

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SCOPE

- A. Construction Site Location: Ft. Wainwright, Alaska (FWA) from existing utilidor access vault H6-6-3 to new utilidor access vault G6-9-3, then direct-buried piping to new Aircraft Parts Storage Building, FTW 336A.
- B. Contractor shall furnish, unless stated otherwise in these specifications, materials, supervision, labor, tools, equipment, transportation, warehousing and each and every other item of expense required to perform work shown on Contract Documents and described in specifications and shall do everything required by the Contract Documents to the satisfaction of Doyon Utilities LLC. (DU).
- C. All work under this contract shall be coordinated with DU Project Manager and with work going on in the area by others. Contractor shall complete the contract in a way that minimizes disruption to all on-going construction projects, without creating work delays.
- D. Roadway cuts performed under this contract shall be repaired under this contract. Contractor is required to bring the surface to proper elevation using aggregate base course.
- E. Scope of work for this project is defined by the specifications, drawings, annotated photos and other information contained in this package. The following does not in any way limit or reduce the scope, but is merely intended to serve as clarification and/or to make special note of items within the scope:

| Distribution System Construction Items  |
|---|
| <p><b><u>SITE &amp; UTILIDOR</u></b></p> <p>Excavate for utilidor roof removal as required.</p> <p>Remove utilidor lids and stack on cribbing for asbestos sealant removal.</p> <p>Remove utilidor vault lids or modify in place.</p> <p>Test sealant for asbestos containing material.</p> <p>Remove sealant from utilidor lids and walls in appropriate manner.</p> <p>Perform topographical survey of the utilidors for input to GIS maps:</p> <p style="padding-left: 40px;">Complete survey information after lids and access hatches have been installed.</p> <p>Repair utilidor/vault walls and floor as necessary.</p> <p>Replace utilidor lids broken during removal.</p> <p>Provide new access vault G6-9-3.</p> <p>Provide new bollards around access hatches and utilidor vents from access vault G6-9-3.</p> <p>Core drill utilidor for WCS direct buried pipe openings.</p> |

| <b>Distribution System Construction Items</b>  |
|--|
| <p>Provide new utilidor access vault lids:</p> <ul style="list-style-type: none"><li>Install DU furnished access hatches.</li><li>Install contractor shop fabricated utilidor vents.</li></ul> <p>Provide new utilidor lighting and convenience power outlets.</p> <p>Provide insulation and waterproofing for utilidors exposed during upgrade work.</p> <p>Reseed / replant disturbed areas and maintain area until plant growth is established.</p> <p>Install base course paving material at disturbed roads, access drives and sidewalks.</p> <p>Repair damaged curbs and gutters.</p>  |
| <p><b><u>DISTRIBUTION PIPING SYSTEMS</u></b></p> <p>Provide temporary support for existing piping wherever anchors, supports and hangers are affected by connection of new piping.</p> <p>Abate, wrap and remove existing piping sections as required to connect new piping work.</p> <p>Provide new HDS and WDS piping, insulation, hangers, and supports from access vault H6-3-3 to new vault G6-9-3.</p> <p>Provide excavation, trenches, and install direct buried HDS, WDS, and WCS piping materials, from new vault G6-9-3 to new building.</p> <p>Perform pressure testing of HDS piping system.</p> <p>Perform pressure testing and ADEC required testing of the WDS piping system.</p> <p>Provide insulation and jacketing for new utilidor piping.</p> <p>Provide one new fire hydrant.</p> <p>Provide recirculation pump and piping for WDS.</p> <p>Provide removable insulation jackets for all main sectionalizing, service branch isolation valves and expansion joints.</p> <p>Assist DU in start-up and commissioning of each system.</p> <p>Remove temporary connections as partial mains have been reenergized.</p> |
| <p><b><u>UTILITY DISTRIBUTION MONITORING SYSTEMS</u></b></p> <p>Install DU furnished field devices and instrumentation in the utilidor system and as noted in the piping distribution system.</p> <p>Install DU furnished utility distribution system monitoring and control panels in utilidors where indicated.</p> <p>Provide conduit, pull boxes and cabling from field devices to the control panels.</p> <p>Install instrumentation on new vault lids</p> <p>Install instrumentation on new sump pumps</p> <p>Install instrumentation on select main distribution lines</p> <p>Install control panels for data acquisition</p>   |

| Distribution System Construction Items  |
|---|
| Provide electrical service into vaults as indicated.                          |
| Provide power for sanitary lift stations, where indicated.                    |
| Install lights and convenience receptacles in each vault and provide power.   |
| Install starter and provide power for recirculation pumps (where applicable). |
| Provide power for process controls.   |
| Provide power for pumps, where indicated.                                     |

## 1.2 SCHEDULE DEVELOPMENT AND UPDATING

- A. Contractor shall develop and submit as part of the bid a preliminary construction schedule using *Microsoft Project* software. Milestone dates listed above shall be used for developing the preliminary construction schedule.
- B. Upon award of contract, the successful Contractor shall utilize the submitted preliminary construction schedule in development of a detailed construction schedule. This schedule shall be updated on no less than a bi-weekly basis to reflect percentage completion and revised completion dated for activities not yet completed. Schedule updates (print and electronic versions) shall be submitted to DU Project Manager for incorporation into overall Post construction schedule, and shall be utilized as part of the weekly construction progress review and coordination meetings.

## 1.3 WORK BY OTHERS

- A. Site parking will be provided (in designated areas only).

## 1.4 SITE CONDITIONS

- A. Contractor shall strictly follow all DU, state and federal OSHA construction regulations and standards during execution of work.

## 1.5 PROJECT REPRESENTATIVE

- A. The DU Project Manager for this project is Mr. Norman Sather.
  - 1. Phone: 907-455-1559
  - 2. Mobile: 907-750-1422
  - 3. Email: nsather@doyonutilities.com

## 1.6 DOYON UTILITIES FURNISHED ITEMS

- A. DU will furnish the majority of materials for the project. See Attachment B, included as part of the Contract Documents.

## 1.7 START-UP

- A. Contractor shall demonstrate proper check-out in presence of DU's Project Manager.

- B. Start equipment in accordance with manufacturer's published instructions. In addition to the previous requirements of this specification adjust equipment to perform in accordance with manufacturer's design intent and operating characteristics. Provide qualified start-up personnel.

END OF SECTION

## SECTION 01100

### INSTALLATION REQUIREMENTS FOR CONTRACTOR EMPLOYEES

#### PART 1 - GENERAL

1.1 The following provisions apply to personnel working on the Installation, but may be changed from time to time by the Installation, command authorities, or the security forces. Contractor agrees to abide by any and all personnel requirements identified by the Installation, command authorities, and security forces.

#### 1.2 EMPLOYEES

- A. The Contractor shall not employ any person for work on this contract if such person is identified by the Installation as a potential threat to the health, safety, security, general well being, or operational mission of the Installation or population. All Contractor and subcontractor employees will comply with Installation security, health and safety conditions.
- B. Where reading, understanding, and discussing environmental, health, and safety warnings are an integral part of an employee's duties, the employee shall be able to understand, read, write, and speak the English language. All employees that interface with customers shall be able to speak and understand the English language. Contractor will allow the Installation to review on a continuing basis a listing of all employees engaged in Contractor work on the Installation. The listing will provide sufficient information on all employees to allow precise Government identification of each individual.

#### 1.3 PERSONAL APPEARANCE AND IDENTIFICATION

- A. Contractor's personnel shall present a neat appearance to the extent practicable and shall be readily recognized as Contractor employees. If required by the Installation, Contractor shall ensure each employee obtains from Security Forces an identification card that shall include at a minimum the employee's name, photograph, and Contractor's name. Each Contractor employee shall follow established Installation procedures for displaying their identification card while within the boundaries of the Installation.

#### 1.4 INSTALLATION'S RULES APPLY TO CONTRACTOR

- A. Contractor shall ensure that employees meet all applicable Federal, state, and local certification, licensing, and health and safety requirements to perform all assigned tasks and functions as defined in this contract.

#### 1.5 NATIONAL AGENCY CHECK

- A. Contractor shall provide sufficient information to obtain complete and favorable national Agency Check (NAC) investigations for its employees for unescorted entrance into restricted areas on post. Normal access to

the Installation shall be in accordance with general Installation requirements. Contractor shall justify to the Installation Security Forces requests for NAC on Contractor employees requiring unescorted entry into restricted areas. Final approval for unescorted entry into restricted areas rests with the Installation Commander.

#### 1.6 CONTROLLED ACCESS AREAS

- A. Contractor shall apply for personnel security clearances required for performance after the contract is awarded. Personnel requiring access to secured areas or restricted areas under the control of the Installation shall comply with applicable regulations. The government reserves the right to terminate the entry of any Contractor employee upon disclosure of information that indicates the individual's continued entry to the Installation is not in the best interests of national security. Additionally, violation of, or deviation from, the established security procedures by Contractor's employees may result in the confiscation of identification media and the denial of future entry to the Installation.

#### 1.7 CONFLICT OF INTEREST

- A. Contractor shall not employ for purposes of the Installation utility services contract, any person who is a U.S. Government employee if employing that person would create a conflict of interest. Contractor shall exercise reasonable diligence to identify and avoid such circumstances.

#### 1.8 CONTRACTOR VEHICLES

- A. All Contractor vehicles shall be readily identifiable. Identification shall include displaying Contractor name in a clear and unobstructed location on the vehicle.

#### 1.9 CONTRACTOR RADIOS

- A. Prior to operating two-way, portable, or land-mobile devices on the Installation, the Contractor shall obtain approval of the Installation Communication Group by requesting an available clear frequency. The Contractor shall follow all Installation procedures for operating radios on the Installation.

#### PART 1 - PRODUCTS

NOT USED

#### PART 2 - EXECUTION

NOT USED

END OF SECTION

## SECTION 01330

### SUBMITTAL REQUIREMENTS

#### PART 1 - GENERAL

- 1.1 Purpose of Submittal is to demonstrate for those portions of Work for which submittals are required, the manner in which Contractor proposes to conform to information given and design concept expressed on Contract Documents.
- 1.2 Submittals that do not bear Contractor's Submittal Certification Form (stamp) as required herein will be returned without action.
- 1.3 Submittals not required by Contract Documents will not be reviewed and may be discarded.
- 1.4 Review is not conducted for purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain responsibility of Contractor.
- 1.5 DU Project Manager's review is for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- 1.6 Notations by DU Project Manager which, if implemented, would require Contractor to perform Extra Work or cause Delay shall be brought to DU Project Manager's attention, in writing, in the manner required by the General Conditions, before proceeding with Work.
- 1.7 Electronic copies of Contract Drawings will not be provided in AutoCAD format for Contractor's use in preparing Submittals.
- 1.8 SECTION INCLUDES
  - A. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and similar Submittals.
  - B. Procedures for preparing and transmitting submittals required by specification sections for a product, material, or construction method.
- 1.9 RELATED DOCUMENTS
  - A. Drawings, Specifications and provisions of Construction Contract, including General and Supplementary Conditions and other General Requirements.
  - B. Section 01550 Construction Facilities and Temporary Controls
  - C. Section 01780 Closeout Submittals.
  - D. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

#### 1.10 DEFINITIONS

- A. **Action Submittals:** Written, physical and graphic information that requires DU Project Manager's action.
- B. **Informational Submittals:** Written information that does not require DU Project Manager's approval.
- C. **Accepted:** Means fabrication, manufacture, or construction may proceed provided that Submittal complies with Contract Documents.
- D. **Accepted as Noted:** Means fabrication, manufacture, or construction may proceed provided that Submittal complies with Contract Documents and DU Project manager's notations. If Contractor cannot comply with such notations, Contractor shall make revisions and resubmit.
- E. **Revise and Resubmit:** Means fabrication, manufacture, or construction may **not** proceed. In resubmitting, Contractor shall limit corrections to items marked.
- F. **Not Approved:** Means Submittal does not comply with expressed design intent of Contract Documents. Do not reuse Submittals stamped "Rejected." Prepare Submittal again and resubmit.

#### 1.11 QUALITY ASSURANCE

- A. General
  - 1. Perform no portion of Work requiring submittal and review of Shop Drawings, Product Data, Samples, or similar Submittals until respective Submittal has been approved by DU Project Manager. All Work shall be in accordance with approved Submittals.
  - 2. Contractor shall not be relieved of its sole responsibility for deviations from requirements of Contract Documents by DU Project Manager's review or approval of Shop Drawings, Product Data, Samples or similar Submittals unless Contractor has specifically informed DU Project Manager in writing of such deviation at time of submittal and DU Project Manager have given written approval of such specific deviation.
  - 3. Contractor shall not be relieved of its sole responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar Submittals by DU Project Manager's review or approval thereof.
  - 4. Direct specific attention on resubmitted Shop Drawings, Product Data, Samples or similar Submittals, to revisions requested by DU Project Manager on previous Submittals.
  - 5. Informational Submittals upon which DU Project Manager is not expected to take responsible action may be so identified in Contract Documents.
  - 6. When professional calculations or certification of performance criteria of materials, systems or equipment is required by Contract Documents, DU Project Manager shall be entitled to rely upon accuracy and completeness of such calculations and certifications.
- B. Product Variances



1. Contractor shall request approval for any variance to material or equipment specified in the Contract Documents.
2. Accompanying Submittal, on attached separate sheet, prepared on Contractor's letterhead, Contractor shall provide a written letter that clearly notes proposed deviations or variances from Specifications, Drawings, and other Contract Documents.
3. Each request for variance shall be addressed in a separate letter.
4. Submittals which do not include "Request for Variance" letter shall be rejected for non compliance with requirements of Contract Documents.
5. Acceptance of Submittals with variances from Contract Documents that have been noted in manner required by Contract Documents shall not relieve Contractor from its sole responsibility for additional costs and Delays associated with changes required to accommodate such variances.
6. Variances included in Submittals, including those that have been noted as such by Contractor, that have not been expressly accepted by DU Project Manager are deemed rejected and exempted from any review or approval of Submittal.

#### 1.12 SUBMITTAL SCHEDULE

- A. Within 10 days after receipt of Notice of Intent to Award, Contractor shall prepare and submit, in accordance with Contract Documents, a Submittal Schedule for DU Project Manager's information and approval. Submittal Schedule shall be coordinated with the Contractor's Construction Schedule and allow DU Project Manager such time for Submittal review as may be required by Contract Documents, or if none is specified in the Section, in accordance with the following:
  1. Allow enough time for Submittal review by DU Project Manager **and** for resubmission, as follows. Time for review shall commence on DU Project Manager's receipt of Submittal.
  2. Allow minimum of 7 days for initial review of each Submittal. Allow additional time if processing must be delayed to permit coordination with subsequent Submittals.
  3. Allow a minimum of 7 days for review of each resubmission of a Submittal.
  4. Coordinate preparation of Submittal Schedule with DU Project Manager, allowing more than average review time for complicated or lengthy Submittals and less time than average for those less complicated and less lengthy Submittals.
- B. Prepare Submittal Schedule in chronological order. Provide following information:
  1. Scheduled date for first Submittal.
  2. Related Section number.
  3. Submittal category.

4. Name of Subcontractor.
  5. Description of part of Work covered.
  6. Scheduled date for resubmittal.
  7. Number of Contractor's shop drawings, coordination drawings or other documents anticipated within each submittal.
- C. Coordinate Submittal Schedule with Work of Subcontractors, Segregation of Costs/Schedule of Values and list of products, as well as Contractor's Construction Schedule.
- D. Include scheduled activities for all Shop Drawings, Product Data, Samples and similar Submittals, including, without limitation, coordination drawings, certificates of compliance, manufacturer's certificates, warranties, and all other types of documents that are required to be submitted by Contractor under the Contract Documents.
- E. Schedule Submittals to avoid concurrent Submittals to maximum extent possible.
- F. Where Submittal is concurrent with or overlaps Submittals currently being reviewed, indicate priority of each outstanding Submittal.
- G. Contractor shall keep Submittal Schedule current and updated in accordance with requirements of the Contract Documents.
- H. No extension of Contract Time will be authorized because of failure to transmit Submittals sufficiently in advance of Work.
- I. Distribution of Submittal Schedule:
1. Following corrections resulting from DU Project Manager's response to initial submission, distribute electronic copies (Microsoft Office format or Adobe pdf format) to DU Project Manager, Subcontractors, and other parties required to comply with Submittal dates indicated.
  2. Post hard copies in temporary field office.
  3. When revisions are made, distribute to same parties and post in same locations.
  4. Delete parties from distribution when they have completed their assigned part of Work and are no longer involved in construction activities.
  5. Adhere to accepted schedule except when specifically otherwise permitted.
- J. Schedule Updating
1. Revise Submittal Schedule after each meeting or other activity where revisions have been recognized or made.
  2. Issue updated Submittal Schedule concurrently with report of each meeting.

#### 1.13 SUBMITTAL PROCEDURES

- A. Coordinate preparation and processing of Submittals with performance of construction activities.
- B. Coordinate each Submittal with fabrication, purchasing, testing, delivery, other Submittals, and related activities that require sequential activity.
- C. Coordinate transmittal of different types of Submittals for related parts of Work so processing will not be delayed because of need to review Submittals concurrently for coordination.
- D. DU Project Manager reserves right to withhold action on Submittal requiring coordination with other Submittals until related Submittals are received.
- E. Submittals received from sources other than Contractor will be returned without review.
- F. Contractor shall certify Submittals were reviewed and coordinated as follows:
  - 1. DU Project Manager will provide an electronic copy (in MS Word) of the Submittal Certification Form shown below.
  - 2. Contractor shall provide a reproduction (stamp) of the "Submittal Certification Form" and furnish required information with all submittals. Include the certification on:
    - a. Title sheet of each shop drawing, or on
    - b. Cover sheet of submittals in 8½ x 11-inch format, or on
    - c. One face of cardstock tag (minimum size 3" x 6") attached to each sample. On sample tag, identify sample to ensure sample can be matched to tag if accidentally separated. Opposite face of tag will be used by DU Project Manager to receive, review, log stamp and include comments.

Doyon Utilities J101395, J101396, J101397  
Utility Service Extension to Aircraft Parts Storage-FTW336A  
Fort Wainwright, Alaska

| <b>SUBMITTAL CERTIFICATION FORM</b>   |  |                          |  |
|---|--|--------------------------|--|
| <b>CONTRACTOR'S<br/>NAME:</b>   |  |                          |  |
| <b>PROJECT NAME:</b>  |  |                          |  |
| <b>DU JOB NO:</b>   |  |                          |  |
| As Prime Contractor, we checked this submittal and we certify it is correct, complete, and in compliance with Contract Drawings and Specifications. All affected Contractors and suppliers are aware of, and will integrate this submittal into their own work. |  |                          |  |
| <b>SUBMITTAL NUMBER</b>   |  | <b>DATE<br/>RECEIVED</b> |  |
| <b>REVISION NUMBER</b>  |  | <b>DATE<br/>RECEIVED</b> |  |
| <b>SPECIFICATION SECTION NUMBER<br/>/PARAGRAPH NUMBER</b>   |  |                          |  |
| <b>DRAWING NUMBER</b>   |  |                          |  |
| <b>SUBCONTRACTOR'S<br/>NAME</b>   |  |                          |  |
| <b>SUPPLIER'S NAME</b>  |  |                          |  |
| <b>MANUFACTURER'S<br/>NAME</b>  |  |                          |  |
| <b>NOTE:</b><br>DEVIATIONS FROM CONTRACT DOCUMENTS ARE PROPOSED AS FOLLOWS (Indicate<br>"NONE" if there are no deviations)  |  |                          |  |
|   |  |                          |  |
| <b>CERTIFIED BY</b>   |  |                          |  |

G. Resubmissions

1. Resubmission of Submittals must be made using original Submittal number and designation.
2. Resubmissions are subject to same terms and conditions as original Submittal.
3. Should more than one resubmission be required, Contractor shall reimburse DU for time spent by Project Manager, Site Manager, Engineering Consultants, or other reviewers in processing additional resubmissions at the rate of 3.5 times the reviewer's Direct Personnel Expense (DPE). For purposes of this Paragraph, "Direct Personnel Expense" is defined as direct salaries of reviewer's personnel engaged on Project and portion of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.

1.14 Transmittal

- A. Transmit all submittals electronically.
1. Submit one electronic copy to DU Project Manager of each Submittal for distribution and review as stated below.
  2. Preferred format is Adobe pdf.
- B. Package each Submittal individually and appropriately for transmittal and handling.
- C. Transmit each Submittal using transmittal form. Transmittal Form shall include as a minimum the following information:
1. Project Name.
  2. Date.
  3. Destination (To:).
  4. Source (From:).
  5. Names of Subcontractor, Manufacturer, and Supplier.
  6. Category and type of submittal.
  7. Submittal purpose and description.
  8. Submittal and transmittal distribution record.
  9. Remarks.
  10. Signature of transmitter certifying.
- D. Include Contractor's certification stating that information submitted complies with requirements of Contract Documents.

- E. On attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, and revisions other than those requested by DU Project Manager on previous Submittals. Include same label information as related Submittal.
- F. Distribution
  - 1. Furnish copies of final Submittals to Subcontractors (including, without limitation, manufacturers, suppliers, fabricators, and installers), Governmental Authorities and others as necessary for performance of construction activities. Show distribution on transmittal forms.
  - 2. Number of Copies: Submit copies of each Submittal, as follows, unless otherwise indicated:
    - a. Submit one electronic copy to DU Project Manager of each Submittal for distribution as stated below.
    - b. Submit number of copies specified in Sections 15010 and 16010 Operation and Maintenance Data where copies are required of operation and maintenance manuals.
    - c. DU Project Manager will, upon initial receipt of a submission or resubmission of a Submittal, forward electronic copies to the DU Site Manager, DU Engineering Staff, and if required in the submittal to the Engineer of Record.
    - d. DU Project Manager will, following review and action by reviewers on a submission or resubmission of a Submittal, assemble all comments and forward one complete set of the annotated documents electronically to each reviewer and the Contractor.
    - e. Contractor shall retain returned electronic copy as a Record Document and use it to prepare copies of the submittal comments for distribution to Subcontractors, material suppliers, etc.

#### 1.15 SUBMITTAL TYPES

- A. SD-01 Preconstruction Submittals
  - 1. Contractor's Construction Schedule: Comply with requirements in Form of Contract and technical specification Section 01520.
  - 2. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of coverage.
  - 3. Material Safety Data Sheets: Submit information directly to DU Project Manager.
  - 4. Subcontract List: Prepare written summary identifying individuals or firms proposed for each portion of Work, including those who are to furnish products or equipment fabricated to special design. Include following information in tabular form:

- a. Name, address, and telephone number of entity performing subcontract or supplying products.
- b. Number and title of related Specification Sections covered by subcontract.
- c. Drawing number and detail references, as appropriate, covered by subcontract.

B. SD-02 Shop Drawings

- 1. Where required by specifications or otherwise needed, prepare Project-specific information drawings illustrating portion of Work for use in fabricating, interfacing with other work, and installing products. Contract Drawings shall not be reproduced and submitted as shop drawings.
- 2. Include following information, as applicable:
  - a. Dimensions.
  - b. Identification of products.
  - c. Fabrication and installation drawings.
  - d. Roughing-in and setting diagrams.
  - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring. **Differentiate between manufacturer-installed and field-installed wiring.**
    - i. Internal wiring diagrams: Provide internal wiring and elementary ladder diagrams for factory pre-wired equipment.
    - ii. Control diagrams: Show relative positions of each component as a system diagram.
  - f. Shopwork manufacturing instructions.
  - g. Templates and patterns.
  - h. Schedules.
  - i. Design calculations.
  - j. Compliance with specified standards.
  - k. Notation of coordination requirements.
  - l. Notation of as-built conditions.
  - m. Notation of dimensions established by field measurement.
- 3. Coordination Drawings: Comply with requirements as stated elsewhere in the Contract Documents.

4. When construction is complete, prepare and submit red-lined copies of the Contract Drawings showing clearly how construction deviated from the design, along with the authority for the deviation or change.
  5. Format
    - a. Size printable to: 8½ by 11 inches minimum and 30 by 42 inches maximum.
    - b. Present in a clear and thorough manner. Title each drawing with Project name. Identify each element of drawing with reference number.
    - c. Plans, elevations, sections, and detail shop drawings shall be to scale with scale indicated.
    - d. Indicate field verified dimensions. Show relationship of products to adjacent work. Note coordination requirements.
    - e. Schematics and diagrams shall be logically arranged and presented in a clear understandable manner with all items labeled.
- C. SD-03 Product Data
1. Provide product data such as manufacturer's brochures, catalog pages, illustrations, diagrams, tables, performance charts, and other material which describe appearance, size, attributes, code and standard compliance, ratings, and other product characteristics.
  2. Mark each copy of each Submittal to show which products and options are applicable.
    - a. Submit **only data which is pertinent**. Mark each copy of manufacturer's standard printed data to identify products, models, options, and other data pertinent to project.
    - b. Modify manufacturer's standard schematic drawings and diagrams and supplement standard data to provide specific information applicable to project. **Delete information not applicable.**
  3. Collect information into single Submittal for each element of construction and type of product or equipment.
  4. If information must be specially prepared for Submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
- D. SD-04 Samples
1. Submit samples to illustrate functional and aesthetic characteristics of products with all integral parts and attachment devices.
  2. Submit number of samples specified in individual specification sections. One sample will be retained by DU Project Manager.



3. Label with identification related to submittal transmittal form.

E. SD-05 Design Data

1. Where required by specification sections provide basic calculations, analyses, and data to support design decisions and demonstrate compliance with specified requirements. State assumptions and define parameters. Give general formulas and references. Provide sketches as required to illustrate design method and application.
2. Prepare written and graphic information, including, but not limited to, performance and design criteria, list of Applicable Laws, and calculations. Include list of assumptions and other performance and design criteria and summary of loads. Provide name and version of software, if any, used for calculations.
3. Arrange calculations and data in a logical manner with suitable text to explain procedures and order. Include page numbers.
4. Indicate name, title, and telephone number of individual performing design and include professional seal of designer where applicable or required.

F. SD-06 Test Reports

1. Written reports from qualified testing agency indicating and interpreting results of field tests performed either during or after installation for compliance with specified requirements.
2. Material Test Reports: Prepare reports written by qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
3. Preconstruction Test Reports: Prepare reports written by qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
4. Compatibility Test Reports: Prepare reports written by qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
5. Field Test Reports: Prepare reports written by qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
6. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by qualified testing agency, or on comprehensive tests performed by qualified testing agency.

7. Research/Evaluation Reports: Prepare written evidence, from model code organization acceptable to authorities having jurisdiction, that product complies with Applicable Laws in effect for Project. Include following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.
- G. SD-07 Certificates
  1. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
  2. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
  3. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
  4. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
  5. Installer approval: Certification on manufacturer's letterhead that installer complies with requirements and is approved for installing manufacturer's products.
  6. Provide notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by officer or other individual authorized to sign documents on behalf of that entity.
- H. SD-08 Manufacturer's Instructions
  1. Where required by specification sections provide manufacturer's instructions for activities such as delivery, storage, assembly, installation, wiring, start-up, adjusting, and finishing.
  2. Indicate pertinent portions and identify conflicts between manufacturer's instructions and Contract Documents.

3. Where appropriate include preparation procedures, service connection requirements, critical ambient conditions, foundation requirements, special precautions, adjustment requirements, alignment procedures, leveling, purging, charging, lubrication and cleaning prior to operation and/or owner's acceptance.
4. Installation (e.g., assembly, mounting, or wiring) and start-up instructions shall be submitted and available for review in the field prior to scheduled material or equipment installation.
5. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include following, as applicable:
  - a. Preparation of substrates.
  - b. Required substrate tolerances.
  - c. Sequence of installation or erection.
  - d. Required installation tolerances.
  - e. Required adjustments.
  - f. Recommendations for cleaning and protection.

I. SD-09 Manufacturer's Field Reports

1. When an individual specification section requires services of manufacturer's field representative, submit report of observations, site decisions, and instructions given to installers.
2. Prepare written information documenting factory-authorized service representative's tests and inspections. Present complete information in clear concise manner. Include following, as applicable:
  - a. Name, address, and telephone number of factory-authorized service representative making report.
  - b. Statement on condition of substrates and their acceptability for installation of product.
  - c. Statement that products at Project site comply with requirements.
  - d. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  - e. Results of operational and other tests and statement of whether observed performance complies with requirements.
  - f. Statement whether conditions, products, and installation will affect warranty.

- g. Other required items indicated in individual Specification Sections.
- 3. Submit report within 15 days of construction site service visit.
- J. SD-10 Operation and Maintenance Data
  - 1. See specification Sections 15010 and 16010.
- K. SD-11 Closeout Submittals
  - 1. See specification Section 01780.

