days before on-site construction begins. The Contractor's program must meet, as a minimum, all applicable federal, state and local government requirements, and the following:
 - 1. The Contractor shall provide the following information for acceptance by the DEN Project Manager prior to the commencement of construction activities. The Operational Safety Plan must address all aspects listed below. If an item is not applicable, then this must be noted in the plan.
 - a. Name of the Contractor's safety representative.
 - b. If the Contractor is running multiple shifts or working more than (40) hours per week, the name of an assistant safety representative who can act in the absence of the site safety representative.
 - c. Twenty-four (24) hours per day emergency phone numbers of Contractor site management to be used in case of injury or accident. Provide at least four contacts.
 - d. Means of protecting employees working in trenches and excavations, including sloping and shielding.
 - 1) Soil classification will be considered as Type C when designing protective systems, unless the Contractor can prove to the satisfaction of DEN that the soil classification is otherwise. Soil classification change request shall be provided to the DEN Project Manager in writing. The decision of the DEN Project Manager will be provided to the Contractor in writing.
 - e. The Contractor shall show how material shall be stored beside the excavation. Stored material shall include the excavated and backfilled

- material
- f. Injury and accident handling, including samples of the reporting form.
 - g. How personnel will be handled who are unable to safely perform their duties, including how the Contractor will determine whether personnel are unable to safely perform duties. This may include the Contractor's disciplinary process and employee's physical capabilities to perform the work safely.
 - h. How and when equipment will be checked to see that it is safe, that all safety guards are in place, and that the equipment is being used for its designed purpose and within its rated capacity.
 - i. How and when all electric devices will be checked for proper grounding and insulation. Describe the methods that will be used to lock out electric systems that should not be energized.
 - j. How trash and human organic waste will be disposed of.
 - k. How snow and ice will be removed by the Contractor in the project area.
 - l. How concrete forms will be anchored to ensure their stability, including calculations showing that the forms will safely hold the maximum construction loads.
 - m. How flammable materials will be stored and handled, and how any spills will be cleaned up and removed for disposal.
 - n. What system will be used to prevent fires and, if fires do occur, who will be trained to fight them. In addition, what firefighting equipment will the Contractor have available and how will this equipment's condition be monitored.
 - o. How materials will be received, unloaded, stored, moved, and disposed of.
 - p. How personnel working above ground level will be protected from falling.
 - q. How people working beneath the construction work will be protected.
 - r. What will be done to protect personnel in case of severe weather.
 - s. How adequate lighting will be provided and monitored.
 - t. How air quality will be monitored to ensure that chemical exposures are below current, established OSHA Permissible Exposure Limits. How personnel will be protected if these limits are exceeded.
 - u. How the safety of work platforms, man lifts, material lifts, ladders, shoring, scaffolding, etc., will be ensured relating to load capacity and the protection of personnel using or working around them.
 - v. The type of personal protective equipment that will be used to protect personnel from hazards.
 - w. The type of safety training that will be provided to personnel to inform them of safe work procedures.
 - x. How daily audits and inspections will be performed to ensure compliance with the Contractor's Operational Safety Plan and current, applicable OSHA regulations.
 - y. Procedures to ensure that welding and other hot work is performed safely.
 - 1) A hot work permit from the Denver Fire Department (DFD) will be required for all welding, soldering, cutting, and brazing and or other processes required by DFD on the project. Contractor will comply with all of the provisions in the permit.
 - z. How compressed gases will be safely stored, handled, and used.

- aa. Methods to ensure that personnel safely enter, work in, and exit confined spaces.
 - 1) All confined spaces on DEN property are considered permit required. A permit must be obtained from the DFD before Contractor personnel may enter a confined space. Contractors will comply with all provisions and requirements of this permit.
- bb. How the hazards of chemicals will be communicated to personnel, including the use of material safety data sheets and chemical labels.
- cc. Methods to ensure that forklifts and other powered industrial trucks are operated in a safe manner.
- dd. How an effective hearing conservation program will be used to protect personnel from high noise levels and prevent hearing loss.
- ee. How personnel will be protected from the effects of jet blast.
- ff. How hazards will be identified and corrected when reported.

2.2 DEN PROJECT MANAGER'S REVIEW

- A. Prior to the start of any work by contractor or subcontractor personnel, the Contractor shall provide the DEN Project Manager with a list of its personnel, subcontractor's personnel and other personnel the Contractor has requested to work at Denver International Airport, who have signified in writing that they have been briefed on, or have read and understand, the Contractor's Operational Safety Plan.

PART 3 - EXECUTION

3.1 IMPLEMENT CONTRACTOR'S OPERATIONAL SAFETY PLAN

- A. Implement the approved Contractor's Operational Safety Plan as described in Part 1 and Part 2 of this Section and in Section 011100 "Summary of Work."
- B. If the Contractor experiences lost time or an injury rate greater than 75 percent of the national average for all construction, the Contractor shall notify the DEN Project Manager, audit its safety procedures, and submit a plan to reduce its rates.
- C. If at any time the lost time or injury rates experienced by the Contractor are 150 percent or more of the national average for construction, the Contractor shall notify the DEN Project Manager and immediately hire an independent safety professional who shall audit the Contractor's procedures and operations and make a report of changes that the Contractor should implement to reduce the rate including changing personnel.
 - 1. The report shall be submitted to the DEN Project Manager.
 - 2. The Contractor shall immediately begin implementing the recommendations of the independent safety professional.
 - 3. A weekly report shall be submitted by the Contractor to the DEN Project Manager on the status of the implementation of the recommendations.
 - 4. Failure to comply with these requirements is a basis to withhold a portion of

progress payments.

3.2 ROLLING OWNER CONTROLLED INSURANCE PROGRAM (ROCIP)

- A. Implement Rolling Owner Controlled Insurance Program (ROCIP) as provided in the Project Manual issued for bid or proposal

3.3 OWNER CONTROLLED INSURANCE PROGRAM (OCIP)

- A. Implement Owner Controlled Insurance Program (OCIP) as provided in the Project Manual issued for bid or proposal

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **013520**

SECTION 014100 - REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section identifies primary compliance with the State, City and County of Denver's regulatory requirements including:
 - 1. City and County of Denver / Department of Aviation.
 - 2. Colorado Department of Public Health and Environment.
 - 3. City and County of Denver Development Services, including the Department of Public Works and Division of Wastewater Management.
 - 4. The standards that govern design and construction projects at Denver International Airport.
- B. Construction shall be based on the latest edition of the referenced codes including additions and revisions thereto that are in effect at the time of Project bidding or Task Order pricing or GMP established whichever is latest, and as specifically related.

1.3 RELATED SECTIONS

- 1. Section 015719 "Temporary Environmental Controls" for environmental and related permitting requirements.

1.4 BUILDING CODE

- A. All design and construction work shall be governed by the Building Code for the City and County of Denver, latest edition. This is based upon the International Building Code of the International Code Council with Denver Amendments to this code. Appendix N of the Denver Amendments addresses Construction of Airport Buildings and Structures.

- 1. This Contract shall be based on IBC 2009 as Amended by Denver dated 2011.

1.5 DENVER BUILDING DEPARTMENT

- A. For review and approval of all construction documents for compliance to the Denver building code:

City and County of Denver
Denver Development Services
201 West Colfax Avenue, Dept 205
Denver, Colorado 80202
Telephone 720-865-2790
Fax 720-865-3020
developmentservices@denvergov.org

1.6 DENVER FIRE DEPARTMENT

- A. For review and approval of plans for compliance with the Denver Fire Department's requirements as they apply to the Denver International Airport:

Denver Fire Department
745 West Colfax Avenue
Denver, Colorado 80204
Telephone 720-913-3474

- B. The Contractor is advised that the Denver Fire Department – Fire Prevention Bureau requires permitting for the following activities as they apply to the scope of work. The Contractor is responsible for obtaining the appropriate permits necessary to complete the work. All costs associated with this permitting and policy compliance shall be the responsibility of the Contractor. The policies all reference the International Fire Code (IFC).

1. “Hot work”, which is defined as the operation of any equipment or tool that creates sparks, hot slag, or radiant or convective heat as a result of the work. This includes, but is not limited to, welding, cutting, brazing, or soldering.
2. Use and storage of compressed gas for both temporary storage and permanent facility installation. This includes, but is not limited to, flammable gas (excluding propane-LPG), oxidizer (including oxygen), and inert and/or simple asphyxiates.
3. Tank installation, which includes aboveground storage tanks (AST) and underground storage tanks (UST) for both temporary tanks and permanent facility installations.

- C. In addition to the above permits, the Denver Fire Department may require other permits that are associated with the specific work in the Contract Documents. Policies provided by the Denver Fire Department are meant to provide basic information for the most common conditions and situations. In any given occupancy, many other Uniform Fire Code requirements may be enforced. These should be addressed with the Denver Fire Department before construction begins and during construction with premise inspection(s).

1. The Fire Prevention Bureau web site is denfpb@denvergov.org

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PERMITS AND CERTIFICATIONS

- A. The Contractor shall maintain records on site of all permits acquired by federal, state, and local agencies. Posting of permits shall conform to requirements of the respective agencies.
- B. At the completion of any inspection by other agencies, the Contractor shall forward copies of the status of the inspection and copies of any approved or "signed-off" inspections by the respective agencies to the DEN Project Manager.
- C. At the time of request for Substantial Completion, the Contractor shall forward to the DEN Project Manager all permits approved by the respective agencies.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 014100

SECTION 014210 - REFERENCED MATERIAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 REFERENCED MATERIAL

- A. City and County of Denver, Department of Aviation, Standard Specification for Construction, General Contract Conditions
- B. The following documents may be available for examination at the Owner's offices unless otherwise noted. The referenced material and documents are not part of the Contract Documents unless otherwise specified.

1. Environmental Impact Statement (EIS).
2. Geotechnical Reports:
 - a. Borings, other field and laboratory explorations, and investigations have been made to indicate subsurface materials at particular locations. Explorations and investigations conducted by designers and their subconsultants are solely for the purpose of study and design.
 - b. The subsurface exploration and investigation information is presented or made available to indicate some of the conditions that may be encountered during construction and is offered as supplementary information only. Geotechnical information presented in the referenced material represents the opinion of soils consultants as to the character of the materials encountered. Subsurface information was directly obtained only at the specified location and necessarily indicates subsurface conditions only at the respective plan location, depths penetrated and only at the time of the exploration.
 - c. Neither the City nor the Designers assume any responsibility whatever in respect to the sufficiency or accuracy of borings made, or of the logs of test borings, or of other investigations, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unforeseen developments may not occur. It is expressly understood that the making of deductions, interpretations, and conclusions from all of the accessible factual information, including the nature of the materials to be excavated, the difficulties of doing other work affected by the geology, groundwater elevations and other subsurface conditions at the site of the Work are the Contractor's sole responsibility.

- d. Information derived from inspection of logs of borings, topographic maps, technical memorandum, reports, or plans showing information of the subsurface of site conditions will not relieve the Contractor from any risk or from properly examining the site and making such additional investigations as the Contractor may elect or from properly fulfilling all the terms of the Contract Documents.
3. Available Conceptual Utility and Drainage Reports.
4. DEN Building Information Modeling (BIM) Design Standards Manual (DSM)
5. Woolpert, Inc. Report - "A Low Distortion Projection for Denver International Airport (DEN)", dated 12/10/2010.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 014210

SECTION 014220 - ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 REFERENCE LIST

- A. Documents published by the following agencies may be referenced within these Contract Documents to define the quality of materials, equipment, workmanship, and other features of Work. Unless otherwise stated, the reference documents shall be of the latest edition as of the date of the Advertisement for Bids.
- B. Wherever used in the Contract Documents, the following abbreviations will have the meanings listed:

Abbreviation	Definition
AALA	American Association of Laboratory Accreditation
AAN	American Association of Nurserymen
AAO	Affirmative Action Officer
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AFI	Air-Filter Institute
AGTS	Automated Ground Transportation System
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
APEN	Air Pollution Emission Notes
APWA	American Public Works Association
ARI	Air Conditioning and Refrigeration Institute
ASCE	American Society of Civil Engineers

Abbreviation	Definition
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWPA	American Wood Preserver's Association
AWS	American Welding Society
AWWA	American Water Works Association
BID	Building Inspection Division, Department of Public Works
BIM	Building Information Modeling
CAR	Corrective Action Report
CCD	City and County of Denver
CCR	Contractor Change Request
CCRL	Cement Concrete Reference Laboratory
CD	Change Directive
CDOH	Colorado Department of Highways or Colorado Department of Health
CDOT	Colorado Department of Transportation
CMEC	Concrete Materials Engineering Council
CN	Change Notice
CO	Change Order
COE	Corps of Engineers
CPM	Critical Path Method
CR	Change Request
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
DEN	Denver International Airport
DFD	Denver Fire Department
DOT	United States Department of Transportation
DOR	Designer of Record
DWB	Denver Water Board
EEO	Equal Employment Officer or Equal Employment Opportunity
EIA	Electronics Industry Association
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration

Abbreviation	Definition
FCC	Federal Communications Commission
FHWA	Federal Highway Administration
FM	Factory Mutual Association
FS	Federal Specifications (U.S. General Services Administration)
GCC	General Contract Conditions
GIS	Geographic Information Systems
GMP -	Guaranteed Maximum Price
IAPMO	International Association of Plumbing and Mechanical Officials
IBC	International Building Code (published by ICC)
IBR	Institute of Boiler and Radiator Manufacturer's
ICBO	International Conference of Building Officials
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IMC	International Mechanical Code (published by ICBO)
IPC	International Plumbing Code (published by ICBO)
ISA	Instrument Society of America
ITA	Independent Testing Agency
MIL	Military Specifications (Naval Publications and Forms Center)
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
MUTCD	Manual of Uniform Traffic Control Devices
NAAB	National Association of Air Balance
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards (now called National Institute of Standards and Technology)
NEC	National Electric Code (NFPA 70)
NECA	National Electric Contractors Association
NEMA	National Electrical Manufacturer's Association
NESC	National Electrical Safety Code
NFC	National Fire Code (as published by NFPA)
NFPA	National Fire Protection Association
NICET	National Institute for the Certification of Engineering Technologies
NIST	National Institute of Standards and Technology
NGS	National Geological Survey
NLMA	National Lumber Manufacturers Association
NOAA	National Oceanic and Atmospheric Administration

Abbreviation	Definition
NRMCA	National Ready Mix Concrete Association
NTP	Notice to Proceed
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PDM	Precedent Diagram Method
PS	Product Standard of NIST (U.S. Department of Commerce)
PM	Project Manager
PMT	Project Management Team
PXP	Project Execution Plan
QA	Quality Assurance
QC	Quality Control
RFI	Request for Information
RTD	Regional Transportation District
SC	Special Contract Condition
SDI	Steel Door Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SSPWC	Standard Specifications for Public Works Construction
TCP	Traffic Control Plan
TSA	Transportation Security Administration
UL	Underwriters Laboratories, Inc.
USC	United States Code
WBS	Work Breakdown Schedule

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **014220**

SECTION 014225 - REFERENCE STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section contains a summary of industry-accepted and recognized standards published by trade associations, government, and institutional organizations that are referred to in the various Sections of these specifications or elsewhere in the Contract Documents.
- B. Standards listed herein are included in the Contract Documents by this reference and become a part of the Contract Documents to the same extent as though included in their entirety unless specific limitations are noted in the individual specifications Sections.
- C. Listings of reference standards include name and address of the organization publishing the standard, and the full name and designator of each of the standards referenced herein.
- D. If a publication date or edition number is listed with the reference standard, that publication date or edition number shall apply. Otherwise, the publication date or edition number in effect at the Contract date shall apply.
- E. Inclusion of reference standards herein does not make the DEN Project Manager an agent of the publishing agency, nor does it obligate the DEN Project Manager to perform inspections required by or to enforce rules or regulations contained in the reference standards.

1.3 SCHEDULE OF REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO), 444 North Capitol Street, NW, Suite 249, Washington, DC 20090:
 - 1. AASHTO M 36–Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains.
 - 2. AASHTO M216–Standard Specification for Lime for Soil Stabilization.
 - 3. AASHTO T26–Standard Method of Test for Water to be Used in Concrete.
 - 4. AASHTO T84–Specific Gravity and Absorption of Fine Aggregate.
 - 5. AASHTO T85–Specific Gravity and Absorption of Coarse Aggregate.
 - 6. AASHTO T103–Soundness of Aggregates by Freezing and Thawing
 - 7. AASHTO T219–Standard Methods of Testing Lime for Chemical Constituents

and Particle Sizes.

- B. American Concrete Institute (ACI) 38800 Country Club Drive, Farmington Hills, MI 48331
1. ACI 211.1—Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
 2. ACI 301—Specifications for Structural Concrete for Buildings.
 3. ACI 304—Recommended Practices for Measuring, Mixing, Transporting and Placing Concrete.
 4. ACI 304.2R—Placing Concrete by Pumping Methods.
 5. ACI 305R—Hot Weather Concreting.
 6. ACI 306R—Cold Weather Concreting.
 7. ACI 318—Building Codes Requirements for Structural Concrete
 - a. Reference to ACI 318 may be limited to more stringent requirements of local building code.
- C. American Society for Testing and Materials (ASTM), International 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428:
1. ASTM A 27—Mild to Medium Strength Carbon - Steel Casting for General Application.
 2. ASTM A 36—Structural Steel.
 3. ASTM A 47—Malleable Iron Castings.
 4. ASTM A 82—Specification for Steel Wire, Plain, for Concrete Reinforcement: Replaced by A1064
 5. ASTM A 123—Hot-dip Galvanizing.
 6. ASTM A 184—Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
 7. ASTM A 185—Specifications for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement: Replaced by A1064
 8. ASTM A 283—Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.
 9. ASTM A 615—Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 10. ASTM A 706—Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
 11. ASTM C 25—Method for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime.
 12. ASTM C29—Unit Weight and Voids in Aggregate
 13. ASTM C 31—Methods of Making and Curing Concrete Test Specimens in the Field.
 14. ASTM C 33—Specification for Concrete Aggregates.
 15. ASTM C 39—Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 16. ASTM C 42—Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 17. ASTM C 76—Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 18. ASTM C 88—Soundness of Aggregates by Use of Sodium Sulfate or Magnesium

Sulfate.

19. ASTM C 94—Specification for Ready Mixed Concrete.
20. ASTM C 109—Compressive Strength of Hydraulic Cement Mortars
21. ASTM C 110—Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone.
22. ASTM C 117—Materials Finer than 75 mm (No. 200) Sieve in Mineral Aggregates by Washing.
23. ASTM C 131—Resistance of Abrasions of Small Size Coarse Aggregate by Use of the Los Angeles Machine.
24. ASTM C 136—Method for Sieve Analysis of Fine and Coarse Aggregates.
25. ASTM C 138—Unit Weight, Yield, and Air Content of Concrete.
26. ASTM C 143—Test Method for Slump of Hydraulic – Cement Concrete
27. ASTM C 150—Specification for Portland Cement
28. ASTM C 171—Specification for Sheet Material for Curing Concrete.
29. ASTM C 172—Method of Sampling Fresh Concrete.
30. ASTM C 173—Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
31. ASTM C 231—Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
32. ASTM C 260—Specification for Air Entraining Admixture for Concrete.
33. ASTM C 309—Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
34. ASTM C 443—Joints for Concrete Pipe and Manholes, using Rubber Gasket
35. ASTM C 494—Specification for Chemical Admixtures for Concrete.
36. ASTM C 595—Blend Hydraulic Cements.
37. ASTM C 618—Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete
38. ASTM C 655—Reinforced Concrete D Load Culvert, Storm Drain, and Sewer Pipe.
39. ASTM C 789—Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers: Replaced by C1433
40. ASTM C 803—Test Method for Penetration Resistance of Hardened Concrete.
41. ASTM C 805—Test Method for Rebound Number of Hardened Concrete.
42. ASTM C 977—Specification for Quicklime and Hydrated Lime for Soil Stabilization.
43. ASTM D 75—Sampling Aggregate.
44. ASTM D 422—Test Method for Particle Size Analysis of Soils.
45. ASTM D 516-88—Standard Test Method for Sulfate Ions in Water.
46. ASTM D 693—Crushed Stone, Crushed Slag and Crushed Gravel for Dryer Water-Bound Macadam Base Courses and Bituminous Macadam Base and Surface Courses of Pavements: Withdrawn
47. ASTM D 698—Laboratory Compaction Characteristics of Soil using Standard Effort
48. ASTM D 751—Test Method for Coated Fabrics
49. ASTM D 1556—Test Method for Density of Soil in Place by the Sand-Cone Method.
50. ASTM D 1557—Laboratory Compaction Characteristics of Soil using Modified Effort
51. ASTM D 1682—Ultraviolet Resistance Grab Tensile Strength Grab Tensile Elongation Toughness: Replaced by D5034 and D5035

52. ASTM D 1751—Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
 53. ASTM D 1752—Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 54. ASTM D 2167—Test Method for Density of Soil in Place by the Rubber-Balloon Method.
 55. ASTM D 2216—Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil Aggregate Mixtures.
 56. ASTM D -79 (2011) Hydroxypropyl Methylcellulose
 57. ASTM D 2419—Sand Equivalent Value of Soils and Fine Aggregate.
 58. ASTM D 2487—Test Method for Classification of Soils for Engineering Purposes.
 59. ASTM D 2922—Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Method: Replaced by D6938
 60. ASTM D 3017—Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth): Replaced by D6938
 61. ASTM D 3665—Random Sampling of Paving Materials.
 62. ASTM D 4253—Test Method for Maximum Index Density of Soils Using Vibratory Table.
 63. ASTM D 4318—Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 64. ASTM D 4397—Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications.
 65. ASTM D 4546—Test Method for One-Dimensional Swell or Settlement Potential of Cohesive Soils.
 66. ASTM E 329—Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
 67. ASTM F 477—Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 68. ASTM F 758—Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport and Similar Drainage.
- D. American Welding Society (AWS), 550 NW LeJeune Road, Miami, FL 33135 AWS Code for Welding in Building Construction (Structural Welding Code).
- E. Concrete Reinforcing Steel Institute (CRSI) 933 N. Plum Grove Road, Schaumburg, IL 60195, (312) 490-1700:
1. Manual of Standard Practice.
- F. Colorado Department of Transportation (CDOT) Division of Administration, Office of Bid Plans, 4201 E. Arkansas Avenue, Denver, CO 80222:
1. Standard Specifications for Road and Bridge Construction (latest edition) Colorado Standard Plans, M&S Standards.
- G. Federal Highway Administration (FHWA) Superintendent of Documents, US Government Printing Office, Washington DC, 20402:
1. Manual of Uniform Traffic Control Devices (latest edition).

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **014225**

SECTION 014230 - DEFINITIONS AND CONVENTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section contains a list of definitions of words or phrases and grammatical or contextual conventions commonly used in these Contract Documents.

1.3 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Alphabetical Listing of Definitions:
 - 1. **As indicated:** Shown on the drawings by graphic indication, notes, or schedules, or written in the specifications or elsewhere in the Contract Documents.
 - 2. **As directed, as approved, as requested:** Unless otherwise indicated, these terms imply "by the DEN Project Manager" and require that an instruction be obtained by the Contractor from the DEN Project Manager.
 - 3. **Concealed:** Embedded in masonry, concrete, or other construction; installed in furred spaces; within double partitions or hung ceilings; in trenches; in crawl spaces or in enclosures.
 - 4. **Ensure:** To make certain in a way that eliminates the possibility of error.
 - 5. **Exposed:** Not installed underground or "concealed" as defined above.
 - 6. **Furnish or Provide:** To supply, install and connect complete and ready for safe and regular operation of particular work unless specifically otherwise noted.
 - 7. **Indicated, Shown, or Noted:** As depicted on drawings or specifications.
 - 8. **Install:** To erect, mount and connect complete with related accessories.
 - 9. **Or equal, or approved equal:** Refers to products which, in the opinion of the DEN Project Manager, are similar in all respects to products specified by proprietary brand name. Refer to Section 012510 "Substitutions" for procedures for submittal of proposed substitutions.
 - 10. **Rework:** To repair existing items or work required to be removed and replaced in order to accomplish the Work in accordance with the Contract Documents.
 - 11. **Related Work:** Includes, but not necessarily limited to, mentioned work associated with, or affected by, the Work specified.
 - 12. **Reviewed, Satisfactory, Accepted, or Directed:** Assumes by or to the DEN Project Manager.
 - 13. **Similar, or Equal:** Same in materials, weight, size, design, construction, capacity, performance, and efficiency of specified product.

14. **Supply:** To purchase, procure, acquire and deliver complete with related accessories.
15. **Unless Otherwise Indicated and Unless Otherwise Noted:** General note to perform work as indicated or shown on drawings or in specifications unless specifically directed otherwise elsewhere in the Contract Documents; may be abbreviated "U.O.N.", "U.O.I.", or "U.N.O."