## PART 2 - PRODUCTS

### 2.1 PAPER AND BINDER MATERIALS (When Used)

- A. Paper: To the extent possible, copies of necessary hard copy documents, shall be reproduced on paper with 30 percent minimum post-consumer recycled content and shall be double-sided copies.
- B. Binders: To the extent possible, submittal binders shall have significant recycled content.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Review each Submittal and check for compliance with Contract Documents. Note corrections and field dimensions. Mark with certification stamp before submitting to DU Project Manager.
- B. Stamp and sign each Submittal with "Submittal Certification Form" stamp indicated in Section 1.A.2.

### 3.2 SUBMITTAL REGISTER AND TRANSMITTAL FORM

- A. Contractor shall use submittal register and transmittal forms as directed by DU Project Manager.
- B. Listing of required submittals within this Section is provided for Contractor's convenience. Review specification technical sections and prepare a comprehensive listing of required submittals. Furnish submittals to DU Project Manager for review.
- C. Contractor shall separate each submittal item by listing all submittals in following groups with items in each group sequentially listed by specification section they come from:
  - 1. Administrative
  - 2. Data
  - 3. Tests
  - 4. Closing

- D. Contractor shall separate all different types of data as separate line items all with column requirements.
- E. Contractor shall send monthly updates and reconciled copies electronically to DU Project Manager in MS Word or MS Excel or other format as accepted by DU Project Manager.

### 3.3 USE FOR CONSTRUCTION

- A. Use only final Submittals which bear mark indicating that Submittal has been approved or that construction may proceed.

| Section No. – Title                           | Shop Drawings & Diagrams | Samples | Certificates (Material, Treatment, Applicator, etc.) | Product Data, Manufacturer's Technical Literature and Brochures | MSDS Sheets | Calculations | Reports (Testing, Maintenance, Inspection, etc.) | Test Plan | O & M Manual | Equipment or Fixture Listing | Schedules (Project Installation) | Maintenance Service Contract | Field Posted As-Built Drawings | Others | Guaranty or Warranty | Manufacturer's Guaranty or Warranty (Greater than one year) |
|---|--------------------------|---------|--|---|-------------|--------------|--|-----------|--------------|------------------------------|----------------------------------|------------------------------|--------------------------------|--------|----------------------|---|
| 01210 – Allowances                            |                          |         |  |   |             |              |  |           |              |                              |                                  |                              |                                | ■      |                      |   |
| 01310 – Project Management and Coordination   |                          |         |  |   |             |              |  |           |              |                              | ■                                |                              |                                | ■      |                      |   |
| 01320 – Construction Progress Documentation   |                          |         |  |   |             |              |  |           |              |                              | ■                                |                              |                                | ■      |                      |   |
| 01322 – Web Based Construction Management     |                          |         |  |   |             |              |  |           |              |                              |                                  |                              |                                | ■      |                      |   |
| 01330 – Submittal Procedures                  |                          |         | ■  |   |             |              |  |           |              |                              |                                  |                              |                                | ■      |                      |   |
| 01450 – Moisture Vapor and Alkalinity Testing |                          |         |  |   |             |              | ■  |           |              |                              |                                  |                              |                                | ■      |                      |   |
| 01500 – Temporary Facilities and Controls     |                          |         |  |   |             |              | ■  |           |              |                              |                                  |                              |                                | ■      |                      |   |

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|---|---|--|---|--|---|--|--|--|---|--|--|--|---|---|---|--|
| 01575 –<br>Temporary<br>Controls – Air<br>Quality<br>Requirements |   |  | ■ |  | ■ |  |  |  |   |  |  |  |   |   |   |  |
| 01700 –<br>Execution<br>Requirements                              |   |  |   |  |   |  |  |  |   |  |  |  |   | ■ |   |  |
| 01770 –<br>Closeout<br>Procedures                                 | ■ |  |   |  |   |  |  |  | ■ |  |  |  | ■ | ■ | ■ |  |
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END OF SECTION

## SECTION 01520

### TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Provisions in this section apply to Contractors and Subcontractors working on the Installation, but may be changed from time to time by the Installation, command authorities, or Doyon Utilities' management. Contractor agrees to abide by any and all requirements identified by the Installation, command authorities, and Doyon Utilities management.
- B. Contractor shall not interfere with nor prevent in any manner access to, or exiting from, any street or neighborhood without prior approval from the DU Project Manager.
- C. Contractor shall maintain storage and staging area in a like manner to adjacent areas throughout construction period and return area to original condition prior to project completion.
- D. Contractor shall prevent environmental damage to site throughout contract period.
- E. Contractor is responsible for maintaining work site and storage areas to DU's satisfaction.
- F. Contractor shall provide temporary drainage and dewatering necessary for the work and shall employ pumps, trenches, drains, sumps, and other necessary elements required to provide satisfactory working conditions for protection, execution, and completion of project.
- G. Contractor shall remove all snow and ice as may be required for reasonably safe access to project site including, but not limited to, building entries, driveways, parking lots and sidewalks.
- H. Employee Parking
  - 1. Contractor employees shall park privately owned vehicles in an area designated by DU Project Manager. This area will be within reasonable walking distance of construction site. Contractor employee parking shall not interfere with existing and established parking requirements of Fort Greely military installation.

## 1.2 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01330 SUBMITTAL PROCEDURES.
- B. DU approval is required for the following items
  - 1. Preconstruction Submittals
    - a. Construction Site Plan
    - b. Traffic Control Plan

## 1.3 AVAILABILITY AND USE OF UTILITY SERVICES

- A. Sanitation
  - 1. Contractor shall provide and maintain within construction area minimum field-type sanitary facilities approved by DU project Manager.
  - 2. DU toilet facilities will not be available to Contractor's personnel.
  - 3. Government toilet facilities will not be available to Contractor's personnel.
- B. Telephone
  - 1. Contractor shall make arrangements and pay all costs for telephone facilities desired.

## PART 2 - PRODUCTS

### 2.1 CONSTRUCTION SITE PLAN

- A. Prior to start of work, submit site plan showing locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to fenced area and details of fence installation.
- B. Identify any areas which may have to be graveled to prevent tracking of mud.
- C. Indicate if use of a supplemental or other staging area is desired.
- D. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.



## 2.2 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

### A. Bulletin Board

1. Immediately upon beginning of work, Contractor shall provide weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying Equal Employment Opportunity poster and other information approved by DU Project Manager.
2. Bulletin board shall be located at project site in a conspicuous place easily accessible to all employees, as approved by DU Project Manager.
3. Legible copies of aforementioned data shall be displayed until work is completed. Upon completion of work bulletin board shall be removed by and remain property of Contractor

### B. Project and Safety Signs

1. Do not permit installation of unauthorized signs.

## 2.3 TEMPORARY SAFETY FENCING

- A. As soon as practicable, but not later than 5 business days after acceptance of Contractor Site Plan, Contractor shall furnish and erect temporary project safety fencing at work site.
- B. Trees within a construction site that are to be retained must also be protected by safety fence. Fence shall be placed minimum of 2 feet from trunk of deciduous trees; and be located outside the tip of lowest branches for evergreen trees.
- C. Temporary safety fencing shall be minimum 6 foot high chain link material supported and tightly secured to steel posts located on maximum 10 foot centers, with lockable gates and constructed at approved location. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit.
- D. Alternate fencing materials and installation methods shall be submitted with Contractor Site Plan for review and acceptance of DU.
- E. Safety fencing shall be maintained by Contractor during life of contract and, upon completion and acceptance of work, shall become property of Contractor and shall be removed from work site.

## PART 3 - EXECUTION

### 3.1 ADMINISTRATIVE FIELD OFFICES

- A. Contractor shall provide and maintain administrative field offices, shops and sheds within construction boundaries at designated project site. Comply

with NFPA 241 for all facilities located within 30 feet of building lines.

- B. Contractor shall provide, and maintain in clean condition, adequate sanitary facilities for use by all Persons at work site. Provide temporary single-occupant, self-contained toilet units of the chemical, aerated recirculation, or combustion type for use by all construction personnel. Units shall be properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- C. Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition.
- D. Smoking is prohibited in all DU and Post facilities.
- E. DU office and warehouse facilities will not be available to Contractor's personnel.
- F. Government office and warehouse facilities will not be available to Contractor's personnel.

### 3.2 STORAGE AREAS

- A. Trailers, materials, or equipment shall not be placed or stored outside fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by DU Project Manager away from vicinity of construction site but within military boundaries.
- B. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside fence in preparation for next day's work.
- C. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within fenced area at end of each work day.

### 3.3 APPEARANCE OF TRAILERS

- A. Trailers utilized by Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in opinion of the DU Project Manager, require exterior painting or maintenance will not be allowed on project site.

### 3.4 PROTECTION AND MAINTENANCE OF TRAFFIC

- A. During construction, Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. Contractor shall maintain and protect traffic on all affected roads during construction period except as otherwise specifically directed by DU Project Manager. Measures for

protection and diversion of traffic, including provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs, shall be as required by State and local authorities having jurisdiction.

- B. Traveling public shall be protected from damage to person and property.
- C. Contractor's traffic on roads selected for hauling material to and from site shall interfere as little as possible with public traffic.
- D. Contractor shall investigate adequacy of existing roads and allowable load limit on these roads. Contractor shall be responsible for repair of any damage to roads caused by construction operations.
- E. Haul Roads
  - 1. Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
  - 2. Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
  - 3. Method of dust control, although optional, shall be adequate to ensure safe operation at all times.
  - 4. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by DU Project Manager.
  - 5. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.
  - 6. Upon completion of work, haul roads designated by DU Project Manager shall be removed
- F. Barricades
  - 1. Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure safety of both pedestrian and vehicular traffic.
  - 2. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of hazard during both day and night conditions.

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END OF SECTION

## SECTION 01570

### STORM WATER POLLUTION PREVENTION MEASURES

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. Contractor shall implement storm water pollution prevention measures to prevent sediment and pollutants from entering streams or water bodies as specified in the NPDES CGP Construction General Permit.

##### 1.2 REFERENCES

- A. Latest edition of publications listed below form part of this specification to extent referenced. Publications are referred to within text by basic designation only.

- 1. U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

- a. NPDES CGP General Permit for Storm Water discharges from Construction Activities.

##### 1.3 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01330 SUBMITTAL PROCEDURES.

- B. DU approval is required for the following items

- 1. Preconstruction Submittals

- a. Storm Water Pollution Prevention Plan (SWPPP)
    - b. Notice of Intent (NOI)
    - c. Description of the Project
    - d. Inspector Qualifications
    - e. Design Data Notice of Termination (NOT)

- C. Hardcopy of all certified SWPPPs, inspection forms, and associated documentation executed by Contractor, according to Appendix G, Section 11 of NPDES General Permit, shall be kept on file as part of final approved Contractor's Storm Water Pollution Prevention Plan.

#### 1.4 EROSION AND SEDIMENT CONTROLS

A. Controls and measures required by Contractor are described below.

1. Stabilization Practices

- a. Stabilization practices to be implemented shall include mulching, geotextiles, erosion control mats, preservation of mature vegetation, and/or other EPA recommended Best Management Practices (BMPs). On daily CQC Report, Contractor shall record dates when major grading activities occur, (e.g., clearing and grubbing, excavation, embankment, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Stabilization practices shall be initiated according to Part 3.0, Subpart 3.13D as soon as practicable, but no more than 14 days, in any portion of site where construction activities have temporarily or permanently ceased.

2. Structural Practices

- a. Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of site. Structural practices shall be implemented in a timely manner during construction process to minimize erosion and sediment runoff. Structural practices shall be detailed in SWPPP.

#### 1.5 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

A. Work shall comply with EPA's NPDES CGP. Contractor is responsible for designing, implementing and maintaining all erosion and sediment controls on project site to ensure compliance with all applicable state and federal regulations.

B. Storm Water Pollution Prevention Plan (SWPPP)

1. On behalf of Contractor and DU, Contractor shall prepare a joint SWPPP in accordance with EPA's NPDES CGP for Storm Water Discharges from Construction Activities, Alaska General Permit AK100000 and any additional state requirements. Contractor is also responsible for compliance with any updates and changes to this permit. SWPPP shall be submitted to DU Project Manager for review and approval.
2. Designer of erosion and sediment control plan and SWPPP shall

have appropriate credentials.

3. Designer must be knowledgeable about erosion and sediment controls and be able to develop a practical and effective plan.

C. Notice of Intent (NOI)

1. Contractor shall complete EPA Form 3510-9, Notice of Intent for Storm Water Discharge (NOI) associated with Construction Activity Under an NPDES General Permit, in accordance with regulations and requirements stated on NOI form. A copy of the form is available on Internet or at local Alaska Department of Environmental Conservation (ADEC) office. Contractor shall complete and submit form, along with SWPPP, a one page Description of Project and copy of Project Drawings to DU Project Manager for review and approval.

D. Filing

1. Upon DU approval of submittals, Contractor shall submit package to EPA NPDES Program Director which includes NOI and SWPPP. Electronic Notice of Intent (eNOI) can be filed at <http://cfpub2.epa.gov/npdes/stormwater/enoi.cfm>. In accordance with applicable requirements, no onsite work shall be performed until Contractor's NOI information for project has been posted on EPA's website for seven (7) days and is shown as Active not withstanding any other provisions of this contract.

E. ADEC

1. Upon DU approval of submittals, Contractor will forward copies of Form 3510-9's, along with SWPPP and one page project description, to ADEC in accordance with State of Alaska regulations. Final plans and specifications will be included. Contractor shall pay all fees required in accordance with 18 AAC 72.

F. Notice of Termination (NOT)

1. When requirements of Part 5, Subpart 5.1 of CGP are met at project site, Contractor shall prepare, with DU Project Manager's approval, a Notice of Termination (NOT) of Coverage Under an NPDES General Permit for Storm Water Discharges Associated with Construction Activity, in accordance with regulations and requirements stated on NOT form. Copy of form is available on Internet at <http://cfpup1.epa.gov/npdes/stormwater/cgp.cfm> or at local ADEC office. Completed form shall be submitted to EPA NPDES Program Director and ADEC.

G. Notice of Doyon Utilities' Delegation of Signature Authority and Inspection Duties

1. DU is delegating the Storm Water Pollution Prevention Plan (SWPPP) storm water inspection duties and signature authority on all reports required by Construction General Permit, including SWPPPs and SWPPP storm water inspection forms to the following Contractor positions:
  - a. Corporation: By responsible corporate officer according to Appendix G section 11.A of Construction General Permit (GPC) or his/her duly authorized representative;
  - b. Partnership or sole proprietorship: By general partner or the proprietor, respectively or his/her duly authorized representative; and
  - c. Limited Liability Company (LLC): By responsible LLC officer or his/her duly authorized representative. For purposes of this Section, responsible LLC officer means:
    - i. Manager or member of the LLC in charge of a principal business function, or any other person who performs similar policy or decision-making function for the LLC, or
    - ii. Manager of one or more manufacturing, production, or operating facilities, provided, manager is authorized to make management decisions which govern operation of regulated facility including having explicit or implicit duty of making major capital investment recommendations, and imitating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations;
    - iii. Manager can ensure that necessary systems are established or actions taken to gather complete and accurate information for permit applications requirements; and where authority to sign documents has been assigned or delegated to manager in accordance with LLC procedures.
  - d. This individual should be designated in your Storm Water Pollution Prevention Plan according to Construction General Permit.



2. Once contract is awarded, an original delegation letter will be provided to Contractor. Contractor shall incorporate delegation letter into Contractor's SWPPP.

## PART 2 - PRODUCTS

- 2.1 Details of the selected Best Management Practices (BMPs) and products to be used shall be included in the SWPPP. Products shall be installed and maintained per the manufacturer's recommendations to ensure effectiveness.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR RESPONSIBILITY

- A. Contractor is responsible for complying with all terms of EPA's NPDES regulations and NPDES CGP permit necessary to ensure compliance with applicable regulations concerning water pollution and water quality standards.
- B. Any fines, penalties, citations or fees issued by EPA and/or Alaska Department of Environmental Conservation (ADEC) against DU resulting directly or indirectly from Contractor's failure to adequately comply with pollution and/or water quality standards and duties and/or responsibilities of this specification section during execution of contract shall be full and complete responsibility of Contractor.

### 3.2 MAINTENANCE

- A. Contractor shall maintain temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures.
- B. Records of maintenance shall be included on inspection forms. Contractor shall review and update SWPPP according to requirements of NPDES CGP Part 3, Subpart 3.11.

### 3.3 INSPECTIONS

- A. General
  1. On behalf of Contractor and DU, Contractor shall comply with inspection requirements of the NPDES CGP Part 3, Subpart 3.10, and shall inspect disturbed areas of construction site, areas that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit site at least once every

seven (7) calendar days, or at least once every 14 calendar days and within 24 hours of end of any storm that produces 0.5 inches or more rainfall at site. Where sites have been finally stabilized, SWPPP may be annotated and no further inspection requirements apply to that portion of site.

B. Inspector Qualifications

1. Qualifications shall be submitted for inspector which demonstrates the ability of inspector to meet definitions established in Subpart 3.10.D of CGP. Inspector should have thorough knowledge and background in storm water management practices and hold a Certified Inspector of Sediment and Erosion Control (CISEC), Certified Erosion and Sediment Control Lead (CESCL), or similar storm water inspector certification.

C. Inspections Details

1. Inspections shall be conducted to meet requirements of Subpart 3.10 of Construction General Permit (CGP). following items are minimum criteria for an inspection:
  - a. Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or potential for, pollutants entering drainage system.
  - b. Erosion and sediment control measures identified in Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly.
  - c. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.
  - d. Locations where vehicles exit site shall be inspected for evidence of offsite sediment tracking. Residual sediment shall be removed daily.
2. Projects which are anticipated to not reach final stabilization prior to winter conditions are eligible for reduced inspections. SWPPP shall include start and end dates for a waiver per Subpart 3.10.D of CGP.

D. Inspection Reports

1. For each inspection conducted, Contractor shall comply with Subpart 3.10 G. of CGP and shall prepare a report summarizing scope of inspection, name(s) and qualifications of personnel making inspection, date(s) of inspection, major observations relating to

implementation of Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. Inspection form shall be certified as defined in appendix G 11.D of CGP. An example of an inspection report is located at [http://www.epa.gov/npdes/pubs/sw\\_swppp\\_inspection\\_form.doc](http://www.epa.gov/npdes/pubs/sw_swppp_inspection_form.doc).

2. Report shall be furnished to DU Project Manager within 24 hours of inspection as part of Contractor's daily report. Copy of inspection report shall be maintained on job site.

END OF SECTION

SECTION 01577  
RADIOACTIVE MATERIALS PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers use of items containing radioactive substances, such as soil density measuring devices and x-ray material testing devices, on military property or installations.

1.2 REFERENCES

- A. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
  - 1. 10 CFR 0-199 Code of Federal Regulations, Title 10, Chapter I, Nuclear Regulatory Commission (NRC)

1.3 REQUIREMENTS

- A. Use of radioactive material on military property or installations shall conform to the following requirements.

1.4 STANDARDS

- A. Contractor shall comply with AR 385-10 and DA PAM 385-24.
- B. Contractor shall comply with 10 CFR 0-199.

1.5 PERMIT

- A. Department of the Army (DA) radiation permits are required for use, storage, possession of radiation sources by non-Army agencies (including civilian contractors). Concurrence of Installation Commander is required to obtain an Army radiation permit (ARP). Contractor shall submit a serial letter to Garrison Commander **through DU Project Manager** requesting an ARP. Serial letter shall be provided 45 days prior to requested start date and should include the following:
  - 1. Describe purpose for Army radiation permit for given project.
  - 2. Listing of the name/type of equipment.
  - 3. Specify start and stop dates that equipment will be on installation.
  - 4. Attach copy of current Nuclear Regulatory Commission (NRC) license applicable to equipment referenced to in ARP.
  - 5. Leak Test results.

- B. Serial letter shall be addressed to Garrison Safety Office, 1060 Gaffney Road, #4300, Fort Wainwright 99703-4300.
- C. The Contractor will receive an approval letter from the Garrison Commander allowing use of described radiation equipment on the installation. Upon receipt of this approval letter the contractor shall submit the permit letter and a copy of the application letter to the ACO under the submittal process.

#### 1.6 INITIAL NOTIFICATION

- A. Once the Contractor has received written approval for use of radioactive material through DU Project Manager, radioactive material may be brought onto installation. Contractor shall notify DU Project Manager and Installation Commander immediately upon bringing material onto installation, and again 3 working days prior to initial use of materials.

#### 1.7 COMPLETE NOTIFICATION

- A. Contractor shall notify DU Project Manager and Installation Commander immediately upon completion of use, and when material is removed from installation.

#### 1.8 VIOLATIONS

- A. Contractor will be subject to inspection by DU Project Manager, Installation Commander, and Federal and State agencies or their designated representatives at all times when materials are on installation.
- B. Any violations of conditions of approval, or of applicable regulations, will require immediate cessation of work until cause is corrected, and written approval for re-start of work is received through DU Project Manager from Installation Commander. All delays, down time, etc. incurred as a result of such cessation of work shall be at Contractor's expense.

#### 1.9 ACCIDENTS

- A. Accidents or incidents involving radioactive material, and any known or potential exposure of Contractor or non-Contractor personnel to radiation, shall be reported immediately to DU Project Manager and Installation Commander, and operations suspended until circumstances have been evaluated by DU Project Manager and Installation Commander, and approval for the re-start has been received through DU Project Manager.
- B. In all cases, Contractor shall restore property to NRC unrestricted use criteria.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01780  
CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01330 - SUBMITTAL PROCEDURES.
- B. DU approval is required for the following items:
  - 1. Shop Drawings
    - a. Preliminary Copy of the Final As-Built Drawings
      - i. Preliminary drawings showing final as-built conditions of the project.
      - ii. Provide one set of electronic CADD drawing files in the specified format; one set of blue-line or black-line prints; one set of approved working as-built drawings
    - b. As-Built Drawings
      - i. Drawings showing final as-built conditions of project.
      - ii. Provide three sets of electronic CADD drawing files in specified format; three sets of blue-line or black-line prints; and one set of approved working as-built drawings.
  - 2. Product Data
    - a. As-Built Record of Equipment and Materials
      - i. Three copies of record listing as-built materials and equipment incorporated into construction of project.
    - b. Warranty Management Plan
      - i. Three sets of warranty management plan containing information relevant to warranty of materials and equipment incorporated into construction project, including the starting date of warranty of construction.
      - ii. Contractor shall provide with each warranty the name, address, and telephone number of each guarantor's representatives nearest to project location.

- c. Warranty Tags
  - i. Three record copies of warranty tags showing layout and design.
- d. Final Cleaning
  - i. Three copies of listing of completed final clean-up items.

## 1.2 PROJECT RECORD DOCUMENTS

### A. As-Built Drawings

- 1. This paragraph covers as-built drawings complete, as a requirement of contract. Terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

### B. Working As-Built and Final As-Built Drawings

- 1. Contractor shall revise 2 sets of paper drawings by red-line process to show the as-built conditions during prosecution of project. These working as-built marked drawings shall be kept current on a weekly basis and at least one set shall be available on jobsite at all times.
- 2. Changes from contract plans which are made in work or additional information which might be uncovered in course of construction shall be accurately and neatly recorded as they occur by means of details and notes. Final as-built drawings shall be prepared after completion of work.
- 3. Working as-built marked prints and final as-built drawings will be jointly reviewed for accuracy and completeness by DU Project Manager and Contractor prior to submission of each monthly pay estimate. If Contractor fails to maintain working and final as-built drawings as specified herein, DU Project Manager will deduct from monthly progress payment an amount representing estimated cost of maintaining as-built drawings. This monthly deduction will continue until an agreement can be reached between DU Project Manager and Contractor regarding accuracy and completeness of updated drawings.
- 4. Working and final as-built drawings shall show, but shall not be limited to, the following information:



- a. Actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in event surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along utility run from a reference point. Average depth below surface of each run shall also be recorded.
  - b. Location and dimensions of any changes within the utilidor, access vault and building structure.
  - c. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.
5. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
  6. Topography, invert elevations and grades of drainage installed or affected as part of project construction.
  7. Changes or modifications which result from final inspection.
  8. Where contract drawings or specifications present options, only option selected for construction shall be shown on final as-built prints.
  9. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, Contractor shall furnish a contour map of final borrow pit/spoil area elevations.
  10. Modifications (change order price shall include Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with following procedures.
    - a. Directions in modification for posting descriptive changes shall be followed.
    - b. Modification Circle shall be placed at location of each deletion.
    - c. For new details or sections which are added to a drawing, Modification Circle shall be placed by detail or section title.

- d. For minor changes, Modification Circle shall be placed by area changed on drawing (each location).
  - e. For major changes to a drawing, Modification Circle shall be placed by title of affected plan, section, or detail at each location.
  - f. For changes to schedules on drawings, Modification Circle shall be placed either by schedule heading or by change in the schedule.
11. Modification Circle size shall be 1/2 inch diameter unless area where circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

C. Drawing Preparation

- 1. as-built drawings shall be modified as may be necessary to correctly show features of project as it has been constructed by bringing contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints shall be neat, legible and accurate.
- 2. These drawings are part of permanent records of this project and shall be returned to DU Project Manager. Any drawings damaged or lost by Contractor shall be satisfactorily replaced by Contractor at no expense to DU.

D. Computer Aided Design and Drafting (CADD) Drawings

- 1. Only personnel proficient in preparation of CADD drawings shall be employed to modify contract drawings or prepare additional new drawings. Additions and corrections to contract drawings shall be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols shall be same as original line colors, line weights, lettering, layering conventions, and symbols.
- 2. If additional drawings are required, they shall be prepared using the specified electronic file format applying same graphic standards specified for original drawings.
- 3. Title block and drawing border to be used for any new final as-built drawings shall be identical to that used on contract drawings. Additions and corrections to contract drawings shall be accomplished using CADD files.

4. Contractor will be furnished "as-designed" drawings in AutoCAD compatible with Windows NT operating system. Electronic files will be supplied on compact disc, read-only memory (CD-ROM). Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings.
5. DU Project Manager will review final as-built drawings for accuracy and Contractor shall make required corrections, changes, additions, and deletions.
6. CADD colors shall be the "base" colors of red, green, and blue. Color code for changes shall be as follows
  - a. Deletions (red) - Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders.
  - b. Additions (Green) - Added items shall be drawn in green with green lettering in notes and leaders.
  - c. Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes shall be in blue.
7. When final revisions have been completed, the cover sheet drawing shall show wording "RECORD DRAWING AS-BUILT" followed by name of Contractor in letters at least 3/16 inch high. All other contract drawings shall be marked either "AS-Built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. Original contract drawings shall be dated in revision block.
8. Within 20 days of substantial completion of all phases of work, Contractor shall submit one preliminary set of final as-built drawing package for entire project for DU Project Manager review and approval. They shall be complete in all details and identical in form and function to contract drawing files supplied by DU. DU Project Manager will promptly return one set of prints annotated with any necessary corrections.
9. Within 10 days Contractor shall revise CADD files accordingly at no additional cost to DU and submit final as-built drawing package for DU Project Manager review and approval. Any transactions or adjustments necessary to accomplish this is responsibility of Contractor. DU Project Manager reserves the right to reject any drawing files deemed incompatible with DU's CADD system.
10. Paper prints, drawing files and storage media submitted will become property of DU upon final approval. Failure to submit final as-built

drawing files and marked prints as specified shall be cause for withholding any payment due to Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to Contractor.

E. Payment

1. No separate payment will be made for as-built drawings required under this contract, and all costs accrued in connection with such drawings shall be considered a subsidiary obligation of Contractor.

F. As-Built Record of Equipment and Materials

1. Contractor shall furnish one copy of preliminary record of equipment and materials used on project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with DU Project Manager comments. Three sets of final record of equipment and materials shall be submitted 10 days after final inspection. Designations shall be keyed to related area depicted on contract drawings. record shall indicate following data:

| Description | Specification Section | Manufacturer and Catalog, Model, and Serial No. | Composition and Size | Where Used |
|-------------|-----------------------|---|----------------------|------------|
|             |                       |   |                      |            |
|             |                       |   |                      |            |

H. Final Approved Shop Drawings

1. Contractor shall furnish final approved project shop drawings 30 days after transfer of completed facility.

I. Construction Contract Specifications

1. Contractor shall furnish final as-built construction contract specifications, including modifications thereto, 30 days after transfer of completed facility.

J. Real Property Equipment

1. Contractor shall furnish list of installed equipment furnished under this contract. List shall include all information usually listed on manufacturer's name plate. "EQUIPMENT-IN-PLACE LIST" shall include, as applicable, the following for each piece of equipment installed: description of item, location, model number, serial number, capacity, name and address of manufacturer, name and address of

equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. Draft list shall be furnished at time of transfer. Final list shall be furnished 30 days after transfer of completed facility.

### 1.3 WARRANTY MANAGEMENT

#### A. Warranty Management Plan

1. Contractor shall develop a warranty management plan which shall contain information relevant to the clause Warranty of Construction in Section 01920 CLOSEOUT SUBMITTALS. At least 30 days before planned pre-warranty conference, Contractor shall submit warranty management plan for DU Project Manager approval. Warranty management plan shall include all required actions and documents to assure that DU receives all warranties to which it is entitled.
2. Plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. Term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Warranty information made available during construction phase shall be submitted to DU Project Manager for approval prior to each monthly pay estimate. Approved information shall be assembled in a binder and shall be turned over to DU Project Manager upon acceptance of the work. Construction warranty period shall begin on date of project acceptance and shall continue for full product warranty period. A joint 4 month and 9 month warranty inspection shall be conducted, measured from time of acceptance, by Contractor and DU Project Manager. Information contained in the warranty management plan shall include, but shall not be limited to, the following:
  - a. Roles and responsibilities of all personnel associated with warranty process, including points of contact and telephone numbers within organizations of Contractors, subcontractors, manufacturers or suppliers involved
  - b. Listing and status of delivery of all Certificates of Warranty for extended warranty items.
  - c. List for each warranted equipment, item, feature of construction or system indicating:
    - i. Name of item.
    - ii. Model and serial numbers.

- iii. Location where installed.
  - iv. Name and phone numbers of manufacturers or suppliers.
  - v. Names, addresses and telephone numbers of sources of spare parts.
  - vi. Warranties and terms of warranty. This shall include one-year overall warranty of construction. Items which have extended warranties shall be indicated with separate warranty expiration dates.
  - vii. Cross-reference to warranty certificates as applicable.
  - viii. Starting point and duration of warranty period.
  - ix. Summary of maintenance procedures required to continue the warranty in force.
  - x. Cross-reference to specific pertinent Operation and Maintenance manuals.
  - xi. Organization, names and phone numbers of persons to call for warranty service.
  - xii. Typical response time and repair time expected for various warranted equipment.
- d. Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections conducted by DU Project Manager.
  - e. Procedure and status of tagging of all equipment covered by extended warranties
  - f. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons
3. Performance Bond
- a. Contractor's Performance Bond shall remain effective throughout construction period
    - i. In event Contractor fails to commence and diligently pursue any construction warranty work required, DU Project Manager will have work performed by others, and after completion of work, will charge remaining

construction warranty funds of expenses incurred by DU while performing work, including, but not limited to administrative expenses.

- ii. In event sufficient funds are not available to cover construction warranty work performed by DU at Contractor's expense, DU will have the right to recoup expenses from the bonding company
- iii. Following oral or written notification of required construction warranty repair work, Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of Contractor to respond will be cause for DU Project Manager to proceed against Contractor

4. Pre-Warranty Conference

- a. Prior to contract completion, and at a time designated DU Project Manager, Contractor shall meet with DU Project Manager to develop a mutual understanding with respect to requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by DU Project Manager for execution of construction warranty shall be established/reviewed at this meeting.
- b. Contractor shall furnish name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of Contractor. This point of contact will be located within local service area of warranted construction, shall be continuously available, and shall be responsive to DU Project Manager inquiry on warranty work action and status. This requirement does not relieve Contractor of any of its responsibilities in connection with other portions of this provision

5. Contractor's Response to Construction Warranty Service Requirements

- a. Following oral or written notification by DU Project Manager, Contractor shall respond to construction warranty service requirements in accordance with "Construction Warranty Service Priority List" and the three categories of priorities listed below. Contractor shall submit a report on any warranty

item that has been repaired during warranty period. Report shall include cause of problem, date reported, corrective action taken, and when repair was completed. If Contractor does not perform construction warranty within timeframes specified, DU will perform work and back charge construction warranty payment item established

- i. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.
- ii. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
- iii. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief

6. The "Construction Warranty Service Priority List" is as follows:

- a. Code 1 - Access Hatches
  - i. Utilidor access hatches or hardware, not functioning properly, causing a security or safety problem.
- b. Code 1 - Electrical
  - i. Utility Distribution Monitoring System
    - Communication between local control panels and building 606 control panel.
    - Communication between field devices and local control panels.
    - Power to utilidor control panels.
    - Power to field devices.
- c. Code 1 – Heat
  - i. Leaks and breaks in heat distribution mains.
  - ii. No HDS to family housing unit or cantonment area.
- d. Code 1 – Water



- i. Leaks and breaks in water distribution mains.
- ii. No WDS to family housing unit or cantonment area.
- e. Code 2 – Electrical
  - i. Utilidor Power Panels
    - Power to utilidor lights.
    - Power to utilidor convenience outlets.
- f. Code 2 – Heat
  - i. Leaks and breaks in HDS service laterals.
- g. Code 2 – Water
  - i. Leaks and breaks in WDS service laterals.
- h. Code 3 -
  - i. All other work not listed above will be determined based on the nature of the item/work.

**B. Warranty Tags**

1. At time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag approved by DU Project Manager. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. Date of acceptance and the signature shall remain blank until project is accepted for beneficial occupancy. Tag shall show the following information (select appropriate job number as applicable):

| <b>WARRANTY TAG</b>       |  |
|---------------------------|--|
| DU Project Name:          | <b>Utility Service Extension to Aircraft Parts Storage</b> |
| DU Job Number:            | <b>[J101396 – WDS][J101395 – HDS][J101397-WCS]</b>         |
| Type of product/material: |  |
| Model number:             |  |
| Serial number:            |  |
| Contract number:          |  |
| Warranty period:          |  |
| Inspector's signature:    |  |

| <b>Construction Contractor</b>  |  |
|---|--|
| Company Name:   |  |
| Company Address:  |  |
| Office Phone:   |  |
| Warranty Contact:   |  |
| Office Phone:   |  |
| Mobile Phone:   |  |
| Warranty response time<br>priority code:  |  |
| <b>WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL<br/>MAINTENANCE DURING WARRANTY PERIOD</b> |  |

1.3 MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

- A. Prior to final inspection and transfer of completed facility; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems shall be submitted to and approved by DU Project Manager as specified in applicable technical specification sections.

1.4 OPERATION AND MAINTENANCE (O&M)MANUALS

- A. Five copies shall be submitted to DU Project Manager not later than 30 days prior to scheduled contract completion. Failure to submit manuals by this date will be considered cause to withhold any payments due Contractor. All equipment manual materials shall be durable, clearly printed or reproduced copies, not more than 8-1/2 x 11 inches in size, or neatly folded to that size without overlapping into the binding. Materials shall be indexed and bound in stiff covers with tab separators. Approval of manuals shall be obtained prior to scheduling operating tests and field training courses. Each hard copy O&M manual submitted shall be accompanied by a copy of the manual on compact disc, read-only memory (CD-ROM) format.

1.5 FINAL CLEANING

- A. Premises shall be left broom clean. Stains, foreign substances, and temporary labels shall be removed from surfaces. Equipment and fixtures shall be cleaned to a sanitary condition. Debris shall be removed from roofs, drainage systems, gutters, and downspouts. Paved areas shall be swept and landscaped areas shall be raked clean. Site shall have waste, surplus materials, and rubbish removed. Project area shall have temporary structures, barricades, project signs, and construction facilities removed. A list of completed clean-up items shall be submitted on day of final inspection.

PART 2 - PRODUCT

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 02080

ASBESTOS HAZARD CONTROL ACTIVITIES

PART 1 - GENERAL

1.1 REFERENCES

- A. Latest edition of publications listed below form a part of this specification to extent referenced. Publications are referred to within text by basic designation only.
- B. STATE OF ALASKA ADMINISTRATIVE CODE (AAC)
  - 1. 8 AAC 61 Occupational Safety and Health
  - 2. 18 AAC 60(2003) Solid Waste Management
- C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
  - 1. ANSI Z87.1 Practice for Occupational and Educational Eye and Face Protection
  - 2. ANSI Z88.2 Respiratory Protection
  - 3. ANSI Z9.2 Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems
- D. ASTM INTERNATIONAL (ASTM)
  - 1. ASTM D 1331 Surface and Interfacial Tension of Solutions of Surface-Active Agents
  - 2. ASTM D 4397 Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
  - 3. ASTM E 1368 Visual Inspection of Asbestos Abatement Projects
- E. COMPRESSED GAS ASSOCIATION (CGA)
  - 1. CGA G-7 Compressed Air for Human Respiration
- F. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
  - 1. NFPA 701 Fire Tests for Flame Propagation of Textiles and Films
- G. NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)
  - 1. NIOSH 94-113(1994; 4th Ed) NIOSH Manual of Analytical Methods
- H. U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
  - 1. EPA 340/1-90/018 Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance
  - 2. EPA 560/5-85-024 Guidance for Controlling Asbestos-Containing Materials in Buildings (Purple Book)

- I. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
  - 1. 29 CFR 1910.134 Respiratory Protection
  - 2. 29 CFR 1910.141 Sanitation
  - 3. 29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)
  - 4. 29 CFR 1926.1101 Asbestos
  - 5. 29 CFR 1926.32 Safety and Health Regulations for Construction - Definition
  - 6. 29 CFR 1926.352 Fire Prevention
  - 7. 29 CFR 1926.59 Hazard Communication
  - 8. 40 CFR 61 National Emission Standards for Hazardous Air Pollutants
  - 9. 40 CFR 763 Asbestos
  - 10. 42 CFR 84 Approval of Respiratory Protective Devices
  - 11. 49 CFR 107 Hazardous Materials Program Procedures
  - 12. 49 CFR 171 General Information, Regulations, and Definitions
  - 13. 49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
  - 14. 49 CFR 173 Shippers - General Requirements for Shipments and Packagings
- J. UNDERWRITERS LABORATORIES (UL)
  - 1. UL 586 High-Efficiency, Particulate, Air Filter Units

## 1.2 DEFINITIONS

- A. Adequately Wet
  - 1. A term defined in 40 CFR 61, Subpart M, and EPA 340/1-90/018 meaning to sufficiently mix or penetrate with liquid to prevent the release of particulate. If visible emissions are observed coming from asbestos-containing material (ACM), then that material has not been adequately wetted. However, absence of visible emissions is not sufficient evidence of being adequately wetted.
- B. Amended Water
  - 1. Water containing wetting agent or surfactant with surface tension of at least 29 dynes per square centimeter when tested in accordance with ASTM D 1331.

- C. Asbestos-Containing Material (ACM)
  - 1. Any materials containing more than one percent asbestos.
- D. Authorized Person
  - 1. Any person authorized by Contractor and required by work duties to be present in regulated areas.
- E. Building Inspector
  - 1. Individual who inspects buildings for asbestos and has EPA Model Accreditation Plan (MAP) "Building Inspector" training; accreditation required by 40 CFR 763, Subpart E, Appendix C, has EPA/State certification/license as a "Building Inspector".
- F. Certified Industrial Hygienist (CIH)
  - 1. An Industrial Hygienist certified in practice of industrial hygiene by American Board of Industrial Hygiene.
- G. Class I Asbestos Work
  - 1. Activities defined by OSHA involving removal of thermal system insulation (TSI) and surfacing ACM.
- H. Class II Asbestos Work
  - 1. Activities defined by OSHA involving removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, removal of asbestos - containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Certain "incidental" roofing materials such as mastic, flashing and cements when they are still intact are excluded from Class II asbestos work. Removal of small amounts of these materials which would fit into a glovebag may be classified as a Class III job.
- I. Class III Asbestos Work
  - 1. Activities defined by OSHA that involve repair and maintenance operations, where ACM, including TSI and surfacing ACM, is likely to be disturbed. Operations may include drilling, abrading, cutting a hole, cable pulling, crawling through tunnels or attics and spaces above ceiling, where asbestos is actively disturbed or asbestos-containing debris is actively disturbed.
- J. Class IV Asbestos Work
  - 1. Maintenance and custodial construction activities during which employees contact but do not disturb ACM and activities to clean-up dust, waste and debris resulting from Class I, II, and III activities. This may include dusting surfaces where ACM waste and debris

and accompanying dust exists and cleaning up loose ACM debris from TSI or surfacing ACM following construction.

K. Clean Room

1. An uncontaminated room having facilities for storage of employees' street clothing and uncontaminated materials and equipment.

L. Competent Person

1. In addition to definition in 29 CFR 1926.32(f), person who is capable of identifying existing asbestos hazards as defined in 29 CFR 1926.1101, selecting appropriate control strategy, has authority to take prompt corrective measures to eliminate them and has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training; has EPA/State certification/license as "Contractor/Supervisor".

M. Contractor/Supervisor

1. Individual who supervises asbestos abatement work and has EPA Model Accreditation Plan "Contractor/Supervisor" training; has EPA/State certification as a "Contractor/Supervisor".

N. Critical Barrier

1. One or more layers of plastic sealed over all openings into a regulated area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a regulated area from migrating to an adjacent area.

O. Decontamination Area

1. An enclosed area adjacent and connected to regulated area and consisting of an equipment room, shower area, and clean room, which is used for decontamination of workers, materials, and equipment that are contaminated with asbestos.

P. Demolition

1. Wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

Q. Disposal Bag

1. 6 mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926.1101, used for transporting asbestos waste from containment to disposal site.

R. Disturbance

1. Activities that disrupt matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than amount which can be

contained in 1 standard sized glovebag or waste bag, not larger than 60 inches in length and width in order to access a building component.

- S. Equipment Room or Area
  - 1. An area adjacent to regulated area used for decontamination of employees and their equipment.
- T. Fiber
  - 1. A fibrous particulate, 5 micrometers or longer, with a length to width ratio of at least 3 to 1.
- U. Friable ACM
  - 1. term defined in 40 CFR 61, Subpart M and EPA 340/1-90/018 meaning any material which contains more than 1 percent asbestos, as determined using method specified in 40 CFR 763, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
- V. Glovebag
  - 1. Not more than a 60 by 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.
- W. High-Efficiency Particulate Air (HEPA) Filter
  - 1. Filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.
- X. Homogeneous Area
  - 1. Area of surfacing material or thermal system insulation that is uniform in color and texture.
- Y. Industrial Hygienist
  - 1. Professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards.
- Z. Intact
  - 1. ACM which has not crumbled, been pulverized, or otherwise deteriorated so that asbestos is no longer likely to be bound with its matrix. Removal of "intact" asphaltic, resinous, cementitious products does not render ACM non-intact simply by being separated into smaller pieces.



- AA. Model Accreditation Plan (MAP)
  - 1. USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763.
- BB. Negative Initial Exposure Assessment
  - 1. Demonstration by Contractor to show that employee exposure during an operation is expected to be consistently below OSHA Permissible Exposure Limits (PELs).
- CC. NESHAP
  - 1. National Emission Standards for Hazardous Air Pollutants. USEPA NESHAP regulation for asbestos is at 40 CFR 61, Subpart M.
- DD. Nonfriable ACM
  - 1. NESHAP term defined in 40 CFR 61, Subpart M and EPA 340/1-90/018 meaning any material containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.
- EE. Nonfriable ACM (Category I)
  - 1. NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90/018 meaning asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos.
- FF. Nonfriable ACM (Category II)
  - 1. NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90/018 meaning any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos.
- GG. Permissible Exposure Limits (PELs)
  - 1. PEL-Time weighted average(TWA)
    - a. Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8 hour time weighted average (TWA).
  - 2. PEL-Excursion Limit
    - a. Airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes.
- HH. Regulated Area
  - 1. OSHA term defined in 29 CFR 1926.1101 meaning an area established by Contractor to demarcate areas where Class I, II, and III asbestos work is conducted; also any adjoining area where debris and waste from such asbestos work accumulate; and an

area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.

II. Removal

1. All operations where ACM is taken out or stripped from structures or substrates, and includes demolition operations.

JJ. Repair

1. Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM attached to structures or substrates.

KK. Surfacing ACM

1. Asbestos-containing material which contains more than 1% asbestos and is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.

LL. Thermal system insulation (TSI) ACM

1. ACM which contains more than 1% asbestos and is applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain or water condensation.

MM. Transite

1. Generic name for asbestos cement wallboard and pipe.

NN. Worker

1. Individual (not designated as Competent Person or supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926.1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation if required by OSHA Class of work to be performed or by state where work is to be performed.

1.3 SUBMITTALS

- A. Doyon Utilities LLC approval is required for submittals with a "D" designation; submittals not having a "D" designation are for information only. The following shall be submitted:
- B. SD-02 Shop Drawings
  1. Detailed Drawings; D
    - a. Descriptions, detailed drawings, and site layout to include worksite containment area(s), local exhaust systems

locations, decontamination units and load-out units, other temporary waste storage facility, location of temporary utilities (electrical, water, sewer) and boundaries of each regulated area.

C. SD-03 Product Data

1. Asbestos Waste Shipment Records; D
2. Weight Bills and Delivery Tickets; D
3. Waste shipment records; D
  - a. Encapsulants
4. Respiratory Protection Program; D
  - a. Activity Hazard Analyses
5. Cleanup and Disposal
6. Asbestos Hazard Abatement Plan; D
7. Manufacturer's catalog data for all materials and equipment to be used, including brand name, model, capacity, performance characteristics and any other pertinent information. Test results and certificates from manufacturer of encapsulants substantiating compliance with performance requirements of this specification. Material Safety Data Sheets for all chemicals to be used onsite in same format as implemented in Contractor's HAZARD COMMUNICATION PROGRAM. Data shall include, but shall not be limited to, the following items:
  - a. High Efficiency Filtered Air (HEPA) local exhaust equipment
  - b. Vacuum cleaning equipment
  - c. Pressure differential monitor for HEPA local exhaust equipment
  - d. Respirators
  - e. Personal protective clothing and equipment
  - f. Glovebags.
  - g. Duct Tape
  - h. Disposal Containers
  - i. Sheet Plastic
  - j. Wetting Agent
  - k. Strippable Coating
  - l. Prefabricated Decontamination Unit

- m. Material Safety Data Sheets (for all chemicals proposed)
- 8. Qualifications; D
  - a. Proof of required State of Alaska Department of Labor, Asbestos Certifications providing evidence of qualifications for personnel, facilities and equipment assigned to the work.
- 9. Training Program
  - a. Copy of written project site-specific training material as indicated in 29 CFR 1926.1101 that will be used to train onsite employees.
- 10. Licenses, Permits and Notifications; D
  - a. Licenses, permits, and notifications.
- D. SD-06 Test Reports
  - 1. Exposure Assessment and Air Monitoring; D
    - a. Initial exposure assessments, negative exposure assessments, air-monitoring results and documentation.
  - 2. Local Exhaust System
    - a. Pressure differential recordings.
- E. SD-07 Certificates
  - 1. Local Exhaust System
  - 2. Manufacturer's certifications showing compliance with ANSI Z9.2 for:
    - a. Vacuums.
    - b. Water filtration equipment.
    - c. Ventilation equipment.
    - d. Other equipment required to contain airborne asbestos fibers.
    - e. Encapsulants
      - i. Certificates stating that encapsulants meet applicable specified performance requirements.
    - f. Medical Surveillance Requirements
      - ii. Required medical certification and the Physician's written opinion.

#### 1.4 DESCRIPTION OF WORK

- A. This section covers all operations in which asbestos-containing materials (ACM) are encountered and as necessary for this project including

removal of utilidor system lids and demolition and re-installation of pipe systems and appurtenances located within the utilidor system. These procedures and equipment are required to protect workers and environment from airborne asbestos fibers and ACM dust and debris. Activities include OSHA, Class I, Class II, and Class IV work operations. This section also includes containment, storage, transportation and disposal of the generated ACM wastes.

- B. All subcontractors to primary contractor will provide documentation and signatures that they have reviewed and agree to requirements of this specification and all plans required by this specification. It is the responsibility of primary contractor to make sure above occurs prior to asbestos related work being performed.

C. Abatement Work Tasks

1. All existing materials encountered on or within utilidor system are to be assumed asbestos containing unless sampling by Contractor determines otherwise. Sampling shall be conducted by personnel who have successfully completed EPA Model Accreditation Plan (MAP) "Building Inspector" training course and is EPA/State certified/licensed as a "Building Inspector" as required by 40 CFR 763, Subpart E, Appendix C.
2. Materials that are not disturbed by scope of demolition and renovation work will not require abatement.
3. All suspect ACM to be abated in utility and utilidor system includes: all thermal system insulation on all pipe systems in utility/utilidor main sections and laterals and small sections of main utility/utilidor sections that have been previously abated may contain asbestos at concentrations greater than 1%. Sections of main utilidors that may have been previously abated may have become re-contaminated and shall be abated using Class I procedures. In addition, existing sewer lines (cement asbestos pipe/transite), gaskets, valve packing, lid, wall and floor section sealants, thermal system insulation, dust, debris and silt in all areas, including the dust on all surfaces within utilidor sections to be impacted by this project are assumed to contain asbestos at concentrations exceeding 1%. All laterals not being abated shall be protected from contamination during abatement activities and cleaned to a distance two feet from opening after abatement is performed. Barriers will be built/established and put in place to prevent recontamination of abated utilidors and laterals from unabated utilidors and laterals.

D. Unexpected Discovery of Asbestos

1. For any previously unidentified components suspected to contain asbestos and located in areas impacted by work, Contractor shall

notify DU Project Manager who will have option of ordering up to 10 bulk samples to be obtained at Contractor's expense and delivered to laboratory accredited under National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program (NVLAP)" and analyzed by PLM at no additional cost to DU. If asbestos content is less than 10 percent, as determined by a method other than point counting, asbestos content shall be verified by point counting. Any additional components identified as ACM that have been approved by DU Project Manager for removal shall be removed by Contractor and will be paid for by an equitable adjustment to contract price. Sampling shall be conducted by personnel who have successfully completed EPA Model Accreditation Plan (MAP) "Building Inspector" training course and is EPA/State certified/licensed as a "Building Inspector" as required by 40 CFR 763, Subpart E, Appendix C.

## 1.5 QUALIFICATIONS

### A. Written Qualifications and Organization Report

1. Contractor shall furnish written qualifications providing evidence of qualifications of Contractor, Contractor's Project Supervisor, Designated Competent Person, supervisors and workers; Designated IH; independent testing laboratory; all subcontractors to be used including disposal transportation and disposal facility firms, subcontractor supervisors, subcontractor workers; and any others assigned to perform asbestos abatement and support activities.

### B. Specific Requirements

1. Contractor shall designate in writing, personnel meeting the following qualifications:
  - a. Asbestos Abatement Contractor
    - i. Contractor shall be certified/licensed by applicable Alaska state agencies to perform asbestos-related activities.
  - b. Designated Competent Person
    - ii. Evidence that full-time Designated Competent Person is qualified in accordance with 29 CFR 1926.32 and 29 CFR 1926.1101, has EPA MAP "Contractor/Supervisor" training accreditation, has EPA/State certification/license as "Contractor/Supervisor" and is experienced in administration and supervision of asbestos abatement projects, including exposure assessment and monitoring, work practices, abatement methods,

protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, etc. Designated Competent Person shall be responsible for compliance with applicable federal, state and local requirements, Contractor's Accident Prevention Plan (APP) and Asbestos Hazard Abatement Plan (AHAP). Contractor shall submit, "Contractor/Supervisor" course completion certificate and most recent certificate for required refresher training, EPA/State certification/license with employee "Certificate of Worker Acknowledgment". Contractor shall submit evidence that this person has minimum of 2 years of on-the-job asbestos abatement experience relevant to OSHA competent person requirements. Designated Competent Person shall be onsite at all times during conduct of this project.

c. Project and Other Supervisors

- i. Evidence that Project Supervisor and other supervisors have EPA MAP "Contractor/Supervisor" training accreditation. Contractor shall submit the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training, EPA/State certification/license with employee "Certificate of Worker Acknowledgment". Contractor shall submit evidence that Project Supervisor has minimum of 2 years of on-the-job asbestos abatement experience relevant to project supervisor responsibilities and other supervisors have minimum of 1 year on-the-job asbestos abatement experience commensurate with responsibilities they will have on this project.

b. Designated Industrial Hygienist

- i. Contractor shall provide resume for Industrial Hygienist (IH) that reviews Contractor's AHAP, direct air monitoring and assist Contractor's Competent Person in implementing and ensuring that safety and health requirements are complied with during

performance of all required work. Designated IH shall be a person who is board certified in practice of industrial hygiene or board eligible (meets all education and experience requirements) as determined and documented by American Board of Industrial Hygiene (ABIH), has EPA MAP "Contractor/Supervisor" training accreditation, has EPA/State certification/license, and has a minimum of 2 years of comprehensive experience in planning and overseeing asbestos abatement activities. Designated IH shall be completely independent from Contractor according to federal, state, or local regulations; that is, shall not be Contractor's employee or be an employee or principal of a firm in a business relationship with Contractor negating such independent status. Copy of Designated IH's current valid ABIH confirmation of eligibility in writing from the ABIH shall be included. Designated IH should visit site at least once during duration of asbestos activities and shall be available for emergencies. In addition, Contractor shall submit resumes of additional IH's and industrial hygiene technicians (IHT) who will be assisting Designated IH in performing onsite tasks. IHs and IHTs supporting Designated IH shall have minimum of 2 years of practical onsite asbestos abatement experience.

- b. Asbestos Abatement Workers
  - i. Asbestos abatement workers shall meet requirements contained in 29 CFR 1926.1101, 40 CFR 61, Subpart M, State of Alaska, 8AAC 61 and other applicable federal, state and local requirements.
- b. Worker Training
  - i. Training documentation is required for each employee who will perform OSHA Class I, Class II, or Class IV asbestos abatement operations. Training course completion certificates (most recent update refresher and State of Alaska, Department of Labor Asbestos Worker Certificate) shall be attached.
- b. Independent Testing Laboratory
  - i. Contractor shall identify independent testing laboratory selected to perform sample analyses and report the results. Testing laboratory shall be completely independent from Contractor as



recognized by federal, state or local regulations. Written verification of the following criteria, signed by testing laboratory principal and Contractor, shall be submitted:

- Phase contrast microscopy (PCM): laboratory is fully equipped and proficient in conducting PCM of airborne samples using the methods specified by 29 CFR 1926.1101, OSHA method ID-160, most current version of NIOSH 94-113 Method 7400. laboratory shall be currently judged proficient (classified as acceptable) in counting airborne asbestos samples by PCM by successful participation in each of the last 4 rounds in American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program or by participating in AIHA PAT Program, and being judged proficient in counting samples. Analysts of PCM samples shall submit verified documentation of their proficiency to conduct PCM analyses by being judged proficient in counting samples as current participating analysts in the AIHA PAT Program, and having successfully completed the Asbestos Sampling and Analysis course (NIOSH 582 or equivalent) with a copy of course completion certificate provide.;
- Polarized light microscopy (PLM): laboratory is fully equipped and proficient in conducting PLM analyses of suspect ACM bulk samples in accordance with 40 CFR 763, Subpart E, Appendix E; laboratory is currently accredited by NIST under NVLAP for bulk asbestos analysis and will use analysts with demonstrated proficiency to conduct PLM analyses.

b. Disposal Facility, Transporter

- i. All regulated ACM and non-regulated ACM or other contaminated material from utilidors, shall be disposed of at Ft. Wainwright Landfill in accordance with "Solid Waste Collection and Disposal Procedure", dated January 2009. Copies of signed agreements between Contractor, subcontractors and transporters

of all asbestos containing waste generated during performance of this contract shall be provided. Qualifications shall be provided for each subcontractor or transporter to be used. Contractor and transporters shall meet DOT requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as registration requirements of 49 CFR 107 and other applicable state or local requirements. disposal facility shall meet requirements of 40 CFR 61, Sections .154 or .155, as required in 40 CFR 61, Section .150(b), and other applicable state or local requirements.

b. Federal, State or Local Citations on Previous Projects

- i. Contractor and all subcontractors shall submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities for the past 5 years (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company shall be provided.

1.2 REGULATORY REQUIREMENTS

- A. In addition to detailed requirements of this specification, work performed under this contract shall comply with, applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. Where requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, most stringent requirements shall apply.

1.3 SAFETY AND HEALTH PROGRAM AND PLANS

- A. Contractor shall prepare a written comprehensive site-specific Safety and Health Plan prior to preconstruction conference. SHP shall incorporate an Asbestos Hazard Abatement Plan, and Activity Hazard Analyses as separate appendices into one site-specific document. Any portions of Contractor's overall Safety and Health Program that are referenced in Accident Prevention Plan, e.g., respirator program, hazard communication program, confined space entry program, etc., shall be included as

appendices to the Accident Prevention Plan. Plan shall be prepared, signed and dated by Contractor's Project Supervisor.

B. Asbestos Hazard Abatement Plan Appendix

1. The AHAP shall include, but not be limited to, the following:
  - a. personal protective equipment to be used;
  - b. location and description of regulated areas including clean and dirty areas, and decontamination unit (clean room, shower room, equipment room, storage areas such as load-out unit);
  - c. Initial exposure assessment in accordance with 29 CFR 1926.1101;
  - d. Level of supervision;
  - e. Method of notification of other employers at worksite;
  - f. Abatement method to include containment and control procedures;
  - g. Interface of trades;
  - h. Sequencing of asbestos related work;
  - i. Storage and disposal procedures and plan;
  - j. Type of wetting agent and asbestos encapsulant;
  - k. Location of local exhaust equipment;
  - l. Air monitoring methods (personal, environmental, and clearance);
  - m. Bulk sampling and analytical methods (if required);
  - n. A detailed description of the method to be employed in order to control the spread of ACM wastes and airborne fiber;
  - o. Fire and medical emergency response procedures;
  - p. Security procedures to be used for all regulated areas.