C. BIM Model Definitions:

1. **Building Information Model (BIM):** BIM is a digital representation of the physical and functional characteristics of the Project and is referred as a Model(s), which term may be used to describe a Model Element, a single Model or technology used to create the Model.
2. **Design Model:** A Model that has reached the stage of completion that would customarily be expressed by an architect or engineer in two-dimensional Construction Documents.
3. **Construction Model:** The equivalent of shop drawing and other information useful to construction. A model that consists of data imported from a "Design Model or", if none exist, from a designer's "Construction Document".
4. **Federated Model:** Distinct component models "linked" together in such a manner that the linked data sources so not lose the indent or integrity by being so linked.
5. **Level of Development (LOD):** LoD describes the level of completeness to which a Model Element is developed.
6. **Model Element:** Is a portion of the BIM representing a component system or assembly within a building or building site.
7. **Model Element Author:** The party responsible for developing the content of a specific Model Element to the LoD for a particular phase of the Project.

1.4 BIM REFERENCE STANDARDS

- A. Refer to the DEN BIM Design Standard Manual (DSM) for the proposed minimum requirements of the BIM Execution Plan. The execution plan shall be further developed jointly with DEN and the Contractor to specifically address the administrative steps necessary to provide comprehensive BIM system before during and after construction.

1.5 CONVENTIONS

A. Specifications Format:

1. In order to standardize the location of information in the Contract Documents, the specifications generally are organized in one or more of the following formats:
 - a. The "MASTERFORMAT" 2011 Edition published by the Construction Specifications Institute.
 - b. The Standard Specifications for Road and Bridge Construction published by CDOT.
 - c. The alphanumeric system as published by the FAA.

B. Organization of Drawings and Specifications:

1. Organization of the specifications into divisions and sections, and arrangement or numbering of drawings is intended solely for the convenience of the Contractor in the Contractor's responsibilities to divide the Work among subcontractors or to establish the extent of work to be performed by any trade.
2. Neither the City nor the DEN Project Manager assume any liability arising out of jurisdictional issues or claims advanced by trade organizations or other interested parties based on the arrangement or organization of drawings or specifications.

C. Gender and Number:

1. For convenience and uniformity, parties to the Contract, including the City, Contractor, and DEN Project Manager, and their subcontractors, suppliers, installers, consultants or other interested parties are referred to throughout the Contract Documents as if masculine in gender and singular in number. Such reference is not intended to limit the meaning of the Contract Documents to the masculine gender or singular number.

D. Singular vs. Plural:

1. Materials, products, equipment, or other items of work referred to in the singular shall be construed as plural where applicable by the intent of the Contract Documents and shall not limit quantities to be provided by the Contractor.

E. Imperative Mood:

1. Specifications and notes on the drawings or elsewhere in the Contract Documents are generally written in the imperative mood as instructions to the Contractor, whether the Contractor is specifically addressed or not.

F. References to Subcontractors or Trades

1. References to subcontractors, trades or other entities, which are not parties to the Contract, shall be construed as meaning the Contractor whose responsibility it shall be to divide the Work among subcontractors or trades. Such references are used as a matter of convention, and are not intended to preclude or direct the Contractor's responsibility to divide the Work.

G. Abbreviations

1. A list of abbreviations used in the Contract Documents is included in Technical Specifications Section 014220 "Abbreviations and Symbols"; an abridged list of abbreviations used on the drawings is included with the drawings.
2. Abbreviations are believed to be those in general use in the construction industry. Contact the DEN Project Manager for clarification of abbreviations for which the meaning is not clear.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **014230**

SECTION 014320 - DEN QUALITY ASSURANCE FOR FAA FUNDED PROJECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Refer to Title 17 – Inspection and Defects in the General Contract Conditions, 2011 Edition.
- C. ASTM standard practices and specifications testing including, but not limited to, the following:
 - 1. ASTM C 1077: Standard Practices for Laboratory Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
 - 2. ASTM D 3666: Road & Paving Materials
 - 3. ASTM D 3740: Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
 - 4. ASTM E 329: Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction
 - 5. ASTM E 543: Determining the Qualifications of Nondestructive Testing Agencies.
- D. Other:
 - 1. Standard testing practices for other disciplines.

1.2 SUMMARY

- A. This Section identifies Denver International Airport (DEN) inspection activities to be performed by inspectors employed by DEN and working under the direction of the DEN Project Manager.

1.3 QUALITY ASSURANCE

- A. Inspection and tests, conducted by persons or agencies other than the Contractor, shall not in any way relieve the Contractor of the Contractor's responsibility and obligation to meet all requirements of Contract Documents and the referenced standards.
- B. The inspection and approval of Work by other agencies above does not constitute inspection or acceptance of Work required by DEN. The Contract Documents may contain requirements more stringent than Denver Building Inspection Division or other code agency requirements. The City will perform all acceptance testing.

- C. The Contractor will employ the services of a Material Testing Agency in conformance with Section 014525 "Material Testing Agency" to perform acceptance testing on all earthwork and earthwork related work items. DEN Quality Assurance (QA) program will monitor all tests performed by the Contractor's Material Testing Agency and must be present on site during all acceptance testing and inspections.
- D. The City will employ the services of a Testing Agency (TA), which will perform all acceptance testing.
- E. Laboratory and field testing requirements to be conducted by the TA for materials and construction on this project are included in the appropriate Contract Documents. Where the Contract Documents reference the CDOT Standard Specifications for Road and Bridge Construction, the references shall also mean CDOT Field Materials Manual for schedule of tests unless otherwise stated. As a minimum, the TA described in this Section shall perform all applicable tests including the sampling and acceptance testing. In the event of such a conflict between the schedule and a specification in the Contract Documents, the more comprehensive testing shall govern unless otherwise noted.
- F. Inspections and tests conducted by the TA shall not in any way relieve the Contractor of the Contractor's responsibility and obligation to meet the requirements of all Contract Documents and referenced standards. Employment of the City's TA does not relieve the Contractor of providing the required Quality Control program.
- G. When inspections or tests by the TA prove that the item or material does not meet all applicable specifications and requirements, the cost incurred for the re-testing or re-inspection shall be borne by the Contractor.
- H. Samples will only be considered if taken at random.
- I. The Contractor is obligated to correct any item deemed deficient at no additional cost to the City.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement will be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 014320

SECTION 014510 - CONTRACTOR QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section identifies the Quality Control activities to be performed during all phases of the Contract by the Contractor.
- B. The Contractor shall have in place a Quality Control Program as necessary to ensure that all materials and work are completed in compliance with Contract Documents. The Contractor is solely responsible for Quality Control and shall provide the necessary quality control personnel to assure that all materials, workmanship, and tests are in conformance with the Project documents with the exception of those tests and/or audits that may be conducted by the City as defined in the contract documents.
- C. Test schedules and/or testing requirements for materials used on this project are included in the technical specifications. Laboratory and field-testing identified in the specifications shall be conducted by a Testing Agency retained by the Contractor; hereafter is referred to as the Contractor Testing Agency (CTA).
- D. The City or its consultant working as the City agent will employ a testing agency to perform all the required Quality Assurance and Special Inspection Testing of material and Inspection of workmanship required by the Contract Documents and the Building Official to fulfill the code and the regulatory authority's requirements. The Contractor must schedule these tests and provide access to the City agents' inspectors and testers to perform these tests and inspections. The performance of the tests by the City does not relieve the Contractor of the responsibility to deliver a fully functional building meeting all the requirements of the Contract Documents and their intent. The Contractor must develop its own testing program for processing, acceptance from the subcontractor or suppliers at a frequency defined by the contractor for its own process control and to assure delivery of the intended acceptable workmanship. All time impacts of testing and retesting shall be accounted for in the updated schedule and any mitigation of time impacts shall be the responsibility of the Contractor.

1.3 SUBMITTALS

- A. Refer to Section 013300 "Submittals" and Section 013325 "Submittal Procedures" for submittal requirements.
- B. Quality Control Plan: Within ten (10) days after Notice to Proceed, the Contractor shall

submit a Quality Control Plan for review and acceptance. The Quality Control Plan shall be accepted by the DEN Project Manager prior to any Work or materials being incorporated into the Project. Acceptance by the DEN Project Manager does not relieve the Contractor of its responsibility to comply with the Contract Requirements. The Contractor Quality Control Plan shall address the following as a minimum:

1. A general description of Quality Control monitoring to be performed until final acceptance by DEN. Include monitoring activities of Work and the work site during times that no construction activity is scheduled to take place.
 - a. No work requiring QC inspection and testing shall take place without QC inspection and testing staff on site.
2. An individual designated by the Contractor and approved in writing by the DEN Project Manager whose [sole] responsibility is Quality Control Management. This individual shall be highly qualified in all phases of construction as it relates to this Project and shall have the authority to direct work changes required to bring the Work into conformance with Contract requirements, including stopping non-conforming work in progress. A detailed resume of the proposed Quality Control Manager including applicable education, experience, and certifications shall be included in the Quality Control Plan.
 - a. At the discretion of the DEN Project Manager, for Small Projects, Early Work Packages and Task Orders all of value less than \$1,000,000 or a duration which is less than three (3) months, the Contractor may assign one of the Contractor's staff, i.e. Contractor's Superintendent, Office Engineer, Field Engineer, or Contractor's Project Manager as Quality Control Manager. The assigned person must be on site while work requiring QC inspection and testing is being completed and available to discuss quality issues, manage all aspects of the Project Quality Control Plan, coordinate all required Special Inspection and Quality Assurance testing, and provide proposed solutions on all quality issues at any time as to not cause any delay to the project. Any delays caused in part or in all due to defective or no conforming work shall be borne by the Contractor.
3. Quality Control inspection staff as needed to assist the Quality Control Manager with implementation of the Quality Control Program. Duties of the Quality Control Inspectors shall be limited strictly to inspection of the ongoing work. Sampling and testing of materials shall be performed by Quality Control personnel other than Quality Control Inspectors. Quality Control Inspectors shall inspect only those work elements for which they are qualified. Resumes of the proposed Quality Control Inspectors including applicable education, experience and certifications shall be included in the Quality Control Plan.
4. An Organization Chart identifying all Quality Control staff by name and function. The chart shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work including tests performed by the CTA or DTA. If necessary, different Quality Control staff can be utilized for specific inspection and testing functions for different items of work. The chart shall show that the Quality Control Manager, Quality Control Inspectors, and Quality Control testing personnel are outside of

- the production staff with clear lines of authority for Quality Control.
5. The City and/or the City Program Management Team acting as the City agent will employ a DTA. The Contractor's testing and inspection shall be performed for the processing, preparation and to request City's inspection and as necessary to produce the required product as specified in the Contract Documents. The Contractor shall meet the minimum inspection and testing frequencies specified in the contract documents. When the contract documents do not specify minimum inspection and testing frequencies the Contractor shall propose in writing to the DEN Project Manager a QC inspection and testing frequencies that meet or exceed industry standards for the material and work being placed or conducted.
 6. Any test performed by any agency on the Project shall be recorded and show a passing re-test of all failing tests.
 - a. All test results shall be made available for inspection by the DEN Project Manager. This includes tests that are above the QC testing frequency required.
 7. Any tests submitted by the Contractor for basis of acceptance, or payment reduction when performed by the Contractor's agency, must meet all standards and must be certified to have followed approved procedure, processed in a certified lab by properly certified or licensed personnel by properly certified testers and on calibrated and certified equipment. Authentications of tests must be preapproved and cannot be selectively submitted. All tests shall be recorded in the field witnessed by DEN inspector to be accepted as a record test of the material in question. Any failing tests could be the sole basis for rejecting the material.
 8. Each technical specification division's requirements for quality control identifying each item requiring submittal and approval/acceptance prior to installation of work, all inspections to be performed during work and prior to acceptance of work, each item of work requiring testing by the independent testing agency or the City provided testing agency, and the testing frequency.
 9. The plan shall address all elements of special inspection required by the statement of special inspection as approved by the Building Official. All special inspections and tests will be performed by agencies employed by the City.
 10. The Contractor is responsible for the complete record of inspection file including but not limited to all manufacturer certificates, certificates of material compliance, Certificates of Material Testing Record, successful re-inspection of all deficiency items, proper deposition of design related Non-Conformance reports (NCR), Structural Engineers' observation reports, certification letters from the DTA, Building Inspectors' records of approvals, permit cards, fire suppression and fire-alarm tests records as witnessed by the authorities of jurisdiction and any record necessary to achieve a certificate of occupancy.
 11. The Contractor must keep track of all logs of discrepancies and submit periodic updates, as required by the DEN Project Manager, of all open issues and track the closure of open items in a timely manner.
 12. Establish controls and documentation format to ensure that items or materials that have been accepted through receiving inspection are used or installed. Identification and traceability shall be provided throughout all inspections, test activities, and records. For stored items, provisions shall be made for the control

- of item/material identification, consistent with the expected duration and type of storage.
13. A methodology of monitoring, testing, and exercising of all equipment, valves, and/or assemblies to ensure the Work installed is in proper working order.
 14. A list of suppliers and subcontractors. This list shall include items to be supplied by each supplier and/or subcontractor and shall identify work to be performed by each subcontractor. The list shall be updated and resubmitted as required.
 15. All approvals related to Special Inspection are subject to the acceptance or approval of the Building Official.
 16. Emergency contact information including name, company, title, work phone number, home phone number, and other means of contact. The Emergency Contact list shall include at least four individuals. The Emergency Contact list shall be maintained on a daily basis. In the event there is any change in any of the information, the Contractor shall forward the updated list to the DEN Project Manager and to DEN Maintenance Control (303-342-2800). The Emergency Contact list shall include the project number, project title, and date of issue.
- C. The Contractor shall transmit the following daily reports to the DEN Project Manager electronically PRIOR TO THE CLOSE OF BUSINESS ON the following work day:
1. CM-13 Contractors Daily Construction Report. The Foreman may add sheets of information to this form as needed.
 2. CM-07 Daily Quality Control Inspection Report and all CTA test results performed that day.
 3. CM-08 Daily DEN Time and Materials Report
- D. Deficiency List: The Quality Control Manager shall establish a deficiency list including the minimum information for each deficiency item; description, date, location, drawings reference, detail reference, specification reference, and superseding document NCR, date of expected solution date repaired date inspected by City representative and accepted.
- 1.4 DOCUMENTATION
- A. The Contractor shall not change or alter approved submittals, procedures, specifications, drawings/MODELS, or other pertinent documentation without the DEN Project Manager's written authorization.
 - B. All records and documents that are quality related shall be prepared, identified and maintained by the Contractor and shall be made available to DEN upon request. Records shall be protected from damage, deterioration, or loss. A copy of the records and documents shall be maintained at the Work site at all times unless the DEN Project Manager has approved other locations in writing. Retention time for all quality records shall be not less than three (3) years from date of Final Acceptance of the Contract.
 - C. The Contractor is responsible for the complete record of inspection file including but not limited to all manufacturer certificates, certificates of material compliance, Certificates of Material Testing Record, successful re-inspection of all deficiency items,

proper deposition of design related NCRs, Structural Engineers' observation reports, certification letters from the DTAs, Building Inspectors' records of approvals, permit cards, fire suppression and fire-alarm tests records as witnessed by the authorities of jurisdiction and any record necessary to achieve a Certificate of Occupancy.

- D. The Contractor shall maintain records at the actual worksite and at Contractor's office to show the inspection status of materials and items installed in order to ensure that the required inspections and tests have been performed in a timely and correct manner.
- E. The Contractor must keep a record of all deficiency issues and show positive evidence of closure (passing re-inspection or re-test) to every issue.

1.5 INSPECTIONS AND TESTS

- A. Inspections, tests and system shut down requests, conducted by persons or agencies other than the Contractor, shall not in any way relieve the Contractor of the responsibility and obligation to meet all specifications and the referenced standards. The Contractor's designated Quality Control Representative shall inspect the work and shall ensure the Work complies with the Contract requirements prior to any requests for inspection or testing.
- B. When the specifications, laws, ordinances, rules, regulations or orders of any public agency having jurisdiction require the DEN Project Manager's surveillance of inspections or tests, the Contractor shall notify the DEN Project Manager, in writing, of the place, date and time 48 hours prior to the inspection and/or test. The Contractor shall be responsible for notifying and requesting inspection by other agencies including but not limited to the Denver Building Inspection Division, Denver Fire Department, and Denver Water Department. Prior to request for other agency inspections, the Contractor shall meet and plan inspection times with the DEN Project Manager.
- C. Special inspections or tests may be required by the technical specifications, City, State and/or Federal Agencies in addition to those tests already performed. The Contractor shall notify the DEN Project Manager, in writing, at least 48 hours in advance of the additional inspections or tests.
- D. Quantities will be verified as defined in the Pre-Work Meetings.

1.6 INSPECTION PLAN

- A. The Contractor shall utilize the following six-point inspection plan to ensure the conformance of the Work performed by the Contractor meets the requirements of the Contract Drawings and specifications, the referenced codes and standards and the approved submittals:
 - 1. Pework Coordination: Prior to the start of construction work on the Contract and prior to the start of Work under each separate specification section and prior to the start of Work where a change in a construction operation is contemplated by

the Contractor, and prior to a new subcontractor starting work, a coordination meeting to ensure that the Contractor's personnel have no misunderstandings regarding their safety and quality procedures as well as the technical requirements of the Contract will be held with the Contractor's superintendent, Quality Control and Safety representatives, and DEN Project Manager. Supervisory, Safety and Quality Control, representatives of all applicable subcontractors will also attend. Prior to the meeting, the Contractor's Quality Control Manager shall provide the DEN Project Manager with a meeting agenda for review. The Contractor's Quality Control Manager shall conduct the meeting and distribute the approved agenda. The Quality Control Manager shall develop and electronically distribute finalized meeting minutes within one business day upon completion of the meeting. The following items shall be presented and reviewed by the Contractor:

- a. Contract requirements and specifications.
 - b. Shop drawings, certifications, submittals, models, and as-built drawings.
 - c. Testing and inspection program and procedures.
 - d. Contractor's Quality Control program.
 - e. Familiarity and proficiency of the Contractor's and subcontractor's workforce to perform the operation to required workmanship standards including certifications of installers.
 - f. Safety, security, and environmental precautions to be observed.
 - g. Any other preparatory steps dependent upon the particular operation.
 - h. The Contractor's means and methods for performing the Work.
2. Initial Inspection: Upon completion of a representative sample of a given feature of the Work and no later than two weeks after the start of a new or changed operation, the DEN Project Manager and/or the DEN Project Manager's designated representatives will meet with the Contractor's Quality Control representative and applicable subcontractor's supervisor and their Quality Control representatives to check the following items, as a minimum:
- a. Workmanship to established quality standards.
 - b. Conformance to Contract Drawings, specifications and the accepted shop drawings.
 - c. Adequacy of materials and articles utilized.
 - d. Results of inspection and testing methods.
 - e. Adequacy of as-built drawings/MODELS maintained daily.
 - f. Once accepted, the representative sample will become the physical baseline by which ongoing work is compared for quality and acceptability. To the maximum practical extent, approved representative samples of work elements shall remain visible until all work in the appropriate category is complete. Acceptance of a sample does not waive or alter any Contract requirements or show acceptance of any deviation from the Contract not approved in writing by the DEN Project Manager.
3. Follow-up Inspection: The Contractor's Quality Control representative will monitor the Work to review the continuing conformance of the Work to the workmanship standards established during the preparatory and initial inspections.
4. Completion Inspection: Forty-eight (48) hours prior to the completion of an item

or segment of work and prior to covering up any work, the Contractor shall notify the DEN Project Manager, in writing, who will verify that the segment of work is substantially complete, all inspections and tests have been completed and the results are acceptable. The purpose of this inspection is to allow further corrective work upon, or integral to, the completed segment of work. THIS IS NOT AN ACCEPTANCE INSPECTION. If any items are determined to be deficient, need correction or are non-conforming, a Deficiency List will be prepared and issued to the respective Contractor for correction, repair, or replacement of any deficient or non-conforming items. The DEN Project Manager and Contractor's Quality Control representative will verify the correction of the deficient and/or non-conforming items prior to the start of the next operation.

5. Pre-Final Acceptance Inspection: Prior to requesting a Pre-Final Acceptance Inspection by DEN, all work and operational systems to be inspected shall be satisfactorily completed and tested by the Contractor. The Contractor's written request for this inspection shall be made seventy-two (72) hours in advance. With the request shall come a list of any known deficiencies and when they will be corrected. If the list is too large or contains too many significant items, in the opinion of the DEN Project Manager, no inspection will be held because of the incompleteness of the Work.
6. The DEN Project Manager will schedule the Pre-Final Acceptance Inspection and will prepare a list of deficient items (punch list) discovered during the inspection. If during the inspection, the list becomes too large or too many significant items are on the list, the inspection will be canceled by the DEN Project Manager. After the inspection is completed, the Deficiency List will be transmitted to the Contractor for correction of the deficient items.
7. Final Acceptance Inspection: After the Contractor has completed all items on the Deficiency List (generated from the Pre-Final Acceptance Inspection), he shall request a Final Acceptance Inspection. The request shall be made in writing at least seventy-two (72) hours in advance of the inspection. All areas must be cleaned and ready for turnover prior to this inspection. The DEN Project Manager, the design consultant, a representative of the funding agency (if applicable) and other interested parties will inspect the subject Work to ensure that all deficiencies have been satisfactorily attended to and that no new deficiencies have appeared and that all systems are completely functional. Any outstanding or additional deficient items will be noted and handled per the requirements of the Pre-Final Acceptance Inspection noted above until the Work is acceptable to the DEN Project Manager.

1.7 CONTRACTOR SUBMITTAL OF PROPOSED CONTRACTOR'S TESTING AGENCIES

- A. Refer to Section 014525 - Material Testing Agency

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REQUIREMENTS

- A. All materials required for the Contract shall be new except where specified otherwise. The DEN Project Manager may elect to perform additional inspections and/or tests at the place of the manufacture, the shipping point or at the destination to verify conformance to applicable specifications. Inspections and tests performed by DEN shall not relieve the Contractor from the responsibility to meet the specifications, nor shall such inspections/tests be considered a guarantee for acceptance of materials that will be delivered at a later time.
- B. Materials accepted based on a Certificate of Compliance may be sampled and inspected/tested by DEN or its designer at any time. The fact that the materials were accepted based on such certification shall not relieve the Contractor of the responsibility to use materials that conform to the specifications.
- C. The Contractor shall impose upon suppliers the same quality control requirements, including inspection and test procedures, as imposed upon him by the specifications and referenced standards. The Contractor shall apply appropriate controls, designed to ensure that all materials supplied meet the requirements and specifications.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.
- B. Refer to Article 1706 - Removal of Defective Materials and Work in the General Contract Conditions, 2011 Edition.

END OF SECTION 014510

SECTION 014520 - CONTRACTOR QUALITY CONTROL PROGRAM - FAA

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. The Contractor shall establish, provide and maintain an effective Quality Control Program that details the methods and procedures that will be taken to ensure that all materials and completed construction required by this Contract conform to Contract Documents and any other requirements, whether manufactured by the Contractor or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the Contract Documents, the Contractor shall assume full responsibility for accomplishing the stated purpose.

1.3 LEVEL OF CONTROL

- A. The intent of this Section is to explain the Contractor's need to establish a necessary level of control that will:
 - 1. Adequately provide for the production of acceptable quality materials.
 - 2. Provide sufficient information to ensure both the Contractor and the DEN Project Manager that the Contract requirements are being met.
 - 3. Allow the Contractor as much latitude as possible to develop the Contractor's own standards of control.

1.4 REQUIREMENTS

- A. The Contractor shall be prepared to discuss at the Preconstruction Conference, the Contractor's understanding of the quality control requirements. A written Quality Control Plan shall be submitted to the DEN Project Manager no later than ten (10) days after the Notice to Proceed. The Contractor shall not begin any construction, production or off-site fabrication of materials to be incorporated into the completed work until the Quality Control Plan has been reviewed and approved by the DEN Project Manager. No partial payment will be made for work or materials subject to specific quality control requirements until the Quality Control Plan has been reviewed and approved by the DEN Project Manager.
- B. The quality control requirements contained in this Section and elsewhere in the

Contract Documents are in addition to and separate from the acceptance testing requirements. Certain acceptance testing requirements as noted in the specifications are also the responsibility of the Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 QUALITY CONTROL PROGRAM

- A. General Description: The Contractor shall establish a Quality Control Program to perform inspection and testing of all items of Work required by the Contract Documents, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the Contract Documents in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.
- B. Quality Control Plan: The following Quality Control Plan shall be submitted within ten (10) days of receiving the Administrative Notice to Proceed (NTP) in a MS Word or MS Excel format that can easily be incorporated into the FAA Construction Management Plan. The Contractor shall describe the Quality Control Program in a written plan. The Quality Control Plan shall provide a general description of minimum quality control monitoring required to be performed for each specification division until Final Acceptance by DEN.
1. The Quality Control Plan shall address and establish controls and documentation to ensure that only items or materials that have been accepted through successful inspection are used or installed. Identification and traceability of construction materials shall be provided throughout all inspections, test activities and records. For stored items, provisions shall be made for the control of the item/material identification, consistent with the expected duration and type of storage.
 2. The Quality Control Plan shall describe the methodology of monitoring, testing and exercising of all equipment, valves and/or assemblies to ensure the Work installed is in proper working order.
 3. In addition, the Quality Control Plan shall be organized to address, as a minimum, the following items:
 - a. Quality control organization and personnel.
 - b. Inspection requirements.
 - c. Quality control testing plan.
 - d. Documentation of quality control activities.
 - e. Requirements for corrective action when quality control and/or acceptance

- criteria are not met.
- f. Testing Agencies Certifications, personnel certifications, equipment lists, test forms, report samples and forms, frequency of tests, specification references, and specification standards.
 - g. Acceptance tests required and methods of quality control for each activity included in the Contract Documents.
4. The Contractor is encouraged to add any additional elements to the Quality Control Plan that he/she deems necessary to adequately control all production and/or construction processes required by this Contract.