1.4 PRECONSTRUCTION CONFERENCE

- A. Contractor's Designated Competent Person and Project Supervisor shall meet with DU Project Manager prior to beginning work at a safety preconstruction conference to discuss details of Contractor's submitted Safety and Health Plan to include Asbestos Hazard Abatement Plan and Activity Hazard Analyses appendices. Deficiencies in Safety and Health Plan will be discussed and Safety and Health Plan shall be revised to correct deficiencies and resubmitted for acceptance. Onsite work shall not begin until Safety and Health Plan has been accepted. Copy of written

Safety and Health Plan shall be maintained onsite. Disregarding provisions of this contract or accepted Safety and Health Plan will be cause for stopping of work, at discretion of DU Project Manager, until matter has been rectified.

## 1.5 SECURITY

- A. Fenced security areas shall be provided for each regulated area. A log book shall be kept documenting entry into and out of regulated area. Entry into regulated areas shall only be by personnel authorized by Contractor and DU Project Manager. Personnel authorized to enter regulated areas shall be trained, medically evaluated, and wear required personal protective equipment.

## 1.6 MEDICAL SURVEILLANCE REQUIREMENTS

- A. Medical surveillance requirements shall conform to 29 CFR 1926.1101. Asbestos workers shall be enrolled in a medical surveillance program that meets 29 CFR 1926.1101 (m) requirements and other pertinent state or local requirements. This requirement shall have been satisfied within last 12 months.

## 1.7 TRAINING PROGRAM

- A. Contractor shall establish training program as specified by EPA MAP, training requirements at 40 CFR 763, OSHA requirements at 29 CFR 1926.1101(k)(9), State of Alaska 8 AAC 61 and this specification. Contractor employees shall complete required training for type of work they are to perform and such training shall be documented and provided to DU Project Manager.

## 1.8 RESPIRATORY PROTECTION PROGRAM

- A. Contractors shall establish in writing, and implement a respiratory protection program in accordance with 29 CFR 1926.1101, 29 CFR 1910.134, and ANSI Z88.2. Contractor's Asbestos Hazards Abatement Plan shall establish minimum respiratory protection requirements based on measured or anticipated levels of airborne asbestos fiber concentrations.
- B. Respiratory Fit Testing
  - 1. Contractor shall conduct a qualitative or quantitative fit test conforming to Appendix A of 29 CFR 1910.134 for each worker required to wear a respirator, and any authorized visitors who enter regulated area where respirators are required to be worn. Respirator fit test shall be performed prior to initially wearing respirator and every 12 months thereafter. If physical changes develop that will affect fit, new fit test shall be performed. Functional fit checks shall be performed each time respirator is put on and in accordance with manufacturer's recommendation.

C. Respirator Selection and Use Requirements

1. Contractor shall provide respirators, and ensure that they are used as required by 29 CFR 1926.1101 and manufacturer's recommendations. Respirators shall be approved by the National Institute for Occupational Safety and Health NIOSH, under provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. For air-purifying respirators, particulate filter shall be high-efficiency particulate air (HEPA)/(N-,R-,P-100). initial respirator selection and decisions regarding upgrading or downgrading of respirator type shall be made by Contractor's Competent Person based on measured or anticipated airborne asbestos fiber concentrations to be encountered.

1.9 HAZARD COMMUNICATION PROGRAM

- A. Hazard communication program shall be established and implemented in accordance with 29 CFR 1926.59. Material safety data sheets (MSDSs) shall be provided for all hazardous materials brought onto worksite. One copy shall be provided to DU Project Manager and 1 copy shall be included in Contractor's Hazard Communication Program.

1.10 LICENSES, PERMITS AND NOTIFICATIONS

- A. Necessary licenses, permits and notifications shall be obtained in conjunction with project's asbestos abatement, transportation and disposal actions and timely notification furnished of such actions as required by federal, state, regional, and local authorities. Contractor shall notify Regional Office of USEPA, Alaska Department of Environmental Conservation and Alaska Department of Labor in writing, at least 10 days prior to commencement of work, in accordance with 40 CFR 61, Subpart M, and state and local requirements to include mandatory "Notification of Demolition and Renovation Record" form and other required notification documents. Notification shall be by US Mail. Contractor is responsible for associated fees/costs for licenses, permits, and notifications.

1.11 PERSONAL PROTECTIVE EQUIPMENT

- A. One complete set of personal protective equipment shall be made available to DU Project Manager and authorized visitors for entry to regulated area. DU Project Manager and authorized visitors shall have been provided with training equivalent to that provided to Contractor employees in selection, fitting, and use of personal protective equipment and site safety and health requirements. Contractor workers shall be provided with personal protective clothing and equipment and Contractor shall ensure that it is worn properly. Contractor's Designated Competent Person shall select and approve all required personal protective clothing and equipment.

B. Respirators

1. Respirators shall be in accordance with Contractor's RESPIRATORY PROTECTION PROGRAM.

C. Whole Body Protection

1. Personnel exposed to or having potential to be exposed to airborne concentrations of asbestos that exceed PELs, or for all OSHA Classes of work for which a required negative exposure assessment is not produced, shall be provided with whole body protection and such protection shall be worn properly. Disposable whole body protection shall be disposed of as asbestos contaminated waste upon exiting from regulated area. Reusable whole body protection worn shall be either disposed of as asbestos contaminated waste upon exiting from regulated area or be properly laundered in accordance with 29 CFR 1926.1101. Contractor's Designated Competent Person has authority to take immediate action to upgrade or downgrade whole body protection when there is an immediate danger to health and safety of wearer.

1.12 HYGIENE FACILITIES AND PRACTICES

- A. Contractor shall establish decontamination area for decontamination of employees, material and equipment. Contractor shall ensure that employees enter and exit regulated area through decontamination area.

1.13 REGULATED AREAS

- A. All Class I, II, and III asbestos work shall be conducted within regulated areas. Regulated area shall be demarcated to minimize number of persons within area and to protect persons outside area from exposure to airborne asbestos. Access to regulated areas shall be limited to authorized persons. Contractor shall control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

1.14 WARNING SIGNS AND TAPE

- A. Warning signs and tape shall be provided at regulated boundaries and entrances to regulated areas. Signs shall be located to allow personnel to read signs and take necessary protective steps required before entering area. Warning signs, and displaying following legend in lower panel:

DANGER  
ASBESTOS  
CANCER AND LUNG DISEASE HAZARD  
AUTHORIZED PERSONNEL ONLY  
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

#### 1.15 WARNING LABELS

- A. Warning labels shall be affixed to all asbestos disposal containers, asbestos materials, scrap, waste debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to requirements are acceptable.

#### 1.16 LOCAL EXHAUST SYSTEM

- A. Local exhaust units shall conform to ANSI Z9.2 and 29 CFR 1926.1101. Filters on local exhaust system equipment shall conform to ANSI Z9.2 and UL 586. Filter shall be UL labeled.

#### 1.17 TOOLS

- A. Vacuums shall be equipped with HEPA filters, of sufficient capacity and necessary capture velocity at the nozzle or nozzle attachment to efficiently collect, transport and retain the ACM waste material. Power tools shall not be used to remove ACM unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation capture and collection system. Reusable tools shall be thoroughly decontaminated prior to being removed from regulated areas.

#### 1.18 RENTAL EQUIPMENT

- A. If rental equipment is to be used, written notification shall be provided to the rental agency, concerning the intended use of the equipment, the possibility of asbestos contamination of equipment and steps that will be taken to decontaminate such equipment.

#### 1.19 AIR MONITORING EQUIPMENT

- A. Contractor's Designated IH shall approve air monitoring equipment. equipment shall include, but shall not be limited to:
  - 1. High-volume sampling pumps that can be calibrated and operated at constant airflow up to 16 liters per minute.
  - 2. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to constant airflow up to approximately 3.5 liters per minute, and self-contained rechargeable power pack capable of sustaining calibrated flow rate for minimum of 10 hours. Pumps shall also be equipped with an automatic flow control unit which shall maintain constant flow, even as filter resistance increases due to accumulation of fiber and debris on filter surface.
  - 3. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands for personal air sampling.

4. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands when conducting environmental area sampling using NIOSH 94-113 Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).
5. Flow calibrator capable of calibration to within plus or minus 2 percent of reading over temperature range of minus 4 to plus 140 degrees F and traceable to NIST primary standard.

## 1.20 EXPENDABLE SUPPLIES

### A. Glovebag

1. Glovebags shall be provided as described in 29 CFR 1926.1101. Glovebag assembly shall be 6 mil thick plastic, prefabricated and seamless at bottom with preprinted OSHA warning label.

### B. Duct Tape

1. Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container.

### C. Disposal Containers

1. Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers shall be provided for ACM wastes as required by 29 CFR 1926.1101.

### D. Reinforced Sheets

1. Reinforced sheets shall be provided where high skin strength is required, such as where it constitutes the only barrier between regulated area and the outdoor environment. Sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.

### E. Mastic Removing Solvent

1. Mastic removing solvent shall be nonflammable and shall not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite shall have a flash point greater than 140 degrees F.

### F. Leak-tight Wrapping

1. Two layers of 6 mil minimum thick polyethylene sheet stock shall be used for containment of removed asbestos-containing components or materials such as insulated pipe segments and other materials too large to be placed in disposal bags. Upon placement of ACM



component or material, each layer shall be individually leak-tight sealed with duct tape.

G. Wetting Agents

1. Amended water shall meet requirements of ASTM D 1331. Removal encapsulant (penetrating encapsulant) shall be provided when conducting removal abatement activities that require longer removal time or are subject to rapid evaporation of amended water. Removal encapsulant shall be capable of wetting the ACM and retarding fiber release during disturbance of ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS.

PART 2 - PRODUCTS

2.1 ENCAPSULANTS

- A. Encapsulants shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvent.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Asbestos abatement work tasks shall be performed as summarized in Contractor's Asbestos Hazard Abatement Plan. All associated work shall be incorporated into Contractor's Safety and Health Plan and Asbestos Hazard Abatement Plan. Contractor shall use engineering controls and work practices required in 29 CFR 1926.1101(g) in all operations regardless of levels of exposure. Personnel shall wear and utilize protective clothing and equipment. Contractor shall not permit eating, smoking, drinking, chewing or applying cosmetics in regulated area. All hot work (burning, cutting, welding, etc.) shall be conducted under controlled conditions in conformance with 29 CFR 1926.352, Fire Prevention. Personnel of other trades shall not be exposed at any time to airborne concentrations of asbestos unless all administrative and personal protective provisions of Contractor's SHP are complied with. Power to regulated area shall be locked-out and tagged in accordance with 29 CFR 1910.147, and temporary electrical service with ground fault circuit interrupters shall be provided as needed. Temporary electrical service shall be disconnected when necessary for wet removal. Contractor shall stop abatement work in regulated area immediately when airborne total fiber concentration: (1) equals or exceeds 0.05 f/cc, or pre-abatement concentration, whichever is greater, outside regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. Contractor shall correct condition to satisfaction of DU Project Manager, including visual inspection and air sampling. Work shall resume only upon notification by DU Project Manager. Corrective actions shall be documented.

### 3.2 PROTECTION OF ADJACENT WORK OR AREAS TO REMAIN

- A. Asbestos abatement shall be performed without damage to or contamination of adjacent work or area. Where such work or area is damaged or contaminated, as verified by DU Project Manager using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by Contractor at no expense to DU.

### 3.3 METHODS OF COMPLIANCE

- A. Mandated Practices
  - 1. Specific abatement techniques and items identified shall be detailed in Contractor's AHAP.

### 3.4 FINAL CLEANING AND VISUAL INSPECTION

- A. After completion of all asbestos removal work and gross amounts of asbestos have been removed from every surface, any remaining visible accumulations of asbestos shall be collected. For all classes of indoor asbestos abatement projects a final cleaning shall be performed using HEPA vacuum and wet cleaning of all exposed surfaces and objects in the regulated area. Upon completion of cleaning, Contractor shall conduct visual pre-inspection of cleaned area in preparation for final inspection before final air clearance monitoring. Contractor and DU Project Manager shall conduct final visual inspection of cleaned regulated area in accordance with ASTM E1368 and document results on Final Cleaning and Visual Inspection. If DU Project Manager rejects clean regulated area as not meeting final cleaning requirements, Contractor shall reclean as necessary and have follow-on inspection conducted with DU Project Manager. Recleaning and follow-up reinspection shall be at Contractor's expense.

### 3.5 LOCKDOWN

- A. Prior to removal of plastic barriers and after final visual inspection, (lockdown) encapsulant shall be spray applied to ceiling, walls, floors, and other surfaces in regulated area.

### 3.6 EXPOSURE ASSESSMENT AND AIR MONITORING

- A. General Requirements
  - 1. Exposure assessment, air monitoring and analysis of airborne concentration of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101, and Contractor's air monitoring plan. Results of breathing zone samples shall be posted at job site and made available to DU Project Manager.

2. Worker Exposure

- a. Contractor's Designated IH shall collect samples representative of exposure of each employee who is assigned to work within regulated area.
- b. Contractor's workers shall not be exposed to an airborne fiber concentration in excess of 1.0 f/cc, as averaged over a sampling period of 30 minutes. Should personal excursion concentration of 1.0 f/cc expressed as 30-minute sample occur inside regulated work area, Contractor shall stop work immediately, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in work area.

3. Environmental Exposure

- a. All environmental air monitoring shall be performed by Contractor's Designated IH.
- b. Environmental and final clearance air monitoring shall be performed using NIOSH 94-113 Method 7400 (PCM) with optional confirmation of results by TEM if required.
- c. For environmental and final clearance, air monitoring shall be conducted at sufficient velocity and duration to establish limit of detection of method used at 0.01 f/cc.
- d. When confirming asbestos fiber concentrations (asbestos f/cc) from environmental and final clearance samples, if required, use TEM in accordance with NIOSH 94-113 Method 7402. When such confirmation is conducted, it shall be from same sample filter used for the NIOSH 94-113 Method 7400 PCM analysis. All confirmation of asbestos fiber concentrations, using NIOSH 94-113 Method 7402, shall be at Contractor's expense.

4. Independent Environmental Monitoring

- a. Contractor shall retain an independent air monitoring firm to perform pre-abatement, during abatement, and, final clearance air monitoring. Abatement Contractor will provide air monitoring Contractor with an up-to-date copy of accepted AHAP, SHP and pertinent detailed drawings. Air monitoring Contractor is required to comply with abatement Contractor's safety and health requirements. Abatement Contractor will coordinate all onsite activities with air monitoring Contractor, DU Project Manager, and abatement Contractor will provide air monitoring Contractor with an up-to-date schedule of abatement Contractor work activities.

5. Initial Exposure Assessment

- a. Contractor's Designated IH shall conduct an exposure assessment immediately before or at the initiation of an asbestos abatement operation to ascertain expected exposures during that operation. Assessment shall be completed in time to comply with requirements, which are triggered by exposure data or lack of negative exposure assessment, and to provide information necessary to assure that all control systems planned are appropriate for that operation.

6. Negative Exposure Assessment

- a. Contractor may provide negative exposure assessment for specific asbestos job which will be performed. negative exposure assessment if provided shall conform to following criteria:
  - i. Prior Asbestos Jobs: Where Contractor has monitored prior asbestos jobs for PEL and PEL-Excursion Limit within 12 months of current job, monitoring and analysis were performed in compliance with asbestos standard in effect; data were obtained during work operations conducted under workplace conditions closely resembling processes, type of material, control methods, work practices, and environmental conditions used and prevailing in Contractor's current operations; operations were conducted by employees whose training and experience are no more extensive than that of employees performing current job; and these data show that under conditions prevailing and which will prevail in current workplace, there is high degree of certainty that monitoring covered exposure from employee exposures will not exceed PEL-TWA and PEL-Excursion Limit.
  - ii. Initial Exposure Monitoring: results of initial exposure monitoring of current job, made from breathing zone air samples that are representative of 8-hour PEL-TWA and 30-minute short-term exposures of each employee. Monitoring covered exposure from operations which are most likely during performance of entire asbestos job to result in exposures over PELs.

7. Preabatement Environmental Air Monitoring
  - a. Preabatement environmental air monitoring shall be established 1 day prior to the masking and sealing operations for each regulated area to determine background concentrations before abatement work begins.
8. Environmental Air Monitoring During Abatement
  - a. Until an exposure assessment is provided to DU Project Manager, environmental air monitoring shall be conducted at locations and frequencies that will accurately characterize any evolving airborne asbestos fiber concentrations. Assessment shall demonstrate that product or material containing asbestos minerals, or abatement involving such product or material, cannot release airborne asbestos fibers in concentrations exceeding 0.01 f/cc as a TWA under those work conditions having greatest potential for releasing asbestos. monitoring shall be at least once per shift at locations including, but not limited to, close to work inside regulated area; preabatement sampling locations; outside entrances to regulated area; close to glovebag operations; representative locations outside of perimeter of regulated area; inside clean room; and at exhaust discharge point of local exhaust system ducted to outside of containment (if used). If sampling outside regulated area shows airborne fiber levels have exceeded background or 0.05 f/cc, whichever is greater, work shall be stopped immediately, and condition causing increase shall be corrected.
9. Final Clearance Requirements, NIOSH PCM Method
  - a. For PCM sampling and analysis using NIOSH 94-113 Method 7400, fiber concentration inside abated regulated area, for each airborne sample, shall be less than 0.01 f/cc. Abatement inside regulated area is considered complete when every PCM final clearance sample is below clearance limit. If any sample result is greater than 0.01 total f/cc, asbestos fiber concentration (asbestos f/cc) may be confirmed from that same filter using NIOSH 94-113 Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, resampling with results to meet above clearance criteria shall be done.

10. Air Clearance Failure

- a. If clearance sampling results fail to meet final clearance requirements, Contractor shall pay all costs associated with required recleaning, resampling, and analysis, until final clearance requirements are met.

11. Air Monitoring Results and Documentation

- a. Air sample fiber counting shall be completed and results provided within 48 hours (breathing zone samples), and 48 hours (environmental/clearance monitoring) after completion of sampling period. DU Project Manager shall be notified immediately of any airborne levels of asbestos fibers in excess of established requirements. Written sampling results shall be provided within 5 working days of date of collection. Written results shall be signed by testing laboratory analyst, testing laboratory principal. Air sampling results shall be documented on Contractor's daily air monitoring log.

3.7 CLEARANCE CERTIFICATION

- A. When asbestos abatement is complete, ACM waste is removed from regulated areas, and final clean-up is completed, Competent Person will allow warning signs and boundary warning tape to be removed. Contractor shall visually inspect all surfaces within containment for residual material or accumulated debris. Contractor shall reclean all areas showing dust or residual materials. Contractor will certify in writing that the area is safe before unrestricted entry is permitted.

3.8 CLEANUP AND DISPOSAL

A. Title to ACM Materials

1. ACM material resulting from abatement work, except as specified otherwise, shall remain the property of DU and shall be disposed of as specified and in accordance with applicable federal, state and local regulations.

B. Collection and Disposal of Asbestos

1. All ACM waste shall be collected including contaminated wastewater filters, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing and placed in leak-tight containers. Waste within the containers shall be wetted in case the container is breached. Regulated asbestos-containing waste and non-regulated asbestos containing waste shall be disposed of at Ft. Wainwright Landfill in accordance with "Solid Waste Collection and Disposal Procedure", dated January 2009. . For temporary storage, sealed impermeable containers shall be stored in an asbestos

waste load-out unit or in a storage/transportation conveyance (i.e., dumpster, roll-off waste boxes, etc.) in manner acceptable to and in an area assigned by DU Project Manager. Procedure for hauling and disposal shall comply with 40 CFR 61, Subpart M, state, regional, and local standards.

C. Scale Weight Measurement

1. Weight Bills and Delivery Tickets

- a. Copies of weight bills and delivery tickets shall be submitted to DU Project Manager during progress of work. Contractor shall furnish DU Project Manager scale tickets for each load of ACM weighed and certified. These tickets shall include tare weight; identification mark for each vehicle weighed; and date, time and location of loading and unloading. Tickets shall be furnished at point and time individual trucks arrive at worksite. A master log of all vehicle loading shall be furnished for each day of loading operations. Before final statement is allowed, Contractor shall file with DU Project Manager certified weigh bills and/or certified tickets and manifests of all regulated ACM actually disposed by Contractor for this contract.

D. Records and Management Plan

1. Asbestos Waste Shipment Records

- a. Contractor shall complete and provide DU Project Manager final completed copies of Waste Shipment Records for all shipments of waste material as specified in 40 CFR 61, Subpart M and other required state waste manifest shipment records, within 3 days of delivery to landfill. Each Waste Shipment Record shall be signed and dated by Contractor, waste transporter and disposal facility operator.

END OF SECTION

SECTION 02085  
LEAD IN CONSTRUCTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Construction activities impacting PWL or material containing lead for this project are covered by this section. Work requires disturbance of Lead-containing materials for demolition, disposal, and construction activities. Appropriate precautions for protecting workers and environment while performing any work disturbing lead shall be addressed. **This is not a lead abatement job.** Depending upon work practices employed by Contractor (i.e., disassembly rather than cutting), workers may minimize or avoid disturbing any MCL/PWL on this project. Work includes all air monitoring, dust sampling, waste stream testing, and disposal as specified herein.
- B. All painted items are assumed to be coated with lead based paint or MCL/PWL. PWL or MCL are not necessarily hazardous waste or hazardous to handle. All subcontractors to primary contractor will provide documentation and signatures that they have reviewed and agree to requirements of this specification and all plans required by this specification. It is the responsibility of primary contractor to make sure above occurs 10-days prior to lead related work being performed.
- C. Coordination with Other Work
  - 1. Contractor shall coordinate with work being performed in adjacent areas. Coordination procedures shall be explained in the Plan and shall describe how Contractor will prevent lead exposure to other contractors and/or DU personnel performing work unrelated to lead activities and adjacent areas.

1.2 REFERENCES

- A. Latest edition of publications listed below form part of this specification to extent referenced. Publications are referred to within text by basic designation only.
- B. STATE OF ALASKA ADMINISTRATIVE CODE (AAC)
  - 1. 8 AAC 61 Occupational Safety and Health
- C. STATE OF ALASKA STATUTES (AS)
  - 1. Title 18 Health, Safety and Housing
- D. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
  - 1. ANSI Z88.2 Respiratory Protection



- E. ASTM INTERNATIONAL (ASTM)
  - 1. ASTM E1613 Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Techniques
  - 2. ASTM E1644 Hot Plate Digestion of Dust Wipe Samples for the Determination of Lead
  - 3. ASTM E1728 Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination
  - 4. ASTM E1792 Wipe Sampling Materials for Lead in Surface Dust
- F. U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)
  - 1. HUD 6780 Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing
- G. NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)
  - 1. NIOSH 94-113 NIOSH Manual of Analytical Methods
- H. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
  - 1. 29 CFR 1926.103 Respiratory Protection
  - 2. 29 CFR 1926.21 Safety Training and Education
  - 3. 29 CFR 1926.33 Access to Employee Exposure and Medical Records
  - 4. 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists
  - 5. 29 CFR 1926.59 Hazard Communication
  - 6. 29 CFR 1926.62 Lead
  - 7. 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
  - 8. 40 CFR 260 Hazardous Waste Management System: General
  - 9. 40 CFR 261 Identification and Listing of Hazardous Waste
  - 10. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste
  - 11. 40 CFR 263 Standards Applicable to Transporters of Hazardous Waste
  - 12. 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
  - 13. 40 CFR 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

14. 40 CFR 268 Land Disposal Restrictions
15. 40 CFR 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures
16. 49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
17. 49 CFR 178 Specifications for Packagings

I. UNDERWRITERS LABORATORIES (UL)

1. UL 586 High-Efficiency, Particulate, Air Filter Units

1.3 DEFINITIONS

A. Action Level

1. Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8 hour period.

B. Area Sampling

1. Sampling of lead concentrations within lead control area and inside physical boundaries which is representative of airborne lead concentrations but is not collected in breathing zone of personnel (approximately 5 to 6 feet above the floor).

C. Competent Person

1. As used in this section, refers to person employed by Contractor who is trained in recognition and control of lead hazards in accordance with current federal, State, and local regulations and has authority to take prompt corrective actions to control the lead hazard.

D. Contaminated Room

1. Refers to room for removal of contaminated personal protective equipment (PPE).

E. Decontamination Shower Facility

1. Facility that encompasses clean clothing storage room and contaminated clothing storage and disposal rooms, with shower facility in between.

F. High Efficiency Particulate Arrestor (HEPA) Filter Equipment

1. HEPA filtered vacuuming equipment with UL 586 filter system capable of collecting and retaining lead-contaminated particulate. High efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

- G. Lead
  - 1. Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.
- H. Lead Control Area
  - 1. System of control methods to prevent spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.
- I. Lead Permissible Exposure Limit (PEL)
  - 1. Fifty micrograms per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.62. If employee is exposed for more than eight hours in work day, PEL shall be determined by following formula:
    - a. 
$$\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs worked per day.}$$
- J. Material Containing Lead/Paint with Lead (MCL/PWL)
  - 1. Any material, including paint, which contains lead as determined by testing laboratory using valid test method. Requirements of this section does not apply if no detectable levels of lead are found using quantitative method for analyzing paint or MCL using laboratory instruments with specified limits of detection (usually 0.01%). An X-Ray Fluorescence (XRF) instrument **is not considered** a valid test method.
- K. Personal Sampling
  - 1. Sampling of airborne lead concentrations within breathing zone of an employee to determine 8 hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employees' work tasks. Breathing zone shall be considered an area within a hemisphere, forward of shoulders, with radius of 12" and centered at the nose or mouth of an employee.
- L. Physical Boundary
  - 1. Area physically roped or partitioned off around lead control area to limit unauthorized entry of personnel.

#### 1.4 SUBMITTALS

- A. Doyon Utilities LLC approval is required for submittals with a "D" designation; submittals not having a "D" designation are for information only. The following shall be submitted:
- B. SD-01 Preconstruction Submittals
  - 1. Occupational and Environmental Assessment Data Report (if objective data is used to justify excluding initial occupational exposure assessment); D
  - 2. Lead Compliance Plan including CP approval (signature, date, and certification number); D
  - 3. Competent Person qualifications; D
  - 4. Training Certification of workers and supervisors; D
  - 5. Lead waste management plan; D
  - 6. Written evidence that TSD is approved for lead disposal if required based on TCLP analytical results; D
  - 7. Certification of Medical Examinations if required; D
- C. SD-02 Shop Drawings
  - 1. None required.
- D. SD-03 Product Data
  - 1. None required.
- E. SD-04 Samples
  - 1. None required.
- F. SD-05 Design Data
  - 1. None required.
- G. SD-06 Test Reports
  - 1. Sampling results; D
  - 2. Occupational and Environmental Assessment Data Report; D
- H. SD-07 Certificates
  - 1. Testing laboratory qualifications; D
- I. SD-08 Manufacturer's Instructions
  - 1. None required.
- J. SD-09 Manufacturer's Field Reports
  - 1. None required.

K. SD-10 Operation and Maintenance Data

1. None required.

L. SD-11 Closeout Submittals

1. Completed and signed hazardous waste manifest from treatment or disposal facility if required; D
2. Waste turn-in documents or weight tickets for non-hazardous wastes that are disposed of at sanitary or construction and demolition landfills; D

1.5 QUALITY ASSURANCE

A. Qualifications

1. Competent Person (CP)

- a. Submit name, address, and telephone number of CP selected to perform responsibilities specified in paragraph entitled "Competent Person (CP) Responsibilities." Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard (29 CFR 1926.62) which shows ability to assess occupational and environmental exposure to lead, experience with use of respirators, personal protective equipment and other exposure reduction methods to protect employee health. Submit proper documentation that the CP is trained in accordance with federal, State, and local laws.

2. Training Certification

- a. Submit certificate for each worker and supervisor, signed and dated by training provider, stating that employee has received required lead training specified in 29 CFR 1926.62(l) and is qualified to perform or supervise deleading, lead removal or demolition activities in State of Alaska.

3. Testing Laboratory

- a. Submit name, address, and telephone number of testing laboratory selected to perform air and/or wipe analysis, testing, and reporting of airborne concentrations of lead. Use a laboratory participating in USEPA National Lead Laboratory Accreditation Program (NLLAP) by being accredited by either American Association for Laboratory Accreditation (A2LA) or American Industrial Hygiene Association (AIHA) and that is successfully participating in Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis. Laboratories selected to perform blood lead analysis shall be OSHA approved.

B. Requirements

1. Competent Person (CP) Responsibilities

- a. Verify training meets all federal, State, and local requirements.
- b. Review and approve Lead Compliance Plan for conformance to the applicable referenced standards.
- c. Continuously inspect PWL or MCL work for conformance with the approved plan.
- d. Perform (or oversee performance of) air sampling. Recommend upgrades or downgrades (whichever is appropriate based on exposure) on the use of PPE (respirators included) and engineering controls.
- e. Ensure work is performed in strict accordance with specifications at all times.
- f. Control work to prevent hazardous exposure to human beings and to the environment at all times.
- g. Supervise final cleaning of lead control area, and make recommendations for further cleaning.
- h. Certify conditions of work as called for elsewhere in this specification.