3.2 QUALITY CONTROL ORGANIZATION

- A. The Contractor's Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.
1. The organizational chart shall identify all quality control staff by name and function and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item or work. If necessary, different technicians can be utilized for specific inspection and testing functions for different items of work. All personnel used for implementation of all or part of the Quality Control Program shall be subject to the qualification requirements of this Section. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.
- B. The quality control organization shall consist of the following minimum personnel:
1. Quality Control Manager:
 - a. The Quality Control Program shall be administrated by a Quality Control Manager. The Quality Control Manager shall be a full-time employee of the Contractor or a consultant engaged by the Contractor. The Quality Control Manager shall have a minimum of five (5) years of experience in airport and/or highway construction and shall have had prior quality control experience on a project of comparable size and scope as this Contract.
 - b. Additional qualifications for the Quality Control Manager shall include the following requirements:
 - 1) A licensed professional engineer with a minimum of five (5) years of airport or highway grading and drainage paving, field and laboratory testing, and quality control experience acceptable to the DEN Project Manager, or,
 - 2) A technician certified at Level III or IV by the National Institute for Certification in Engineering Technologies (NICET) for Construction Materials, Highway Materials, Highway Construction or five (5) years of highway and/or airport paving experience in all fields of work

- included in the scope of work and acceptable to the DEN Project Manager.
- 3) Submit the following documentation to the DEN Project Manager for review:
 - a) A current resume including the individual's experience and qualifications.
 - b) Copy of current PE registration and/or all applicable certifications.
 - c) Four (4) references for work on projects completed within past five (5) years, including names, current organization, and telephone numbers.
 - c. The Quality Control Manager shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the Contract Documents. The Quality Control Manager shall report directly to a responsible officer of the construction firm. The Quality Control Manager shall be on-site for a minimum of forty (40) hours per week during all production and shall be released from full-time duties only after written permission from the DEN Project Manager.
2. Electrical Quality Control Manager: Depending on the project's scope of work, the Contractor shall provide a dedicated, full-time Electrical Quality Control Manager. The Electrical Quality Control Manager shall have no other responsibilities other than overall electrical quality control. The Electrical Quality Control Manager shall be a master electrician with a minimum of five (5) years electrical airfield construction experience at a commercial carrier airport. The Electrical Quality Control Manager shall be a Certified Senior Technician.
 - a. The Quality Control personnel:
 - 1) Shall be familiar with and prove proficiency in all aspects of inspections and testing he/she is supervising.
 - 2) Shall not perform any testing or inspection he/she is not certified to perform.
 - 3) Shall be subject to the approval of DEN Project Manager.
 - 4) Shall not report or be part of the production team on the Project.
 3. Quality Control Inspection Technicians: A sufficient number of Quality Control Inspection Technicians necessary to adequately implement the Quality Control Program shall be provided by the Contractor. The Quality Control Inspection Technicians shall have the authority to bring the Work into conformance with Contract requirements including stopping non-conforming work in progress. A document signed by an officer of the Contractor shall convey and acknowledge the Inspector's authority. Inspection personnel shall be engineers, engineering technicians, or experienced craftsman with the following qualifications:
 - a. Engineer-in-training with minimum two (2) years of airport/highway grading experience acceptable to the DEN Project Manager.

- b. An individual with 3 years of highway and/or airport grading experience acceptable to the DEN Project Manager, with a Bachelor of Science degree in Civil Engineering, Civil Engineering. Technology or Construction.
 - c. The Quality Control personnel:
 - 1) Shall be familiar and prove proficiency in all aspects of inspections and testing he or she is supervising.
 - 2) Shall not perform any inspection he/she is not certified to perform.
 - 3) Shall be subject to the approval of DEN Project Manager.
 - 4) Shall not report or be part of the production team on the Project.
 - d. The Quality Control Inspection Technicians shall report directly to the Quality Control Manager and shall perform the following functions:
 - 1) Inspection of all materials, construction, plant and equipment for conformance to the Technical Specifications, and as required by Article 3.3 below
 - 2) Performance of all quality control tests as required by the Technical Specifications and Article 3.4 of this Section.
- C. If the DEN Project Manager determines that the Quality Control Manager or any of the Quality Control Manager's authorized support personnel are not effectively enforcing or performing the Quality Control requirements specified in the Contract, the DEN Project Manager will, in writing, require the Contractor to remove and replace such personnel from the Project at no cost to the City. No further work will be performed by the Contractor until an acceptable replacement for the replaced personnel is approved by the DEN Project Manager.
- D. Staffing Levels: The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the Work, separate plant and field testing technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Plan shall state where different technicians will be required for different work elements. Should the DEN Project Manager determine that staffing levels are not sufficient to ensure compliance with the Quality Control Plan and Contract Documents, the Quality Control Manager shall take steps to bring staffing levels to an acceptable level.
- E. Suppliers and Subcontractors: The Quality Control Plan shall include a list of suppliers and subcontractors. The list shall include items to be supplied by each supplier and/or subcontractor and shall identify work to be performed by each subcontractor. The list shall be updated and submitted as required.
- F. Emergency Contact Information: Provide the name, company, title, work phone number, home phone number, and other means of contact for at least four (4) individuals. The individuals can be associated with production and/or quality control. The Emergency Contact list shall be revised in the event there is any change in any of the information and forwarded to the DEN Project Manager and DEN Maintenance Control (303-342-2800). The Emergency Contact list shall also include the project

number, title and date of issue.

3.3 INSPECTION REQUIREMENTS.

- A. The Contractor shall utilize the following six-point inspection plan to ensure the conformance of the Work performed by the Contractor meets the requirements of the Contract Documents, the referenced codes and standards and the approved submittals:
1. **Prework coordination:** Prior to the start of construction work on the Contract and prior to the start of work under each separate specification section and prior to the start of work where a change in a construction operation is contemplated by the Contractor and prior to a new subcontractor starting work, a coordination meeting will be held with the Contractor's Quality Control Manager, Project Manager, Superintendent, Foreman, Safety representative, Quality Control Inspector(s), MTA representative, and the DEN Project Manager, DEN Inspector(s), and DEN Quality Assurance Laboratory representative. Supervisory, Safety, and Quality Control representatives of all applicable subcontractors will also attend. The Contractor's Quality Control Manager will chair the meeting and shall distribute the proposed meeting agenda 48 hours prior to the meeting. Upon completion of the meeting, minutes including any revisions to the agenda shall be distributed within twenty-four (24) hours.
 2. The purpose of the coordination meeting is to ensure that the Contractor's personnel have no misunderstandings regarding their safety and quality procedures as well as the technical requirements of the Contract. The following items shall be submitted to the DEN Project Manager no less than seventy-two (72) hours prior to the meeting and shall be presented and reviewed by the Contractor at the meeting held no less than forty-eight (48) hours prior to start of work:
 - a. Contract requirements and specifications.
 - b. Shop drawings, certifications, submittals and as-built drawings that apply.
 - c. Testing and inspection program and procedures.
 - d. Contractor's Quality Control Program.
 - e. Familiarity and proficiency of the Contractor's and subcontractor's workforce to perform the operation to required workmanship standards including certifications of installers.
 - f. Safety and environmental precautions to be observed.
 - g. Any other preparatory steps dependent upon the particular operation.
 - h. The Contractor's means and methods for performing the Work.
 3. **Initial Inspection:** Upon completion of a representative sample of a given feature of the Work and no later than two (2) weeks after the start of a new or changed operation, the DEN Project Manager or the DEN Project Manager's designated representative will meet with the Contractor's Quality Control representative and applicable subcontractor's supervisor and their Quality Control representatives to check the following items, as a minimum:
 - a. Workmanship to established quality standards.

- b. Conformance to Contract Documents and the accepted shop drawings.
 - c. Adequacy of materials and articles utilized.
 - d. Results of inspection and testing methods.
 - e. Adequacy of as-built drawings maintained daily.
 - f. Once accepted, the representative sample will become the physical baseline by which ongoing work is compared for quality and acceptability. To the maximum practical extent, approved representative samples of work elements shall remain visible until all work in the appropriate category is complete. Acceptance of a sample does not waive or alter any Contract requirements or show acceptance of any deviation from the Contract not approved in writing by the DEN Project Manager. The Contractor's Quality Control representative shall chair, prepare and distribute minutes of Quality Control meetings. Meeting minutes shall be distributed within twenty-four (24) hours of the meeting.
4. Follow-up Inspection: The Contractor's Quality Control representative will monitor the Work to review the continuing conformance of the Work to the workmanship standards established during the preparatory and initial inspections.
 5. Completion Inspection: Forty-eight (48) hours prior to the completion of an item or segment of work and prior to covering up any work, the Contractor will notify the DEN Project Manager who will verify that the segment of work is substantially complete, all inspections and tests have been completed and the results are acceptable. The purpose of this inspection is to allow further corrective work upon, or integral to, the completed segment of work. **THIS IS NOT AN ACCEPTANCE INSPECTION.** If any items are determined to be deficient, need correction or are non-conforming, a deficiency list will be prepared and issued to the respective Contractor for correction, repair or replacement of any deficient or non-conforming items. The DEN Project Manager and Contractor's Quality Control representative will verify the correction of the deficient and/or non-conforming items prior to the start of the next operation.
 6. Pre-Final Acceptance Inspection: Prior to requesting a Pre-final Acceptance Inspection by DEN, all work and operational systems to be inspected shall be satisfactorily completed and tested by the Contractor. The Contractor's written request for this inspection shall be made seventy-two (72) hours in advance. With the request shall come a list of any known deficiencies (punch list) and the time frame in which they will be corrected. If the list is too large or contains too many significant items, in the opinion of the DEN Project Manager, no inspection will be held due to the incompleteness of the Work.
 - a. The DEN Project Manager will schedule the Pre-final Acceptance Inspection and will add to the punch list deficient items discovered during the inspection. If during the inspection the list becomes too large or too many significant items are on the list, the inspection will be canceled. After the inspection is completed, the deficiency list will be transmitted to the Contractor for correction of the deficient items.
 7. Final Acceptance Inspection: After the Contractor has completed all items on the deficiency list (generated from the Pre-final Acceptance Inspection) he/she shall request a Final Acceptance Inspection. The request shall be made in

writing at least seventy-two (72) hours in advance of the inspection. All areas must be cleaned and ready for turnover prior to this inspection. The DEN Project Manager, the design consultant, a representative of the funding agency, if applicable, and other interested parties will inspect the subject Work to ensure that all deficiencies have been satisfactorily attended to and that no new deficiencies have appeared and that all systems are completely functional. Any outstanding or additional deficient items will be noted and handled per the requirements of the Pre-final Acceptance Inspection noted above until the Work is acceptable to the DEN Project Manager.

3.4 QUALITY CONTROL TESTING PLAN.

- A. As a part of the overall Quality Control Program, the Contractor shall implement a Quality Control Testing Plan as required by the specifications. The testing plan shall include the minimum tests and test frequencies required by each item in the Contract Documents as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.
- B. The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:
 - 1. Specification item number (e.g., P-401).
 - 2. Item description (e.g., Plan Mix Bituminous Pavements).
 - 3. Test type (e.g., gradation, grade, asphalt content).
 - 4. Test standard (e.g., ASTM or AASHTO test number, as applicable).
 - 5. Test frequency (e.g., as required by specifications or minimum frequency when requirements are not stated).
 - 6. Responsibility (e.g., plant technician).
 - 7. Control requirements (e.g., target, permissible deviations).
- C. The testing plan shall contain a statistically based procedure of random sampling for acquiring test samples in accordance with ASTM D 3665. The DEN Project Manager shall be provided the opportunity to witness quality control sampling and testing.
- D. All quality control test results shall be documented by the Contractor as required by this Section.

3.5 DOCUMENTATION.

- A. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved, results of inspections or tests, nature of defects, deviations, causes for rejection, etc., proposed remedial action, and corrective actions taken.
- B. These records must cover both conforming and defective or deficient features and must include a statement that all supplies and materials incorporated in the Work are in full compliance with the terms of the Contract. Legible copies of these records shall

be furnished to the DEN Project Manager daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Program Manager.

- C. Specific Contractor quality control records required for the Contract shall include, but are not necessarily limited to, the following records:
1. Certificates of compliance shall be submitted minimum thirty (30) days prior to the product's incorporation into the Work.
 2. Quality Control Charts for materials shall be established as required by the individual specification sections.
 3. Daily Foreman Report: The Foreman shall report daily construction activities using the Daily Foreman Report form QCP-1 as included in Specification Section 019990 "Standard Forms". The reports shall be completed in their entirety and shall as a minimum include the following:
 - a. Daily activities.
 - b. Quantities of material placed and completed.
 - c. Weather.
 - d. Safety issues.
 - e. Personnel.
 - f. Equipment on site with time used.
 - g. Equipment under repair.
 - h. Work delays.
 - i. Possible delays.
 - j. Materials delivered.
 - k. The reports shall be signed by the responsible foreman and Contractor Superintendent. The DEN Project Manager shall be provided a copy of each daily construction report on the work day following the day of record.
 4. Daily Quality Control Inspection Reports: Each Contractor Quality Control Inspection Technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations on forms QCP-2 and QCP-2-2 included in Section 019990 "Standard Forms". The reports shall be completed in their entirety, shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:
 - a. Technical Specification item number and description.
 - b. Compliance with approved submittals.
 - c. Proper storage of materials and equipment.
 - d. Adherence to plans and specifications.
 - e. Review of quality control tests.
 - f. Compliance of quality control testing frequencies.
 - g. Identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, remedial or corrective actions taken or proposed.
 - h. The reports shall be signed by the responsible Quality Control Inspection Technician and the Program Manager. The DEN Project Manager shall be provided a copy of each report on the workday following the day of record.

5. Test Reports: The Contractor shall be responsible for establishing a system which will record all quality control test results. Daily test reports shall document the following information:
 - a. Technical Specification item number and description.
 - b. Test designation.
 - c. Location.
 - d. Date of test.
 - e. Control requirements.
 - f. Test results.
 - g. Causes for rejection.
 - h. Recommended remedial actions.
 - i. Retests.
 - j. Fresh concrete properties tests and in-place moisture-density tests shall be reported in legible draft form to the DEN Inspector immediately at the test site. Any failing test shall be reported separately to a DEN Inspector or the DEN Project Manager within two (2) hours after the discovery.
 - k. Test results from each day's work period shall be transmitted to the DEN Project Manager on the next work day. These initial daily test reports shall be signed by the responsible Quality Control Technician and the Program Manager.
 - l. Typed final laboratory and field tests shall be provided to the DEN Project Manager as specified in paragraph 3.5.D "Weekly Summary Reports" below.

D. Weekly Summary Reports:

1. Typed final laboratory and field test reports summarizing the activities and results for the quality control tests and inspections for each week shall be prepared by the ITA and submitted to the DEN Project Manager. The weekly summary report shall meet the requirements of Section 014525 "Material Testing Agency" and be submitted within two (2) weeks from the end of the reporting period. At a minimum, the weekly summary report shall identify all test types, test locations, testers, test results, worksheets showing all calculations used, specifications, whether the test passed or failed, quantity of materials placed and the number of tests performed for each material, the material supplier, installer, and Contractor. Retests shall be identified in a fashion that easily correlates to the failing test. Any failed tests that have not been corrected when the report is published shall be highlighted and noted in the cover letter of the report. A current Correction Action Report (CAR) log shall also be included in the weekly summary report.

3.6 CORRECTIVE ACTION REQUIREMENTS

- A. The Quality Control Plan shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process under control. The requirements for corrective action shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the specifications.

- B. The Quality Control Plan shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.
- C. When applicable or required by the specifications, the Contractor shall establish and utilize statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

3.7 SURVEILLANCE BY THE DEN PROJECT MANAGER

- A. All items of material and equipment shall be subject to surveillance by the DEN Project Manager at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed herein and the applicable Contract Documents. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the DEN Project Manager at the site for the same purpose.
- B. Surveillance by the DEN Project Manager does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

3.8 NONCOMPLIANCE

- A. The DEN Project Manager will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the DEN Project Manager or the DEN Project Manager's authorized representative to the Contractor or the Contractor's authorized representative at the site of the work, shall be considered sufficient notice.
- B. In cases where quality control activities do not comply with either the Contractor's Quality Control Program or the Contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the DEN Project Manager, the DEN Project Manager may:
 - 1. Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors
 - 2. Order the Contractor to stop operations until appropriate corrective actions are taken.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

END OF SECTION 014520

SECTION 014525 - MATERIAL TESTING AGENCY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Contractor shall employ the services of a Material Testing Agency; hereafter referred to as the Contractor Testing Agency (CTA). This Section identifies the requirements for the Contractor to employ a Material Testing Agency and identifies the required activities of the Material Testing Agency.
- B. Laboratory and field-testing requirements to be conducted by the CTA for materials and construction methods used on this project are included in the appropriate technical specifications. Where the Specifications reference the CDOT Standard Specifications for Road and Bridge Construction, the references shall also mean CDOT Field Materials Manual for schedule of tests unless otherwise stated. As a minimum, the CTA described in this Section shall perform all applicable tests listed in the manual including the independent assurance sampling and testing. In the event of such a conflict between the schedule and a specification in these technical provisions, the more comprehensive testing shall govern unless otherwise noted.
- C. Inspections and tests conducted by the CTA shall not in any way relieve the Contractor of the Contractor's responsibility and obligation to meet all specifications and referenced standards. Employment of the CTA does not relieve the Contractor of providing the required Quality Control program.
- D. When inspections or tests by the CTA prove that the item or material does not meet all applicable specifications and requirements, the cost incurred for the re-testing or re-inspection shall be borne by the Contractor as per this Section.
- E. Samples will only be considered if taken at random. The Contractor shall permit representatives of the City to witness the selection of samples. Inspection or tests of items or materials that fail shall be sufficient cause to terminate further inspections/tests of the same brand, make or source of that product.
- F. The Contractor is obligated to correct any item deemed deficient at no additional cost to DEN.

1.3 SUBMITTALS

- A. All submittals shall comply with requirements of Sections 013300 "Submittal

Procedures" and 013325 "Shop and Working Drawings, Product Data and Samples" for submittal requirements.

1.4 CONTRACTOR SUBMITTAL OF PROPOSED TESTING AGENCIES

- A. The Contractor shall employ the services of a CTA that has been accredited by AASHTO or CCRL or an approved equal to perform the tests required in the Contract. The CTA may also provide technicians to perform the required inspections. However, inspection and testing cannot be performed simultaneously by the same technician. The Contractor shall receive written acceptance from the DEN Project Manager of the CTA prior to any permanent work being installed or tested.
- B. The Contractor shall not submit for acceptance to the DEN Project Manager any testing agency or laboratory utilized in the design or construction document preparation or presently employed by DEN as part of DEN Quality Assurance, Material Testing, or special inspection agencies.
- C. For consideration of acceptance, the Contractor shall submit to the DEN Project Manager the following items received from the CTA:
 - 1. Affidavit of current accreditation from a national certification and/or accreditation programs.
 - 2. Evidence that the CTA Laboratory is accredited to perform the testing required in the Contract Documents.
 - 3. Resumes and evidence of professional engineer registration and licensing in the State of Colorado for the personnel reviewing and signing test reports.
 - 4. Resumes and current certifications verifying that CTA management and supervisory personnel, laboratory staff, field testing technicians, and inspecting technicians are qualified in accordance with ASTM C 1077, D 3666, D 3740, and E 329 requirements to perform the Work. NICET, ACI, WAQTC, LabCAT, CDOT, NRMCA, PCA, AWS, ASNT certifications or a degree in a related engineering field with construction field experience that can demonstrate qualifications. A list summarizing all management, supervisory, laboratory, field testing, and inspection personnel assigned to the Project including the testing and/or inspection each individual will be performing, certifications held by each individual, and the expiration date of each certification.
 - 5. A matrix indicating each technical specification section, paragraph, quantity and type of sampling and/or testing required.
 - 6. Copies of all laboratory, field testing, and inspection report forms.

1.5 SUBMITTAL OF REPORTS

- A. Test results shall be submitted by the Contractor to the DEN Project Manager after completion of inspections/tests by the CTA and prior to incorporation of the items into the Work unless the test or inspection must be done during or after installation.
- B. All field test results including but not limited to fresh concrete properties and in-place moisture-density shall be reported in legible draft form to the DEN Inspector

immediately at the test site. Any failing test shall be reported separately to the DEN Inspector or DEN Project Manager. The draft test results shall also be attached to the Daily Quality Control Inspection Report (reference Section 014510 "Contractor Quality Control") and transmitted to the DEN Project Manager the next workday.

- C. Typed test reports shall be provided to the DEN Project Manager as specified in the "Weekly Reports" Article in this Section. The test reports shall be numbered sequentially in chronological order. Individual tests shall be numbered sequentially. The reports and tests shall also be organized per specification section. All test results must be reviewed and signed by a registered licensed engineer in the State of Colorado. The signature represents that the test procedures used are in strict conformance with the applicable testing standard, the calculated data are true and accurate, the tools and equipment used were in calibration, the sample was not contaminated and the persons running the test were qualified.
- D. Reports of inspections and test activities are record documents and shall be maintained in a manner that provides integrity of item identification, acceptability, and traceability. Reports shall identify the following:
1. Contractor's name.
 2. DEN Contract number and title.
 3. Material Testing Agency name.
 4. Name of items inspected/tested including a physical description and, as applicable, model and make.
 5. Quantity of items.
 6. Inspection/test procedure used. If national standards are used, any deviation from these standards.
 7. Date the sample was taken and the date the test was made.
- E. Location (by coordinates, building grid or station number and elevation) of where tests and/or samplings were performed including environmental condition where applicable. Include plan drawing indicating location of test, lot size and location and work item sampled or tested.
1. Name of inspector/tester.
 2. In the event the testing or sampling is a re-test or re-sampling, reference the previous respective testing or sampling report.
 3. Specified requirements in the Contract that the item must meet. Include reference to technical specification section and paragraphs.
 4. Acceptability.
 5. Deviations/nonconformance.
 6. Evaluation of results.
 7. All information required for the specific test as specified in the applicable ASTM standard.
 8. Signature of authorized evaluator.

1.6 WEEKLY SUMMARY REPORTS

- A. The CTA and Quality Control Manager shall prepare and submit to the DEN Project

Manager a weekly summary report each week, which summarizes by specification section all work activities and results for the quality control tests and inspections conducted during that period. The weekly summary report shall be submitted within two (2) weeks from the end of the reporting period. At a minimum, the weekly summary report shall identify all inspections, test types, test locations, testers, test results, specifications, whether the test passed or failed, quantity of materials placed and the number of tests performed for each material, and the material supplier, installer and Contractor. Re-tests shall be identified in a fashion that easily correlates to the failing test. Any failed tests that have not been corrected when the report is published shall be highlighted and noted in the cover letter of the report.

- B. The weekly report shall be submitted per Sections 013000 and 013350 requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REMOVAL OF NONCONFORMING MATERIAL

- A. The Contractor is obligated to correct or remove nonconforming materials, whether in place or not. If necessary, the DEN Project Manager will send written notification to the Contractor to correct or remove the defective materials from the project. If the Contractor fails to respond, the DEN Project Manager may order correction, removal, and/or replacement of defective materials by others, in which case the Contractor shall bear all costs incurred by such actions.

3.2 PERFORMANCE

- A. If the DEN Project Manager determines that the CTA or its personnel are not effectively enforcing or performing the testing and documentation requirements specified in the Contract, the DEN Project Manager will require, in writing, the Contractor to remove and replace CTA or such personnel at no cost to DEN.

3.3 CONTROL OF MEASURING AND TEST EQUIPMENT

- A. The CTA shall select measuring and test equipment in such a manner as to provide proper type, range, accuracy, calibration, and tolerance for determining compliance with specified requirements. Measuring and test devices shall be calibrated, adjusted and maintained at prescribed intervals prior to use based upon equipment stability and other conditions affecting measurement. Provisions shall be made for the proper handling and storage of equipment. Calibration shall be accomplished using certified standards that have a known traceable relationship to the National Institute of Standards and Technology. Every calibrated measuring and test device shall show the current status, date of last calibration and the due date for the next calibration. Calibration records shall be maintained onsite as quality records and shall be made available for inspection upon the DEN Project Manager's request.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under the Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.
- B. Refer to Title 17 - Inspection and Defects of the General Contract Conditions, 2011 Edition, for guidance on payment methods.

END OF SECTION **014525**

SECTION 014545 - SPECIAL INSPECTION AGENCY AND OWNER TESTING AGENCIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Special Inspection Statement issued as part of the application for building permit for the specific task or project.

1.2 SUMMARY

- A. The City will employ the services of Special Inspection Agencies (SIA). This Section identifies the requirements for the Contractor to coordinate, facilitate, and support DEN and its agents and consultants to fulfill the requirements of Special Inspection.
 - 1. Any additional tests deemed necessary by the Building Official, Engineer of Record, Special Inspector or DEN Project Manager to assure these agencies that all material and work on the Project meet the requirements of the Contract and all applicable codes and regulations.
 - 2. Minimum Laboratory and field testing requirements to be conducted by the SIA for materials and construction on this Project are included in the Table at the end of this Section.
 - 3. All caissons and piers drilling on this Project shall be continuously inspected by Special Inspection Agency hired by DEN directly or through the Engineer of Record or its sub-consultants.
 - 4. The Contractor shall not perform any work that could cover work or material that has not passed the requirement of special inspection or require the presence of the special inspector to meet the requirements of continuous or periodic inspection.
 - 5. It is the responsibility of the Contractor to plan, coordinate all testing requirements on the project to assure no delays are occurring due to the lack of inspection or testing.
 - 6. The Contractor must allow sufficient time in the schedule to perform all required inspection and testing.
 - 7. All rework due to nonconformance, failing tests or rework to test covered work prior to proper inspection and testing shall be borne by the Contractor.
 - 8. All re-inspections and re-testing costs due to non-conformances or failing tests or revisiting to test covered or incomplete work shall be borne by the Contractor at a cost of \$100 per hour in addition to all direct and indirect costs associated with testing.
 - 9. Periodic welding inspection shall include the minimum of fitting inspection and final inspection at all times.
 - 10. Inspections and tests conducted by the SIA shall not relieve in any way the

Contractor of the Contractor's responsibility and obligation to meet all specifications and referenced standards. Employment of the SIA does not relieve the Contractor of providing the required Quality Control program.

11. When inspections or tests by the SIA prove that the item or material does not meet all applicable specifications and requirements, the cost incurred for the re-testing or re-inspection shall be borne by the Contractor. Reference Article 5.1 of this Section.
12. Samples will only be considered if taken at random. The Contractor shall permit representatives of the City to witness the selection of samples. Inspection or tests of items or materials that fail shall be sufficient cause to terminate further inspections/tests of the same brand, make or source of that product.
13. The Contractor is obligated to correct any item deemed deficient at no additional cost to DEN.

1.3 SUBMITTALS

- A. All submittals shall comply with requirements of Section 013300 "Submittals" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal requirements.

1.4 CONTRACTOR SUBMITTAL OF PROPOSED CONTRACTOR'S TESTING AGENCIES

- A. Projects requiring Special Inspection where the Contractor is utilizing certified shop to produce material. DEN requires that testing be performed to satisfy the certification be no less than the following: All material and workmanship meets the requirements of a Contractor Material Testing Agency.
- B. The Contractor shall employ the services of a Testing Agency for process control and acceptance by the subcontractors and suppliers or material delivery for Contractor convenience or contractual obligations with others.
- C. The Contractor's Testing Agency must be accredited agency to perform any test required to be submitted for compliance with a Contract requirement or for use of data by DEN agencies for any official use, for examples and not to grant any obligation on the DEN Project Management Team, any payment reduction factor calculation. Any dispute or requirement to recalibrate testing equipment or machine, proof of compliance of material that was installed in contrary to manufacturer recommendation, any apparent defect due to adverse weather, improper installation, incomplete material record.
- D. Contractor's testing agency must be a qualified entity that has performed testing on similar jobs in size and complexity and has been accredited by AASHTO or CCRL or an approved equal to perform the tests required in the Contract. The CTA may also provide technicians to perform the required inspections. However, inspection and testing cannot be performed simultaneously by the same technician.
- E. The Contractor shall not submit for acceptance to the DEN Project Manager any

testing agency or laboratory utilized in the design or construction document preparation or presently employed by DEN as part of DEN Quality Assurance.

- F. For consideration of acceptance, the Contractor shall submit to the DEN Project Manager the following items received from the CTA:
1. Affidavit of current accreditation from a national certification and/or accreditation program.
 2. Evidence that the CTA Laboratory is accredited to perform the testing required in the Contract Documents.
 3. Resumes and evidence of professional engineer registration and licensing in the State of Colorado for the personnel reviewing and signing test reports.
 4. Resumes and current certifications verifying that SIA management and supervisory personnel, laboratory staff, field testing technicians, and inspecting technicians are qualified in accordance with ASTM C 1077, D 3666, D 3740, and E 329 requirements to perform the Work. NICET, ACI, WAQTC, LabCAT, CDOT, NRMCA, PCA, AWS, ASNT certifications, or a degree in a related engineering field with construction field experience can demonstrate qualifications. A list summarizing all management, supervisory, laboratory, field testing, and inspection personnel assigned to the Project including the testing and/or inspection each individual will be performing, certifications held by each individual, and the expiration date of each certification.
 5. A matrix indicating each technical specification section, paragraph, quantity and type of sampling and/or testing required.
 6. Copies of all laboratory, field testing, and inspection report forms.

1.5 SUBMITTAL OF REPORTS

- A. Test results shall be submitted by the Special Inspector and/or DEN Testing Agency to the DEN Project Manager after completion of inspections/tests by the SIA/OTA and prior to incorporation of the items into the Work unless the test or inspection must be done during or after installation.
- B. All field test results including but not limited to fresh concrete properties and in-place moisture-density shall be reported in legible draft form to the DEN/PMT Inspection and the Contractor Quality Control Manager immediately at the test site. Any failing test shall be reported separately to the DEN/PMT Inspector or DEN Project Manager within two (2) hours after the discovery.
- C. The Contractor's Quality Control Manager or his/her Authorized representative must keep track and official record of all tests passed, failed, or defected. The Contractor shall be fully responsible to show passing tests of all required elements. The lack of any passing test record of any required element does not waive the requirement to of testing or inspection as required by the Contract Documents and the IBC. The Contractor shall bear all costs associated with recovering missing tests including but not limited to the cost of the cost of disassembling, testing or inspecting, reassembling, and any indirect time or cost impacts of a missing required test or inspection.
- D. Typed test reports shall be provided by the testing agency to the DEN Project Manager

as specified in Part 1 of this Section Weekly Summary Reports. The test reports shall be numbered sequentially in chronological order. Individual tests shall be numbered sequentially. The reports and tests shall also be organized per specification section. All test results must be reviewed and signed by a registered licensed engineer in the State of Colorado. The signature represents that the test procedures used are in strict conformance with the applicable testing standard, the calculated data are true and accurate, the tools and equipment used were in calibration, the sample was not contaminated and the persons running the test were qualified.

- E. A plan of work and administrative procedure shall be established to assure that all test and inspections frequency required are performed and all defects are tracked and retested and re-inspected to meet all applicable specifications, codes, and standards.
- F. The Contractor shall track all tests performed on the daily reports and shall submit a statement for each phase of the Work showing all elements of Quality have been completed and all defects are addressed or scheduled to be addressed prior to covering the Work.
- G. Reports of inspections and test activities are record documents and shall be maintained in a manner that provides integrity of item identification, acceptability, and traceability. Reports shall identify the following:
 - 1. Contractor's name.
 - 2. DEN Contract number and title.
 - 3. Testing Agency name.
 - 4. Name of items inspected/tested including a physical description and, as applicable, model and make.
 - 5. Quantity of items.
 - 6. Inspection/test procedure used. If national standards are used, any deviation from these standards.
 - 7. Date the sample was taken and the date the test was made.
 - 8. Location, by coordinates, building grid or station number, of where tests and/or samplings were performed including environmental condition where applicable. Include plan drawing indicating location of test and work item sampled or tested.
 - 9. Name of inspector/tester.
 - 10. In the event the testing or sampling is a re-test or re-sampling, reference the previous respective testing or sampling report.
 - 11. Specified requirements in the Contract that the item must meet. Include reference to technical specification section and paragraphs.
 - 12. Acceptability.
 - 13. Deviations/nonconformance.
 - 14. Corrective action.
 - 15. Evaluation of results.
 - 16. All information required for the specific test as specified in the applicable ASTM standard.
 - 17. Signature of authorized evaluator.

1.6 WEEKLY SUMMARY REPORTS

- A. The SIA/OTA shall prepare and submit to the DEN Project Manager a weekly summary report each week that summarizes by specification section all work activities and results for the quality control tests and inspections conducted during that period.
- B. The weekly summary report shall be submitted within two (2) weeks from the end of the reporting period. At a minimum, the weekly summary report shall identify all inspections, test types, test locations, testers, test results, specifications, whether the test passed or failed, quantity of materials placed and the number of tests performed for each material, and the material supplier, installer and Contractor.
- C. Re-tests shall be identified in a fashion that easily correlates to the failing test. Any failed tests that have not been corrected when the report is published shall be highlighted and noted in the cover letter of the report. The SIA shall identify costs of re-testing or additional site visits required due to scheduling changes by the Contractor. A current Corrective Action Report log (CAR) shall also be included in the weekly summary report.
- D. The weekly report shall be submitted per Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CORRECTION OR REMOVAL OF NONCONFORMING MATERIAL

- A. The Contractor is obligated to correct or remove nonconforming materials, whether in place or not. If necessary, the DEN Project Manager will send written notification to the Contractor to correct or remove the defective materials from the Project. If the Contractor fails to respond, the DEN Project Manager may order correction, removal, and/or replacement of defective materials by others, in which case the Contractor shall bear all costs incurred by such actions.

3.2 PERFORMANCE

- A. If the DEN Project Manager determines that the SIA or its personnel are not effectively enforcing or performing the testing and documentation requirements specified in the Contract, the DEN Project Manager will, state in writing, the requirement for the Contractor to remove and replace SIA or such personnel at no cost to DEN.

3.3 CONTROL OF MEASURING AND TEST EQUIPMENT

- A. The SIA shall select measuring and test equipment in such a manner as to provide proper type, range, accuracy, calibration, and tolerance for determining compliance with specified requirements. Measuring and test devices shall be calibrated, adjusted and maintained at prescribed intervals prior to use based upon equipment stability and other conditions affecting measurement.
- B. Provisions shall be made for the proper handling and storage of equipment. Calibration shall be accomplished using certified standards that have a known traceable relationship to the National Institute of Standards and Technology. Every calibrated measuring and test device shall show the current status, date of last calibration and the due date for the next calibration. Calibration records shall be maintained onsite as quality records and shall be made available for inspection upon the DEN Project Manager's request.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for Work under the Section. DEN Project Management Team staff will track all costs and remark the conditions and track all associated impacts for credits to the City. The contractor record of the same is only valid if signed by the DEN Project Manager or authorized representative.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for Work under this Section.
- B. Refer to Title 17 - Inspection and Defects in the General Contract Conditions, 2011 Edition, for guidance on payment methods.

END OF SECTION 014545

SECTION 015050 - MOBILIZATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Section 012910 "Schedule of Values"

1.2 SUMMARY

- A. The Work specified in this Section consists of preparatory work and operations including, but not limited to the following:
 - 1. Those necessary for the movement of personnel, equipment, supplies, and incidentals to the work site.
 - 2. For the establishment of all offices, buildings and other facilities necessary for the Work on the Project.
 - 3. For all other work and operations that must be performed or costs incurred prior to beginning work on the various Contract items on the work site.

1.3 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
- B. Submit a Mobilization Schedule a minimum of fourteen (14) days prior to first billing for mobilization.

1.4 DELIVERY

- A. Delivery to the work site of construction tools, equipment, materials, and supplies shall be accomplished in conformance with all local governing regulations.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Provide construction tools, equipment, materials, and supplies of the type and quantities that will facilitate the timely execution of the Work.

PART 3 - EXECUTION

3.1 EXECUTION AND REMOVAL

- A. Provide personnel, products, construction materials, equipment, tools, and supplies at the work site at the time they are required and scheduled to be installed or utilized.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. The Contractor shall submit for the DEN Project Manager's approval minimum fifteen (15) days prior to the first mobilization billing a detailed breakdown of all items, including subcontractor mobilization items that are proposed to be invoiced under Mobilization as part of the Schedule of Values (reference Section 012910 "Schedule of Values"). This breakdown shall be labeled "MOBILIZATION SCHEDULE". This schedule will be reviewed by the DEN Project Manager to inform the Contractor what exact types of costs will be approved and paid under Mobilization.
- B. All requests for payment for mobilization shall include a detailed Mobilization Schedule which shall identify the nature of each expense item, its delivery date, setup and startup date and the actual invoice amounts inclusive of acquisition, taxes, transportation assembly, and installation less all discounts.
- C. The contractor shall identify a line item in the Mobilization Schedule as "Pre-Construction" and shall establish the value for this line item, at a maximum, of ten percent (10%) of the pay item for mobilization. The requirements of pre-construction start-up activities, as outlined in this specification, shall be substantially complete to qualify for payment as determined and approved by the DEN Project Manager prior to commencing construction activities.
- D. The Contractor shall identify a line item in the Mobilization Schedule as "Demobilization" and shall establish the value for this line item, at a minimum, of fifteen percent (15%) of the pay item for mobilization.
- E. The initial approved Mobilization Schedule shall determine the basis for all future mobilization payments.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. Payment will be made only for substantiated Mobilization costs in accordance with the approved Mobilization Schedule, and only to the limit of the Contract lump sum

amount for the pay item Mobilization. In no case will the City pay Mobilization in excess of five percent (5%) of the total Contract amount.

- B. Payment for the Contractor's bonds may be included in the Mobilization Schedule to the limits of the actual amount.
- C. Payment amounts for personnel involved in mobilization and listed on the approved Mobilization Schedule shall be limited to the Contractor's certified payroll amounts.
- D. Payment amounts for materials, supplies and transportation involved in mobilization and listed on the approved Mobilization Schedule shall be for the actual amounts paid as shown on invoices marked paid. No payment will be made under mobilization for the cost of permanent materials to be installed for this Contract. Payment for permanent material shall be paid in accordance with section 012910 "Schedule of Values".
- E. No payment under mobilization will be made for rented or leased equipment other than actual transportation cost.
- F. No separate payment will be made as part of the Mobilization Schedule for the maintenance and/or use of personnel, equipment, supplies and incidentals after project setup except for demobilization. These costs are to be incorporated in the remaining items of work in the Schedule of Values by multiplier or work request.
- G. For any mobilization payment amounts requested by the Contractor that are unsubstantiated or exceed the allowable limit of five percent (5%) of the total Contract amount, the DEN Project Manager, may in the DEN Project Manager's sole discretion reallocate any, all, or none of those amounts to other work items in the Schedule of Values for lump sum contracts or to be disbursed on a prorated basis as determined by the DEN Project Manager for unit price contracts. Any unsubstantiated mobilization payment amounts not reallocated by the DEN Project Manager will not be paid.

Payment Shall Be Made Under:

015050a Mobilization Per Lump Sum

END OF SECTION **015050**

SECTION 015210 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special 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 011000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 312319 "Dewatering" for disposal of ground water at Project site.
 - 3. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
 - 4. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 DESCRIPTION

- A. The Work specified in this Section consists of furnishing, installing, operating, maintaining, and removing temporary construction barriers, enclosures, and field facilities including the Contractor's construction offices, staging areas, yards, storage areas, electrical power, telephone, water, fire protection, and sanitary service.
- B. Construction Offices, Construction Yards and Storage Areas:
 - 1. The Contractor's offices, construction yards laydown and storage areas shall be located as shown on the Contract Drawings and/or as designated by the DEN Project Manager. All construction offices, staging areas, and material storage areas are to occur within these areas.
 - 2. Any activity that is expected to result in disturbance of the ground surface equal to or greater than one acre or part of a larger project that is expected to disturb equal to or greater than one acre, is required to be identified in their Erosion Control permit. These areas include, but are not limited to, laydowns, borrow areas, stockpiles, and storage areas regardless of the location.
 - 3. All areas of ground disturbance are required to be stabilized in accordance with State, local, and airport rules and regulations prior to permit termination and/or closure of the Contract.
 - 4. The Contractor shall restore any area on DEN property that becomes

- contaminated as a result of its operations in accordance with Airport Rule and Regulation 180. Restoration shall be either to applicable standards under Federal and State law or to such other levels as may be required by the Manager of Aviation, at the Manager's sole discretion.
5. All temporary facility sites must be inspected prior to Contract closeout.
 - a. The DEN Project Manager or authorized representative shall conduct an inspection of contractor areas used during the life of the project. These areas include but are not limited to, staging areas, laydown areas, borrow areas, and contractor yards and offices.
 6. The DEN Project Manager will ensure these areas have been properly stabilized in accordance with DEN Rules and Regulations and required permits. Site must be restored to the condition in which the City initially provided to the Contractor. A representative from DEN Environmental Services shall be present during the final walk through.
 7. Contractor materials shall be managed in accordance with all applicable Environmental Regulations.
 8. Temporary facilities which the Contractor desires to locate in secondary laydown and staging areas adjacent to the Work or within the project limits are subject to approval by the DEN Project Manager. If approved, these areas must also be included as part of their erosion control permit.
 9. Access to and security of the Contractor's construction offices, yard, temporary facilities, and storage areas shall be as shown on the Contract Drawings or as specified in the Contract Special Conditions.
 10. Contractor Field Office:
 - a. The Contractor shall acquire all necessary permits for installation and construction work related to the Contractor's field office and fencing.
 - b. The Contractor shall provide, as part of the Contractor's on-site field office, a conference room for weekly meetings. Minimum size to accommodate fifteen (15) people with the currently approved schedule posted on a wall. The conference room shall have and one (1) available telephone.
 - c. Jack the mobile office unit off its wheels and provide support. Enclose the underside of the trailer with weatherproof skirting.
 - d. Install tie downs in compliance with all applicable codes.
 - e. Provide access to the field office and easily accessible space for parking six (6) full size passenger automobiles as a minimum. Grade the field office site, access roadway, and parking area for drainage, and surface with gravel paving or crushed stone.
 - f. Water and sewer lines to the field office, if installed, shall be installed so they will not freeze.
 11. All Contractor Storage Yards must be fenced. Submit fencing plan and typical details to DEN Project Manager at least seven (7) days before planned execution for review and acceptance.
 12. In accordance with Denver Fire Department Requirements, all Temporary Facilities shall have signage that lists the following information:
 - a. Company Name

- b. Contact Telephone Number
- c. Facility Address

C. Electrical Service

1. Provide lighting and power for field offices, storage facilities and other construction facilities and areas.
2. Provide power centers for electrically operated and controlled construction facilities including tools, equipment, testing equipment, interior construction lighting, heating, cooling and ventilation equipment.
3. Provide night security lighting at secured areas within construction limits at offices, storage facilities, temporary facilities and excavated areas.
4. Provide battery operated or equivalent emergency lighting facilities at construction areas where normal light failures would cause employees to be subjected to hazardous conditions. Test such facilities monthly and maintain a record of these tests for the DEN Project Manager's review.
5. Contractor shall bear all costs of temporary electric service permits, fees, and deposits required by the governing authorities, and connection charges and temporary easements including installation, maintenance, and removal of equipment.

D. Telephone/Communications Service:

1. The Contractor shall furnish, install, and maintain at least two (2) telephones in the Contractor's main field office. These phones shall be manned at all times by the Contractor's personnel or by an answering machine when personnel are not in the field office.
2. Comply with requirements of Division 26 Sections.

E. Water Service:

1. The Contractor shall make all connections and extensions required and shall make use of water in direct support of the Work. The Contractor shall install an approved Water Department tap at the City's water source prior to obtaining any water. The Contractor shall arrange and pay for its supply/distribution system from the City's point of connection. The location and alignment of the Contractor's temporary supply/distribution system must be approved by the DEN Project Manager prior to its installation. The Contractor shall leave in place all above ground and underground water distribution facilities unless otherwise directed by the DEN Project Manager.
2. The Contractor shall not use in place fire hydrants or standpipes as sources for construction water or potable water.
3. Comply with requirements of Division 22 Sections.

F. Fire Protection:

1. Furnish, install, and maintain temporary portable fire protection equipment throughout the construction period at all buildings (including the project site), maintenance shops, and fuel storage on all large construction equipment and at the location of any flammable materials or construction materials.

2. Comply with requirements of Division 21 Sections.

G. Sanitary Service:

1. Furnish, install, and maintain temporary sanitary facilities and services throughout the construction period.
2. Ensure that separate or single user toilets shall be provided to ensure privacy between the sexes.
3. Provide general washing facilities adequate for the number of employees.
4. Provide special washing facilities adequate for the number of employees engaged in the application of paints, coating, and other volatile or hazardous materials.

1.4 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
- B. Submit a shop drawing within five (5) days of the Notice to Proceed that shows the following:
 1. Temporary facilities equipment and materials (include manufacturer's literature).
 2. Details and layout of temporary installations including fences, roads, parking, buildings, storage areas, signage, and drainage plans.
 3. Lighting plan showing temporary lighting facilities, electrical service panel location, electrical circuit diagram, and anticipated light level on the working roadway, pathway, or construction surface.
 4. As-built description of any temporary underground utilities referenced to the Airport grid and benchmark system within five (5) days of completion of the installation.
 5. Copies of all permits for all temporary facilities.

1.5 QUALITY CONTROL

- A. Provide products for, and the execution of, the Work of this Section that will satisfy the requirements of all applicable codes. Provide products that satisfy the requirements of the applicable codes.

PART 2 - PRODUCTS

2.1 ELECTRICAL SERVICE

- A. Provide temporary power and lighting equipment consisting of fixtures, transformers, panel boards, groundings, lamps, switches, poles, conduits and wiring sized and capable of continuous service and having adequate capacity to ensure a complete operating system. Comply with NEMA and Division 26 requirements.

2.2 TELEPHONE/COMMUNICATIONS SERVICE

- A. Provide equipment that is compatible with that of the current DEN service provider and the telephone exchange to which the Contractor connects.

2.3 POTABLE WATER SERVICE

- A. Provide sanitary materials and equipment that satisfies the requirements of codes and regulations pertaining to temporary water systems. Bottled products may be used if those products comply with codes. Clearly label portable containers having a dispensing tap and used only for drinking water. Provide single service disposable cups and a sanitary container for dispensing cups. A trash receptacle shall be provided and maintained beside each portable water supply.
- B. If paints, coatings and other volatile or hazardous materials injurious to humans will be applied as part of the Contract, provide washing facilities with warm water of approximately 120 degrees F.

2.4 FIRE PROTECTION

- A. Fire extinguishers shall be UL rated and shall comply with the International Fire Code with City of Denver amendments.

2.5 SANITARY SERVICE

- A. Provide materials and equipment adequate for the intended purposes, which will neither create unsanitary conditions nor violate the codes applicable to temporary sanitary facilities. Enclosures for toilet and washing facilities shall be weatherproof, sight proof, ventilated and sturdy, and shall be maintained in clean conditions.
- B. Provide portable type toilet facilities that satisfy the requirements of OSHA.
- C. Provide washing facilities as needed. Furnish soap, single-service paper towels, towel dispenser, and towel receptacle.

PART 3 - EXECUTION

3.1 ELECTRICAL SERVICE

- A. The approximate location of primary power lines is shown on the Construction Drawings. The Contractor shall locate electrical service where it will not interfere with equipment, storage spaces, traffic, and prosecution of the Work or the work of others. Installation shall present a neat and orderly appearance and shall be structurally sound. Maintain service in a manner that will ensure continuous electrical service and safe working conditions.

- B. Comply with requirements of Division 26 Sections.

3.2 TELEPHONE/COMMUNICATION SERVICE

- A. Install temporary telephone service in a neat and orderly manner, and make structurally and electrically sound to ensure continuous service. Modify, relocate, and extend, as work progress requires. Place conduit and cable where those products will not interfere with traffic, work areas, materials, handling equipment, storage areas, and the work of other contractors. Service lines may be aerial.