2. Lead Compliance Plan

- a. Submit detailed job-specific plan of work procedures to be used in disturbance of PWL or MCL. Plan shall include sketch showing location, size, and details of lead control areas, physical boundaries, location and details of decontamination facilities. Include description of equipment and materials, work practices, controls and job responsibilities for each MCL/PWL component demolition activity. Include in plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead related work, air sampling, respirators, personal protective equipment, and detailed description of method of containment of operation to ensure that lead is not released outside of lead control area. Include site preparation, cleanup and final visual inspection procedures. Include occupational sampling, training and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in air sampling portion of plan. Include description of arrangements made among contractors on multi-contractor

worksites to inform affected employees and to clarify responsibilities to control exposures.

3. Occupational and Environmental Assessment Data Report

- a. If initial monitoring is necessary, submit occupational and environmental sampling results to DU Project Manager within three working days of collection, signed by testing laboratory employee performing the analysis, employee that performed sampling, and CP.
- b. In order to reduce full implementation of 29 CFR 1926.62, Contractor shall provide documentation. Submit report that supports determination to reduce full implementation of requirements of 29 CFR 1926.62 and supporting Lead Compliance Plan.
  - i. Initial monitoring shall represent each job classification, or if working conditions are similar to previous jobs by same employer, provide previously collected exposure data that can be used to estimate worker exposures per 29 CFR 1926.62. Data shall represent worker's regular daily exposure to lead for stated work.
  - ii. Submit worker exposure data gathered during task based trigger operations of 29 CFR 1926.62 with complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead containing coatings are present.
  - iii. Initial assessment shall determine requirement for further monitoring and need to fully implement control and protective requirements including lead compliance plan per 29 CFR 1926.62.

4. Medical Examinations

- a. Initial medical surveillance as required by 29 CFR 1926.62 shall be made available to all employees exposed to lead at any time (1 day) above action level. Full medical surveillance shall be made available to all employees on an annual basis who are or may be exposed to lead in excess of action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records shall show that employees meet medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62 and 29 CFR 1926.103.

Provide medical surveillance to all personnel exposed to lead as indicated in 29 CFR 1926.62. Maintain complete and accurate medical records of employees for duration of employment plus 30 years.

5. Training

- a. Train each employee performing work that disturbs lead, who performs MCL/PWL disposal, and air sampling operations prior to time of initial job assignment and annually thereafter, in accordance with 29 CFR 1926.21, 29 CFR 1926.62, and State, and local regulations where appropriate.

6. Respiratory Protection Program

- a. Provide each employee required to wear a respirator a respirator fit test at time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62.
- b. Establish and implement respiratory protection program as required by ANSI Z88.2, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

7. Hazard Communication Program

- a. Establish and implement Hazard Communication Program as required by 29 CFR 1926.59.

8. Lead Waste Management

- a. Please note that USEPA has clarified waste requirements where lead-based paint debris generated by contractors in households is excluded from RCRA Subtitle C hazardous waste regulations. Contractors may dispose of LBP-wastes as household wastes subject to applicable State regulations. Determination of expected waste materials as hazardous or solid waste for disposal should be performed in conjunction with site work. Lead Waste Management Plan shall comply with applicable requirements of federal, State, and local hazardous waste regulations and address:
  - i. Identification and classification of wastes associated with the work.
  - ii. Estimated quantities of wastes to be generated and disposed of.
  - iii. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of wastes. Include facility location and operator and 24-hour point of contact. Furnish two copies of USEPA,



State, and local hazardous waste permits and USEPA Identification numbers.

- iv. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
- v. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
- vi. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.
- vii. Work plan and schedule for waste containment, removal and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Wastes shall be cleaned up and containerized daily.
- viii. Include any process that may alter or treat waste rendering a hazardous waste non hazardous.
- ix. Unit cost for hazardous waste disposal according to this plan.

b. Environmental, Safety and Health Compliance

- i. In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, State, and local authorities regarding lead. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply.

C. Pre-Construction Conference

- 1. Along with CP, meet with DU Project Manager to discuss in detail Lead Waste Management Plan and Lead Compliance Plan, including procedures and precautions for work.

## 1.6 EQUIPMENT

### A. Respirators

1. Furnish appropriate respirators approved by National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing lead dust, fume and mist. Respirators shall comply with requirements of 29 CFR 1926.62.

### B. Special Protective Clothing

1. Furnish personnel who will be exposed to lead-contaminated dust with proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce level of protection only after obtaining approval from CP.

### C. Rental Equipment Notification

1. If rental equipment is to be used during PWL or MCL handling and disposal, notify rental agency in writing concerning intended use of equipment.

### D. Vacuum Filters

1. UL 586 labeled HEPA filters.

### E. Equipment for Doyon Utilities Personnel

1. Furnish DU Project Manager with two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of lead removal work within lead controlled area. Personal protective equipment shall include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE shall remain property of Contractor.

## 1.7 PROJECT/SITE CONDITIONS

### A. Protection of Existing Work to Remain

1. Perform work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better as determined by DU Project Manager.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

### 3.1 PREPARATION

#### A. Protection

1. Notification
  - a. Notify DU Project Manager prior to start of any lead work.
2. Lead Control Area
  - a. Physical Boundary - Provide physical boundaries around lead control area by roping off area designated in work plan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside of lead control area.
  - b. Warning Signs - Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read sign and take necessary precautions before entering area. Signs shall comply with requirements of 29 CFR 1926.62.
3. Furnishings
4. Heating, Ventilating and Air Conditioning (HVAC) Systems
5. Decontamination Shower Facility
  - a. Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.
6. Eye Wash Station
  - a. Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of eyes shall be provided within the work area.
7. Mechanical Ventilation System
  - a. To extent feasible, use local exhaust ventilation or other collection systems, approved by CP. Local exhaust ventilation systems shall be evaluated and maintained in accordance with 29 CFR 1926.62.
  - b. Use locally exhausted, power actuated tools or manual hand tools.
8. Personnel Protection
  - a. Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in lead control

area. No one will be permitted in lead control area unless they have been appropriately trained and provided with protective equipment.

### 3.2 ERECTION

#### A. Lead Control Area Requirements

1. Establish lead control area by completely establishing barriers and physical boundaries around area or structure where PWL or MCL removal operations will be performed as needed. Contractor shall perform visual inspection once per day outside lead control area(s) to assure visual clearance criteria are maintained while lead control activities are performed. Contractor shall clean at its own expense, and to DU's satisfaction, all visually contaminated surfaces outside lead control area, if surfaces fail visual clearance criteria.

### 3.3 APPLICATION

#### A. Lead Work

1. Perform lead work in accordance with approved Lead Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead when work is performed in accordance with 29 CFR 1926.62 or 40 CFR 745, and as specified herein. Dispose of all PWL or MCL and associated waste in compliance with federal, State, and local requirements.

#### B. Paint with Lead or Material Containing Lead Removal

1. Manual or power sanding or grinding of lead surfaces or materials is not permitted unless tools are equipped with HEPA attachments or wet methods. Dry sanding or grinding of surfaces that contain lead is prohibited. Provide methodology for removing lead in the Lead Compliance Plan. Select lead removal processes to minimize contamination of work areas outside control area with lead-contaminated dust or other lead-contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in Lead Compliance Plan.
2. Paint with Lead or Material Containing Lead - Outdoor Removal
  - a. Perform outdoor removal as indicated in federal, State, and local regulations and in Lead Compliance Plan. Worksite preparation (barriers or containments) shall be job dependent and presented in Lead Compliance Plan.

C. Personnel Exiting Procedures

1. Whenever personnel exit lead-controlled area, they shall perform following procedures and shall not leave work place wearing any clothing or equipment worn in control area:
  - a. Vacuum all clothing before entering contaminated change room.
  - b. Remove protective clothing in contaminated change room, and place them in approved impermeable disposal bag.
  - c. Wash hands and face at site, don appropriate disposable or uncontaminated reusable clothing.
  - d. Change to clean clothes prior to leaving clean clothes storage area.

3.4 FIELD QUALITY CONTROL

A. Tests

1. Conduct air sampling for lead in accordance with 29 CFR 1926.62 and as specified herein. Air sampling shall be directed or performed by the CP.
  - a. CP shall be on job site directing air sampling and inspecting PWL or MCL removal work to ensure that requirements of contract have been satisfied during entire PWL or MCL operation.
  - b. Collect personal air samples on employees who are anticipated to have greatest risk of exposure as determined by the CP. In addition, collect air samples on at least twenty-five percent of work crew or minimum of two employees, whichever is greater to establish an initial exposure assessment of demolition task below Action Level. Resume personnel exposure monitoring if any new or significantly different task is initiated.
  - c. Submit results of air samples, signed by CP, within 72 hours after air samples are taken.
  - d. Sufficient area monitoring shall be conducted to ensure unprotected personnel are not exposed at or above 30 micrograms per cubic meter of air. If 30 micrograms per cubic meter of air is reached or exceeded, stop work, correct condition(s) causing increased levels. Determine if condition(s) require any further change in work methods.

B. Testing of Material Containing Lead Residue

1. Test residue in accordance with 40 CFR 261 for hazardous waste.

### 3.5 CLEANING AND DISPOSAL

#### A. Cleanup

1. Maintain surfaces of lead control area free of accumulations of dust and debris. Restrict spread of dust and debris; keep waste from being distributed over work area. Do not dry sweep or use pressurized air to clean up area. If adjacent areas become contaminated at any time during work, clean, visually inspect, and then visually inspect all contaminated areas. CP shall then certify in writing that area has been cleaned of lead contamination before clearance inspection.
2. Clearance Certification
  - a. CP shall certify in writing that air samples collected outside lead control area during demolition operations are less than 30 micrograms per cubic meter of air; respiratory protection used for employees was adequate; work procedures were performed in accordance with 29 CFR 1926.62; and that there were no visible accumulations of material and dust containing lead left in work site.
  - b. Clear lead control area in utilidors of all visible dust and debris. Certify that lead control area(s) for each individual work task have passed visual clearance criteria. To pass visual clearance, lead hazards have to be removed; demolition area must be free from visible dust, debris, paint chips or any other residue that may have been generated by the lead hazard control activities.
  - c. CP shall prepare clearance report including above and following information:
    - i. Start and completion dates of demolition activities.
    - ii. Type of lead hazard control activity performed (i.e., demolition), and locations.
    - iii. Name and address of each firm conducting lead hazard control activities and name of each supervisor assigned to the project.
    - iv. detailed written description of lead hazard control activities performed, including hazard control methods (i.e., Demolition)
    - v. Hazardous waste disposal documentation.
    - vi. Certification of each Final Cleaning and Visual Inspection performed by CP.

3. Disposal

- a. All material, whether hazardous or non-hazardous shall be disposed in accordance with all laws and provisions and all federal, State or local regulations. Ensure all waste is properly characterized. Result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements.
- b. Contractor is responsible for segregation of waste. Collect lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing that may produce airborne concentrations of lead particles. Label containers in accordance with 29 CFR 1926.62 and 40 CFR 261.
- c. Dispose of lead-contaminated material classified as hazardous waste at an USEPA or State approved hazardous waste treatment, storage, or disposal facility off Government property.
- d. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved 55 gallon drums. Properly label each drum to identify type of waste (49 CFR 172) and date drum was filled. For hazardous waste, collection drum requires marking/labeling in accordance with 40 CFR 262 during accumulation/collection timeframe. DU Project Manager will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.
- e. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

4. Disposal Documentation

- a. Submit written evidence to demonstrate the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the USEPA, State or local regulatory agencies. Submit one copy of completed hazardous waste manifest, signed and dated by initial transporter in accordance with 40 CFR 262. Contractor shall provide certificate that waste was accepted by disposal facility. Provide turn-in documents or weight tickets for non-hazardous waste disposal.

5. Payment for Hazardous Waste
  - a. Payment for disposal of hazardous and non-hazardous waste will not be made until a signed copy of manifest from treatment or disposal facility certifying amount of lead-containing materials or non-hazardous waste delivered is returned and copy is furnished to DU Project Manager .

END OF SECTION



## SECTION 02100

### FIELD SCREEN TESTING OF SOILS FOR POL CONTAMINATION

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Contractor shall field screen soils at the project site to determine if petroleum, oil, and lubricants (POL) or any other type of contamination is present.
- B. **Soils within the project site are not expected to be contaminated with POL products.**

##### 1.2 REFERENCES

- A. Latest edition of the publications listed below form part of this specification to extent referenced. Publications are referred to in the text by basic designation only.
- B. U.S. Army Corps of Engineers (USACE)
  - 1. EM 385-1-1 Safety -- Safety and Health Requirements
  - 2. ER 385-1-92 Safety and Occupational Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities
- C. American Society for Testing and Materials (ASTM)
  - 1. ASTM D 2488 (2000) Description and Identification of Soils (Visual-Manual Procedure)
- D. State of Alaska Administrative Code (ACC)
  - 1. 18 AAC 75 Oil and Other Hazardous Substances Pollution Control
  - 2. 8 AAC 61 Occupational Safety and Health
- E. State of Alaska Statutes (AS)
  - 1. Title 18 Health, Safety and Housing
- F. U.S. National Archives and Records Administration (NARA)
  - 1. 29 CFR 1910 Occupational Safety and Health Standards
  - 2. 29 CFR 1926.21 Safety Training and Education

##### 1.3 WORKER PROTECTION

- A. Contractor shall provide personal protective equipment and other tools required for worker protection as appropriate for work conditions and as required by paragraph, SAFETY AND HEALTH. Contractor shall provide 2 sets of personal protective equipment, as required, for DU Site Representatives.

#### 1.4 AVAILABLE DATA

- A. Test borings have been taken at various locations throughout the project site. Note that Benzene and Benzo(a)pyrene were documented on this site at levels exceeding ADEC cleanup criteria at the surface of locations AP-9695 and AP-9697, respectively. DRO was also noted approaching (230 ppm) the ADEC cleanup limit (250 ppm) in AP-9695.
- B. Drawings are available with plotted locations of test borings. A Chemical Data Report containing details of soil contamination documented on the project site is also available upon request.

#### 1.5 INSPECTION

- A. Federal, State or local agencies may require their representative(s) to be present to inspect operations. Contractor shall comply with all such inspection requirements.

#### 1.6 COMPLIANCE

- A. Work shall meet or exceed the minimum requirements established by State of Alaska in applicable statutes and administrative codes. These documents are under constant revision. Contractor shall be responsible for compliance with most recent revisions to regulations throughout duration of work. Contractor shall also be responsible for compliance with all applicable Federal and local regulations. Any instances where compliance would exceed scope of work or specific requirements of contract, and any conflicts between various regulations or between any regulation and contract specifications, shall be brought to the immediate attention of the DU Project Manager for resolution.

#### 1.7 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01330 SUBMITTAL PROCEDURES.
- B. DU approval is required for the following items.
  - 1. Preconstruction Submittals – SD-01
    - a. Sampling and Analysis Plan (SAP); DU
      - i. Sampling and Analysis Plan (SAP) shall include Field Sampling Plan (FSP). See paragraph, SAMPLING AND ANALYSIS PLAN (SAP).
      - ii. One electronic copy of SAP shall be submitted for approval at least 30 days prior to start of work at jobsite. Contractor shall make corrections indicated by comments and identify any items considered to be in

conflict with, or a change to, the contract. Excavation shall not begin prior to approval of SAP by DU Project Manager.

- iii. Contractor shall correct and resubmit items which are unacceptable for detailed review. The 30 day period specified above will not begin until all corrected items are received by DU Project Manager.
- b. Safety and Health Program(SHP); DU
  - i. Include Site Specific Safety and Health Plan (SSSHP), and qualifications and training of site supervisors and employees. See paragraph, SAFETY AND HEALTH.
  - ii. Resume' of consultant. See paragraph, PERSONNEL.
- 2. Test Reports – SD-06
  - a. Field Reports; DU
    - i. Draft and Final Field Report. See paragraph, FIELD REPORT.
  - b. Correspondence; DU
- 3. Certificates – SD-07
  - a. Qualifications; DU

## PART 2 - PRODUCTS

NOT APPLICABLE

## PART 3 - EXECUTION

### 3.1 CORRESPONDENCE

- A. Copies of all correspondence with other government agencies shall be furnished to the DU Project Manager immediately upon issue or receipt. All Contractor correspondence with ADEC shall be through the DU Project Manager. Cover letters shall be appropriately addressed with "TO:" and "THROUGH:" headings.

### 3.2 CONTAMINATED SOIL IDENTIFICATION

- A. **Soils within the project site are not expected to be contaminated with POL products.** Visual inspection and field screening shall be used as described in the FSP. Contractor shall perform a general site inspection as outlined in paragraph, FIELD REPORT.

B. Leaks, Spills, and Releases

1. Whenever Contractor suspects or has knowledge of a leak, spill, or release of oil, hazardous substance, or regulated substance NOT PREVIOUSLY IDENTIFIED IN THE CONTRACT DOCUMENTS, they shall immediately prepare an ADEC Oil and Hazardous Materials Incident Report Form in accordance with ADEC regulations. Contractor shall hand-deliver (or send by facsimile mail) a copy of form to the DU Project Manager. Fort Wainwright's Installation Environmental Office will be responsible for providing notification to ADEC.

C. Indications of Soil Contamination

1. Should Contractor encounter visible stains, smell of fuels or volatiles, or instrument readings or test kit results significantly above background levels (e.g. a reading greater than 20 ppm on a PID) in any field screening test, the DU Project Manager shall be notified immediately by phone and in writing. Contractor shall reevaluate APP as appropriate and shall take immediate steps to avoid mixing contaminated and uncontaminated soil.

3.3 SAMPLING AND ANALYSIS PLAN (SAP)

- A. Plan shall include an executive summary. SAP shall reflect the degree of complexity of the project. Contractor shall formulate the plan to provide field screening for potential contamination in all soils to be excavated. Contractor shall prepare and submit SAP to the DU Project Manager for review and approval.

B. Sampling and Analysis Plan

1. Sampling and Analysis Plan shall be composed of Field Sampling Plan (FSP) and Quality Assurance Program Plan (QAPP). Plans shall include methods to be used for field screening and frequency of sampling.

C. Control

1. Contractor shall exercise a high degree of control over field screening in conjunction with construction in order to adequately screen for potentially contaminated soil.

D. Field Screening Tests

1. Contractor's consultant shall use a Hydrocarbon Vapor (HV) test or other appropriate field test to qualitatively check for presence or absence of soil contamination where visible stains are not apparent. Field screening shall be utilized according to prudent, professional

judgment.

2. Contractor shall include in SAP a description of instruments selected, limits, action levels, procedures for testing, and consultant's training to use the instruments and interpret data. Contractor shall prepare a table of field screening results to be updated as work proceeds. Final copy, including an explanatory narrative, shall be part of Field Report.

E. Additional Sampling

1. If unsuitable (contaminated) soil conditions, in opinion of the DU Project Manager, are encountered at the excavation lines specified, or elsewhere within the site boundaries, they may direct sampling and testing beyond that outlined in the SAP be performed.
2. Contractor shall perform such additional sampling and testing only when so directed in writing. Sampling and testing shall include quality control and government quality assurance sampling, as required. An equitable modification of the Contract will be made for any directed additional sampling and testing.

3.4 PERSONNEL

A. Consultant

1. Contractor shall provide an experienced and qualified individual. Consultant shall be on site during all excavation operations involving soil to be checked for contamination.
2. Consultant shall perform all field screening. Consultant shall review the SAP, review tests results, and provide recommendations for Contractor's testing program.
3. Consultant's qualifications shall be submitted to DU Project Manager for approval. Acceptability will be determined on the basis of education, training, experience, and past performance. Qualification criteria include:
  - a. Minimum of 2-years experience in the development and preparation of SAP's.
  - b. Minimum of a 4-year college degree in Chemistry, Environmental Science, Engineering, Geology, Hydrology, or a related field
  - c. Experience in and knowledge of EPA methods for collecting environmental and hazardous waste samples
  - d. Experience in operation of field screening equipment.

### 3.5 EXCAVATION

- A. Contractor shall conduct field screen testing prior to excavation to determine approximate boundaries of any soil contamination and throughout duration of excavation activities to identify any contaminated soils.

### 3.6 BACKFILL

- A. Contractor shall obtain approval for backfilling from the DU Project Manager in writing prior to placement of any backfill. Backfill shall be placed in accordance with other sections of these specifications, as appropriate. Excavated materials conforming to specification requirements for materials to be used for fills, backfilling, grading or topsoiling, may be utilized provided there are no indications of contamination as defined herein.

### 3.7 FIELD REPORT

- A. Field Report Contents
- B. Contractor shall prepare and submit a draft and final Field Report to the DU Project Manager. All copies, except one final Field Report, shall be bound, including all photographs/slides. Contractor shall make an assessment of site based on field work and analysis required by this contract. As a minimum, each Field Report shall include the following:
  - 1. Owner's name and address (\_\_\_\_\_);
  - 2. Operator's name and address, if different from the owner (\_\_\_\_\_);
  - 3. Name and business address of each person who supervised site assessment or site inspection;
  - 4. Scaled site sketch that approximately shows;
    - a. Location and configuration of any tanks and piping (if applicable);
    - b. Locations and depths of field screening tests;
    - c. Proximity to buildings and residences;
    - d. Any release sites (if applicable);
    - e. Any free product sites (if applicable);
    - f. Facility and property boundaries;
    - g. Bar scale and north arrow; and
    - h. Any other pertinent information;

5. Photographic history and description of contract work to include pre- and post-construction photographs. Each print shall show the following information in typewritten format.
  - a. Location Contract No.
  - b. Contractor/Photographer Date/Time:
  - c. Photograph No.
  - d. Description
  - e. Direction of View
6. Local climatological conditions during on-site work;
7. Field screening information to include:
  - a. Date, time, and location of tests, including plan and section view of excavation;
  - b. Name of person performing;
  - c. Unusual/unexpected problems;
  - d. Photographs;
  - e. Summary of test results.
8. General Site Inspection: Inspection of site(s) shall be documented in Field Report. Inspection shall include:
  - a. Checking for obvious leaks and spills;
  - b. Checking for any obvious soil contamination caused by a release or leakage
  - c. Classifying the soil strata according to ASTM D 2488 from visual observations of the site and any required excavation. (Note: sieve analyses ARE NOT required; excavation is not required SOLELY for soil strata classification);
  - d. Recording local climatological conditions during inspection.
    - i. Field Notes: Contractor shall maintain field notes in a bound book. Field notes shall be written in ink. Erasures will not be allowed. Contractor shall document all field activities and any visibly contaminated soil. Contractor shall include a copy of field notes as part of draft Field Report. Original field notes shall be submitted as part of final Field Report.

END OF SECTION

## SECTION 02200

### EARTHWORK

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. This section covers furnishing of materials, labor, equipment, and supervision required to complete site earthwork construction as shown on contract drawings. This includes, but is not limited to, the following:
  - 1. Protection for structures, pavements, vegetation, utilities, excavations, and other improvements that are to remain.
  - 2. Implementation of Storm Water Pollution Prevention plan (SWPPP).
  - 3. Undercutting and replacement of unacceptable existing in-place materials.
  - 4. Excavating, filling and backfilling.
  - 5. Subgrade preparation and compaction.
  - 6. Rough and finish grading
  - 7. Dewatering of excavated and graded areas.
  - 8. Granular and aggregate drainage fill.
  - 9. Removal and disposal of excess material.

##### 1.2 REFERENCES

- A. ASTM (American Society for Testing and Materials) D698, Standard Proctor Method for density and moisture control.
- B. ASTM D2487 Unified Soil Classification System.
- C. Other specified ASTM standards.
- D. State of Alaska, Department of Transportation Construction and Materials Specifications.
- E. Occupational Safety and Health Administration, OSHA.

##### 1.3 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01330 SUBMITTAL PROCEDURES.



B. DU approval is required for the following items.

1. Preconstruction Submittals

- a. Contractor shall submit a gradation test in accordance with ASTM D 422 on each type and source of material used in fills and backfills. If material is to be non-frost susceptible, hydrometer tests shall be performed in accordance with ASTM D 422.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with applicable laws, ordinances and State of Alaska codes and standards.

B. Soil Testing and Inspection: Contractor shall provide services of Geotechnical Testing Laboratory to perform lab and field testing and inspection in accordance with the following:

1. Inspection, testing and approval of subgrades for fills, pavements and slabs.
2. Soils compaction testing of in-place soil, and filling compacted areas will be performed by Testing/Inspection Laboratory in accordance with their requirements. Contractor shall pay for any retesting required as a result of inadequate compaction.
3. Submit reports of all inspections, tests and approvals in accordance with Section 01330 SUBMITTAL PROCEDURES.
4. Identify existing unsuitable material to be undercut.
5. At completion of earthwork, submit Certification that all work requiring inspection and testing complies with requirements of these Specifications.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Schedule and coordinate delivery and removal of material to avoid stockpiling on site.

1.6 PROJECT CONDITIONS

- A. Undertake earthwork operations only when weather conditions permit compliance with the referenced standards and Contract Documents.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate earthwork with the work of related Sections.

## PART 2 - PRODUCTS

### 2.1 MATERIAL SOURCE AND HANDLING

- A. Borrow sources shall be approved by DU Project Manager prior to any usage as a borrow source for project needs
- B. No borrow material shall be brought on site without approval of DU Project Manager.
- C. There is no borrow site for selected backfill or unclassified material available on Fort Greely.
- D. Contactor shall check any proposed borrow source for presence of hazardous substances and petroleum products as defined in ASTM E 1527. A phase 1 Environmental Site Assessment shall be submitted for each proposed borrow site.
  - 1. Assessment shall be performed under direct supervision of an independent, registered professional engineer, currently licensed by the State of Alaska, within such time frame as will ensure reports are valid when submitted.
  - 2. Engineer shall have a minimum of three years experience in performing satisfactory Environmental Site Assessments. Qualifications of engineer performing assessment shall be included with report.
  - 3. All reports shall be certified in writing by engineer and submitted to DU Project Manager for review.
  - 4. Reports shall be submitted at least 30 days prior to needing borrow materials for work.
- E. Where hazardous materials are indicated, use of source will not be allowed.
- F. When soils into which excavation will penetrate and/or when backfill soils are sensitive to erosion, sloughing under seepage forces, softening during soaking, and/or repeated loading of heavy equipment, Contractor shall take all necessary steps to protect work. This may include, but is not limited to:
  - 1. Sloping excavation to drain and/or dewatering from inside excavation with sumps and/or pumps or from outside the excavation with well-points or other means;
  - 2. Limiting construction traffic to designated and maintained construction roads and placing additional temporary fill as necessary to support traffic loads;
  - 3. Developing alternate access routes; and,

4. Excavating with a backhoe with a smooth blade from outside excavation.
- G. If subgrade or backfill soils are disturbed by surface runoff, ponding, seepage, and/or construction traffic, disturbed soils shall be regraded and densified to density requirements indicated or completely removed and replaced with selected materials compacted to applicable density requirements. Contractor shall perform corrective work at no extra cost.
- H. NFS Material: Non-frost susceptible (NSF) material is sand, gravel, crushed stone, or mixtures thereof, which contains no more than three percent particles finer than 0.02 mm by weight.
- I. Unsuitable Material: Do not use the following material for fill or backfill.
  1. Frozen, excessively wet, organic or deleterious material.
  2. Material containing soft limestone, sandstone, shale, debris or waste.
  3. Material classified as ML, OL, OH or PH.

## 2.2 BACKFILL

- A. Use excavated native material for backfill if it meets requirements of Alaska DOT Selected Backfill Material, Section 204-2.01, Type C (Subsection 703-2.07). If excavated material does not comply, provide Selected Backfill Material from preapproved borrow source.
- B. Use backfill material within the pavement structure, meeting requirements for applicable lift of material.
- C. Use all suitable material from excavation for backfill prior to using material from another source.
- D. Backfill materials shall maintain their hardness or stability when exposed to water or loads.

## 2.3 PIPING TRENCH BACKFILL

- A. Use Bedding Material complying with Alaska DOT Type A (Subsection 703-2.07) passing the 3-inch sieve for trench backfill material to 12 inches above the pipe.
- B. Use excavated native material for backfill if it meets requirements of Alaska DOT Selected Backfill Material, Section 204-2.01, Type C (Subsection 703-2.07). If excavated material does not comply, provide Selected Backfill Material from preapproved borrow source.

- C. Use bedding material, and backfill material within the pavement structure, meeting requirements for applicable lift of material.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Examine areas and conditions under which earthwork is to be performed. Notify DU Project Manager of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Starting of work constitutes acceptance of substrate.