3.3 WATER SERVICE

- A. Install the systems in a neat and orderly manner. Make them structurally and mechanically sound. Provide continuous service. Modify, relocate, and extend the systems as the Work progresses.
- B. Comply with requirements of Division 22 Sections.
- C. Locate systems where they will be convenient to work stations, sanitary facilities, and first aid station but will not interfere with traffic, work areas, materials handling equipment, storage areas, or the work of other contractors.
- D. Provide sanitary bubbler drinking fountains if potable water service is available. Disinfect water piping before using for the potable water service.
- E. Install vacuum breakers, backflow preventers, and similar devices in a manner and location that will prevent temporary water from returning to the water mains.
- F. Do not incorporate any part of temporary water distribution system into the permanent water distribution system.

3.4 FIRE PROTECTION

- A. Install products in conformance with the requirements of the applicable Denver Fire Department and OSHA regulations.
 - 1. Provide functional, approved fire extinguishers that are clearly identified for fire and an accessible supply of water during the period of construction. These fire extinguishers shall remain in place until permanent fire protection systems are functional.
- B. Instruct construction personnel as to location and use of temporary fire protection equipment.
- C. Comply with requirements of Division 21 Sections.

3.5 SANITARY SERVICE

- A. Place temporary sanitary and washing facilities in a neat and orderly manner within the limits of the Work and convenient to the workstations. Make these facilities structurally and mechanically sound. Modify, relocate, and extend the facilities as required by progress of the Work.
- B. Service toilets at those time intervals that will minimize the accumulation of wastes and prevent creation of unsanitary conditions, but not less than once a week.
- C. The waste from the sanitary and wash facilities shall be disposed of in accordance with all applicable rules, regulations, and laws and with the least environmental impact.

3.6 FENCING

- A. Contact all utility service companies prior to planning fence location and post locations for certification of current utilities. Locate pothole posts planned within five (5) feet of known utilities.

3.7 SIGNAGE

- A. Contractor shall not provide any signage for temporary facilities without prior approval from the DEN Project Manager.

3.8 REMOVAL

- A. The Contractor shall locate all temporary facilities including the underground utilities so they can be completely removed without damaging permanent work or the work site of other contractors.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this section.

END OF SECTION 015210

SECTION 015525 - TRAFFIC CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section consists of furnishing plans and designs for traffic control and haul routes, implementing these plans with all necessary personnel and equipment. Installation may require but not be limited to signage, cones, flaggers, signal lights, lighting and temporary roads.
- B. All Work must be in conformance with the "Manual of Uniform Traffic Control Devices for Streets and Highways" (MUTCD) and CDOT Standard Plans regarding traffic control.
- C. The Contractor must coordinate the Contractor's proposed traffic control needs with the needs of other contractors on the airport construction site in writing through the DEN Project Manager.
- D. Refer to Article 805 – Protection of Street and Road System in the General Contract Conditions, 2011 Edition.

1.3 QUALITY CONTROL

- A. Temporary signal work shall conform to CDOT Standard Plans and the current version of the CDOT Standard Specifications.
- B. Designate a qualified person to inspect and test traffic control devices daily and to ascertain that those devices are continuously operating, serviceable, in place, and clean.
- C. Provide certified personnel who will be responsible for design, implementation, and inspection of traffic control needs.

1.4 SUBMITTALS

- A. Refer to Technical Specifications Sections 013300 "Submittals" and 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
- B. Submit a Traffic Control Plan (TCP) that includes, at a minimum, the following list of

items for approval before starting Work. Submit an updated TCP when necessary to modify traffic operation or undertake a construction activity that creates a different traffic pattern:

1. Traffic blockade and reductions anticipated to be caused by construction operations.
 2. Temporary detours.
 3. A Method of Handling Traffic (MHT) must be submitted and approved by the DEN Project Manager, which at a minimum will show and describe proposed location, dates, hours, and duration of detours, vehicular traffic routing, and management, traffic control devices for implementing detours and details of barricades.
- C. Submit Haul Route Plan for both on- and off-site hauls. The Haul Route Plan shall be submitted 30 days prior to hauling any permanent material. The Plan shall be updated as the Contractor's plans change.
- D. Specific Traffic Considerations: The DEN Project Manager may require the Contractor to revise the Traffic Control Plan to address traffic considerations not included in the Contractor's plan.
- E. Shutdown requests for any impact to traffic must be submitted for approval a minimum of five days before the intended shutdown. These requests will be made through the DEN Project Manager.

PART 2 - PRODUCTS

2.1 TRAFFIC CONTROL DEVICES

- A. Devices including signs, delineators, striping, barriers, barricades, and high-level warning devices shall conform to the latest revision of the MUTCD and the latest revision of the Colorado Department of Transportation Standard Plans.

PART 3 - EXECUTION

3.1 TEMPORARY TRAFFIC CONTROL DEVICES

- A. Place temporary control devices in a manner that allows for the smooth flow of traffic at the posted speed limit, limiting hazards or abrupt changes in direction.
- B. Place traffic cones or delineators as directed by the MUTCD. Operate warning lights between sunset and sunrise.
- C. Place control devices so that approaching traffic is alerted to hazards and variances to normal traffic patterns.
- D. Clean and repair damaged devices or replace them with new devices as required.

3.2 TEMPORARY TRAFFIC STRIPING AND PAVEMENT MARKINGS

- A. Full-compliance striping is required at all times per the MUTCD.
- B. Temporary signs must be replaced with permanent signing within three days per the MUTCD.

3.3 FLAGGERS

- A. Furnish flaggers where required for safety and by the MHT.

3.4 CONSTRUCTION VEHICULAR TRAFFIC

- A. Restrict construction vehicles to approved haul routes.
- B. Haul routes on the airfield must be approved by Security.

3.5 CONTROLLING VEHICULAR AND PEDESTRIAN FLOW ADJACENT TO WORK SITE

- A. Ensure that construction operations will not impede normal traffic. Where work is in the area of pedestrian or occupant activity, the Contractor shall detail a plan for managing pedestrian traffic safely. Refer to Title 8 - Protection of Persons and Property, Section 801.1 in the General Contract Conditions, 2011 Edition.

3.6 SIGNS

- A. Refer to Title 8, Article 802 - Protective Devices and Safety Precautions in the General Contract Conditions, 2011 Edition.
 - 1. The Contractor must contact the DEN Project Manager a minimum of five (5) working days in advance of construction for installation, relocation, or removal of regulatory parking signs.
- B. Coordinate and pay any expense associated with the furnishing and installation of all parking regulatory signs, such as "No Stopping Any Time," etc., at the work site.
- C. Furnish and install any necessary advance detour or guidance signing.
- D. Authorize, modify, and install regulatory parking controls and vehicle turn restrictions.
- E. Implement those traffic control modifications outside of the traffic control zone that are necessary to manage diverted traffic.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. Measurement for Flagger shall be made per hour. This shall include all associated costs with providing the flaggers.
- B. Measurement for Gate Guard shall be made per hour. This shall include all associated costs with providing the Gate Guards.
- C. Measurement for Gate Guard Shack shall include the installation, maintenance, and removal of the guard shack at Gate P11 including all required incidental items described in the Contract Drawings.
- D. Measurement for Traffic Control shall be per lump sum. This item shall include installation, maintenance, re-positioning (as required by phase or the DEN Project Manager) and removal upon completion; of the low profile barricades (with lights), tubular barricades, temporary haul routes and temporary signage, temporary pavement markings, gates, and any other item associated with providing traffic control for the project.

4.2 PAYMENT

- A. Payment for Flagger will be made at the contract unit price per hour.
- B. Payment for Gate Guard will be made at the contract unit price per hour.
- C. Payment for Gate Guard will be made at the contract unit price per lump sum. This price will include the installation, maintenance, and removal of the guard shack at Gate P11 including all required incidental items described in the Contract Drawings.
- D. Payment for Traffic Control shall be per lump sum. This item shall include installation, maintenance, re-positioning (as required by phase or the DEN Project Manager) and removal upon completion; of the low profile barricades (with lights), tubular barricades, temporary haul routes and temporary signage, temporary pavement markings, gates, and any other item associated with providing traffic control for the project.

Payment Shall Be Made Under:

015525a	Flaggers	Per Hour
015525b	Gate Guard	Per Hour
015525c	Gate Guard Shack	Per Lump Sum
015525d	Traffic Control	Per Lump Sum

END OF SECTION 015525

SECTION 015719 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Specifications Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Title 8 - Protection of Persons and Property in the General Contract Conditions, 2011 Edition, specifically the following articles:
 - 1. Article 806 - Protection of Drainage Ways
 - 2. Article 807 - Protection of Environment
 - 3. Article 808 - Hazardous and Explosive Materials or Substances
 - 4. Article 809 - Archaeological and Historical Discoveries
- C. Denver Municipal Airport System Rules and Regulations, Part 180-Environmental Management.
- D. DEN Environmental Management System (EMS)

1.2 SUMMARY

- A. The Work specified in this Section consists of identifying, and avoiding or mitigating adverse environmental impacts to air, water, soil, and other natural resources caused by construction activities.
 - 1. The Contractor, in conducting any activity on airport property or in conducting work for an airport project not on airport property, shall comply with all applicable airport, local, state, and federal rules, regulations, statutes, laws, and orders.
 - 2. Work shall not commence on any project until all FAA approvals have been received, applicable permits have been issued and signed by permittee, and all inspection requirements have been satisfied in accordance with State and local permitting requirements.

1.3 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
- B. Within ten (10) days after Notice to Proceed on a task order, the Contractor shall submit the following if applicable, unless waived by the DEN Project Manager:
 - 1. Submittals pertaining to water quality management:

- a. Construction Activities Stormwater Discharge Permit
 - 1) City and County of Denver
 - a) Sewer Use & Drainage Permit (SUDP)
 - b) Construction Activities Stormwater Discharge Permit (CASDP)
 - 2) Colorado Department of Public Health and Environment (CDPHE) Colorado Discharge Permit System (CDPS) Authorization to Discharge (Contractor need not submit a copy of the general permit or the general permit rationale)
 - a) CDPS General Permit for Stormwater Discharges Associated with Construction Activities
 - b) CDPS General Permit for Associated with Non-Extractive Industrial Activity
 - c) CDPS General Permit for Construction Dewatering Discharges (Prior to obtaining a CDPS General Permit for Construction Dewatering Discharges permit, the Contractor shall submit a draft permit application and the final permit application for DEN review and approval PRIOR to submittal to CDPHE. The Contractor need not submit a copy of the general permit or the general permit rationale.
 - 3) Upon request the contractor shall provide the following documentation
 - a) Stormwater Management Plan (SWMP)
 - b) CASDP Inactivation Request
 - c) CDPS Notice of Termination
 - d) Permit Transfer Application
 - e) Modification Application
 - f) Discharge Monitoring Reports (DMRs)
 - g) A copy of the well permit from the state Division of Water Resources for every new well that diverts or for the monitoring of groundwater. (A draft copy of the Notice of Intent for any borehole structure filed with the state Division of Water Resources).
 - h) Section 404 related permitting (Prior to obtaining a permit issued by the US Army Corps of Engineers, the contractor shall submit a draft copy of the application and coordinate with efforts DEN Environmental Services).
 - 4) Revisions or amendments to the CASMP by the Contractor: At the completion of the Project, after final stabilization has been achieved and accepted in accordance with CASDP requirements, the Contractor shall submit a copy of the CASDP Inactivation Request.
2. Submittals pertaining to sewage holding tanks associated with buildings and trailers: For purposes of this Section, the generic term "sewage holding tank"

means "individual sewage disposal system (ISDS)", "privy vault", "septic tank", or "septic system":

- a. Draft copy of the permit application for a sewage holding tank.
 - b. Copy of the Sewer Use & Drainage Permit issued by the Denver Department of Public Works.
 - c. Copy of the ISDS permit issued by the Denver Department of Environmental Health.
3. Submittals pertaining to air quality management:
- 1) Copy of any permit issued by the CDPHE Air Pollution Control Division (APCD)
4. Submittals pertaining to storage tanks and containers:
- a. Copy of the approved application issued by the State of Colorado, Department of Labor and Employment, Division of Oil and Public Safety, for installation of petroleum, or other regulated substances, storage tanks located on airport property and used for the Project.
 - b. Copy of permits issued by the Denver Fire Department for storage tank installations, storage tank removals, and hazardous materials use/storage.
 - c. Copy of Spill Prevention, Control, and Countermeasure (SPCC) Plan for petroleum storage tanks and containers with capacity of 55 gallons of oil or greater located on airport property and used for the Project.
5. Copies of any other plans, permits, permit applications, correspondence with regulatory agencies, including violations, waste manifests, results of laboratory analyses, or other environmental documentation required for the Project not previously identified herein.

1.4 RELATED DOCUMENTS

- A. Code of Federal Regulations (CFR) Publications, including, but not limited to, the following:
1. 33 CFR 323 - Permits for discharges of dredged or fill materials into waters of the United States.
 2. 40 CFR - Protection of Environment.
 3. 49 CFR 171-180 Hazardous Materials Transportation Regulations.
- B. Colorado Revised Statutes, including, but not limited to, the following:
1. Water Quality Control, Title 25, Article 8.
 2. Air Quality Control, Title 25, Article 7.
 3. Hazardous Waste, Title 25, Article 15.
 4. Noise Abatement, Title 25, Article 12.
 5. Petroleum Storage Tanks, Title 8, Article 20.5.
 6. Liquefied Petroleum Gas (LPG) Storage Tanks, Title 8, Article 20, Part 4.

7. Solid waste regulations.
- C. City and County of Denver Executive Orders, including, but not limited to, the following:
 1. Executive Order No. 115 - Required Use of Denver-Arapahoe Disposal Site (Landfill).
 2. Executive Order No. 123 - Greenprint Denver Office and Sustainability Policy.
 3. Denver Revised Municipal Code, Title II, Sections 48-44 and 48-93 - Solid Waste.
 - D. City and County of Denver Construction Sites Program.
 - E. City and County of Denver Construction Activities Stormwater Management Plans Information Guide.
 - F. Any other applicable rules, regulations, ordinances, and guidance must be followed as applicable.
 - G. Refer to Section 013300 "Submittal Procedures" and 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
 - H. Refer to Section 017419 "Construction Waste Management" for waste management requirements

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Products required for the Work shall meet all Environmental Requirements.
- B. At a minimum, products for erosion and sediment control must conform to the technical requirements contained in the City and County of Denver "Construction Activities Stormwater Manual" and the current version of the "Urban Drainage and Flood Control District's Urban Storm Drainage Criteria Manual, Volume 3: Best Management Practices".

PART 3 - EXECUTION

3.1 AIR POLLUTION CONTROLS

- A. The Contractor shall use appropriate control measures to comply with applicable air quality permit requirements. Additionally, the Contractor must be aware of the following procedures and techniques while conducting construction activities on DEN property.
NOTE: Application of dust control measures should be discussed and outlined in the Dust Control Plan.

1. Apply water as needed to the construction site haul roads, disturbed surface areas and public access roads as needed to suppress dust. The use of chemical stabilizer can be requested by the Contractor. The type of stabilizer to be used and locations of use must be included in the Dust Control Plan, which must be approved by the DEN Project Manager prior to application.
2. The Contractor shall suspend all earthmoving activities if wind speed exceeds 30 mph. For purposes of this Section, the generic term "earthmoving" means clearing, grubbing, excavation, topsoil removal, backfilling, embankment work, grading, trenching, drilling, and installation of borings. Contractors are expected to check wind speeds with the airport's ramp tower to demonstrate compliance with this requirement. In addition, the Project may be shut down if two of three of the Runway Visual Range (RVR) instruments read visibility of 2,400 feet or less. The instruments are used by FAA Control Tower personnel to ensure safe aircraft operations. Costs for shutdowns due to wind velocities or RVR readings shall not be grounds for delay or extra cost claims.

B. Burning of materials is strictly prohibited on DEN property.

3.2 WATER POLLUTION CONTROLS

- A. The Contractor shall conduct construction activities in accordance with all applicable permit requirements. In addition, the Contractor shall comply with the following procedures and requirements while conducting activities on DEN property:
1. Water encountered during construction cannot be discharged to the stormwater system or placed onto the ground surface without a permit AND prior written approval by the DEN Project Manager. If groundwater or stormwater is anticipated to be encountered and the Contractor desires to discharge it to the stormwater system or onto the ground surface, then the Contractor must obtain an appropriate CDPS discharge permit in advance of the discharge unless this activity is specifically authorized under the CDPS Construction Stormwater Permit.
 2. If water is encountered and the Contractor desires to discharge these waters to the sanitary sewer system, then the Contractor must obtain approval from DEN Environmental Services in advance of the discharge.
 3. The Contractor shall ensure that stormwater that comes in contact with storage areas does not become impacted and discharged to the stormwater sewer system or to an impervious surface. Furthermore, any materials in storage areas shall not be stored directly on the ground. Refer to Section 264200 "Cathodic Protection" for cathodic protection requirements.
 4. The Contractor shall not operate any valves, sluice gates or other drainage appurtenances related to any DEN sewer system without the prior approval of both the DEN Project Manager and DEN Environmental Services. Any violation of this directive may result in the payment of a financial penalty by the Contractor if the State of Colorado assesses such a penalty.

3.3 EROSION CONTROL AND SEDIMENTATION CONTROL

- A. This Work consists of constructing, installing, maintaining and removing, if required, temporary and permanent control measures during the life of the Contract (and possibly afterward) until the Contractor achieves final stabilization of the site to prevent or minimize erosion, sedimentation, and pollution of any state waters in accordance with all Environmental Requirements.
- B. The Contractor is responsible for compliance with all requirements in accordance with the CASDP, the City and County of Denver Construction Sites Program, the approved CASMP, and CDPS-issued permits.
- C. Temporary facilities, including but not limited to storage areas, laydowns, borrow areas, and contractor offices and work yards, shall be managed in accordance with Section 015210 "Temporary Facilities".
- D. Clean soil fill may be stockpiled in any area that has been previously approved and signed off by the DEN Section Manager of Construction, Design and Planning, and Environmental Services. Soil stockpiles are considered a potential pollutant source and must be addressed in the CASMP and/or SWMP.
- E. Make immediately available, upon the DEN Project Managers request, all labor, material, and equipment judged appropriate by the DEN Project Manager to maintain suitable erosion and sediment control features. These actions requested by the DEN Project Manager take precedence over all other aspects of project construction that have need of the same labor, material and equipment, except those aspects required to prevent loss of life or severe property damage.

3.4 CONSTRUCTION OF CONTROL MEASURES FOR EROSION AND SEDIMENTATION

- A. The Contractor must install control measures in accordance with the most recent version of the "Urban Drainage and Flood Control District's Urban Storm Drainage Criteria Manual, Volume 3: Best Management Practices and the City and County of Denver Construction Activities Stormwater Manual".
 - 1. Deviations from these two documents are allowed with written consent from the City and County of Denver NPDES Inspector.

3.5 STORAGE OF OIL, FUELS, OR HAZARDOUS SUBSTANCES

- A. The Contractor shall prevent oil or other hazardous substances, as defined in federal and state regulations, from entering the ground, drainage or local bodies of water, and shall provide containment, diversionary structures, or equipment to prevent discharged oil from reaching a watercourse and take immediate action to contain and clean up any spill of oily substances, petroleum products, or hazardous substances. The Contractor shall provide one or more of the following preventive systems at each petroleum storage site:

1. Dikes, berms, or retaining walls capable of containing at least 100% of the volume of the largest single tank and equipped with sufficient freeboard to contain precipitation events. The secondary containment must be “sufficiently impermeable” to prevent a release to the environment.
2. Culverting, curbing, guttering, or other similar structures capable of containing at least 100% of the volume of the largest single tank and freeboarding from precipitation.

- B. The provision of such preventive systems shall be subject to acceptance by the DEN Project Manager prior to tank installation and shall follow the SPCC regulations (40 CFR Part 112).
- C. Prior to bringing any containers of 55-gallon or above capacity onto DEN property for storage of oil, fuel, or other petroleum substances, the Contractor may be required to prepare an SPCC Plan that conforms to 40 CFR Part 112. The plan must include a certification either from a Professional Engineer or self-certification, if applicable, as well as management approval from the legally responsible Contractor representative.

3.6 SPILL RESPONSE AND NOTIFICATION

- A. The Contractor is responsible for all spills that may result from its activities. For ANY suspected or confirmed release or spill of oil, fuel, solid waste, hazardous waste, unknown materials, lavatory waste, or miscellaneous chemicals, etc., that occurs as the result of the Contractor’s activities on DEN property, the Contractor is required to take immediate action to mitigate the release or spill and report it to the DEN Project Manager and to the DEN Communications Center at (303) 342-4200.
- B. The Contractor is responsible for notifying the appropriate regulatory agency in the event suspected and/or confirmed releases are identified, in accordance with regulatory requirements.

3.7 SITE REMEDIATION AND RESTORATION

- A. The Contractor shall be required to perform any necessary site assessment and remediation activities required by applicable regulatory agency.
- B. During routine construction activities, the Contractor is required to manage soils using typical construction techniques. The Contractor must differentiate between soils and wastes, including contaminated soils versus clean soils, and determine those materials that can remain on DEN property and those that must be transported off site for disposal.
- C. During all construction activities that require the management of soils, the Contractor must notify the DEN Project Manager and DEN Environmental Services (ES) that soils being managed may be impacted by industrial activities conducted at the airport. “Process knowledge” pertaining to previous use and/or impact for the locations under construction can be used to determine whether impacted soils are probable. Also, common indices such as soil staining and odor can be used as a determination for the

probable condition. If probable contamination conditions are suspected, the Contractor will notify the DEN Project Manager and DEN ES immediately. At that time, which may be before the Work is initiated where indicative conditions exist, all work will cease until a sampling and analysis approach is determined and implemented by the proper responder.

- D. If the site conditions warrant based on evidence of spillage or contamination, process knowledge, and/or visual or olfactory observations, the Contractor may be required to conduct sampling and analysis to confirm that no remedial action is required. Prior to conducting any removal activities, the Contractor must provide a Scope of Work to the DEN Project Manager describing the proposed site assessment activities.
- E. The impacted project will modify its operation to include a segregation area where probable impacted soils can be placed, stored, and sampled for characterization. Should the soil materials be determined to exceed the applicable standards, the DEN Project Manager, in conjunction with DEN ES, will be responsible for the proper disposal of these materials. Materials that are determined to contain contamination levels below the applicable standards can be considered clean soils and placed back into the excavation or reused elsewhere on DEN property. In accordance with Part 3 of this Section, materials removed that are suitable for recycling will be placed within areas designated on DEN to store these materials.
- F. The Contractor shall restore any area on the Airport that becomes contaminated as a result of its operations. Restoration shall be either to applicable standards under federal and state law or to such other levels as may be required by the Manager of Aviation, at the Manager's sole discretion. Such restoration shall be completed at the earliest possible time, and the Contractor's restoration shall be subject to inspection and approval by the Manager of Aviation or duly authorized representative. See DEN Rules & Regulations - Part 180.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. Measurement for Temporary Erosion Control shall be considered lump sum. There shall be no separate measurement for work associated with any temporary erosion control measures implemented during the life of the contract required to satisfy all local, State, and Federal stormwater permitting. The contractor shall prepare and submit a Schedule of Values to the DEN Project Manager for his/her approval prior to initial installation of any control measures.

4.2 METHOD OF PAYMENT

- A. Payment for Erosion Control – Temporary Erosion Control will be made at the contract unit price per lump sum for work completed and accepted in place as described in the Schedule of Values. This price will be full compensation for furnishing all materials, all

labor, equipment, tools, and incidentals necessary to complete this item, including the removal and disposal of such items in accordance with the contract documents and specifications.

- B. The Contractor shall be responsible for payment of all fees associated with review of environmental permit applications and processing of environmental permits.

Payment Shall Be Made Under:

015719a Temporary Erosion Control Per Lump Sum

END OF SECTION 015719

SECTION 015810 - TEMPORARY SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for the following:
 - 1. Construction signage visible to the public.
 - 2. Temporary directional, informational, or regulatory signage.
- B. Related Requirements:
 - 1. Section 015210 "Temporary Facilities" for requirements for temporary facilities.

1.3 SUBMITTALS

- A. Submit temporary sign finishes, materials and paint, etc., for review and approval by DEN Project Manager prior to any fabrication.

1.4 QUALITY CONTROL

- A. Construction and other temporary signage visible to the public must be commercial grade quality, professionally fabricated, and installed based on the location of the sign. The Contractor is responsible to maintain this signage until it is no longer needed, and to remove signage from the site.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Interior signs that are visible and not physically accessible to the public may be made of rigid board, such as "Gator Board", with vinyl messages. All edges must be finished and all fasteners concealed.
- B. Interior signs that are visible and physically accessible by the public must be vandal-proof. Acceptable examples of vandal-proof signs are messages applied second surface with concealed tamperproof fasteners.

- C. Exterior signs must be vandal-proof and fabricated of weatherproof materials.

PART 3 - EXECUTION

3.1 HARDWARE

- A. Interior Signs: Attach with suitable adhesive and/or tape which may be removed without damage to finishes.
- B. Exterior Signs: Must be secured to withstand site conditions and varying weather conditions.

3.2 SIGN FINISHES, MATERIALS, AND PAINT

- A. Provide temporary signage to reflect permanent sign design and/or as directed by the DEN Signage Design Project Manager. Submit temporary sign finishes, materials and paint, etc., for review and approval prior to any fabrication.

3.3 MAINTENANCE

- A. The Contractor shall maintain temporary signage until it is no longer needed, as determined by DEN Project Manager.

3.4 REMOVAL

- A. The Contractor shall remove all temporary signs, and clean and refurbish affected areas to their original, or intended, condition.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special 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 012510 "Substitutions" for requests for substitutions.
 - 2. Section 014225 "Reference Standards" for applicable industry standards for products specified.

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. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process 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.

1.4 SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number, title, and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. DEN Project manager's Action: If necessary, DEN Project Manager will request additional information or documentation for evaluation within one week of receipt of a comparable product request. DEN Project Manager will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if DEN Project Manager does not issue a decision on use of a comparable product request within time allocated.

1.5 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.
 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, DEN Project Manager will determine which products shall be used.

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 to determine that products are undamaged and properly protected.
- C. Storage:
 1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.

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

1.7 PRODUCT WARRANTIES

- A. Refer to Title 18 - Warranties, Guarantees and Corrective Work of the General Contract Conditions, 2011 Edition.
- B. Submittal Time: Comply with requirements in Section 017720 "Contract Closeout."

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. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," DEN Project Manager 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 "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
 1. 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.
 2. 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.

3. Products:

- a. Restricted List: 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 will be considered.
- b. Nonrestricted List: 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. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

- a. Restricted List: 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 **will** be considered.
- b. Nonrestricted List: 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. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

C. Visual Matching Specification: Where Specifications require "match DEN Project Manager's sample", provide a product that complies with requirements and matches DEN Project Manager's sample. DEN Project Manager'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 012510 "Substitutions" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by DEN Project Manager from manufacturer's full range" or similar phrase, select a product that complies with requirements. DEN Project Manager will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: DEN Project Manager will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, DEN Project Manager may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
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.

2.3 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- 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 DEN Project Manager for the visual and functional performance of in-place materials.

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION **016000**

SECTION 016610 - STORAGE AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section consists of providing storage and protection of the materials, products and supplies which are to be incorporated into the construction and indicating such storage areas on the working drawings with the location and dates when such areas will be available for each purpose.
- B. Related Requirements:
 - 1. Section 015210 "Temporary Facilities" for requirements for temporary facilities.

1.3 SUBMITTALS

- A. Refer to Technical Specifications Sections 013300 "Submittal Procedures" and 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures. Submit concurrently with submittals required in Section 013223 "Construction Layout, As-built and Quantity Surveys".
- B. Submit working drawings showing locations of storage areas not indicated on the Contract Drawings.
- C. Submit descriptions of proposed methods and locations for storing and protecting products.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials required for the storage and protection of the items specified shall be durable, weatherproof and either factory finished or painted to present an appearance acceptable to the DEN Project Manager and the City. Storage facilities shall be uniform in appearance with similar materials used to the maximum extent possible.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS OF EXECUTION

- A. Palletize materials, products, and supplies that are to be incorporated into the construction and stored off the ground. Material and equipment shall be stored only in those areas that are indicated as storage areas on the Contract Drawings and on the reviewed and accepted working drawings.
 - 1. Store these items in a manner which will prevent damage and which will facilitate inspection.
 - 2. Leave seals, tags, and labels intact and legible.
 - 3. Maintain access to products to allow inspection.
 - 4. Protect products that would be affected by adverse environmental conditions.
- B. Periodically inspect stored products to ensure that products are being stored as stipulated and that they are free from damage and deterioration.
 - 1. Any damaged or deteriorated materials must be replaced immediately to avoid delays in the project schedule.
- C. Do not remove items from storage until they are to be incorporated into the Work.
- D. The Contractor shall ensure that all protective wrappings and coverings are secure and ballasted to prevent any items from deterioration and/or subsequent dislodgment. All items on the work site that are subject to becoming windborne shall be ballasted or anchored.

3.2 HANDLING AND TRANSPORTATION

- A. Handling:
 - 1. Avoid bending, scraping, or overstressing products. Protect projecting parts by blocking with wood, by providing bracing or by other approved methods.
 - 2. Protect products from soiling and moisture by wrapping or by other approved means.
 - 3. Package small parts in containers such as boxes, crates, or barrels to avoid dispersal and loss. Firmly secure an itemized list and description of contents to each container.
- B. Transportation:
 - 1. Conduct the loading, transporting, unloading, and storage of products so that they are kept clean and free from damage.

3.3 STORAGE

- A. Store items in a manner that shall prevent damage to the DEN's property. Do not store

hydraulic fluids, gasoline, liquid petroleum, gases, explosives, diesel fuel, and other flammables in excavations. Petroleum products and chemicals must be stored in closed containers within secondary containment.

- B. Provide sheltered weather-tight or heated weather-tight storage as required for products subject to weather damage.
- C. Provide blocking, platforms or skids for products subject to damage by contact with the ground.
- D. All material shall be stored according to the manufacturer's recommendations. Any material that has to be stored within specified temperature or humidity ranges shall have a 24-hour continuously written recording made of the applicable condition. Should the recording show that the material was not stored within the recommended ranges the material shall be considered defective and in nonconformance. If a certification from the manufacturer's engineering design representative is provided stating that the actual variations are acceptable and will in no way harm the material or affect warranties, then the deficiency will be considered corrected.
- E. Store hazardous material separately, with all material marked with a label showing the hazard and how to treat exposure to the material. Store incompatible materials separately.
- F. Extra materials that are left over at the completion of the Work shall be removed from the Project site by the Contractor unless they are required to be delivered to DEN as per Contract Document requirements for maintenance stock.

3.4 LABELS

- A. Storage cabinets and sheds that will contain flammable substances and explosive substances shall be labeled "FLAMMABLE - KEEP FIRE AWAY" and "NO SMOKING" with conspicuous, bold lettering and conforming to OSHA requirements. Flammable substances shall be stored in flammable storage cabinets that conform to OSHA requirements.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. The cost of the Work described in this Section shall be included in the applicable unit

price item, work order, or lump sum bid item.

- B. Reference Section 012910 "Schedule of Values" for additional requirements for the possible payment of stored material.

END OF SECTION 016610

SECTION 017330 - CUTTING AND PATCHING

PART 1 - GENERAL

- A. RELATED DOCUMENTS
- B. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
- C. Refer to Article 316, Cutting and Patching the Work in the General Contract Conditions, 2011 Edition

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work by DEN.
 - 5. Work under separate contracts.
 - 6. Future work.
 - 7. Purchase contracts.
 - 8. DEN-furnished products.
 - 9. Contractor-furnished, DEN-installed products.
 - 10. Access to site.
 - 11. Coordination with occupants.
 - 12. Work restrictions.
 - 13. Specification and drawing conventions.
 - 14. Miscellaneous provisions.
- B. Related Requirements:
 - 1. Section 015210 "Temporary Facilities" for limitations and procedures governing temporary use of DEN's facilities.
 - 2. Section 015719 "Temporary Environmental Controls" for environmental control requirements.

1.3 DEFINITIONS

- A. Cutting: Removal of existing construction to permit installation of or to perform other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
- B. Cutting and Patching Proposal: Submit a proposal describing procedures at least thirty (30) calendar days before the time cutting and patching will be performed, requesting approval to proceed. Obtain approval of cutting and patching proposal by DEN Project Manager before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work. The proposal shall include at least the following information:
1. Identification of the Contract and the Contractor's name.
 2. Description of proposed work:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. The necessity for cutting or alteration.
 - c. Drawing showing location of the requested cutting or alteration, along with radar or x-ray report.
 - d. Trades that will execute the work.
 - e. Products proposed to be used.
 - f. Extent of refinishing to be done.
 - g. Alternatives to cutting and patching.
 3. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
 4. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted and proposed dates of interruption of service. Additionally, verify and locate anything in or behind the area prior to cutting.
 5. Proposed Dust Control and Noise Control Measures: Submit a statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
 6. Effect on the work and other surrounding work or on structural or weatherproof integrity of Project.
 7. Written concurrence of each contractor or entity whose work will be affected.
 8. Cost proposal, when applicable.

1.5 QUALITY CONTROL

- A. Operational Elements: Do not cut and patch ANY operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance, decreased operational life or safety unless approved by the DEN Project Manager. Operations elements may include, but are not limited to the following:

1. Primary operational systems and equipment.
 2. Air or smoke barriers.
 3. Fire protection systems.
 4. Control systems.
 5. Communication systems.
 6. Conveying systems.
 7. Electrical wiring systems.
 8. Operating systems of special construction as described in Divisions 13 and 26.
 9. HVAC systems.
- B. Miscellaneous Elements: Do not cut and patch ANY of the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or those results in increased maintenance, decreased operational life or safety unless approved by the DEN Project Manager. Miscellaneous elements may include, but are not limited to the following:
1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels and equipment.
 6. Noise control and vibration control elements and systems.
 7. Stud walls.
 8. Roofing system
- C. Visual Elements: Do not cut and patch ANY construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would reduce, in DEN's sole opinion, the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactorily manner.
1. If possible, retain the original installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized, experienced, and specialized firm as approved by the DEN Project Manager. Visual elements may include, but are not limited to:
 - a. Stonework and stone masonry.
 - b. Ornamental metal.
 - c. Matched-veneer woodwork.
 - d. Preformed metal panels.
 - e. Firestopping.
 - f. Window wall systems.
 - g. Terrazzo.
 - h. Flooring.
 - i. Wall coverings and finishes.
 - j. HVAC enclosures, cabinets, or covers.
- D. Cutting and Patching Conference: Before proceeding, meet at the Project site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve

potential conflicts before proceeding.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch and repair materials and surfaces cut or damaged during cutting and patching operations by methods and with materials so as not to void existing warranties.
1. All effort shall be made to engage the original installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage the original installer or fabricator, engage another recognized, experienced and specialized firm as approved by the DEN Project Manager:
 - a. Processed concrete finishes.
 - b. Stonework and stone masonry.
 - c. Ornamental metal.
 - d. Matched-veneer woodwork.
 - e. Preformed metal panels.
 - f. Firestopping.
 - g. Window wall systems.
 - h. Terrazzo.
 - i. Flooring.
 - j. Wall coverings and finishes.
 - k. HVAC enclosures, cabinets, or covers.

1.7 MATERIALS

- A. General: All patching material shall be of the type specified for the material being patched. Comply with requirements specified in other specifications Sections.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually and texturally match existing adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials as approved by the DEN Project Manager.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and

patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers. Provide additional substrates or materials if required to achieve desired final results of patching work.
2. Immediately notify the DEN Project Manager, in writing, of unsuitable, unsafe, or unsatisfactory conditions.
3. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
4. Proceed with patching only after construction operations requiring cutting are complete and inspected by the DEN Project Manager.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut to ensure structural value or integrity.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid or minimize interruption of services to occupied areas. Do not interrupt services in without approval from the appropriate authority. Refer to the appropriate Shutdown specification/procedures for applicable services.

3.3 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations. Reference Section 015719 "Temporary Environmental Controls" for requirements.
 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions such as ice, flooding, and pollution.
 2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosures. Vacuum carpeted areas. Professionally clean carpeted areas if required.
 3. For outdoor concrete saw cutting operations, slurry waste must be vacuumed up immediately to prevent migration off-site to pervious surfaces, surface waters or drains.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on

adjacent surfaces and areas.

1. Concrete slurry waste must be disposed of properly in accordance with applicable airport, local and state rules and regulations.

- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to the condition existing before selective demolition operations began.

3.4 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Execute cutting and demolition by methods that will prevent damage to other work and will provide a proper surface to receive patching.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
2. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerance, and finishes.
3. Restore work that has been cut or removed; install new products to provide complete work in accordance with requirements of the Contract Documents.
4. Fit work airtight and fire safe to pipes, sleeves, ducts, conduit, and other penetrations through surfaces as required by the Contract Documents.

- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and other similar operations, including excavation, using methods least likely to damage elements retained to adjoining construction. If possible, review proposed procedures with original installer and comply with original installer's written recommendations.

1. In general, use ground fault hand or small power tools designed (to short if metal is hit) for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to the size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Use a cutting machine such as an abrasive saw or a diamond-core drill.
4. Proceed with patching after construction operations requiring cutting are complete.

- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other specification Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish

restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing. For continuous surfaces, refinish entire unit to the nearest break line. For an assembly, refinish entire unit.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

- a. Where patching occurs on a painted surface, apply primer and intermediate paint coats over the patch and apply the final coat over the entire unbroken surface containing the patch. Provide additional coats until the patch blends with adjacent surfaces.

4. Ceilings: Patch, repair or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

- D. Fire Rated Construction: Where rated elements are cut, reconstruct to approved designs to provide original fire rating.

3.5 CORE DRILLING

- A. The Contractor shall execute a minimum of x-rays or ground penetrating radar (GPR) at each location planned for core drilling prior to submittal to the DEN Project Manager and to utility representatives for approval for core drilling. The request for approval shall be submitted a minimum seven (7) days before Core Drilling. The request for approval shall indicate on the x-ray or radar information regarding alternate locations or core drilling to avoid structural members and any embedded conduit. Embedded conduit may be metallic or plastic. The x-ray or radar system shall be capable of detecting both types of conduit.
- B. Core drilled "cores" and the core-drilled opening shall be inspected by DEN Project Manager Representatives prior to installation of any systems in new openings.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 017330

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section describes the requirements for the disposal, recovery, reuse or recycling of non-hazardous and non-asbestos containing construction and demolition waste for both LEED and non-LEED projects. Note that LEED projects may have more specific requirements than identified in this section.
- B. Waste materials shall be managed in accordance with all local, state, and federal regulations.
- C. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submittal procedures.
 - 2. Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
 - 3. Section 015719 "Temporary Environmental Controls" for environmental control procedures.

1.3 DEFINITIONS

- A. Solid Waste: means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, air pollution control facility, or other discarded material; including solid, liquid, semisolid, or contained gaseous material resulting from industrial operations, commercial operations or community activities. Solid waste does not include any solid or dissolved materials in domestic sewage, or agricultural wastes, or solid or dissolved materials in irrigation return flows, or industrial discharges which are point sources subject to permits under the provisions of the "Colorado Water Quality Control Act", Title 25, Article 8, CRS or materials handled at facilities licensed pursuant to the provisions on "Radiation Control Act" in Title 25, Article 11, CRS. Solid waste does not include:
 - 1. Materials handled at facilities licensed pursuant to the provisions on radiation control in Article 11 of Title 25, C.R.S.
 - 2. Excluded scrap metal that is being recycled.
 - 3. Shredded circuit boards that are being recycled.
- B. Salvaged Materials: Defined as materials that exist on the site that can be reused,

either on site or by another entity

- C. Recyclable Materials: Defined as materials that exist on site or are generated during the construction process that can be recycled and/or remanufactured into another material. Recyclable waste includes, but is not limited to, the following:
1. Concrete.
 2. Asphalt
 3. Ferrous and non-ferrous metals.
 4. Untreated wood, engineered wood.
 5. Gypsum wallboard.
 6. Corrugated cardboard, paper goods.
 7. Plastic.
 8. Glass, insulation.
 9. Carpet.
 10. Paints, fabric.
 11. Rubber.
 12. Stone and brick.
- D. Hazardous Waste: Per 6 CCR 1007-3, those substances and materials defined or classified as such by the Hazardous Waste Commission pursuant to 25-15-302, C.R.S., as amended. Also, see hazardous waste definition per 40 CFR 261.3.
- E. Asbestos Containing Materials: Per 5 CCR 1001-10: Regulation No. 8, The Control of Hazardous Air Pollutants, Part B The Control of Asbestos- material containing more than 1% asbestos

1.4 SUBMITTALS

- A. The Contractor shall submit a list of materials and products used with Safety Data Sheets (SDS). Examples include chemicals, solvents, fuels, building materials, etc.
1. A hardcopy or electronic link to the SDS for all materials and products used, if applicable.
 2. Identify storage methods for materials, including measures to segregate incompatible materials.
- B. The Contractor shall submit a Waste Management Plan to the DEN Project Manager and DEN Environmental Services. Minimum Waste Management Plan requirements include the following:
1. A list of all waste streams generated by the project
 - a. For each waste stream listed, the Contractor shall identify the handling/transportation method, the disposal method, and the disposal facility utilized.
 - b. If the Contractor anticipates generation of hazardous waste, the Contractor shall provide its USEPA (generator) identification number.

2. Pollution Prevention Measures
 - a. Describe best practices that will reduce waste. For example, waste reduction measures, requiring vendors to deliver materials in reusable packaging, etc.
 3. Waste Management Plan Training.
 4. Storage of materials.
 5. Spill response.
- C. Approval of Contractor's Waste Management Plan does not relieve the contractor of responsibility for compliance with applicable environmental regulations.
1. The contractor shall maintain a record of the amounts of construction and demolition waste generated, recycled, reused, salvaged, or disposed of, in pounds for review.
 2. Hauling manifest records shall be maintained and available for review. Manifest forms are available from the DEN Project Manager

PART 2 - PRODUCTS

- 2.1 A list of all materials and products used. Examples include chemicals, solvents, solvents, fuels, curing compounds, etc.
- A. A hardcopy or electronic link to SDSs for all materials and products used.
 - B. Identify storage methods, including measures to segregate incompatible materials.
 - C. Refer to the Waste Management Plan

PART 3 - EXECUTION

- A. The Contractor shall not wash down equipment in such a manner as to flush grease, oils, detergents, and other contaminants onto the project site or onto airport property unless the waste is properly contained, treated, and disposed of.
- B. DEN maintains two dry concrete and asphalt recycling yards used for the accumulation and crushing of asphalt and concrete. The South Yard is located on 71st Ave just east of Jackson Gap Street. The North Yard is located on the south side of 110th, west of Queensburg Street.
- C. Concrete washwater cannot be discharged to surface waters or to storm sewer systems. Colorado Discharge Permit System (CDPS) coverage conditionally authorizes discharges to the ground of concrete wash water from washing of tools and concrete mixer chutes when appropriate best management practices (BMPs) are implemented.
 1. A bermed containment area that allows discharge water to infiltrate or evaporate;

- a. Alternatives to bermed containment areas include portable concrete washout bins, and industrial washout containment systems where the accumulated waste is removed from the site and disposed of properly.
 2. Use of the washout site should be temporary (less than one year);
 3. The washout site should not be located in an area where shallow groundwater may be present, such as near natural drainages, springs, or wetlands
 4. Upon termination of the washout site, accumulated solid waste, which includes concrete waste and contaminated soils, must be removed from the site and disposed of properly.
- D. Rejected loads and/or other wet concrete or asphalt materials are PROHIBITED TO BE PLACED ANYWHERE on DEN property. These materials must be returned to the facility of origination or other permitted facility for proper disposal.
- E. Concrete saw cutting slurry must be properly contained and disposed of.
- F. Unknown or questionable materials encountered during construction activities, must immediately be reported to the DEN Communications Center at (303) 342-4200 and the DEN Project Manager.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 017419

SECTION 017420 - CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this section consists of maintaining a clean, orderly, hazard free work site during construction, and final cleaning for the City's Final Acceptance. Failure to maintain the work site will be grounds for withholding monthly payments until corrected to the satisfaction of the DEN Project Manager.
- B. Refer to Article 325, Cleanup During Construction in the General Contract Conditions, 2011 Edition

1.3 JOB CONDITIONS

- A. Safety Requirements

- 1. Maintain the work site in a neat, orderly, and hazard-free manner in conformance with all federal, state, and local rules, codes, regulations, and orders, including all OSHA requirements, until Final Acceptance of the Work. Keep catwalks, underground structures, work site walks, sidewalks, roadways, and streets, along with public and private walkways adjacent to the work site, free from hazards caused by construction activities. Inspect those facilities regularly for hazardous conditions caused by construction activities.

- B. Hazards Control:

- 1. Store waste materials in properly labeled waste containers. This includes solid wastes, hazardous wastes, universal wastes, etc.
- 2. Store volatile wastes in covered metal containers and remove those wastes from work site daily.
- 3. Do not accumulate wastes that create hazardous conditions.
- 4. If volatile and noxious substances are being used in spaces that are not naturally ventilated adequately, provide artificial ventilation.
- 5. Hazard controls shall conform to the applicable federal, state, and local rules and regulations.
- 6. Provide appropriate waste receptacles in all areas in which employees are working. Waste receptacles shall be kept covered at all times. All materials on site shall be anchored and covered to prevent any objects from becoming wind-borne.

C. Access:

1. Maintain the work site to permit access by other City contractors as required and to allow access by emergency personnel.

1.4 SUBMITTALS

A. Washing Plan: The Contractor shall prepare a plan describing the specific procedures and materials to be utilized for any equipment, vehicle, etc., washing activities. The plan must be submitted to the DEN Project Manager and approved by the DEN Project Manager and Environmental Services.

1. Outdoor washing at DEN is not allowed unless the materials will be collected or managed in a manner to ensure that they will not enter the municipally owned separate storm sewer system (MS4). The materials can only be disposed at a location pre-approved by DEN Environmental Services (refer to DEN SWMP). Failure to comply with this requirement would result in the discharge of non-stormwater.
 - a. Outdoor wash materials that contain soaps or other cleaning chemicals must be collected and disposed of off site
2. Indoor washing must be conducted in accordance with the Best Management Practices (BMPs) detailed in the DEN SWMP. Refer to Section 015719 "Environmental Controls". In addition, all indoor washing must be conducted in a manner that ensures that there are no prohibited discharges to the sanitary sewer system.
 - a. All wash-water that will be disposed of into the sanitary sewer must comply with City and County Denver rules and regulations pertaining to prohibited discharges.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Utilize the type of cleaning materials recommended by the manufacturer for the surfaces to be cleaned.
- B. Maintain current Safety Data Sheets (SDS) on site for all chemicals. DEN Environmental Services must approve the chemicals used prior to discharge to the sanitary sewer system.
- C. Ensure proper disposal of all wastes generated from the use of these materials. The Contractor must ensure compliance with all environmental regulations. No wastes can be disposed of on DEN property.

PART 3 - EXECUTION

3.1 INTERIM CLEANING

- A. Clean the work site every shift/workday for the duration of the construction Contract. Maintain structures, grounds, storage areas and other areas of work site, including public and private properties immediately adjacent to work site, free from accumulations of waste materials caused by construction operations. Place waste materials in covered metal containers. All hard concrete, steel, wood, and finished walking surfaces shall be swept clean daily.
- B. Remove or secure loose material on open decks and on other exposed surfaces at the end of each workday or more often in a manner that will maintain the work site hazard free. Secure material in a manner that will prevent dislodgment by wind and other forces.
- C. Sprinkle waste materials with water or acceptable chemical palliative to prevent blowing of dust.
- D. Promptly empty waste containers when they become full and legally dispose of the contents at dumping areas off the City's property.
- E. Control the handling of waste materials. Do not permit materials to be dropped or thrown from structures.
- F. Immediately remove spillage of construction related materials from haul routes, work site, private property, public rights of way, or on the Denver International Airport site.
- G. Clean only when dust and other contaminants will not precipitate upon newly painted surfaces.
- H. Cleaning shall be done in accordance with manufacturer's recommendation.
- I. Cleaning shall be done in a manner and using such materials as to not damage the Work.
- J. Clean areas prior to painting or applying adhesive.
- K. Clean all heating and cooling systems prior to operations. If the Contractor is allowed to use the heating and cooling system, it shall be cleaned prior to testing.
- L. Clean all areas that will be concealed prior to concealment.
- M. Dispose of all fluids according to the approved Washing Plan.

3.2 FINAL CLEANING

- A. Refer to Article, Clean-up Upon Completion in the General Contract Conditions, 2011 Edition. Additionally, the Contractor, shall at a minimum, complete the following:

1. Inspect interior and exterior surfaces, including concealed spaces, in preparation for completion and acceptance.
2. Remove dirt, dust, litter, corrosion, solvents, discursive paint, stains, and extraneous markings.
3. Remove surplus materials, except those materials intended for maintenance.
4. Remove all tools, appliances, equipment, and temporary facilities used in the construction.
5. Remove detachable labels and tags. File them with the manufacturer's specifications for that specific material for the City's records.
6. Repair damaged materials to the specified finish or remove and replace.
7. After all trades have completed their work and just before Final Acceptance, all catch basins, manholes, drains, strainers and filters shall be cleaned; roadway, driveways, floors, steps and walks shall be swept. Interior building areas shall be vacuum cleaned and mopped.
8. Final cleanup applies to all areas, whether previously occupied and operational or not.
9. Dispose of all fluids according to the approved Washing Plan.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 017420

SECTION 017515 - SYSTEM STARTUP, TESTING AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Provide complete startup, testing, and operator training services to ensure operability of all systems supplied.
- B. Coordinate all start-up and testing with DEN Commissioning Authority or DEN Asset Management through the DEN Project Manager.