### 3.2 PROTECTION

- A. Protect reference points, existing structures, sidewalks, paving, curbs and other improvements to remain against damage during earthwork operations.
- B. Provide shoring, bracing, sheet piling, underpinning and other methods as needed to prevent cave-ins and other unplanned displacement of earth, for safe execution of the work, and for protection of persons and property.
- C. Design and install retention systems for all excavations with slopes greater than 1:1, unless otherwise approved by Contractor's Geotechnical Testing Laboratory.
- D. Protect bottoms of excavations and soil around and beneath foundations from frost.
- E. Water Removal:
  - 1. Grade around excavations to prevent accumulation of surface runoff.
  - 2. Provide and operate equipment to keep construction areas free of subsurface, surface, and storm water.
  - 3. Dispose of water as directed by DU Project Manager so construction and storage areas, streets, drives and other surfaces are not flooded.
  - 4. Should uncharted or incorrectly charted piping or appurtenances be encountered during excavation, consult the DU Project Manager immediately for direction. Cooperate with Army and DU Project Manager in keeping services and facilities in operation. Repair utilities damaged by neglect of Contractor to the satisfaction of DU Project Manager.
  - 5. Contractor shall be responsible for rodding, routing and flushing clean existing sewers, catch basins, hose bibs and field drains at no cost to DU Project Manager if silt runoff from stockpiled excavated materials or unprotected disturbed areas obstructs drainage, at any time during the Work.

- F. Provide barricades and protection required by law for all open excavations occurring as part of this work.
- G. Existing Utilities:
  - 1. Follow dig permit procedure and standards. If utilities are to remain in place, provide adequate protection during earthwork operations.
  - 2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult DU Project Manager immediately for direction. Cooperate with DU Project Manager, other utility companies and Fort Greely DPW in keeping services and facilities in operation. Repair utilities damaged by neglect of Contractor, to satisfaction of DU Project Manager.
  - 3. Do not interrupt existing utilities except when permitted in writing and then only after acceptable temporary utility services have been arranged.
  - 4. Do not remove utilities that must be removed with excavations until they have been properly disconnected and capped.
- H. Protect existing trees and shrubs outside grading area using suitable barriers or other acceptable methods.

### 3.3 CLEARING AND DEMOLITION

- A. Remove above and below grade site improvements as necessary for accomplishment of earthwork, including but not limited to pavements, bases, curbs, steps and sidewalks.
- B. Asphaltic concrete pavements, concrete pavements, sidewalks and curbs in areas to be excavated shall be completely removed. In areas to receive stockpiled fills or used for construction access, these improvements may remain in place, but must be restored to their original condition or replaced by Contractor following earthwork operations.
- C. Closely coordinate work under this specification section with DU Project Manager regarding which existing site improvements will be removed or retained.
- D. Legally dispose of all waste materials on Post.

### 3.4 EXCAVATION

- A. Excavation is unclassified and includes excavation to subgrade elevations shown or described, regardless of character of materials or obstructions encountered.

- B. Do not allow water to accumulate in excavations. Remove water before it causes soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey water from excavation. Comply with ADOT Standard Specifications for Highway Construction and ADNIR specifications.
- C. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of DU Project Manager.
- D. Excavate unsatisfactory soil materials encountered that extend below required elevations to additional depth directed by Contractor's Geotechnical Testing Lab. Such additional excavation and related backfill, provided it is not due to fault or neglect of Contractor, will be paid for as a change in the Work. Removal of material softened by moisture and water **will not be considered** as a change in the Work.
- E. Disposal
  - 1. Legally dispose of excavated materials on Post.
- F. Protect excavation bottoms from freezing when atmospheric temperature is less than 35°F.
- G. Use of explosives is prohibited.
- H. Stability
  - 1. Contractor shall slope sides of excavations to angle required for safety, use trench boxes or shore and brace where sloping is not possible either because of space restrictions or stability of material excavated.
  - 2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling by scaling, benching, shelving or bracing.
  - 3. Take precautions to prevent slides or cave-ins when excavations are made in locations adjacent to backfilled excavations and when sides of excavations are subjected to vibrations from vehicular traffic or the operation of machinery or any other source.
  - 4. In all cases sides of all excavations shall be constructed to satisfy requirements set forth in local, state, and federal safety regulations regarding shoring and slope angle.
  - 5. Minimum temporary excavation slopes for excavations exceeding 4 feet in depth shall be 1.0 horizontal to 1.0 vertical.

6. Flatten slopes where top of excavation is surcharged and/or during wet conditions.
7. Excavations to be constantly observed by Contractor for signs of yielding and potential failures or “cave-ins”.

### 3.5 SUBGRADE PREPARATION

- A. Undercut any soft or yielding areas as per ADOT Standard Specifications for Highway Construction.

### 3.6 BACKFILL AND FILL

#### A. General

1. Fills and backfills shall be constructed in lifts of 12-inch maximum thickness; **6-inch maximum lift thickness if hand operated compactors are used.**
2. Finished surface of fills and backfills shall be smooth with no soft or yielding areas.

#### B. Backfill

1. Backfill excavations as promptly as work permits, but not until completion of the following:
  - a. Acceptance by DU Project Manager of construction below finish grade including, where applicable, insulation and waterproofing.
  - b. Removal of concrete formwork, shoring and bracing, and filling of voids with selected materials.
  - c. Removal of trash and debris.

#### C. Ground Surface Preparation

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions and deleterious materials from ground surface prior to placement of backfills.
2. When existing ground surface in backfill areas has a density less than specified, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

#### D. Dewatering

1. Maintain surfaces of fills properly compacted and drained at all times



to prevent surface water penetration and deterioration and to prevent flooding of excavations and adjacent property.

### 3.7 GRADING

- A. Area grading fill shall be constructed of selected material. Fill material shall be placed in lifts of 12-inch maximum thickness; six-inch maximum thickness if hand operated compactors are used.
- B. Finished surface of fill shall be smooth with no soft or yielding areas and shall be graded to not more than 0.10-foot above or below the design finish grade.
- C. Uniformly grade areas, including adjacent transition areas. In those areas where the grade at limit of grading is above or below elevation of adjoining natural surface, provide finish grade to limit of grading, edge of the cut or fill feathered off to make a smooth transition to adjoining natural surface.
- D. Grading for Pavements
  - 1. After grading or excavating to specified tolerances, compact subgrade surfaces to specified depth and percentage of maximum density.
- E. Grading Outside Pavement Lines
  - 1. Grade areas adjacent to pavement lines to drain away from pavements and to prevent pooling. Finish surfaces free from irregular surface changes and specified tolerances.

### 3.8 FIELD QUALITY CONTROL

- A. Hold a pre-construction meeting with DU Project Manager and Contractor's QC personnel.
- B. Prior to the acceptance of work specified in this section, comply with all testing and / or inspections required by the DU Project Manager.
- C. Comply with all codes and procedures applicable to this Section.

### 3.9 TOLERANCES

- A. Establish all subgrades and finish grades as follows:
  - 1. Base course for slabs and pavements within ¼ inch when tested with 10 ft. straightedge.
  - 2. Subgrades within ½ inch of bid package elevations.
  - 3. All other areas within 0.10 ft. of bid package elevations.

END OF SECTION

## SECTION 02500

### RESTORATION OF SURFACE CONDITIONS

#### PART 1 - GENERAL

##### 1.1. GENERAL REQUIREMENTS

- A. Contractor shall restore site surface of all areas affected by project. Only those new improvements indicated in contract documents will be permitted to alter appearance of site surface after completion of work.
- B. Contractor shall be responsible for restoration of surface conditions within construction limits.
- C. All existing surface improvements and landscaping if removed, destroyed or damaged during course of work shall be replaced. Extent of this work will be dependent on Contractor's means and methods used during course of construction and the care exercised by Contractor in protecting surface features.

##### 1.2. CONTROL

- A. Because extent of surface conditions which must be restored is dependent on Contractor, extent of this work is not itemized in contract documents. The contract documents do, however, define typical items of work which shall be used in the replacement of those surface conditions which DU Project Manager anticipates will require replacement. If Contractor removes, destroys or damages an existing surface feature not anticipated to require replacement and replacement work is not defined in contract documents, Contractor shall inform DU Project Manager who will develop and issue documents defining work to be performed in replacement of said feature. Contractor shall perform this replacement work and all other replacement work at no additional cost to DU
- B. Videotapes and photographs of the site surface taken prior to construction will be produced and maintained by Contractor. These records shall be used to determine extent of surface condition restoration work.

##### 1.3. QUALITY ASSURANCE

- A. All restoration of roadway, pavement, curb, gutter, and sidewalk surface conditions shall conform to following codes and standards as if reproduced herein:
  - 1. State of Alaska, Department of Transportation, "Construction and Materials Specifications
  - 2. State of Alaska, Department of Transportation, "Standard Construc-

tion Drawings".

PART 2 - PRODUCTS

AS REQUIRED.

PART 3 - EXECUTION

AS REQUIRED.

END OF SECTION

SECTION 02560

BITUMINOUS WATERPROOFING/INSULATION

PART 1 - GENERAL

1.1. SUMMARY

- A. The work of this section includes, but is not limited to, the following:
  - 1. Modified bituminous sheet waterproofing.
  - 2. Extruded polystyrene insulation board.
  - 3. Asphalt protection board.
- B. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
  - 1. Section 03300 – Cast-In-Place Concrete
  - 2. Section 07920 – Joint Sealants

1.2. REFERENCE STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text.
- B. American Society for Testing and Materials (ASTM)
  - C 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
  - D 412 Standard Test Methods for Rubber Properties in Tension
  - D 570 Standard Test Method for Water Absorption of Plastics
  - D 882 Standard Test Methods for Tensile Properties of Thin Plastic Sheeting
  - D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
  - D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
  - D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
  - D 3767 Standard Practice for Rubber - Measurements of Dimensions
  - D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
  - E 96 Standard Test Methods for Water Vapor Transmission of Materials
  - E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

### 1.3 SUBMITTALS

- A. SD-03 Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations. Include certification of data indicating VOC (Volatile Organic Compound) content of all components of waterproofing system.
- B. SD-07 Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

### 1.3. QUALITY ASSURANCE

- A. Manufacturer: Sheet membrane waterproofing shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.
- B. Installer: A firm which has at least 3 years experience in work of the type required by this section.
- C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

### 1.4. DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets.
- B. Protect from damage from sunlight, weather, excessive temperatures and construction operations.
- C. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- D. Protect mastic and adhesive from moisture and potential sources of ignition.
- E. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
- F. Sequence deliveries to avoid delays, but minimize on-site storage.
- G. Remove damaged material from the site and dispose of in accordance with applicable regulations.

### 1.5. PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.6. WARRANTY

- A. Sheet Membrane Waterproofing: Provide written 5 year material warranty issued by the membrane manufacturer upon completion of the work.

PART 2 - PRODUCTS

2.1. MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Self-adhesive, cold-applied composite sheet consisting of a thickness of 0.056 in. of rubberized asphalt and 0.004 in. of cross-laminated, high density polyethylene film.
- B. Provide rubberized asphalt membrane covered with a release sheet, which is removed during installation. No special adhesive or heat shall be required to form laps.
- C. Approved Products
1. Bituthene 3000/Low Temperature Membrane by Grace Construction Products (Basis of Design)
  2. CCW MiraDRI 860/861 by Carlisle Coatings
  3. Blueskin WP 200 by Henry Company
  4. SealTight Mel-Rol by WR Meadows

| PHYSICAL PROPERTIES FOR MEMBRANE                |                       |                                   |
|---|-----------------------|-----------------------------------|
| PROPERTY  | TEST METHOD           | TYPICAL VALUE                     |
| Thickness                                       | ASTM D 3767 Method A  | 0.060 in. nominal                 |
| Low Temperature Flexibility at -45°F            | ASTM D 1970           | Un affected                       |
| Crack Cycling at -25°F, 100 Cycles              | ASTM C 836            | Unaff ected                       |
| Lap Adhesion at Minimum Application Temperature | ASTM D 1876           | 5 lbs/in                          |
| Tensile Strength, Membrane Die C                | ASTM D 412            | 325 lbs/in <sup>2</sup> minimum   |
| Tensile Strength, Film                          | ASTM D 882            | 5,000 lbs/in <sup>2</sup> minimum |
| Ultimate Elongation                             | ASTM D 412            | 300% minimum                      |
| Peel Strength                                   | ASTM D 903            | 9 lbs/in                          |
| Puncture Resistance, Membrane                   | ASTM E 154            | 50 lbs minimum                    |
| Resistance to Hydrostatic Head                  | ASTM D 5385           | 200 ft of water                   |
| Vapor Permeance                                 | ASTM E 96, Section 12 | 0.05 perms maximum                |
| Water Absorption                                | ASTM D 570            | 0.1% maximum                      |

## 2.2. MISCELLANEOUS WATERPROOFING MATERIALS

- A. Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

## 2.3. BOARD INSULATION

- A. Extruded polystyrene board insulation complying with ASTM C 578, square or shiplap edged.
  - 1. Thickness as indicated on DU Standard Construction Drawings.
  - 2. Type VI (minimum 40 psig compressive strength) for vertical application.
  - 3. Type VII (minimum 60 psig compressive strength) for horizontal application.
  - 4. Type V (minimum 100 psig compressive strength) for traffic lid application.
  - 5. Minimum R-Value of 5.0 per inch of thickness.
  - 6. Maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.
- B. Approved Products
  - 1. STYROFOAM Highload by Dow Chemical Company (Basis of Design)
  - 2. FOAMULAR by Owens Corning
  - 3. CertiFoam by Diversifoam Products (Type VI & VII only)

## 2.4. ASPHALT HARDBOARD

- A. Premolded semi-rigid protection board consisting of bitumen, mineral core and reinforcement, ASTM D 6506.
  - 1. Provide 1/8" thick hardboard on vertical surfaces.
  - 2. Apply two layers of 1/8" thick hardboard or one layer of 1/4" thick hardboard on horizontal surfaces.
  - 3. Asphaltic hardboard shall be Bituthene Asphaltic Hardboard by Grace Construction Products.

## PART 3 - EXECUTION

### 3.1. EXAMINATION

- A. Installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

### 3.2. PREPARATION OF SUBSTRATES

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate

and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.

B. Cast-In-Place Concrete Substrates

1. Do not proceed with installation until concrete has properly cured and dried minimum 7 days for normal structural concrete. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
3. Repair bungholes over 0.5 in. in length and 0.25 in. deep and finish flush with surrounding surface.
4. Remove scaling to sound, unaffected concrete and repair exposed area.
5. Grind irregular construction joints to suitable flush surface.

3.3. INSTALLATION

A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:

1. Apply primer at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of primer.
2. Delay application of membrane until primer is completely dry. Dry time will vary with weather conditions.
3. Seal daily terminations with troweled bead of mastic.
1. Apply protection board and related materials in accordance with manufacturer's recommendations.

3.4. INSULATION

- A. Utilidors and access vaults shall be insulated as described in the Contract Documents and as hereinafter specified.
- B. Insulation shall be kept dry at all times and protected from weather and moisture before and after installation. Polystyrene insulation shall not be left exposed to direct sunlight for a combined period greater than 24 hours.
- C. Exterior insulation for utilidors with traffic lids shall have the added requirement of 100 psi minimum compressive strength.
- D. Adhere insulation to waterproofing membrane with Bituthene Protection Board Adhesive.
- E. Joints between blocks shall be buttered with insulation manufacturer's recommended mastic compatible with waterproofing material, and blocks shall be butted snugly together. Insulation shall be protected during backfill operations to prevent any damage. Damaged insulation shall be replaced at no cost to DU.



- F. Openings in insulation around lifting loops, vents, and other protrusions shall be filled and cemented flush with the face of the insulation, with mastic compatible with waterproofing material.

3.5. PROTECTION

- A. Do not permit foot or vehicular traffic on unprotected membrane
- B. Protect waterproofing from damage and wear from subsequent construction activities during remainder of construction period.
- C. Protect installed board insulation from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction

END OF SECTION

SECTION 02920  
TOPSOIL AND SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Placing topsoil.
  - 1. Subsoil grade shall be 4 inches plus-or-minus 1 inch below finish grade for lawn areas allowing for 4 inch lift of topsoil in lawn areas.
  - 2. Place, level, and compact topsoil when material is dry and unfrozen.
- B. Seeding, hydroseeding, mulching.
- C. Maintenance.

1.2 RELATED WORK

- A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

1.3 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Provide fresh, recleaned seed of latest crop, meeting minimum purity and germination requirement.

1.4 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01330 SUBMITTAL PROCEDURES.
- B. DU approval is required for the following items.
  - 1. Preconstruction Submittals
    - a. Submit soil test report on soils proposed for use under this section. Include pH, nitrogen, phosphorus, and potassium; particle size and organic content by volume.
    - b. Contractor shall notify DU Project Manager of location from which it proposes to furnish topsoil at least 30 days prior to delivery of topsoil to project from location. Topsoil and its source will be inspected and tested by DU Project Manager before approval will be granted for its use. Should topsoil not

meet standards of approved submittal, Contractor must adjust topsoil or remove existing and replace.

- c. Provide written certification from seed supplier confirming seed mix, guaranteed analysis, germination rate, and purity rate.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Furnish standard products in manufacturer's standard containers bearing original labels showing quantity, analysis and name of source.
- C. Store products with protection from weather or other conditions which would damage or impair the effectiveness of the product.
- D. At conclusion of maintenance period, final acceptance inspection shall be conducted. Contractor shall notify DU Project Manager in writing seven days in advance of final inspection.

## 1.6 MAINTENANCE

- A. Upon satisfactory completion of substantial completion inspection, Contractor shall commence maintenance period and warranty.
- B. Provide sixty-day establishment, maintenance and warranty period for seeding.

## PART 2 - PRODUCTS

### 2.1 TOPSOIL

- A. Topsoil furnished shall consist of a natural friable surface soil without admixtures of undesirable subsoil, refuse, or foreign materials. It shall be free from roots, hard clay, coarse gravel, stones larger than 3/4" in diameter, noxious weeds, tall grasses, brush, sticks, stubble, or other litter, and shall have a healthy growth of crops, grasses, trees, or other vegetation that it is free-draining and non-toxic. Amend topsoil as needed to meet requirements identified below prior to delivery to site.
- B. Topsoil Composition:
  - 1. Organic Materials: Not less than 40% or more than 60% by volume. (15-20% by weight)
  - 2. Silt: Not less than 20% by volume. (50-60% by weight)
  - 3. Sand: Not less than 20% or more than 30% by volume. (20-30% by weight)

## 2.2 FERTILIZER AND LIMESTONE

- A. Application rate of fertilizer and limestone per 1,000 square feet of ground area of topsoil shall be based on soil analysis test so that total natural and applied chemical constituents are as follows:
1. Nitrogen 21-35 PPM
  2. Phosphoric Acid 11-20 PPM
  3. Potassium 76-150 PPM
  4. Limestone Sufficient to attain a pH of 6.0-6.5

## 2.3 SEED MIXTURE

- A. Lawn Seed Mix

| Seed type                       | % by Weight | Min. % Purity | Min. % Germination |
|---------------------------------|-------------|---------------|--------------------|
| Festuca Rubra 'Arctared Fescue' | 45          | 90            | 85                 |
| Poa Protensis 'Alene'           | 45          | 90            | 85                 |
| Annual Ryegrass                 | 10          | 90            | 85                 |

## 2.4 ACCESSORIES

- A. Water: Clean fresh and free of substances or matter which could inhibit vigorous growth of grass.
- B. Top Mulch: Use topsoil for top mulch where dry lawn seeding is used.
- C. Mulch for hydroseeding: Mulch shall be cellulose wood or paper fiber such as Astromulch, Silva fibre, or Conwed

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Verify that prepared soil base is ready to receive the work of this Section.
- B. Beginning of installation means acceptance of existing site condition.

### 3.2 SUBSOIL PREPARATION

- A. Smooth subgrade to eliminate uneven areas and low spots. If hazardous materials of any kind are observed at subgrade, Contractor shall immediately notify DU Project Manager. Do not resume work in area until it has been

determined that there is no hazardous material or until any hazardous material has been properly removed.

### 3.3 PLACING TOPSOIL

- A. Till existing subsoil that will receive topsoil to depth of 6 inches prior to placing topsoil. Ensure all areas that have been compacted due to heavy vehicular and construction related traffic have been fully tilled to depth of 6 inches.
- B. Spread topsoil to minimum depth of 4", after compaction, over all disturbed areas.
- C. Grade to eliminate rough, low, or soft areas. Grades shall meet and blend naturally with existing, undisturbed areas. All grades shall produce positive drainage.
- D. Loosen area 4" deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
- E. Remove all foreign materials, roots, stones larger than 3/4" in diameter, noxious weeds, or other litter while spreading material.
- F. Place topsoil seven days maximum prior to seeding.
- G. After seeded areas have been prepared, take no heavy objects over them except lawn rollers.
- H. After preparation of lawn areas and with top soil in semi-dry condition, roll lawn planting areas in two directions at approximately right angles with water ballast roller weighing between 100 and 150 lbs.
- I. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.

### 3.4 SEEDING TIME

- A. Seed shall be installed between May 15 and September 1 for summer establishment; and after first hard frost and before snow accumulation for dormant seeding in the fall. Dormant seeding in fall is entirely at Contractor's risk. In event that dormant seeding is unsuccessful, it shall be Contractor's responsibility to re-seed the following spring.
- B. Application Rate: 5 pounds per 1,000 square feet.

### 3.5 HAND SEEDING

- A. Apply seed evenly, at specified rates, in two intersecting directions. Rake in lightly. Do not seed in excess of that which can be mulched on same day.

- B. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- C. Roll seeded area with roller not exceeding 150 lbs.
- D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

### 3.6 HYDROSEEDING

- A. Apply seeded slurry at rate of required seed mixture.
- B. Integral mulch shall be applied to thickness of approximately 1/8 inch. Maintain clear of shrubs, trees or other objects.
- C. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil, but do not allow puddling, slumping, or erosion of planted area. If hydraulic methods are used, apply spray mulch to attain uniform cover over seed bed to depth of 1/8" after seeding is complete.

### 3.7 SEED PROTECTION

- A. Identify seeded areas with stakes, string, and fluorescent ribbon around area periphery. Set string height to 36 inches. Space stakes at maximum 60" intervals.

### 3.8 CLEANUP

- A. Project area shall be left clean and neat at end of each working day.
- B. Wash clean all building and paving surfaces that were affected by seed installation.

### 3.9 MAINTENANCE

- A. Lawn maintenance period shall be a period of 60 days from date that lawn seeding is completed. In event of late-season planting, maintenance season will stop on October 1 and start for remainder of the 60 days on May 15 of following year.
- B. Mow lawn areas to a height of 2-1/2"-inches when grass reaches a height of 4-inches.
- C. During period when seed is germinating and lawn is establishing, water daily to maintain moist conditions
- D. Once lawn is established, all areas shall be watered at least once a week during maintenance period, excluding period from first hard frost or October 15, whichever comes first to May 15, to maintain soil moisture throughout

root zone and shall be conducted regardless of natural rain fall unless approved in writing DU Project Manager.

- E. One-half of an inch (1/2") of water is required weekly and shall be applied at rates to promote maximum penetration to root zone with minimal run-off.
- F. Water to prevent grass and soil from drying out.
- G. Control growth of weeds.
- H. Repair and replacement of all damaged or dead seeded areas shall occur upon request by DU Project Manager.
- I. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 03300  
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. All labor, materials, equipment, special tools and services to complete cast-in-place concrete work required for the Project, as herein specified, and as indicated on the Contract Documents.
- B. Described elsewhere and Included as Part of Section 03300.
  - 1. Section 05550 – Miscellaneous Metal Fabrications.
- C. Related Sections:
  - 1. Section 02200 – Earthwork.
  - 2. Section 03410 – Pre-cast Concrete.
  - 3. Section 02560 – Bituminous Damp-proofing.
  - 4. Divisions 15 and 16 - Pads, inserts, sleeves and embedments for mechanical and electrical items specified therein.

1.2 REFERENCES

Note: All reference specifications noted throughout 03300 shall be the latest edition at time of proposal submittal, unless otherwise stated.

- A. American Concrete Institute (ACI) 301: Standard Specifications for Structural Concrete is hereby incorporated as part of this Section. Supplemental requirements and modifications listed herein take precedence over the requirements of ACI 301. All ACI 301 items unless modified by the Contract Documents are incorporated as written. When any part of any item is modified or voided, the unaltered provisions of the part shall apply as written.
- B. ACI 305R: Hot Weather Concreting.
- C. ACI 306.1: Standard Specification for Cold Weather Concreting.
- D. ACI 318 "Building Code Requirements for Reinforced Concrete."
- E. The ACI SP-15 Field Reference Manual.
- F. Other ACI references as noted in this Section.
- G. American Association of State Highway and Transportation Officials



(AASHTO) Specifications as noted in this Section.

- H. American Society for Testing Materials (ASTM) Specifications as noted in this Section.
- I. Concrete Reinforcing Steel Institute (CRSI): Manual of Standard Practice.

### 1.3 SUBMITTALS

- A. Submit to DU Project Manager mix designs and test results conforming to requirements of Section 4 of ACI 301. Submit request for approval to use admixtures, if any. A complete mix design submittal must be furnished at least three weeks prior to planned use of that mix. Contractor is cautioned to undertake mix design preparation and submittal procedures immediately after authorization to proceed with the Project. Submitted mix design shall address weather conditions which are expected to occur during concrete construction phase. Concrete mixes shall not only be designed for average temperature and humidity conditions, but also for adverse conditions (hot and cold weather), as applicable to this project.
- B. Submit letter to DU Project Manager stating that concrete subcontractors and suppliers are familiar with reference standards.
- C. Submit to DU Project Manager reinforcing steel shop drawings in accordance with Section 3 of ACI 301 and Division 1 - General Requirements.
  - 1. Shop drawings shall be made by Contractor and submitted to DU Project Manager for review. Fabrication of material prior to receipt of approved shop drawings for that material shall be at Contractor's risk.
  - 2. Contractor is responsible to furnish field-verified information, coordinate material requirements, and review shop drawings prior to submittal of shop drawings to DU Project Manager. Receipt of shop drawings by DU Project Manager will be an assumption by DU Project Manager that this has been done.
  - 3. Notations by DU Project Manager made on shop drawings do not authorize additional compensation for Contractor.
  - 4. Contract Documents (the drawings and specifications) govern all concrete work. Errors on shop drawings or discrepancies between shop drawings and Contract Documents shall be governed by Contract Documents. Even if shop drawings contain errors after review by DU Project Manager, no additional compensation is due Contractor to correct work to what is shown on Contract Documents.
- D. Submit procedures and records required in hot and cold weather concreting

work.

- E. The following submittals shall be provided in accordance with ACI 301 and Division 1 - General Requirements.
1. Contractor's proposed Testing agency.
  2. Field and Laboratory tests that are the Contractor's responsibility.
  3. Data and test documentation on proposed materials including but not limited to:
    - a. Cement
    - b. Aggregates
    - c. Admixtures
    - d. Reinforcing
    - e. Curing materials
    - f. Forms release agents
    - g. Testing services
    - h. Related materials for concrete construction specified herein
  4. Construction joints not shown on the drawings.
  5. Method of developing bond at joints (except slabs on grade).
  6. Method of adding admixtures.
  7. Procedure for adding water to ready-mix at site, including method of measuring water.
  8. Method(s) for preserving moisture in the concrete.
  9. Ready-mix delivery tickets.
  10. Certificate of Conformance for concrete production facilities by NRMCA.
- F. DU Project Manager's review of details and construction operations shall not relieve Contractor of responsibility to successfully complete work in accordance with these Specifications and within Contract time.

#### 1.4 QUALITY ASSURANCE

- A. Regulatory requirements:

1. Comply with all applicable laws, ordinances, codes and regulations.
2. Comply with the referenced ACI publications, as modified and supplemented in this Section.

B. Tests and inspections:

1. Contractor shall employ a Geotechnical Engineer to inspect and approve foundation bearings and backfill compaction. Contractor will place no concrete until subgrade approvals have been obtained.
2. Contractor shall employ a testing agency to provide the services specified in Section 1.6.4 of ACI 301, including additional testing services defined in 1.6.4.3.
3. Contractor shall employ a testing agency to perform all testing required by Contractor for qualification of proposed materials and establishment of mix designs for his use in determining concrete strengths for early form removal, and for all other testing services needed or required by the Contractor.
4. Contractor shall coordinate all required inspections and testing.
5. Contractor shall provide a minimum of 24 hours notice for inspections and testing to be performed Monday thru Friday, and 72 hours notice for inspections and testing to be performed on Saturdays, Sundays, and Holidays.
6. Inspections and testing are required for all work that is to be performed over the weekend and/or after normal working hours.
7. Premium cost required by the Testing Agency is to be paid by the Contractor.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to the project site bundled, tagged and marked. Use durable tags indicating bar size, lengths, etc., and other information corresponding to markings shown on placing drawings.
- B. All reinforcement at the site shall be stored off the ground and protected from damage, accumulation of dirt and excessive rust.