1.3 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures. Submit the following:
 - 1. Test procedures.
 - 2. Test reports.
 - 3. Training outline.
- B. Submit Qualification Data: For instructor.
- C. Attendance Record: For each training module submit the following:
 - 1. Module title
 - 2. Module description
 - 3. Length of instruction time
 - 4. Participant names
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

- B. Instructor Qualifications: A factory-authorized service representative, experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required. Recordings shall be high-resolution 4k with a minimum framerate of 60Hz
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 014510 "Contractor Quality Control". Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructor's personnel, audiovisual equipment, and facilities needed to avoid delays. Ensure that students are notified at least 14 [insert other] days prior to the start of instruction.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with DEN's operations. Adjust schedule as required to minimize disrupting DEN's operations and to ensure availability of DEN's personnel. As required, include multiple classed to accommodate various shifts
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by DEN Project Manager.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FIELD TESTS AND ADJUSTMENTS

- A. All electrical and mechanical equipment including the interfaces with control systems and the communication system, and all alarm and operating modes for each piece of equipment, shall be tested by the Contractor to the satisfaction of the DEN Project Manager before any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned and connected. Any changes, adjustments, or replacements required to make

the equipment operate as specified shall be carried out by the Contractor as part of the Work.

1. At least thirty (30) days before the time allowed in the construction schedule for commencing startup and testing procedures, the Contractor shall submit to the DEN Project Manager six (6) copies of the detailed procedures the Contractor proposes for testing and startup of all electrical and mechanical equipment. These procedures are submitted for review and acceptance by DEN.
 2. The Contractor's startup and testing procedures shall include detailed descriptions of all pre-operational hardware, electrical, mechanical and instrumentation used for testing work.
 - a. Each control device, item of electrical, mechanical and instrumentation equipment, and all control circuits shall be considered in the testing procedures which shall be designed in a logical sequence to ensure that all equipment has been properly serviced, aligned, connected, wired, calibrated and adjusted prior to operation.
 - b. Motors shall be tested in accordance with ANSI/IEEE Publication 112. The Contractor is advised that failure to observe these precautions may place the acceptability of the subject equipment in question, and the Contractor may either be required to demonstrate that the equipment has not been damaged, or replace it as determined by the DEN Project Manager.
 3. Testing procedures shall be designed to duplicate as nearly as possible all conditions of operations and shall be carefully selected to ensure that the equipment is not damaged. All filters shall be in place during startup and testing.
 - a. Once the DEN Project Manager has accepted the testing procedures, the Contractor shall provide checkout, alignment, adjustment and calibration signoff forms for each item of equipment and each system that will be used.
 - b. The Contractor and the DEN Project Manager shall use the signoff forms in the field jointly to ensure that each item of electrical, mechanical and instrumentation equipment and each system has been properly installed and tested. The Contractor shall cooperate with project-wide systems contractors where startup and testing is to be conducted concurrently.
 4. Any special equipment needed to test equipment shall be provided by the Contractor to the City at no cost for a period of thirty (30) days during startup.
- B. Before starting up the equipment, the Contractor shall properly service it and other items, which normally require service in accordance with the maintenance instructions. The Contractor shall be responsible for lubrication and maintenance of equipment and replacement filters throughout the entire equipment "break-in" period described by the manufacturer.
1. The Contractor shall be responsible for the startup, adjustment, preliminary maintenance, and checkout of all equipment and instrumentation. All systems shall be carefully checked for conformance with the design criteria.
 2. If any equipment or system does not operate as specified in the Contract, the Contractor shall immediately replace or repair components until it operates

- properly.
3. The Contractor shall submit a test report to the DEN Project Manager within thirty (30) days after completion of the system startup period.

3.2 SYSTEMS STARTUP AND TESTING

- A. The Contractor shall be responsible for a 30-day startup period during which time all hardware, electrical and mechanical equipment, communications, alarm systems, and associated devices shall be energized and operated under local and automatic controls. The Contractor shall be present during the startup period with adequate labor and support personnel to adjust equipment and troubleshoot system failures that might arise.
- B. When a piece of electrical or mechanical equipment is found to be in conflict with specific criteria, an experienced representative of the manufacturer shall adjust the item.
- C. If adjustments fail to correct the operation of a piece of equipment or fixture, the Contractor shall remove the equipment or fixture from the Project site and replace it with a workable replacement that meets the specification requirements.
- D. The 30-day startup period shall commence thirty (30) days prior to the Contract completion date and shall be completed prior to final payment. If, during the startup, any system fails to operate in accordance with Contract requirements, the failure shall be corrected and the startup period shall begin again.
 1. At the end of the startup period, all filters shall be replaced with new ones.
 2. The City may provide, at its option, a Commissioning Representative to observe or participate in the startup and testing of any system. The Contractor shall coordinate with the Commissioning Representative relating to scheduling, reporting, forms, methods, and procedures of the startup and testing.

3.3 FINAL INSTRUCTIONS AND OPERATION TRAINING

- A. After startup and testing is completed, the Contractor shall demonstrate to the City's personnel the proper manner of operating the equipment, programming messages, making adjustments, responding to alarms and emergency signals, and maintaining the system.
- B. The Contractor shall provide on-the-job training by a suitably qualified instructor to designated personnel and shall instruct them in the operation and maintenance of the systems. In the event qualified instructors on the Contractor's staff are not available, the Contractor shall arrange with the equipment manufacturer for such instruction at no additional cost to the City.
- C. The Contractor shall provide a minimum of eight (8) hours of operator training to the Airport per shift. Classes shall accommodate up to five (5) people at a time with up to two (2) separate courses (one for each shift).

- D. The Contractor shall provide a syllabus to the DEN Project Manager at least seven (7) calendar days prior to the start of each course that outlines topics to be covered, the proposed time allotted to each topic, and the target audience of the training session (technical, casual operator, overview, etc.). The Contractor shall not commence any training courses until the syllabus has been reviewed and approved by the DEN Project Manager.
- E. The Contractor shall video record all training sessions and provide to the DEN Project Manager. The Contractor shall provide video recordings in format as required in Section 017900 "Demonstration and Training".
- F. The Contractor shall provide an annotated syllabus to the DEN Project Manager that indicates topics contained on each tape.
- G. The contractor shall provide instruction for obtaining live help for questions relating operation and troubleshooting

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.
- B. No contractual item requiring startup or testing will be paid until the conditions of this Section are completely satisfied.

END OF SECTION 017515

SECTION 017720 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Work specified in this Section includes procedures required prior to Final Acceptance of the Work in addition to those specified in Title 20 – Final Completion and Acceptance of The Work in the General Contract Conditions, 2011 Edition, and Technical Specification Section 017840 "Contract Record Documents".
- B. This Section also includes procedures and penalties to ensure prompt completion of the Project Closeout.
- C. Related Sections:
 - 1. Title 20 of the General Contract Conditions, 2011 Edition..
 - 2. Section 017840 "Contract Record Documents" for required record documents.
 - 3. Form CM-75, Closeout Checklist
- D. SUBMITTALS
 - 1. Submit written Certification to the DEN Project Manager that, in the opinion of the Contractor, the Work is complete.
 - 2. Submit final survey within 60 days after issuance of Substantial Completion.
 - 3. Submit a Final Statement of Accounting to the DEN Project Manager.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION FOR FINAL INSPECTION

- A. Before requesting inspection for Final Acceptance of the Work by the City, the Contractor shall inspect, clean, and repair the Work as required.
- B. The Contractor shall ensure that all items on the Closeout Checklist have been addressed and accepted by the DEN Project Manager.

3.2 FINAL INSPECTION

- A. The Contractor shall submit written certification to the DEN Project Manager when, in the opinion of the Contractor, the Work is complete. Such communication shall certify that:
1. The Work has been inspected by the Contractor for conformance with the Contract Documents.
 2. The Work has been completed in conformance with the Contract Documents, including all punchlist items.
 3. The Work is ready for final inspection by the City.
 4. All as-built documents have been submitted and accepted.
 5. All damaged or destroyed real, personal, public, or private property impacted by the Work has been repaired or replaced.
 6. All Warranties and Bonds have been completed, executed, submitted, and accepted.
 7. All personnel badges and vehicle permits have been returned to DEN Airport Security.
- B. The DEN Project Manager will inspect the Work in accordance with the Section 2002.1 of the City and County of Denver's Department of Aviation's General Contract Conditions.
- C. If the DEN Project Manager finds incomplete or defective Work:
1. The DEN Project Manager may, at the DEN Project Manager's sole discretion, either terminate the inspection, or prepare a punchlist and notify the Contractor in writing, listing the incomplete or defective Work.
 2. The Contractor shall take immediate steps to remedy all identified deficiencies and resubmit a written certification to the DEN Project Manager that Work is complete.
 3. The DEN Project Manager will then re-inspect the Work.

3.3 REINSPECTION FEES

- A. Should the DEN Project Manager be required to perform re-inspections of the Work due to the Contractor prematurely claiming the status of the Work to be complete:
1. The Contractor shall compensate the City for such additional services at the rate of \$125.00 per man-hour, with a minimum charge of \$250.00.
 2. The City shall deduct the amount of such compensation from the final payment to the Contractor.

3.4 FINAL SURVEY FEES

- A. The Contractor shall complete and submit the final survey within 60 days after issuance of Substantial Completion. If the Contractor fails to complete and submit the final survey within this time frame it is understood that DEN will arrange for a qualified

surveying company to complete this work at the Contractor's expense. All costs associated with DEN arranging for and completing the final survey will be deducted from the final payment including compensation due the City for the DEN Project Manager's time to manage this work.

1. The DEN Project Manager's rate of compensation shall be set at \$150.00 per man-hour.
2. Survey submittals needing to be revised may extend the 60-day time frame at the DEN Project Manager's discretion.
3. Costs, including the DEN Project Manager's, for the review of the resubmitted survey shall be deducted from the final payment.

3.5 LATE CLOSEOUT FEES

- A. Within 100 days after issuance of substantial completion, all documentation required by this Contract to achieve Project Closeout shall be submitted. Failure to submit all required documentation shall result in fees to compensate the City for project management work while the project remains open.
 1. Fees at the rate of \$450 per day.
 2. The resubmittal of required documents may extend the 100-day time frame at the DEN Project Manager's discretion.

3.6 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a Final Statement of Accounting to the DEN Project Manager.
- B. The Final Statement of Accounting shall reflect all adjustments to the Contract amount and shall include the following:
 1. The original Contract Value.
 2. Additions and deductions resulting from the following:
 - a. Approved Change Orders.
 - b. Allowances.
 - c. Final quantities for unit price items, including required backup for the quantities.
 - d. Deductions for corrected work.
 - e. Penalties.
 - f. Deductions for liquidated damages.
 - g. Deductions for re-inspection payments.
 - h. Other adjustments.
 3. Total Contract Value, as adjusted.
 4. Previous payments.
 5. Sum remaining due.
- C. If required, the DEN Project Manager will prepare a final Change Order, reflecting the approved adjustments to the Contract Value that were not included in previously

issued Change Orders.

3.7 FINAL APPLICATION FOR PAYMENT

- A. The Contractor shall submit the final application for payment in accordance with the procedures and requirements detailed in Article 2003, Final Settlement in the General Contract Conditions, 2011 Edition.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 017720

SECTION 017825 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section consists of preparing and submitting operation and maintenance data for mechanical, electrical, and other specified equipment/products.
- B. Coordinate all the requirements of the required data with DEN Asset Management.

1.3 SUBMITTALS

- A. Refer to Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.
- B. All submittals must be provided in electronic data as indicated by the DEN Building Information Modeling (BIM) Design Standards Manual (DSM) and as required by the DEN BIM and DEN Asset Management groups.
- C. Submit one (1) electronic copy and three (3) bound hard copies of the proposed Operation and Maintenance Data Manual not less than [30] [90] days prior to [system startup] [acceptance tests and final inspection].
 - 1. The submitted copies shall provide the Information following the MasterFormat standard. Equipment/Data shall be organized using Section formatting within the 50 MasterFormat Divisions.
- D. Submit one (1) electronic copy and three (3) bound hard copies of Operation and Maintenance Data Manual within ten days after [system startup] [commissioning] is complete. These copies shall incorporate any comments made on the previous submittals, along with final readings on all settings and gauges taken while the system is in fully satisfactory operation.

1.4 CONTINUOUS UPDATING PROGRAM

- A. Furnish to DEN AIM Asset Management one (1) electronic copy of the Contractor's letter indicating that suppliers have been notified to provide updated operation and maintenance data, service bulletins, and other information pertinent to the equipment, as it becomes available.

PART 2 - PRODUCTS

- A. The following products are the requirements of hard copies:
1. Paper size: 8-½ inches x 11 inches.
 2. Paper: White bond, at least 20-pound weight.
 3. Text: Typewritten.
 4. Printed data: Manufacturer's catalog cuts, brochures, operation, and maintenance data. Clear reproductions thereof will be acceptable. If this data is in color, all final manuals must contain color data.
 5. Drawings: 8½ inches x 11 inches, bound with the text. Larger drawings are acceptable provided they are folded to fit into a pocket inside the rear cover of the manual. Reinforce edges of large drawings.
 6. Prints of drawings: Black ink on white paper, sharp in detail and suitable for making reproductions.
 7. Flysheets: Separate each portion of the manual with colored, neatly prepared flysheets briefly describing the contents of the ensuing portion.
 8. Covers: Provide 40 to 50 mil, clear plastic, front and plain back covers for each manual. The front covers shall contain the information required in paragraph 3.2 below.
 9. Bindings: Conceal the binding mechanism inside the manual. Lockable 3-ring binders shall be provided.
 10. Training Videos: Provide in digital electronic format as per current DEN requirements.
 - a. Refer to Section 017900 - Demonstration and Training for video requirements.

PART 3 - EXECUTION

3.1 GENERAL

- A. Assemble each operation and maintenance manual using the manufacturer's latest standard commercial data, and include all additional information that is unique to the Project.

3.2 COVER

- A. Include the following information on the front cover and on the inside cover sheet:
1. Operation and maintenance instructions.
 2. Title of structure or facility.
 3. Title and number of Contract.
 4. Contractor's name and address.
 5. General subject of the manual.

3.3 CONTENTS OF THE MANUAL

1. Table of Contents, which references, at a minimum, three heading levels.
2. Index of Equipment/Data with entries for equipment type and MasterFormat Division and Section.
3. A Master Index that contains index entries for all submitted Operation and Maintenance Data Manuals.
 - a. Equipment/Data shall be indexed by equipment type and MasterFormat Division and Section.
4. Name, address, and telephone numbers of Contractor, suppliers and installers along with the manufacturer's order number and description of the order.
5. Name, address, and telephone numbers of manufacturer's nearest service representatives.
6. Name, address, and telephone number of nearest parts vendor and service agency.
7. Copy of guaranties and warranties issued to, and executed in the name of, the City.
8. Anticipated date the City assumes responsibility for maintenance.
9. Description of system and component parts including theory of operation.
10. Pre operation check or inspection list.
11. Procedures for starting, operating, and stopping equipment.
12. Post operation check or shutdown list.
13. Inspection and adjustment procedures.
14. Troubleshooting and fault isolation procedures for on-site level of repair.
15. Emergency operating instructions.
16. Accepted test data.
17. Maintenance schedules and procedures.
18. Test procedures to verify the adequacy of repairs.
19. One (1) copy of each wiring diagram.
20. One (1) copy of each piping diagram.
21. Location where all measurements are to be made.
22. One (1) copy of each duct diagram.
23. One (1) copy of control diagram.
24. One (1) copy of each accepted shop drawing.
25. One (1) copy of software programs imputable or changeable on site.
26. Ordering information.
27. Training course material used to train DEN staff, including slides and other presentation material.
28. Provide the following information, unless the item is covered in the Manufacturer's Operation and Manual:
 - a. Manufacturer's parts list with catalog names, numbers, and illustrations.
 - b. A list of components that are replaceable by the City.
 - c. An exploded view of each piece of the equipment with part designations.
 - d. List of manufacturer's recommended spare parts, current prices, and recommended quantities for two years of operation.
 - e. List of special tools and test equipment required for the operation, maintenance, adjustment, testing and repair of the equipment, instruments

- and components.
- f. Scale and corrosion control procedures.
- g. Disassembly and re-assembly instructions.
- h. Troubleshooting and repair instructions.
- i. Calibration procedures.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 017825

SECTION 017835 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section consists of preparing and submitting warranties and bonds required by the Contract and these Specifications.

1.3 SUBMITTALS

- A. Refer to Technical Specifications Section 013300 "Submittal Procedures" and Section 013325 "Shop and Working Drawings, Product Data and Samples" for submittal procedures.

- 1. All warranties shall be executed specifically to the City.
- 2. Photocopies or reproductions of stock manufacturer's warranties will not be accepted, although electronic copies are acceptable when the manufacturer's warranty is contained in the O&M manual.

- B. Submit samples of warranties and bonds for review by the City prior to execution of Work. Do not submit final warranties until sample warranties have been approved by the City.

- 1. Submit the warranties and bonds required by the Contract Documents.
- 2. Prepare and submit a list of all warranties and bonds on the following forms:

- a. CM-10: Contractor Warranty
- b. CM-11: Contractor/Sub-Contractor Warranty

- C. Submit executed warranties and bonds

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 WARRANTIES AND BONDS

- A. Submit executed warranties and bonds required by the Contract Documents, as detailed in Title 15 - Performance and Payment Bonds and Title 18 - Warranties, Guarantees, and Corrective Work in the General Contract Conditions, 2011 Edition.

1. Prepare and submit a list of all warranties and bonds on the following forms:
 - a. CM-10, Contractor Warranty
 - b. CM-11, Contractor/Sub-Contractor Warranty

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 017835

SECTION 017840 - CONTRACT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Work specified in this Section consists of maintaining, marking, recording, and submitting Contract record documents that include shop drawings, warranties, Contract Documents, and contractor records.
- B. Refer to DEN Building Information Modeling (BIM) Design Standards Manual (DSM) and Approved BIM execution for data format and file types acceptable for different type of data.
- C. Related Requirements:
 - 1. Section 013100 "Project Management and Coordination".
 - 2. Section 013223 "Construction Layout, As-built and Quantity Surveys".
 - 3. Section 013300 "Submittal Procedures".
 - 4. Section 013325 "Shop and Working Drawings, Product Data and Samples".
 - 5. Section 017720 "Contract Closeout".
 - 6. Section 017825 "Operation and Maintenance Data".

1.3 SUBMITTALS

- A. Each submittal of record documents shall contain the following information:
 - 1. Date.
 - 2. Project title and numbers.
 - 3. Contractor's name and address.
 - 4. Title and number of each record document.
 - 5. Certification that each document as submitted is complete and accurate.
 - 6. Signature of the Contractor or the Contractor's authorized representative.
- B. At the completion of this Contract, deliver all record documents including the following:
 - 1. As-built shop drawings, diagrams, illustrations, schedules, charts, brochures and other similar data.
 - 2. Warranties, guarantees, and bonds.
 - 3. Contract Documents.
 - 4. Contractor records.

- C. As-built Contract Drawings shall be submitted with each monthly progress payment application, and a complete set shall be submitted prior to final payment.
 - 1. The Contractor shall provide a single electronic copy of each Contract drawing sheet which has been used to produce work during the payment period or work that payment is being requested on, which records the current as-built conditions of work, including the posting of any change orders or change directives not shown on the Contract Documents at the time of Contract signing.
 - a. The Contractor must show as-built work completed through the payment application date including but not limited to utilities, empty conduit, conduit for actual electrical lines, plumbing, HVAC, location of anchor bolts and support points for use by others.
 - b. The Contractor shall be liable for any costs incurred by the City or a third party due to errors or lack of information provided on the as-built drawings.
 - c. All markings on drawings shall be legible to identify the portion of work completed.
 - d. For projects utilizing BIM system by the Contractor or a consultant of the Contractor, all data formats shall be compatible and as approved by the BIM execution plan as required in the DEN BIM DSM.

1.4 QUALITY CONTROL

- A. Submit electronically scanned copies of all documents required by Chapter 17 “Special Inspection and Testing” of the International Building Code 2009 as amended by City and County of Denver 2011. Keep scale and clarify dimension where electronic copies are not as originally scaled and dimensioned.
- B. For projects utilizing BIM for Revit, follow approved BIM execution plan and DEN BIM DSM for record documents, formats, and quality control and assurance procedures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 MAINTENANCE OF DOCUMENTS

- A. The Contractor must follow all the procedures established in the Contract Documents and DEN BIM DSM.
- B. The Contractor shall maintain at the work site on a current basis one (1) record copy of all drawings, specifications, addenda, change orders, approved shop drawings, working drawings, product data and samples in good order and marked currently to record all changes made during construction.
- C. Maintain at the field office one copy of the following record documents:

1. Contract Documents:

- a. Contract Drawings with all clarifications, requests for information, directives, changes, and as-built conditions clearly posted.
- b. Contract Specifications with all clarifications, requests for information, changes, directives and record of manufacturer actually used along with product trade name.
- c. Reference Standards in accordance with Section 014225 "Referenced Standards".
- d. Affirmative Action Plan and documents.
- e. One (1) set of drawings to record the following:
 - 1) Horizontal and vertical location of underground utilities affected by the Work.
 - 2) Location of internal utilities; include valves, controls, conduit, duct work, switches, pressure reducers, size reducers, transitions, crosses, tees, filters, motors, heaters, dampers, regulators, safety devices, sensors, access doors and appurtenances that are concealed in the construction shall be shown with dimensions given from a visible and recognizable reference to the item being located in all three dimensions. The drawings shall also reference the applicable submittal for the item being located.
 - 3) Field changes of dimensions and details including as-built elevations and location (station and offset).
 - 4) Details not on original Contract Drawings but obtained through requests for information or by other communications with the City.

2. Contractor Records:

- a. Daily Quality Control Reports.
- b. Certificates of compliance for materials used in construction.
- c. Completed inspection list.
- d. Inspection and test reports.
- e. Test procedures.
- f. Qualification of personnel.
- g. Approved submittals.
- h. Material and equipment storage records.
- i. Safety Plan
- j. Erosion, sediment, hazardous and quality plans.
- k. Hazardous material records.
- l. First report of injuries.

3.2 RECORDINGS

- A. Label each document page or article "PROJECT RECORD" in two-inch high letters.
- B. Keep record documents current daily.
- C. Legibly mark copies of the Contract Drawings to record actual construction.

- D. Legibly mark up each Section of the specifications and Contract Drawings to record:
1. Manufacturer, trade name, catalog number and supplier of each product and item actually installed
 2. Changes made by change orders, requests for information, substitutions, and variations approved by submittals.

3.3 DOCUMENT MAINTENANCE

- A. Follow all the required processes of the approved BIM Execution Plan as approved by DEN for this specific project or in formats acceptable to DEN BIM management system.
- B. Do not use record documents for construction purposes.
- C. Make documents available for inspection by the DEN Project Manager and any others having jurisdiction.

3.4 MONTHLY REVIEW

- A. Prior to any application for payment, the DEN Project Manager or the DEN Project Manager's designated representative will inspect the record documents to ensure that they are being maintained and contain the most current correct data with particular attention to as-built drawings.
- B. If, during the inspection, the DEN Project Manager determines that the documents are not being maintained and kept current as to as-built conditions, an amount may be withheld from the payment request and deducted from the Contract value to cover the City's cost of collecting and recording the as-built Contract data. This cost will be determined based on \$100.00 per man-hour of effort.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 017840

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing City's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructor's names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two (2) copies within seven (7) days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:

- a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Date of video recording.
2. Closed Caption: Videos shall contain a visible text version of all speech provided in the recording.
 3. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
 4. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
 5. At completion of training, submit complete training manual(s) for City's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A professional instructor/trainer who is experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 014510 "Contractor Quality Control". Review methods and procedures related to demonstration and training including, but not limited to, the following:
 1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructor's personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with City's operations. Adjust schedule as required to minimize disrupting City's operations and to ensure availability of City's personnel.
 - 1. Include multiple classes to accommodate various shifts, as necessary.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by DEN Project Manager.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.

- g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.

8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017825 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and City for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct City's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Contractor will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 2. City will furnish an instructor to describe City's operational philosophy.
 3. DEN Project Manager will furnish Contractor with names and positions of DEN participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with City, through DEN Project Manager, with at a minimum of thirty (30) days advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written or a demonstration performance-based test.

- F. Cleanup: Collect used and leftover educational materials and give to City. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video Recordings: Submit video recordings in an electronic format acceptable to DEN Project Manager by posting to Project Web site. Recordings shall be high-resolution 4k with a minimum framerate of 60Hz
 - 1. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 - 2. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 - 1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
 - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by audio narration by microphone while

or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

1. Closed Caption: Videos shall contain a visible text version of all speech provided in the recording.
 2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
 3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Failure of Video Recordings: If video recordings submitted by Contractor do not comply with Project requirements, or have audio and/or video problems, Contractor will be required to repeat training and video recording in compliance with this Section in order to re-create the training video.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION 017900

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Specification Sections:
 - 1. Section 013100 – Project Management and Coordination
 - 2. Section 013119 – Project Meetings
 - 3. Section 013300 – Submittal Procedures
 - 4. Section 014510 – Contractor Quality Control

1.2 SUMMARY

- A. Scope
 - 1. Commissioning requirements common to all Sections
 - 2. Systems and equipment functional performance testing
 - 3. Validation of proper and thorough installation of systems and equipment
 - 4. Equipment performance verification
 - 5. Documentation of tests, procedures, and observations.
 - 6. Review of DEN Training agency.
- B. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- C. Related Sections

1.3 DEFINITIONS

- A. Acceptance Phase: The phase of the project when the facility and its systems and equipment are inspected, tested, verified, and documented; and when most of the Functional Performance Testing and formal training occurs. This will generally occur after the Construction Phase is complete (start-up and checks have been accomplished). The Acceptance Phase typically begins with Substantial Completion and ends with Final I Completion.
- B. Commissioning Authority (CA or CxA): The Party retained by DEN who will oversee the Commissioning process as well as develop and stipulate many of the Commissioning requirements. They will also manage the Commissioning

process, and ensure and validate that systems and equipment are designed, installed, and tested to meet DEN's requirements.

- C. Commissioning Contact (CxC): Individuals, appointed by the installing contractor, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action.
- D. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- E. Construction Phase: Phase of the project during which the facility is constructed and/or systems and equipment are installed and started. Contractor and subcontractors complete the installation, complete start-up documentation, submit operation and maintenance information, establish trends, and perform any other applicable requirements to get systems started. Contractor and Vendors may also conduct equipment specific training. The Construction Phase will generally end upon Substantial Completion.
- F. Contractor: As used herein, 'Contractor' is a general reference to the installing Party and can therefore refer to the General Contractor, subcontractors, or vendors as inferred by its usage.
- G. Deficiency: A condition in the installation or function of a component, piece of equipment or system that does not comply with the Contract Documents, i.e., does not perform properly or is not complying with the design intent.
- H. Factory Authorized Representative: An individual fully trained on the equipment and certified by the manufacturer to perform the respective task.
- I. Factory Testing: Testing of equipment off-site at the manufacturer's facility. The testing may be witnessed by the members of the project team.
- J. Functional Performance Testing (FPT): The detailed and thorough testing of building systems and their interactions with building components and other building systems.
- K. Issue Log: This list is maintained and updated by the Commissioning Authority that includes all Issue items that relate to Commissioning activities and site observations requiring contractor action or response.
- L. Maximum Failure Limit: The maximum percentage of a test population that is permitted to fail before the test is considered a failure and subject to correction and retesting. Where test sampling is used, the Maximum Failure Limit shall be the maximum percentage of a test sample that is permitted to fail before an entirely new sample must be selected for testing.
- M. Operation and Maintenance (O&M) Documentation: Contractor-developed documentation designed to address the needs of facilities personnel and

customized for the context of the specific facility and installation. This includes manufacturer's literature (including O&M manuals, parts lists, troubleshooting guides, etc.), Contractor-developed instructions for start-up and shut-down, control sequences, and other installation-specific information.

- N. Pre-Start Up: Preliminary testing accomplished during a scheduled system outage to verify system functionality prior to placing the system/equipment into preliminary service.
- O. Start-Up: Refers to the quality control process whereby the Contractor verifies the proper installation of a device or piece of equipment, executes the manufacturer's starting procedures, completes the Start-Up Checklist, energizes the device, verifies that it is in proper working order and ready for dynamic testing, including Start-Up Tests.
- P. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
- Q. Test, Adjust, and Balance (TAB): Refers to the test, adjust, and balance process or the Testing, Adjusting, and Balancing Contractor.

1.4 ACTION SUBMITTALS

- A. General requirements:
 - 1. Provide individual checklists and procedures for each system or component.
 - 2. Develop individual checklists and procedures for each tagged piece of equipment. General procedures developed for multiple pieces of equipment, including similar equipment, are not acceptable.
 - 3. Procedures and checklists for specified phases of commissioning (e.g. Pre-startup, startup, functional performance testing) must be submitted and approved prior to commencement of the related activity.
- B. CxA submittals:
 - 1. Commissioning plan.
 - 2. Pre-functional checklists: For each system or component.
 - 3. Startup procedures: For each system or component.
 - 4. Startup checklists: For each system or component.
 - 5. Completed startup checklists: For each system or component.
 - 6. Functional Test Procedures: For each system or component.
 - 7. Functional Test Checklists: For each system or component.
 - 8. Formal acceptance recommendation for each component or system tested, following successful completion of testing.
- C. Contractor submittals:

1. Completed pre-functional checklists: For each system or component.
2. Completed startup checklists: For each system or component.
3. Completed functional test checklists: For each system or component.

1.5 INFORMATIONAL SUBMITTALS

A. CxA submittals:

1. Qualifications: For CxA and testing technicians.
2. Test equipment calibration certificates.
3. Preliminary Commissioning Report, including the following:
 - a. Compiled test results.
 - b. Updated Issues Log.
 - c. Updated Checklist log.
4. Final Commissioning Report, including the following:
 - a. Compiled test results.
 - b. Seasonal test results.
 - c. Warranty walkthrough results.
 - d. Completed issues log.
 - e. Completed checklist log.

1.6 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):

1. Contractor shall appoint a CxC.
2. The commissioning team shall consist of, but not be limited to, representatives of **each** Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by DEN Project Manager:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. DEN will engage the CxA under a separate contract.
2. Representatives of DEN Sustainability, DEN Project Manager Representative, and DEN Maintenance personnel.
3. Architect and engineering design professionals.

1.7 DEN'S RESPONSIBILITIES

A. Assign DEN Sustainability and Operations Maintenance personnel and

schedule them to participate in commissioning team activities.

- B. Coordinate activities specified in paragraph below with DOR and Architect-Consultant agreements.
- C. Provide the BoD documentation, prepared by DOR, and approved by DEN, to the CxA and **each** Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.8 **EACH CONTRACTOR'S RESPONSIBILITIES**

- A. **Each** Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - 1. Include Commissioning requirements in price and plan for work.
 - 2. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 3. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
 - 4. Attend commissioning team meetings held on a **weekly** basis and progressing to weekly meetings as construction project nears completion.
 - 5. Integrate and coordinate commissioning process activities with construction schedule.
 - 6. Review and accept construction pre-functional checklists provided by the CxA prior to commencing functional testing.
 - 7. Complete electronic construction checklists as Work is completed and provide to the DEN Project Manager after each checklist has been completed.
 - 8. Review and accept commissioning process functional test procedures provided by the Commissioning Authority.
 - 9. Designate a CxC from each major subcontractor with activities related to commissioning. These CxCs are to be the primary contacts for Commissioning activities.
 - 10. Contractor shall incorporate the Commissioning process into the construction schedule, outlining generic Commissioning tasks with precedents or prerequisites to each task. These tasks will apply to many systems and the Contractor shall incorporate as such. Examples of enumerated tasks include, but are not limited to:
 - a. Contractor preparation of the Training Plan
 - b. Testing Agency activities
 - c. Contractor documentation of pipe pressure testing, flushing, and cleaning of applicable systems
 - d. Documentation of the Start-Up Procedures for equipment and systems
 - e. TAB of applicable system

- f. Preparation of the O&M Manual content
 - g. FPT and Acceptance
 - h. Observation Period and System Optimization
 - i. Occupant or other Regulatory Agency testing or approval process
 11. Assist the CxA in preparation for the specific FPT procedures. Contractors, subcontractors, and vendors shall review the FPTs to ensure feasibility, safety, and equipment protection and provide necessary written alarm limits to be used during the tests. Damage caused to equipment performed in accordance with the approved procedures that is the result of malfunctioning equipment or contract deficiencies, shall be the responsibility of the Contractor.
 12. Record start-up and testing procedures.
 13. Demonstrate the operation of all systems as specified.
 - a. Operate systems, with assistance of DEN Maintenance, under direction of the CxA during FPT's and other acceptance testing.
- B. Acceptance Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Acceptance Phase.
1. Work in conjunction with CxA in FPT and shall include, but not limited to the following:
 - a. Operate and Manipulate systems and equipment to facilitate testing (as dictated in this section, relevant technical sections and the Commissioning Plan).
 - b. Operate and Manipulate EMCS and other control systems to facilitate FPT (as dictated in this section, relevant technical sections and the Commissioning Plan).
 2. Correct any work not in accordance with Contract Documents.
 3. Maintain record documentation and update and resubmit it after Functional Completion.
 4. Compensate DEN for additional CxA fees and expenses incurred to retest equipment and systems following testing failures.
 5. Monitor systems, equipment, and areas throughout the Transition Period. Log and diagnose all alarms during this period. Maintain trends and logs of all critical parameters. Forward the logs and trends on a weekly basis throughout all Transition Periods.
- C. Warranty Period: The following delineates the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Warranty Period.
1. Provide warranty service
 2. Conduct EMCS Sequence Training
 3. Respond to and document Warranty issues
 4. Correct any deficiencies identified throughout the Warranty Period

5. Update record documentation to reflect any changes made throughout the Warranty Period and resubmit final Record Drawings and data records at the close of the Warranty period

1.9 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team through the entire project.
- B. Provide and update **construction phase** commissioning plans.
- C. Convene commissioning team meetings to discuss commissioning activities and current issues and resolutions.
- D. Provide Project-specific construction checklists and commissioning process test procedures.
- E. Review all pertinent equipment submittals, shop drawings, and O&M documentation.
- F. Verify the execution of commissioning process activities. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the DPR. When a requirement is not met, the CxA will report the failure in the Issues Log.
- G. Prepare and maintain the Issues Log.
- H. Prepare and maintain completed construction checklist log.
- I. Organize and lead the functional, seasonal, any LEED required tests, and 10-month Warranty review in the presence of the contractor, DEN Maintenance, and DEN PM assigned personnel.
- J. Witness systems, assemblies, equipment, and component startup.
- K. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

1.10 ISSUES LOG

- A. CxA shall maintain an Issues Log (required information, identified deficiencies, work required, etc.) that relates to Commissioning. Each item shall be tracked with the initiator, the parties responsible, due date, the date of closure, and a description of the resolution. Each item shall be categorized for sorting and tracking and for documentation on applicable forms.
- B. CxA will provide this list to the DEN Project Manager during regular project meetings as appropriate to keep all parties informed.

- C. All parties indicated as responsible for an action item shall respond to the DEN Project Manager. Responses are due within 10 days of action items being identified to the team.

1.11 PRE-START UP

A. PREREQUISITES

1. All equipment, components, and devices applicable to the Pre-Start Up must be installed, and the Pre-Start Up must be documented and approved. This includes installation, identification labeling, insulation, and all other requirements for placing systems into dynamic operation.

B. COMMON ELEMENTS

1. Required submittal documentation shall be present and located convenient to testing area.
2. Contractor shall submit the completed Pre-Start Up Procedures at least 10 days prior to the start of Functional testing. CxA shall review the Pre-Start Up Procedure documentation at the beginning of Start Up. Contractor shall demonstrate to DEN Project Manager, DEN Maintenance and DEN Sustainability that access is sufficient to perform required maintenance.
3. System and equipment configurations shall be compared against the contract documents.

1.12 INSTRUMENTATION

- A. All test instruments described in this section shall be acceptable for any portion of the commissioning process herein described.
- B. All instruments shall conform to the standards specified in the most recent edition of "NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" in regard to accuracy and calibration status. Current calibration certificates must be available to the CxA if requested.
- C. Test instrument accuracy and resolution must match or exceed that of the system component being verified or calibrated.
- D. Test instruments must be used within guidelines as recommended by instrument manufacturer. All measuring methods must be appropriate to the instrument application and measurements must be repeatable under equivalent conditions.
- E. Standard Testing Instrumentation: Standard instrumentation normally used for performance assessment and diagnosis shall be provided by testing entity. These include, but are not limited to:

1. Electronic Manometer (for Air and Flow Hood)
2. Electronic Manometer (for Water)
3. Temperature Instruments
4. **Pressure instruments**
5. Humidity Instruments
6. CO2 Instrument
7. Sound Meter
8. Electronic Multimeter
9. Tachometer
10. Ultrasonic Flow Meter
11. Others as required

1.13 START-UP

A. Prerequisites

1. All equipment, components, and devices applicable to the FPT must be started, and the Start-Up must be documented and approved. This includes completion of Start-Up Procedures, pressure testing (of equipment, duct and piping), flushing/cleaning, identification labeling, insulation, and all other requirements for placing systems into dynamic operation.
2. Unless specifically agreed to by DEN and CxA, all support systems shall be complete prior to FPT.
3. The CxA shall determine the optimal sequence of testing.

B. Common Elements

1. Required submittal documentation shall be present and located convenient to testing area. Validate that all required documentation has been submitted and **complete** per the contract requirements.
2. Contractor shall provide the completed Start-Up Procedures at the time of testing. CxA shall review the Start-Up Procedure documentation and spot-check at the beginning of FPT.

C. Procedure

1. Purpose:
 - a. Verify adherence to, and documentation of, quality control processes involved with preparing systems and equipment for operation.
 - b. These procedures shall be performed on all installed systems and equipment and no sampling strategy is used for the start-up process.
 - c. The Commissioning process requires all Parties to collaborate to establish the optimal standard of care for starting systems and equipment.
 - d. After the procedures are established, the Contractor performs them

and documents them with the Start-up Procedures that are developed by the Contractor.

2. Start-Up Procedures: The content of these Start-Up Procedures shall provide the minimally acceptable content in accordance with the OEM field quality control requirements. Generic refers to the fact that the protocols may be created before the shop drawings are finalized. These procedures and protocols will normally be common across different manufacturers.
3. Content of Start-Up Procedures: Start-Up Procedures shall generally include the following for each item of equipment or system (as applicable):
 - a. Project-specific designation, location, and service.
 - b. Indication of the Party performing and documenting the Start-Up Procedure.
 - c. Clear explanation of the inspection, test, measurement, and outcome with a Pass/Fail indication and a record of measure parameters.
 - d. A Start-up Checklist item indicating that proper maintenance clearances have been maintained.
4. Recording and Documentation of Factory Start-Up: Manufacturer's start-up protocols shall be executed and forms shall be completed by a qualified/authorized technician.
5. Recording and Documentation of non-Factory Start-Up: The start-up tests and checklists shall be completed by a qualified technician.
6. Commissioning Authority Review: CxA will review and spot-check procedures during FPT.
7. Documentation Completion: The individual executing the start-up must complete the start-up and pre-functional documentation for any given equipment and acknowledge acceptability with the indication of who did the associated task.
8. Sampling and Final Submission: All (100% of) systems are started and documented per the approved procedures and NO sampling strategy is used. Completed Start-up and pre-functional checklists for all pieces of equipment associated with independent systems shall be submitted to CxA prior to any associated FPT. Any outstanding item shall be clearly indicated and an associated Action Item must be entered to track resolution.
9. DEN Access: Contractor shall allow access by DEN representatives to inspect the equipment and ensure its proper operation.

1.14 TEST, ADJUST, AND BALANCE

- A. CxA shall review TAB reports.
- B. The CxA shall select up to 10% of the readings from the Balancing Reports and

verify performance readings. Readings selected by the CxA may include:

1. Supply air diffuser readings (both minimum and maximum readings for variable air volume boxes).
 2. Main and branch supply duct traverse readings.
 3. Outside/return air flow readings.
 4. Exhaust airflow readings.
 5. Water flow readings.
 6. Ampere readings.
 7. Water pressure drop readings through coils, heat exchangers, and other hydronic elements.
- C. For all readings, a deviation of more than 10% between the verification reading and reported data shall be considered as failing the FPT. The maximum failure rate for the sample is 10%.
- D. If greater than 10% of sample readings have failed, the TAB contractor shall justify all noted failures or rebalance and re-document the system.

1.15 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope

1. Demonstrate that each system is operating according to the documented design intent and Contract Documents.
2. Bring all commissioned systems from a state of substantial completion to full dynamic operation.
3. Identify and correct performance deficiencies.
4. Operate each system through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, normal and emergency power, fire alarm, part- and full-load) where there is a specified system response.
5. Verify each sequence in the sequences of operation as required.
6. Verify responses to abnormal operational modes and conditions, such as power failure, freeze conditions, no flow, equipment failure, etc..

B. Development of Test Procedures

1. CxA shall develop specific test procedures to verify and document proper operation of each piece of equipment and system.
2. CxA shall develop fill-in forms for use during FPT, based on the test procedures.
3. Not less than 14 days prior to execution of FPT, CxA shall submit completed test procedures to the DEN Project Manager to review the tests for feasibility, safety, equipment and warranty protection, and scope.
4. EMCS trends shall have been established as required in the documents. These shall generally be reviewed prior to or during FPT.
5. Capacities and adjusted/balanced conditions as applicable shall be subject to review.

6. Sequencing Verification: For applicable systems and equipment, all modes of operation shall be verified for proper sequencing.
 7. System and equipment configurations shall be compared against the contract documents.
 8. All adjusted, balanced, controlled systems shall be assessed to determine the optimal setting for the system as applicable. The optimal settings should be determined to establish reliable, efficient, safe, and stable operation.
- C. Scheduling:
1. Contractor shall notify the CxA and the DEN Project Manager that systems are ready for testing, to schedule FPT.
 2. To the extent practical, tests shall be scheduled to allow efficient and contiguous testing of inter-related systems and equipment.
- D. Phasing:
1. Non-interdependent segments of the project testing may be phased.
 2. Phasing of FPT for this project shall be coordinated between the CxA, Contractor, and the DEN Project Manager as the project progresses.
- E. Participation:
1. CxA shall witness and document FPTs performed by the contractor after Start-Up Procedure documentation of systems and equipment has been reviewed and accepted.
 2. Contractor shall perform the FPTs as described, with manipulation of the systems or equipment, provision of supporting equipment or materials (lifts, ladders, specialty test equipment, safety equipment), and on-the-spot remediation of minor identified deficiencies whenever possible.
 3. Required participating Parties shall be indicated in the test plan for each individual FPT.
 4. Required participating parties shall be available on-site throughout the testing of any given system for which they are required participants.
 5. CxA shall coordinate effectively with the individual Contractors throughout FPT and minimize their required involvement.
- F. Completeness:
1. All systems must be completed and ready for FPT at the time of the test.
 2. All start up, factory authorized field testing, independent testing agency tests, and TAB procedures must be complete and the control systems must be tested and operational for the respective system or component.
- G. Test Documentation:
1. CxA shall witness and document the tests.
 2. CxA shall record all test results on the forms developed for the testing.

3. CxA shall 'Pass' or 'Fail' the testing and record the date and time of the test.
4. Deficiencies shall be clearly indicated when the test is failed.
5. When all related testing is completed successfully, CxA shall recommend acceptance of the system or component.
6. In the case of specialized testing, CxA shall witness and review the testing reports prepared by the Contractor.

H. Acceptance Criteria

1. The Acceptance Criteria shall be as follows unless specifically indicated within applicable individual specification sections or test procedures.
 - a. Accuracy/repeatability on sensing devices will be as specified for the device. CxA and TAB will use calibrated gauges for independent validation of sensing devices.
 - b. HVAC sequence-related criteria will be as specified in the documents.

I. Deficiencies

1. CxA shall record the results of each functional test. All deficiencies or non-conformance issues shall be brought to Contractor's attention immediately, noted in the Issues Log, and reported to the DEN Project Manager within 72 hours.
 - a. Corrections of identified minor deficiencies may be made during the tests where feasible. In such cases, the deficiency will be noted on the FPT documents.
 - b. Deficiencies with potential schedule or cost impacts shall be reported to the DEN Project Manager within 24 hours of discovery.
2. Contractor shall correct all identified deficiencies as directed by the DEN Project Manager.
 - a. CxA shall maintain Contractor's response to each deficiency in the Issues Log.
 - b. Contractor shall correct each deficiency, and notify CxA upon completion by completing an action item response.
 - c. Contractor shall schedule repeat testing and ensure CxA is available to observe.
3. Disputes:
 - a. Contractor shall notify the DEN Project Manager and CxA immediately if the responsibility or nature of any identified deficiency is in dispute.
 - b. The CxA shall document as a disputed deficiency in the Issues Log.
 - c. The Contractor shall negotiate a resolution to the dispute with the DEN Project Manager.

- d. Upon resolution , CxA shall update the Issues Log to reflect the status of the deficiency

J. Sampling Percentage:

1. Sampling percentage shall be as indicated in the test plan.
2. Where no sampling percentage is indicated, the implied sampling percentage is 100% and all units shall be tested.

K. Maximum Failure Limit:

1. Maximum Failure Limit shall be as indicated in the test plan.
2. When the maximum number of failures is reached, testing on that sample will be terminated and re-testing will be scheduled.
3. If no Maximum Failure Limit is indicated, the implied failure limit is 0% and all tested samples must pass.
4. Where sample tests involve multiple systems (i.e., checking strainers on different hydronic systems), the Maximum Failure Limit will apply per system.
5. The responsible Contractors shall reimburse DEN for the CxA's cost of that sample test, and redo the start-up and TAB for the applicable devices/systems.
6. All work necessitated by sample failures shall be at no cost to DEN.

L. Manufacturer's Defects:

1. If 10% of identical pieces of equipment fail to perform to the Contract Documents (mechanically or substantively) due to a manufacturing defect, all identical units may be considered unacceptable by the DEN Project Manager.
2. For the purposes of defining 'identical equipment' for this Section, size or capacity alone does not constitute a difference.
3. In case of failure due to manufacturer's defects, the Contractor shall provide DEN with the following:
 - a. Manufacturer's response in writing as to the cause of the failure and proposed resolution.
 - b. Manufacturer shall implement their proposed resolution on a representative sample of the product.
 - c. The DEN Project Manager will determine whether a replacement of all identical units or a repair is acceptable.
 - d. Upon acceptance, the Contractor shall replace or repair all identical items at their expense and shall extend the warranty accordingly (if the original equipment warranty had begun).
 - e. Manufacturer shall pay the costs of all retesting necessitated by the failure.

1.16 CLOSEOUT

A. Commissioning Report

1. A final summary report by the CxA shall be provided to the DEN Project Manager, focusing on evaluating commissioning process issues and identifying areas where the process could be improved.
2. Include all acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., compiled in appendices, and provided with the summary report.
3. Pre-Start Up verification, Start Up checklists, TAB, functional tests, and monitoring reports shall not be included the final report, but shall be submitted as part of the Commissioning Record in the O&M manuals.

B. Logs

1. CxA shall submit an updated Issues Log and all Issues Logs upon substantial completion of the project.

C. Acceptance

1. CxA shall recommend acceptance of each test in writing to the DEN Project Manager.
2. The CxA shall note each satisfactorily demonstrated function on the test documentation.
3. Tests shall be considered accepted only upon formal acceptance by the DEN Project Manager.

D. Training

1. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.
2. The CxA shall witness the content and adequacy of the training of DEN personnel for commissioned equipment. Any issues shall be noted in the Issues Log and reported immediately to the DEN Project Manager.

E. Operation and Maintenance Manual and Record Drawing Review

1. Prior to substantial completion, the CxA shall review the O&M manuals, documentation, and redlined as-built drawings for systems that were commissioned to verify compliance with the Specifications.
2. The CxA shall review completed record drawings and document any discrepancies in the Issues Log.

1.17 WARRANTY PERIOD

A. Warranty Review

1. CxA, under direction from the DEN Project Manager and DEN Asset Management, shall participate in warranty walkthrough of all commissioned systems.

2. The warranty walkthrough shall occur not less than ten (10) months following substantial completion, and not more than twelve (12) months following substantial completion.
3. The CxA shall document any deficiencies found during the warranty walkthrough in the Issues Log and notify the DEN Project Manager.

B. Seasonal Testing

1. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract.
2. The CxA shall coordinate this activity with the DEN Project Manager and the Contractor.
3. Tests will be executed, documented and deficiencies corrected by the appropriate parties, with DEN maintenance staff and the CxA witnessing.
4. Any final adjustments to the O&M manuals and Record Drawings due to the testing will be made by the responsible parties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section. .

END OF SECTION 019113