1.6 SEQUENCING

- A. Utilidor and access vault construction sequencing shall allow placement of pipe sections and hangers in the utilidor by Mechanical Contractor before

forming or placing utilidor/access vault roof slab. General Contractor coordinate placement with Mechanical Contractor.

## 1.7 SUPPLEMENTAL REQUIREMENTS AND MODIFICATIONS TO ACI 301

- A. The following statements modify and supplement ACI 301. All unaltered parts of ACI 301 shall apply as written. The Section and paragraph numbers correspond to those in ACI 301. Note that each technical section of ACI 301 includes General Requirements, Products, and Execution per the Three-Part Section Format of the Construction Specification Institute.

### Section 1 (ACI 301) - General Requirements

#### 1.6.3.2.c

The Contractor is required to arrange for all testing, giving the testing agency advance notice as required per specification section 03300 - 1.4.B.

#### 1.6.3.2.d.1

The Contractor shall provide a curing box as required by ASTM C 31.

#### 1.6.4.1.c

Report in writing all test results to DU Project Manager and General Contractor on same day tests are made. Report by phone the results of early break cylinders to Contractor/DU Project Manager. Reports of strength tests shall contain the name of the project, date of placement, location of batch mix portions, breaking strength and type of break, size of aggregates, unit weight per cu. ft., type of cement, types of admixtures, percentage of entrained air, slump and required strength.

#### 1.6.4.2.d.1

All concrete mixes except foundation concrete and backfill concrete shall have at least one strength test for each 30 cubic yards or fraction thereof, placed in any one day.

#### 1.6.4.2.e.1

Make four (4) test specimens for each sample. One specimen shall be a hold specimen, to be tested only if a defective specimen is found.

#### 1.6.4.2.e.2

Age of concrete for acceptance testing shall be 28 days unless otherwise shown in TABLE 4.2.2.8.

#### 1.6.4.2.f.1

Determine the slump (ASTM C 143) for each batch of concrete to which superplasticizer is being added. This slump testing shall be provided by the Contractor.

#### 1.6.4.2.i

Air content tests shall be taken from every truck. Do not allow concrete to be placed

which does not satisfy air entrainment requirements. The second or third truck every day shall have air content checked at the end of truck discharge.

1.6.4.2.j

The testing services provide the acceptance or rejection basis for concrete furnished by this contract. It is, therefore, necessary that testing for air content and slump not only be done after all adjustments have been made, but before the concrete is discharged.

1.6.4.3.a Contractor shall employ an inspection agency to visually inspect the placement of reinforcing steel. Do not place concrete until all outstanding issues cited in the inspection report have been corrected. Inspection of reinforcing steel to include, but not limited to:

1. Size, spacing, and quantity of bars.
2. Bar splices.
3. Embedments.
4. Concrete cover.
5. Support and securement.
6. Coatings

1.6.4.3.b

Contractor shall employ an inspection agency to inspect concrete operations including, but not limited to:

1. Use of proper concrete mix.
2. Consolidation.
3. Finish and finishing operations.
4. Curing methods, materials, and procedures.
5. Shoring removal and reshoring operations.
6. Formwork materials.

1.7.1.5

The Contractor shall bear all costs of correcting rejected work, including the cost of the DU's additional services thereby made necessary.

Section 2 (ACI 301) - Formwork and Form Accessories

2.1.2.3.d

Form tie configuration and spacing for exposed-to-view concrete shall be submitted for review and approval by DU Project Manager.

2.2.1.3

Form release shall be a commercial formulation form coating compound that will not bond with, stain, nor adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. The form release agent manufacturer shall certify that the form release agent is chemically and physically compatible with all subsequent treatments of concrete surfaces. Furthermore, the form release agent shall be approved in writing by the manufacturers of all subsequent treatments.

2.2.1.4

Preformed Expansion Joint Filler - Resilient bituminous type, complying with ASTM A1751, shall be ½" in thickness unless otherwise noted. Usage: Exterior slabs, walks, drives, curbs and walls.

2.2.1.6

Form lumber shall be new and of grade and size to adequately form, support and brace concrete to shapes and dimensions indicated on Drawings and to provide finishes as herein specified.

2.2.2.3

Earth cuts shall be used for vertical forms for footings below ground where indicated on the Drawings and approved by DU Project Manager prior to placement of concrete.

2.2.2.5.a.1

Bonding agent is required for vertical construction joints in horizontal members, except for slabs on grade.

2.2.2.5.a.2

Maximum one day's placement length of a continuous concrete wall shall not exceed 100 feet.

2.2.3.2.a

Exposed edges of columns, walls and beams shall have ¾" bevels.

2.3.1.2.b

A preconstruction meeting shall be arranged by General Contractor for purpose of reviewing critical tolerances, methods of making measurements, and basis for acceptance/rejection of completed work to avoid misunderstandings at time of final inspection.

2.3.1.3.a

If required, retighten forms and bracing after concrete placement, but before

concrete has taken its initial set, to eliminate mortar leaks and maintain proper alignment.

2.3.1.10.a

All sleeves, inserts and embedded items required by other trades shall be furnished and placed by appropriate mechanical contractor. All other sleeves, inserts, reglets, dovetail anchor slots, anchors and embedded items shall be furnished by appropriate supplier and placed by General Contractor performing work of this Section.

2.3.1.10.b

Sleeves, inserts, anchors and embedded items not shown on structural drawings must be approved by DU Project Manager.

2.3.1.12.a

Remove chips, wood, sawdust, dirt and debris just before concrete is placed.

2.3.1.14

Provisions for Other Trades: Provide openings in concrete and concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

2.3.3.1.a

Reshoring is required. DU Project Manager may disallow any specific procedures which he may consider to be deleterious to the performance of the structure in its completed form.

2.3.4.2.b

In addition to the methods described in 2.3.4.1.a and 2.3.4.1.b, forms (for slabs and beams other than post-tensioned concrete) may be removed when the in-place strength of the concrete reaches the specified strength for removal as determined by the "Windsor Penetrometer" test performed by an approved testing agency in accordance with ASTM C 803, with at least one test per 1800 S.F.

2.3.4.3

Forms may be removed when the in-place concrete reaches the specified 28-day strength, or when the concrete reaches 75% of the specified 28-day strength and is no less than 7 days old. The 7-day minimum age requirement may be waived pending review of the proposed mix designs, forming systems, re-shoring procedures and in-place concrete strengths.

2.3.4.4

For other than post-tensioned concrete, between the dates of October 1 and April 1 or when the average daily temperature has been below 50 degrees F for the duration of the curing period, forms may not be removed until the actual in-place strength of the concrete is demonstrated by two field-cured test cylinders, by

Windsor Penetrometer, or pullout tests, regardless of the results of tests on laboratory-cured cylinders.

### Section 3 (ACI 301) - Reinforcement and Reinforcement Supports

#### 3.2.1.1.a

All reinforcing steel shall have a minimum  $F_y$  of 60 ksi. In addition, all reinforcing steel to be welded shall meet ASTM A706, maximum carbon equivalent of 0.45%

#### 3.2.1.2.b.1

Provide epoxy coated steel where indicated on contract documents.

#### 3.2.1.2.b.2

Since the epoxy coating is flammable, the coated bars shall not be exposed to any fire or flame. Cutting coated bars by burning will not be permitted.

#### 3.2.1.2.b.3

Repairs of coatings on epoxy coated bars and coated accessories shall be made at all breaks, abrasions, etc. exceeding an area of  $0.01 \text{ in}^2$ , and at cut ends.

#### 3.2.1.2.b.4

Every reasonable effort shall be made to repair all damaged areas of the reinforcing steel and accessories before any rusting occurs. If infrequent and small damaged areas do rust, the rust shall be thoroughly removed by sandblasting or other approved method before the areas are repaired. Contractor shall exercise care to ensure that coated bars, when incorporated into the work, are free from dirt, paint, oil, grease, or other foreign substances. DU Project Manager reserves right to require cleaning of reinforcement without additional compensation due Contractor. It is intent of this specification that an entirely rust-free and completely coated steel reinforcement system be provided before concrete is placed. Placing of concrete in the deck shall be performed with methods and equipment which will not damage the coated materials.

#### 3.2.1.5.a.1

Welded wire fabric shall be in accordance with ASTM A 185 (smooth wire) unless noted otherwise on drawings.

#### 3.2.1.10

Tie wire for epoxy-coated bars shall be nylon or plastic-coated. Typically, ends of tie wire must have a minimum of 1" clear distance to face of concrete.

#### 3.2.1.11

Mechanical connections for reinforcing steel shall be in accordance with ACI 318 and ACI 439.3 and approved by DU Project Manager.



3.2.2.2.a.1

Welding of reinforcing steel and welded wire fabric is not permitted without the approval of DU Project Manager.

3.3.2.5.a

Reinforcing steel shall not be continued across joints of slabs on grade, unless otherwise detailed on the drawings.

3.3.2.8.a

Bending of reinforcing steel partially embedded in concrete is not permitted.

3.3.2.11

Placement of bars shall also be in accordance with the detailed recommendations given in the Concrete Reinforcing Steel Institute's "Placing Reinforcing Bars".

Section 4 (ACI 301) - Concrete Mixtures

4.1.1.1

Ready Mix Producer is completely and solely responsible for the design, production, and delivery of the concrete mixes to satisfy this specification. General Contractor shall coordinate the review of the mix designs between the Ready Mix Producer, Forming Contractor, and Placing/Finishing Contractor. General Contractor is responsible for informing Ready Mix Producer of conditions at job site such as methods being used for placing concrete. Adjustments required to facilitate placing and achieve the desired results shall fall within criteria of this specification and shall be at no additional cost to DU. All mix designs and proposed adjustments to same shall be submitted to DU Project Manager for review.

4.2.1.1.a

Cement for all concrete shall be ASTM C 150, Type 1 unless otherwise noted. Air-entrained cement shall not be used. Air requirements shall be met by separate admixtures.

4.2.1.2.a

All normal weight aggregates shall also conform to Alaska Department of Transportation (ODOT) Standard Specifications for Highway Const. sec. 703.

1. Aggregate certification submittal shall include copies of test reports on the fine and coarse aggregates proposed to be used, made by testing laboratory acceptable to DU Project Manager, showing source of the materials and conformance with specification requirements. Date of test shall not be more than six months prior to date of submittal. General Contractor shall furnish similar copies, of current date, when there is a change in source of material and at any time upon demand by DU Project Manager.

4.2.1.3.a

Concrete mixer washout water shall not be used in any concrete.

4.2.1.4.a

Calcium chloride, calcium nitrate, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.

4.2.1.4.b

High Range Water-Reducing Admixture (Superplasticizer) conforming to ASTM C 494, Type F or G shall be used in all concrete with a water/cement ratio below 0.42. The admixture may also be used at General Contractor's option in other mixes, with the written approval of DU Project Manager, at no additional expense to DU.

4.2.1.4.c

Water-reducing, non-chloride, non-corrosive, accelerating admixture conforming to ASTM C 494, Type C or E, shall be used when early initial set is required. admixture must have noncorrosive test data of a year's duration from an independent testing laboratory using an acceptable, accelerated corrosion test method such as that using electrical potential measures.

4.2.1.4.d

Corrosion inhibitors where specified shall be "DCI" by W.R. Grace, added at the rate of 4 gallons per cubic yard of concrete.

4.2.1.4.e

Extended set control admixtures, such as "Delvo" or "Recover", shall not be used with any concrete.

4.2.1.4.f

All admixtures shall be approved by the cement manufacturer and used in accordance with the manufacturer's recommendations.

4.2.1.5.a

Materials used for exposed concrete shall be furnished from the same source throughout the Project unless approved by DU Project Manager.

4.2.2.2

Slump - The concrete shall be produced to have a maximum slump at the point of placement of 4 inches with a tolerance of one inch. This maximum slump may not be exceeded except by the job site addition of High Range Water Reducer (Superplasticizer). In those portions of the structures where member dimensions and/or congestion due to reinforcing steel prevent the proper placement and consolidation of the concrete at the maximum slump specified, superplasticizer shall be used by the Contractor in lieu of increasing the slump of non-superplasticized concrete by the addition of water. Approved mix designs, with smaller size aggregates, may also be used in congested areas to facilitate concrete placement.

- a. When superplasticizer is used, the maximum preadjusted slump shall be 4", and the maximum superplasticized slump shall be 8".

4.2.2.5.a

Calcium chloride, thiocyanates or admixtures containing more than .05% calcium chloride ions are not permitted. Written conformance to this requirement and the chloride content is required from the admixture manufacturer prior to mix design review.

4.2.2.6

Chloride ion concentration - Maximum total chloride ion concentrations in hardened concrete at an age of 28 days contributed from all ingredients, including water, aggregates, cementitious materials and admixtures shall not exceed the limits indicated in TABLE 4.2.2.8 Immediately following DU selection of successful Contractor, Contractor shall test proposed individual concrete ingredients for total chloride ion content. If this ion content calculated on the basis of the proposed concrete mix proportions exceeds the specified limits, it will be necessary to test hardened concrete samples of the proposed mix at age 14 days for total chloride ion content. If these test results exceed the limits, it will be necessary to vary ingredients and material sources and retest until specified limits are met.

a. Testing shall be performed by an independent testing laboratory employed and paid by the Contractor following ASTM C 114 or ASTM Committee C09.03.12 proposed testing procedures.

4.2.2.7.a

Maximum concrete temperature at time of discharge shall not exceed 85 deg. F. Add ice as part of mixing water or use nitrogen cooling to maintain concrete temperature.

4.2.2.8

Strength - Minimum concrete strengths shall be in accordance with Table. Note that some mixes are specified with compressive strength requirements at other than 28 days.

4.2.3.5.a

Mix designs incorporating superplasticizer must be accompanied by test results from cylinders made from trial batches and/or field test data in which the superplasticizer was added to an 8 cy. (min.) batch in a truck mixer.

4.3.1.1.a

Site produced concrete is prohibited.

4.3.1.1.b

Concrete shall be supplied from the Ready Mix Producer's plant closest to the Project.

4.3.1.4

High Range Water Reducers (Superplasticizers) shall be premeasured and added at the site in accordance with the manufacturer's written instructions and

specifications, using truck-mounted power injection equipment capable of rapidly and uniformly distributing the admixture to the concrete. Concrete shall be mixed for a minimum of six minutes after addition of the superplasticizer prior to discharge.

#### 4.3.2.1

Slump adjustment - when concrete arrives at project with slump below that suitable for placing and below the slump specified, water may be added only if neither maximum specified water/cement ratio nor maximum slump is exceeded, provided that:

- The approved mix design has allowed for on-site addition of water.
- The amount of water added at the site is accurately measured to  $\pm 1$  gallon of the desired added amount.
- That water addition is followed by 3 minutes of mixing at mixing speed prior to discharge.
- Standard cylinder samples as required by these Specifications are taken after addition of water.
- The person authorized to add water shall be mutually approved by DU Project Manager, General Contractor and R/M Producer.

**Table 4.2.2.8 - Mixes and Locations**

| LOCATION  | SPECIFIED STRENGTH (AT DAYS) | CEMENT TYPE | * MIN. PORTLAND CEMENT #/C.Y. | % MAX. CHLORIDE BY WEIGHT OF CEMENT | MAX W/C RATIO | ** % AE | *** AGG. SIZE |
|---|------------------------------|-------------|-------------------------------|-------------------------------------|---------------|---------|---------------|
| All utilidor precast roof panels, toppings, paving, sidewalks, curbs, walls and piers exposed to public view. | 4500 AE @ 28                 | I           | 565                           | 0.15                                | 0.45          | 5-7     | #57, 1"       |
| Cast-in Place access vault roof slab, and typical utilidor floor and walls.                                   | 4000 AE @ 28                 | I****       | 565                           | 0.30                                | 0.45          | -       | #57, 1"       |

\*\* Tolerance on air content shall be as delivered.

\*\*\* Normal weight unless indicated lightweight (LW) at 118 #/C.F.

\*\*\*\* Provide 1-1/2 gallon of ECLIPSE per cubic yard by W.R. Grace with 565lbs/cy of Type I cement.

**NOTE:**

Concrete which is placed and does not meet strength and/or air content requirements shall be removed and replaced at no cost to DU.

4.3.2.1.a

The maximum water/cement ratio is defined as that of the mix design furnished by the R/M producer. (Not to exceed values noted in Table 4.2.2.8).

4.3.2.1.b

All concrete arriving at the site above the maximum slump shall be rejected.

4.3.2.1.c

Addition of cement, except as part of initial batching at the plant in accordance with an approved mix design, is prohibited.

4.3.2.2.a

The concrete must be discharged from the ready-mix trucks within 1-1/2 hours after the introduction of mixing water to the cement and aggregates.

1. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required. When air temperature is between 85 °F and 90° F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90°F, reduce mixing and delivery time to 60 minutes.

4.3.2.3

Furnish to the DU Project Manager 2 delivery tickets with each load of R/M concrete. Tickets shall contain the following information:

- Date.
- Producer and plant.
- Job.
- Contractor.
- Truck No. and time dispatched.
- Concrete designation and cement type.
- Admixtures description and content.
- Time discharge started and completed.
- Amount of concrete in load.
- Amount of water in mix at plant.
- Amount of any material added at the site and authorized signature.

Section 5 (ACI 301) - Handling, Placing and Constructing

5.1.2.2.b

Notify DU Project Manager at least two working days prior to placing concrete.

5.1.2.2.b.1

No concrete shall be placed except when DU Project Manager is present unless this requirement is specifically waived by DU Project Manager. Give due notice to DU Project Manager and all Contractors affected before placing concrete. Allow adequate time for installation of all necessary parts.

5.2.1.1

Curing Compounds - Liquid Membrane-Forming Curing Compound shall conform to the requirements of AASHTO M148 and Federal Specifications TT-C-800 A, 18% to 30% solid content minimum and have test data from an independent laboratory indicating a maximum moisture loss of .030 grams per square cm when applied at a coverage rate of 300 square feet per gallon. The compound shall be chemically and physically compatible with all coatings, floor coverings and surface treatments in the project specifications. Further, the curing compound shall be approved in writing by the manufacturers of all project used coatings, floor coverings and surface treatments. Manufacturer's certification is required.

5.2.1.2

Curing Sheets shall be used for specified wet curing. Prior approved materials for use as curing sheets include:

- a. Sisalkraft Sk-10 (C171)
- b. Burlap.
- c. Filter Fabric (8 ounce minimum).
- d. Visqueen (polyethylene) plastic, 8 mils in thickness.

5.2.1.6

Related materials for concrete construction shall be as follows:

5.2.1.6.a

Epoxy Grout:

- 1. Two component, 100% solids, high modulus, high strength, structural epoxy adhesive for use in grouting reinforcing dowels.
- 2. ASTM C-881, Type III, Grade 2 or 3 with class corresponding to temperature at time of placement.

5.2.1.6.b

Waterstop Bead:

- 1. For all vertical and horizontal construction joints in concrete walls.

2. Approved Products: Waterstop RX 102 (3/4" x 3/8") by American Colloid Company or approved equal.

5.2.1.6.c

Circumferential Expansion Joints:

1. For expansion joints as indicated on the Drawings (CEJ).

2. 9" wide polyvinylchloride ribbed with center bulb.

3. Approved Products:

a. Greenstreak Plastics Products style 709.

b. Vinylex Corporation RB9-316.

5.2.1.6.d

Non-shrink grout shall have a minimum compression strength of 7000 psi (28 days) and be a non-shrink, non-metallic, non-staining, non-corrosive, premixed grout. Comply with Corps of Engineers CRD C621, "Specification for Non-Shrink Grout". In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 4' x 4' base plate.

5.2.1.6.e

Bonding Agent: Epoxy Bonding Agent complying with ASTM C-881, Type II, Grade 2, with Class corresponding to temperature at time of concrete placement.

5.3.1.7

Discharge of concrete from ready-mix trucks shall not start until testing agency has taken required samples, including verification of slump (and air content - if required).

5.3.2.1.a.1

Adequate protection against rain, sleet or snow shall be defined as protection which prevents any and all adverse affects of the rain, sleet or snow on the appearance, strength and durability of the concrete.

5.3.2.1.d

Evaporation Retarder - When high temperatures, low humidity and dry winds create conditions suitable for plastic cracking, evaporation retarder may be required to be applied by spray one or more times during the finishing operation.

5.3.2.3.c.1

Pumping pipes and hoses shall be supported above in place reinforcing on plywood or tires to cushion impacts, and prevent displacement of reinforcement.

5.3.2.4.a Concrete is not permitted to be placed in standing water or under water without express approval of DU Project Manager.



#### 5.3.3.6 Specified Finishes of Formed Surfaces:

## NON-EXPOSED SURFACES

a. Type 1 - AS CAST: Rough form finish per 5.3.3.3.a. This includes all non-exposed flat surface and ribbed slabs. Metal pans shall be new or factory reconditioned, with stiffeners to support concrete without sags and bulges exceeding 0.50 inches.

## EXPOSED SURFACES

a. Type 2 - AS CAST: Smooth Form Finish per 5.3.3.3.b cast against Class 1 High Density, Overlaid plywood Ext-ADA true to line. This finish applies to all formed surfaces exposed to view when the project is complete, both interior and exterior.

1. Material and layout must be approved by DU Project Manager prior to placing concrete.

2. Formwork for exposed surfaces shall be in 8-foot lengths, 4-foot widths.

### 5.3.3.7

In the case of disagreement regarding use of damaged or worn formwork impairing the concrete surface the DU Project Manager's decision shall be final.

### 5.3.4.1.a

Slabs shall be finished in accordance with 5.3.4.2.j Non-specified finish, (as described in ACI 301) unless indicated otherwise on drawings.

### 5.3.4.2.K

Floor areas sloped for drainage shall be finished to provide positive drainage and no "ponds" greater than 6" in diameter.

### 5.3.6.4.

Unless noted otherwise, preservation of moisture in concrete shall be by continuous wet curing in accordance with 5.3.6.4.b. for seven days.

### 5.3.7.1.a

Repair materials and procedures including those specified in 5.3.7.5 & 5.3.7.6 may only be used with prior written approval by DU Project Manager.

### 5.3.7.8

All patching materials shall be proportioned to match color of surrounding material after patch material has cured. Prior to starting patching operation, test different techniques, grout mixes, and curing procedures on concealed areas to best match cast concrete.

**END OF FOREGOING PARAGRAPH 1.7 ENTITLED "SUPPLEMENTAL REQUIREMENTS AND MODIFICATIONS TO ACI 301".**

## 1.8 COLD WEATHER CONCRETING

- A. Concrete construction shall conform to all requirements of ACI 306.1.
- B. Provisions of ACI 306.1 shall be followed for all concrete placed or cured when the average daily temperature is below 40 deg. F. Methods of protection used for cold weather concrete shall be submitted in writing to the DU Project Manager for review at least one week prior to cold weather placement.
- C. Plan construction schedule and obtain needed materials and equipment on the job site in advance of cold weather.
- D. All reinforcement, formwork and top 12 inches of the subgrade shall be clear of ice and snow and be above 40°F at time of placement of concrete.
- E. Concrete temperature as discharged shall not be less than 50 ° F or greater than 70 ° F. Temperature of the concrete being discharged shall be tested by the testing agency and hourly by General Contractor whenever cylinders are cast. General Contractor shall maintain records of such testing and submit same to DU Project Manager weekly.
- F. Any covering, insulation or housing shall be extended to protect projecting reinforcement and embedments.
- G. Contractor shall install and read maximum/minimum thermometers twice daily during the construction and curing of all structural slabs in cold weather. Provide one thermometer for each 3000 square feet of slab. Place thermometers near slab perimeter. Contractor shall submit those temperature readings to DU Project Manager weekly.
- H. Concrete shall be exposed to ambient temperature in a gradual manner after being cured. Refer to ACI 306.1 Table 3.2.1.

## 1.9 HOT WEATHER CONCRETING

- A. Provisions of ACI 305R shall be followed for all concrete placed when the air and/or form temperature is greater than 90°F. Note: Concrete protection during windy conditions combined with hot and/or low humidity shall also conform to ACI 305R. Methods of protection used for hot weather concreting shall be submitted in writing to DU Project Manager for review at least one week prior to hot weather placement.
- B. Plan construction schedule and obtain needed materials and equipment on the job site in advance of hot weather.

- C. General Contractor and ready-mix supplier shall review concrete mixes for use in hot weather with respect to placing requirements, strength and durability.
- D. Concrete temperatures as discharged from the truck shall not exceed 85°F. Ice, if used, shall be considered part of the total mix water (50 lbs. ice = 6 gallons of water). (Retarders in low slump superplasticized mixes may be required to comply with this requirement). Temperature of concrete being discharged shall be tested by testing agency and hourly by Contractor whenever cylinders are cast. Contractor shall maintain a written record of these temperatures and submit same to DU Project Manager weekly.
- E. Cool and moisten formwork and subgrade by sprinkling with water prior to placing concrete.
- F. Placement and Finishing:
  - 1. Concrete shall be discharged from truck maximum one hour after introduction of mix water to cement and aggregates.
  - 2. Do not add water to mix to increase slump. Use approved superplasticizer to maintain a placeable concrete mix.
  - 3. Strike off and screed slabs immediately. Protect slab's surface against moisture loss prior to final finishing.
  - 4. Thoroughly vibrate through all wall and column lift lines and adjacent slab placements to prevent cold joints.
  - 5. Immediately apply liquid curing compound as specified in Section 5 (ACI 301) after final finishing. Follow with continuous wet curing as specified in paragraph 5.3.6.4.b (ACI 301) for seven days.

## PART 2 - PRODUCTS

As Required.

## PART 3 - EXECUTION

- 3.1 PRODUCT AND EXECUTION requirements are included in paragraphs 1.7, 1.8 and 1.9 above.

END OF SECTION

SECTION 03410  
PRECAST CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. All labor, material, equipment, special tools and services required to complete all precast structural concrete components for the utilidor roof lid panels, vault roof, and access shaft, as herein specified, and as indicated on Drawings, including but not limited to:
  - 1. All precast concrete components, including fabrication, delivery and erection.
  - 2. Inserts, anchors, bearing pads, hardware, and miscellaneous items cast into precast concrete, or shown to be furnished by the Contractor.
  - 3. All shop welding, including repair of galvanized material.
  - 4. Concrete testing and inspection.
  - 5. Erection Drawings and Production Drawings.

1.2 REFERENCES

- A. ACI 318 "Building Code Requirements for Structural Concrete."
- B. AWS (American Welding Society) D1.1 "Structural Welding Code – Steel"
- C. CRSI (Concrete Reinforcing Steel Institute) "Manual of Standard Practice."
- D. PCI (Precast/Pre-stressed Concrete Institute) MNL 116 "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products".
- E. PCI MNL 120 "Design Handbook - Precast and Pre-stressed Concrete".
- F. ASTM (American Society of Testing and Materials) Specifications as referred to and referenced in this specification.

1.3 PERFORMANCE REQUIREMENTS

- A. General:
  - 1. Precast Components: The manufacturer shall review the design assuring that the manufacturing, transportation and erection process are compatible with the Contract Drawings and Specifications.
  - 2. Erection: The manufacturer shall review the design for erection of the precast components for guying, staying, and shoring all precast

components to assure structural stability during the construction stage and before all permanent structural connections are completed. Provide for removal, replacement, and relocation of guying, bracing, and shoring before all permanent precast structural connections are completed. Manufacturer shall retain responsibility for erection.

#### 1.4 SUBMITTALS

- A. Submit Shop Drawings to DU Project Manager for review prior to manufacture of components. Indicate the following on the Shop Drawings:
  - 1. Layout, dimensions and identification of each member corresponding with the sequence and procedure for erection and installation.
  - 2. Location, type and sequence of connections. Indicate all welds with AWS Standard Welding Symbols.
- B. Submit to DU Project Manager manufacturer's Product Data including:
  - 1. Specified certifications.
  - 2. Laboratory test reports described in paragraph 2.8.B below.
- C. Submit qualification data to DU Project Manager for manufacturer and persons specified in 'Quality Assurance' sec 1.5 (below) to demonstrate their capabilities and experience.

#### 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer: A firm that complies with the following requirements and is experienced in manufacturing structural precast concrete components similar to those indicated for this Project and with a record of successful in-service performance.
    - a. Assumes responsibility to review structural precast concrete components to comply with the performance requirements noted in Article 1.4.
    - b. Has sufficient production capacity to produce required units without delaying the Work.
  - 2. Installer/Erector: An experienced installer who has completed structural precast concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
  - 3. Testing Agency: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077

and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

B. Regulatory requirements:

1. Comply with applicable laws, ordinances, and building codes.
2. Comply with the referenced standards in section 1.2, above.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural precast concrete components to the Project site in such quantities and at such times to ensure continuity of installation.
- B. Store to prevent damage such as cracking, distortion, or staining, and to maintain visibility of markings.
- C. Lift and support components only at designated lift points.

1.7 WARRANTY

- A. A warranty period of two years shall be provided for concrete work performed under this Section against defects, as determined by DU Project Manager, including but not limited to debonding, excessive cracking and surface scaling.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Refer to Specification Section 03300.

2.2 REINFORCING MATERIALS

- A. Reinforcing bars: ASTM A615, Grade 60, deformed. Provide epoxy coated bars.
- B. Epoxy-coated reinforcing bars: ASTM A775.
- C. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 116, and as follows:
  1. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire or all-plastic bar supports.

2.3 CONNECTION MATERIALS

- A. Miscellaneous metal components – Refer to Specification Section 05500.
- B. Bearing pads:

1. Elastomeric pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 40 Shore A durometer, minimum tensile strength 1000 psi per ASTM D 412.
- C. Accessories: Provide clips, hangers, and other accessories required for installation of precast and support of related construction and finishes.

## 2.4 GROUT MATERIALS

- A. Sand-cement grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Non-shrink grout: Non-metallic, non-staining factory premixed grout complying with CRDC621, 8000 psi minimum.
- C. Epoxy grout: ASTM C 881, 2-component epoxy resin, of type, grade, and class to suit requirements.

## 2.5 CONCRETE MIXES

- A. Refer to Specification Section 03300.
- B. Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on the Project, to provide normal-weight concrete.

## 2.6 FABRICATION

- A. Formwork: Accurately construct forms mortar tight and of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated within fabrication tolerances.
  1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.
- B. Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect position of main reinforcement or concrete placement.
- C. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.



1. Clean reinforcement of earth and other materials that reduce or destroy the bond with concrete.
  2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by chairs, runners, bolsters, spacers, and hangers, as required.
  3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- D. Mix concrete according to PCI MNL 116 and requirements in this Section. After concrete batching, no additional water may be added.
- E. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.
- F. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116.
- G. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- H. Comply with ACI 305R recommendations for hot-weather concrete placement.
- I. Identify pickup points of the precast concrete units and the orientation of the units in the structure with permanent markings. Imprint casting date on each precast concrete unit on a surface that will not show in the finished structure.
- J. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
- K. Product Tolerances: Fabricate structural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product tolerances.
- L. Exposed surfaces of structural precast concrete utilidor system lids shall have a light broom finish.
- M. Finish formed surfaces of structural precast concrete as indicated for each type of unit, and as follows:
1. Standard Finish: Unless noted otherwise provide a normal plant-run

finish produced in forms that impart a smooth finish to the concrete. Small surface holes caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.

## 2.7 SOURCE QUALITY CONTROL

- A. Precast contractor is responsible for conformance with the references in this Section.
- B. Precast contractor is responsible for concrete cylinder testing program required to verify and document concrete mix strengths, per ASTM C31 and ASTM C39.
- C. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.
- D. Strength of precast concrete units will be considered deficient if units fail to comply with PCI MNL 116 requirements, including the following:
  - 1. Units fail to comply with compressive-strength test requirements.
  - 2. Reinforcement of units do not comply with fabrication requirements.
  - 3. Concrete curing and protection of units against extremes in temperature fail to comply with requirements.
  - 4. Units are damaged during handling and erecting.
- E. Dimensional Tolerances: Units with dimensions smaller or larger than required and not complying with tolerance limits may be subject to additional testing.
  - 1. Precast concrete units with dimensions different than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to comply with construction conditions.
- F. Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions where structural precast concrete is to be

placed. Notify DU Site Manager of conditions detrimental to proper and timely completion of the Work.

- B. Starting of work constitutes acceptance of substrates.

### 3.2 INSTALLATION

- A. Comply with erection recommendations and tolerances of PCI MNL-120.
- B. Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.
- C. Bearing Pads: Install bearing pads as precast concrete units are being erected. Set pads on true, level, and uniform bearing surfaces and maintain in correct position until precast concrete units are placed.
- D. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to structural precast concrete units unless approved by Owner.
- E. Erection Tolerances: Install precast concrete units level, plumb, square, and true, without exceeding the recommended erection tolerances in PCI MNL 127, "Recommended Practice for Erection of Precast Concrete."

### 3.3 FIELD QUALITY CONTROL

- A. Testing: Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Testing agency will report test results promptly and in writing to DU Project Manager, Contractor and Precast subcontractor.
- C. Remove and replace work that does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
- E. Damaged or discolored components shall be replaced, patched or refinished as directed by DU Project Manager. Cracks greater than 0.007 inches wide and broken edges shall be repaired. Repair procedure shall be approved by DU Project Manager.

### 3.4 CLEANING

- A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.
  - 1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
  - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.
- B. Remove all surplus materials and rubbish from the premises.

Doyon Utilities J101395, J101396, J101397  
Utility Service Extension to Aircraft Parts Storage-FTW336A  
Fort Wainwright, Alaska

END OF SECTION

## SECTION 05500

### MISCELLANEOUS METAL FABRICATIONS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Brackets and sleeves.
- B. Access ladders.
- C. Utilidor vent stacks.
- D. Embedded items to be installed in concrete.
- E. Bolts and expansion anchors.
- F. Structural steel supports and anchors.

##### 1.2 REFERENCES

- A. The following codes and standards are hereby incorporated as part of the Project Specifications. These codes and standards, including all supplements, apply to all structural steel and miscellaneous metals work as if fully reproduced herein. More recent officially released and industry-recognized versions shall take precedence when in conflict with the referenced codes and standards.
  - 1. *Alaska Building Code*
  - 2. *AISC Code of Standard Practice for Steel Buildings and Bridges, and including the Commentary on the Code of Standard Practice.*
  - 3. *AISC Specifications for Structural Steel Buildings and including the Commentary of the AISC Specification.*
  - 4. *ASTM A36/A36M-08 Standard Specification for Carbon Structural Steel*
  - 5. *ASTM A53/A53M-07 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*
  - 6. *American Welding Society (AWS) Structural Welding Code - Steel.*
  - 7. *ASTM A6 - General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.*
  - 8. *ASTM A123 - Zinc (Hot-Galvanized) Coatings on Iron and Steel Products*
  - 9. *ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware*

10. *ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength*
11. *ASTM A653 / A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*
12. *NACE No. 1/SSPC-SP 5- White Metal Blast Cleaning*
13. *NACE No. 3/SSPC-SP 6- Commercial Blast Cleaning*
14. *NACE No. 2/SSPC-SP 10- Near-White Metal Blast Cleaning*
15. *ASTM B633- Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel*

### 1.3 SUBMITTALS

- A. For information only, submit to DU Project Manager one electronic copy of producer's or manufacturer's specifications for the following products. Include laboratory test reports and other data as required to show compliance with these Specifications (including specified standards). Indicate by transmittal form that copy of each applicable instruction has been distributed to fabricators and installers.
  1. Structural Steel (each type) including certified copies of mill reports covering the chemical and physical properties.
  2. Unfinished bolts and nuts.
  3. Welding materials and procedures.
  4. Galvanizing.
  5. Paint and primer.
- B. Shop Drawings: Submit shop drawings to DU Project Manager for approval. Include complete details and schedules for fabrication for shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of installation.
- C. Submit the following reports in electronic form (Adobe .pdf) directly to DU Project Manager from the testing laboratory, with a copy to Contractor:
  1. Welder Certification documentation for the Project Shop and Field Welders.

### 1.4 QUALITY ASSURANCE

- A. Steel Fabricator shall have not less than 10 years experience in the fabrication of miscellaneous steel.

- B. All welders, welding operators, tackers and inspectors shall be fully qualified in accordance with the requirements of the American Welding Society for the type of work they are to perform. Electronic copies of certifications shall be submitted to DU Project Manager prior to performing any such work.
- C. Modifications to the AISC Code of Standard Practice:
  - 1. Mechanical plans are to be used as supplements to the structural steel plans. Requirements for structural steel work may be shown on mechanical plans.
  - 2. Contract drawings may be made to a scale less than 1/8-inch to the foot. With written DU Project Manager's approval, shop drawings may also be made to a lesser scale.
  - 3. Section 4.2 is to be replaced with the following sections:
    - a. 4.2 Review of Shop Drawings - Shop drawings shall be made by the Contractor and submitted to DU Project Manager for review. DU Project Manager will endeavor to complete his review of a shop drawing submittal within 14 days of receiving submittal. Shop drawings shall be returned noted: "No exceptions noted", or "Exceptions noted", or "Exceptions noted; revise and resubmit". Fabrication of material before the receipt of approved shop drawings ("No exceptions noted" or "Exceptions noted") shall be at the Contractor's risk.
    - b. 4.2.1 Review of shop drawings does not relieve Contractor of the responsibility for: accuracy of detail dimensions; general fit-up of parts to be assembled in the field; ability to erect material; adequacy of any members or connections designed by Contractor.
    - c. 4.2.2 Any notations by DU Project Manager made on shop drawings does not authorize additional compensation for the Contractor without issuance of a formal change order.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Material Storage: Protect steel members and fabricated items from corrosion and deterioration. Store off ground and pitched to drain off water.
- B. Do not store fabricated items in a manner that might cause distortion or damage to the members. Repair or replace damaged materials as directed by DU Project Manager.



## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Rolled Steel Plates, Shapes and Bars: ASTM A36.
- B. Steel pipe: Steel pipe conforming to ASTM A53, Type E or S, Grade B.
- C. Expansion Anchors:
  - 1. Stud type with wedge meeting the requirements of Federal Specification A-A 1923A, Type 4. Zinc plated in accordance with ASTM B633.
  - 2. Approved products: Kwik Bolt 3 expansion anchors by Hilti.
- D. Threaded Fasteners: (galvanized unless indicated "plain")
  - 1. Anchor Bolts and Temporary Erection Bolts: Unfinished ASTM A307, Grade A, regular low carbon steel bolts and nuts. Provide hexagonal heads and nuts with washers for all connections.
  - 2. All Other Bolts: High Strength - heavy hexagon structural bolts, heavy hexagon nuts and hardened washers, quenched and tempered medium-carbon steel, complying with ASTM A325.
- E. Welding: Contractor shall determine, in accordance with AWS requirements, and submit to DU Project Manager for review, appropriate welding materials and procedures for the base metals involved for all welding in both new and existing structures.
- F. Galvanizing:
  - 1. All materials, unless indicated "painted", shall be galvanized with a zinc coating of 2.00 oz./S.F. conforming to ASTM A653.
  - 2. After installation, welds and abraded areas to be power tool cleaned and receive a heavy spot coat of galvanizing repair paint applied per manufacturer's instructions.
- G. Galvanizing Repair Paint:
  - 1. ZRC Cold Galvanizing Compound by ZRC Chemical Products Company.
  - 2. LPS Cold Galvanize Corrosion Inhibitor by LPS Laboratories, Inc.

## 2.2 FABRICATION

### A. General:

1. Fabricate items in accordance with AISC Specifications and as indicated on final shop drawings.
2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite installation and minimize field handling of materials.
3. Where finishing is required, complete assembly, including connections and welding of units, before start of finishing operations.
4. Mill all surfaces in contact bearing.

### B. Connections:

1. Provide welded shop connections unless otherwise shown. Grind smooth and flush all welds to match curve of joints. Grind welded area to remove weld flux, slag and spatter.
2. Provide field bolted or field welded connections as indicated.
3. Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld sections by methods which will produce true alignment of axis without warp.

### C. Surface Preparation:

1. After inspection and before shipping, clean all metal fabrications to be painted or galvanized. Remove loose rust, millscale and spatter. Clean metal fabrications in accordance with SSPC SP-5, SP-6 and SP-10.
2. Clean and touch-up with galvanizing repair paint all abrasions on galvanized items before shipment.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Installer shall examine area and conditions under which metal fabrications are to be installed, and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

### 3.2 INSTALLATION

- A. Comply with AISC Specifications and Code of Standard Practice, and with specified requirements.
- B. Provide erection equipment, hoists, temporary shoring and bracing, and other equipment required for proper and safe erection of work. Do not remove temporary members and connections until permanent construction required to make installation self-supporting is in place and final connections are made.
- C. Provide temporary planking and working platforms as required and as necessary to effectively and safely complete work.
- D. Field Assembly:
  - 1. Set metal fabrications accurately to lines and elevations indicated. Align and adjust various members forming part of a complete installation before permanently fastening. Perform necessary adjustment to compensate for discrepancies in elevations and alignment.
- E. Following installation of metal fabrications clean all mud, dirt and debris accumulated during installation. Inspect all items for abrasions and touch up with specified primer.

### 3.3 ANCHORS

- A. Furnish embedded plates, anchor bolts, and other items built into cast-in-place concrete to appropriate installer, together with template and detailed setting drawings required to assure accurate positioning of items.
- B. Establish permanent bench marks as necessary for the accurate erection of structural steel. Check elevations of concrete bearing surfaces, and locations of anchor bolts and similar devices before erection work proceeds, and report measurement discrepancies to DU Project Manager. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with DU Project Manager.

END OF SECTION

SECTION 07920  
JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Sealing of joints along utilidor roof slab.
- B. Sealing of joints where shown on Drawings or specified.
- C. Back up material and primers.

1.2 SUBMITTALS

- A. Product Data: For each sealant, indicating compliance with specification requirements and manufacturer's recommended installations procedures, and Material Safety Data sheets.
- B. Sealant manufacturer's installer certification letter, per paragraph 1.4.B below.
- C. Letter of compatibility of substrates from Contractor, as issued by the sealant manufacturer for the Project substrates; and testing reports; per paragraph 3.1.B below.

1.3 QUALITY ASSURANCE

- A. Use only installers who are thoroughly trained and experienced in skills required, who are completely familiar with materials involved and manufacturer's recommended methods of installation, and who are thoroughly familiar with requirements of this work.
- B. Obtain letter from manufacturer indicating manufacturer's acceptance of installer's past performance using manufacturer's products.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project site in manufacturer's original unopened containers with labels intact.
- B. Store and protect accepted materials to prevent freezing and damage in strict conformance with manufacturer's specifications. Clearly show manufacturing date and recommended shelf life date as placed by manufacturer.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not proceed with installation of sealants under weather conditions not recommended by manufacturer, or when temperatures are below or above manufacturer's recommended limitations for installation, or when substrates do not meet conditions recommended by manufacturer.
- B. Protect work and adjacent surfaces during and after applications. Replace damaged work with new.
- C. Remove empty containers from the Project at the end of each working day. Place all cloths soiled with substances that might constitute a fire hazard in suitable metal safety containers or remove from Project at the end of each working day. Take special care in storage or disposal of flammable materials. Comply with health and fire regulations.
- D. When toxic or flammable solvents are used, take all necessary precautions as

recommended by the manufacturer. In all cases, the handling and use of toxic or flammable solvents, including adequate ventilation and personal protective equipment, shall conform to requirements of applicable safety regulatory agencies.

#### 1.6 WARRANTY

- A. Guarantee joint sealant work for a period of three years against defects due to installation or material deficiencies, including but not limited to leakage, adhesion, and ultraviolet exposure degradation. Guarantee separately on separate documents by Contractor and sealant manufacturer the completed installation, or jointly on a single document, beginning with date of Substantial Completion, as acknowledged by DU Project Manager.

### PART 2 - PRODUCTS

#### 2.1 UTILIDOR LID SEAL TO WALLS

- A. Surfaces of joints to be in contact with mastic shall be dry and free of oil, grease, dirt, loose concrete particles, or other foreign substances.
- B. Trowel on a generous layer of ConSeal CS 1000 high performance acrylic mastic by Concrete Sealants Inc.
- C. Lay two runs of "Oakum" type filler material on top of wall, into the mastic.

#### 2.2 SEALANT

- A. ConSeal CS-102B bituminous/butyl blend sealant by Concrete Sealants Inc.

#### 2.3 MISCELLANEOUS MATERIALS

- A. Joint Cleaner: Compound recommended by sealant manufacturer for joint surfaces to be primed or sealed.
- B. Joint Primer/Sealer: Recommended by sealant manufacturer for joint surfaces to be primed or sealed.
- C. Sealer Backer Rod: Compressible rod stock of closed-cell polyethylene foam, or other flexible permanent, as recommended by sealant manufacturer. Place only when joint substrates are completely dry.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions where joint sealants are to be installed. Notify DU Project Manager of conditions detrimental to proper and timely completion of the Work.
- B. Starting of work constitutes acceptance of substrates. Confirm substrate compatibility in writing per paragraph 1.3.E above.

#### 3.2 PREPARATION

- A. Thoroughly clean all joints, removing all foreign matter such as existing sealant, dust, oil, grease, water, surface dirt and frost. Sealant must be applied to clean base surface.
- B. Clean porous materials such as concrete or masonry where necessary by grinding or mechanical abrading.

- C. Clean non-porous surfaces, such as metal and glass, either mechanically or chemically. Remove protective coatings on metallic surfaces by a solvent that leaves no residue.
- D. Do not install sealant over joint surfaces which have been painted over original finish, lacquered, waterproofed or treated with water repellent or other treatment or coating. Remove these finishes prior to installing new sealant.

### 3.3 INSTALLATION

- A. As Required.

### 3.4 FIELD QUALITY CONTROL

- A. DU Project Manager may, at its discretion, choose to remove up to a six inch length of sealant in any location at any time after installation and initial curing and set of sealant product, to verify installation details, depth of sealant, surface preparation, adhesion, material uniformity, or other issues. Contractor shall test and report field adhesion tests with DU Project Manager as witness, as recommended by manufacturer.
- B. Include in Proposal the costs to repair up to ten (10) such locations. If inspections of these locations by DU Project Manager reveal deficient installation of sealant, DU Project Manager may remove additional sealant to further quantify the length of deficient sealant. Repair all deficient locations of sealant found by DU Project Manager at no additional cost and no extension of time for the work.

### 3.5 CLEANING

- A. Remove excess and spillage of compounds promptly as work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate immediate and long-term evidence of spillage, without damage to adjoining surfaces of finishes.

### 3.6 CURING AND PROTECTION

- A. Cure sealants in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability. Protect sealant installations as required from adverse weather to obtain these properties.
- B. Cure and protect sealants in a manner which will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorated during construction period. Protect per paragraph 3.6.A above.

END OF SECTION

## SECTION 15010

### BASIC MECHANICAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SCOPE OF WORK

- A. Provide labor, equipment, and materials necessary for installation of work specified herein and shown on drawings. Labor shall be performed by qualified tradesmen. Equipment and materials shall be new and of manufacturer's most recent model or type, unless otherwise specified. Each system installed under this contract shall be complete, with all accessories and safety devices, and tested to perform at design conditions.
- B. Division 1 (as well as any other files, drawings or specifications which together compose the document set referred to as the Contract Documents), apply to work in this Section. Work of other trades included in this Contract shall comply with applicable Sections of this Specification.
- C. Examine drawings and specifications for this branch of work and drawings and specifications of other branches of work. Visit site to become familiar with existing conditions. Submit requests for clarification in writing. Read answers to requests for clarification submitted by all Contractors. Submitting a proposal signifies that all conditions which have a bearing in any way on the manner of providing the work are known and included in proposal.
- D. Systems and equipment included in work shall be provided such that they are complete and operable. Provide all work, including work of other trades, required to render systems and equipment complete and operable, unless such items are specifically included in work of another Contractor, as defined by contract documents. Work of other trades shall be performed by an approved tradesman or Subcontractor.
- E. Scope of work includes work made necessary by field conditions that are apparent during an inspection of construction site, even though some such conditions may not be indicated in Contract Documents.
- F. Testing and Balancing and Commissioning work as specified herein shall be applied to new systems and components provided in this project, and to existing systems and components which are reused and/or modified.
- G. In drawing notes and specifications, the following definitions apply:
  - 1. "Approved" means approved in writing by the DU Project Manager.
  - 2. "As shown" (or "as indicated" or "as described") means as shown on drawings and/or described in the specifications.

3. "Contract documents" means drawings and all sections of the Specifications taken together.
4. "Contractor's documents" means all documents submitted by Contractor.
5. "Provide" means furnish and install.
6. "Work" means all labor, material, and equipment described by contract documents.
7. "Work of other trades" means work included in this contract that is normally described in other Sections of the Specifications under the Construction Specification Institute's sixteen division format. (Such work may be described in this Section of this Specification. If it is, description given in this Section is intended to supplement descriptions of work given in other Sections of this Specification).
8. "Remove" means to disconnect dismantle or disconnect and dismantle as necessary. All removals not designated for reuse nor designated to be salvaged for DU is property of the Contractor. Dispose of removals in the Fort Greely Landfill.
9. "Replace" means to remove existing and provide new as indicated in same location.
10. "Coordinate" means to locate to avoid (both existing and new) equipment, services, and obstructions.
11. "Reroute" mean to remove parts of system and provide extension to system to circumvent obstruction.
12. "Relocate" means to remove existing, install existing in different location indicated and make operational.
13. "Reinstall" means to remove existing, install existing in same location and make operational.

## 1.2 CONTRACT DOCUMENTS

- A. The drawings are diagrammatic representations of the work. Do not scale drawings to determine exact locations, distances, or sizes. Take field measurements to make these determinations.

## 1.3 PERMITS AND INSPECTIONS

- A. DU will obtain and pay for Water Distribution System permits, and obtain any waivers required.



- B. Contractor shall obtain all other necessary permits and pay for inspections required by state or local governing agencies, and authorities having jurisdiction.
- C. Provide DU Project Manager a certificate of approval from the authorities having jurisdiction.

#### 1.4 CODES AND STANDARDS:

- A. Provide evidence that electrical equipment and materials meet the standards of Underwriters Laboratories, Inc. (UL). The listing Mark or Classification Marking of UL displayed on the equipment will be accepted as evidence of such compliance. Third party certification, by a testing agency approved by the Alaska Division of Labor - Standards and Safety (or supervising authority having jurisdiction), shall be provided if UL certification is not available.
- B. Welding qualifications and procedures shall be based on ASME Boiler and Pressure Vessel Code, Section IX.
- C. Pressure piping shall be installed in accordance with ANSI B31.1 Power Piping Code, UFC/IMC regulations and applicable State of Alaska laws, codes and regulations. Pressure piping systems shall include all systems indicated by this Code. Systems shall be inspected by an inspector as required by local codes and AKDOL. Contractor shall provide all necessary inspections of the system and welds, shall document results in a complete and organized manner, and shall provide copies of all documentation to DU Project Manager. Inspections shall be in accordance with ASME B31.1 Power Piping requirements and the Doyon Utility Standards.
- D. Provide inspections for all pressure vessels, such as heat exchangers, flash tanks, and pressurized receivers, that are subject to inspection and acceptance by the State of Alaska Department of Labor, Mechanical Inspections Division, in accordance with the requirements of Title 18, Chapter 60, Article 3-Boilers. Contractor or subcontractor who installs the pressure vessel shall be responsible to notify the AKDOL within thirty (30) days of installation. Contractor shall pay all associated fees when inspections and certifications are subject to fees as established by the State of Alaska.
- E. Codes to be complied with include but are not limited to the following:
  - 1. Doyon Utilities, LLC (DU)
  - 2. Alaska Department of Environmental Conservation (ADEC)
  - 3. Alaska Department of Labor (ADOL)
  - 4. International Mechanical Code (IMC)
  - 5. Uniform Plumbing Code (UPC)

6. International Fire Code (IFC)

F. All materials and workmanship shall be in accordance with the latest editions and addenda of the codes and standards listed below and all Federal, State and local codes. Should there be any conflict between any codes, standard, and/or specification, the more stringent shall govern.

1. ACI - American Concrete Institute
2. AISC - American Institute of Steel Construction
3. ANSI - American National Standards Institute
4. ASME - American Society of Mechanical Engineers
5. ASSE - American Society of Sanitary Engineers
6. ASTM - American Society for Testing Material
7. AWWA - American Water Works Association
8. AWS - American Welding Society
9. CIPRA - Cast-Iron Pipe Research Association
10. CISPI - Cast-Iron Soil Pipe Institute
11. CISS - Commercial and Industrial Insulation Standards
12. DIPRA - Ductile Iron Pipe Research Association
13. DOD - Unified Facilities Criteria
14. EPA - U.S. Environmental Protection Agency
15. FM - Factory Mutual
16. IRI - Industrial Risk Insurers
17. MSS - Manufacturer Standardization Society of the Valve and Fitting Industry
18. NBIC - National Board Inspection Code
19. NEC - National Electric Code
20. NECA - National Electric Contractors Association
21. NEMA - National Electric Manufacturers Association
22. NETA - National Electric Testing Association
23. NFPA - National Fire Protection Association
24. NSF - National Sanitation Foundation
25. OSHA - Occupational Safety and Health Act
26. PDI - Plumbing Drainage Institute
27. SMACNA - Sheet Metal and Air Conditioning National Association
28. UL - Underwriters Laboratories
29. State of Alaska

### 30. Local codes and regulations

#### 1.5 SUBMITTALS

- A. Submit electronic document (Acrobat .pdf) shop drawings and catalog literature of equipment and systems being provided as part of this work. Submittals shall show size, weight, arrangement, capacities, performance curves, construction details, connection details, wiring and flow diagrams, finish and color, and other features as applicable, to show compliance with the contract documents and suitability for the job requirements. Specific features, characteristics, sizes, model numbers, options, accessories, and all other information necessary to fully identify the items being provided shall be clearly marked on the submittals. Submittals provided without such marking of applicable features shall be returned unreviewed for correction and resubmitted.
- B. Submit samples of materials if asked to do so by the DU Project Manager.
- C. Do not release any equipment for manufacture or shipment to job until submittals have been returned from DU Project Manager indicating "No Exceptions Noted."
- D. Stamp, initial, and date submittals before submitting them for DU Project Manager 's review. Contractor's stamp shall be taken as indication that the Contractor has reviewed the submittals and certifies that it complies with the contract documents and is suitable for the job requirements. DU Project Manager 's review will not be a thorough review for contract compliance, and no change in the contract requirements shall be inferred from the DU Project Manager 's notations, lack of notations, or affixing of the "No Exceptions Noted" stamp to a submittals.
- E. DU Project Manager will mark-up, stamp, and return an electronic copy of all submittals.

#### 1.6 RECORD DRAWINGS

- A. Keep a set of the contract and coordination drawings at the job site on which a running record of changes in routing of services and location of equipment shall be kept in a neat and legible manner. DU Project Manager may require evidence that record drawings are up to date prior to approval of pay requests. Record Drawings shall not be used for construction purposes.
- B. At the completion of the job, the record drawings shall be given to the DU Project Manager. If documents are not provided in a neat and legible manner, DU Project Manager reserves the right to require Contractors to transfer information to clean document copies.

#### 1.7 COORDINATION DRAWINGS

- A. Contractor shall provide, after drawings have been approved by the DU Project Manager, electronic 11 x 17 Acrobat .pdf file of each of the contract plans and drawings. Submittal of these drawings shall be construed to mean that Contractor has investigated all site conditions affecting the installation of the work (dimensions, locations, routing, obstructions, penetrations through rated walls/floors, etc.) and that provisions for same are incorporated into the drawings.
- B. Copies of all coordination drawings of all Contractors shall be provided to the DU Project Manager for approval before any work is begun.

#### 1.8 FIELD MEASUREMENTS

Utilize benchmarks provided when taking measurements. Take all field measurements necessary to properly provide the work. Do not rely on measurements taken or provided by others or scaled from drawings.

#### 1.9 PROTECTION OF EQUIPMENT, MATERIALS, UTILITIES, AND FACILITIES

- A. Protect existing buildings, grounds, utility lines, and equipment from damage resulting from work performed. Verify locations of underground utilities, or those otherwise obscured from view, in the vicinity of the work before work commences. If any item is damaged, promptly repair or replace it to the satisfaction of DU Project Manager.
- B. Provide secure housings during construction for job tools, material, and equipment. Protect materials and equipment at all times from weather and other exposure to water and extreme temperatures and humidity. Materials or equipment sustaining damage in any way shall be repaired or replaced as directed by the DU Project Manager.

#### 1.10 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this Contract Document with minimum of 5 years documented experience, unless otherwise stated in individual component specifications..
- B. Installer: Company specializing in performing the work in this Contract Document with a minimum of 5 years documented experience, unless otherwise stated in individual component specifications.
- C. Acceptable Products And Basis Of Design
  - 1. Wherever in the contract documents products are specified by manufacturers' names, base proposals on the named products. Where more than one manufacturer's name is mentioned, the first listed establishes the standard and basis of design for that product. If a product of a manufacturer other than that listed first is used, it must

be the equivalent of the one listed first. If revisions in piping, conduit work, foundations, anchor bolts, connections, etc., are required by other named products or approved substitutions, the cost of engineering and installing such revisions shall be borne by the Contractor.

2. The inclusion of a manufacturer's name in the specifications does not imply that all of that manufacturer's standard products and options are acceptable. Manufacturers shall modify their standard offerings, if necessary, to comply with the contract documents.

#### 1.11 EXISTING CONDITIONS

- A. Routing of services must be verified in the field. Anticipate and provide for minor deviations in routing and configuration. No extra costs will be allowed because of such deviations.
- B. If asbestos, PCB's, LBP's, mercury or other hazardous materials are encountered in the course of the work, stop work in the vicinity of such materials and report their presence to the DU Project Manager.
- C. Take all field measurements necessary to properly complete the work. Utilize benchmarks provided when taking measurements. Do not rely on measurements taken or provided by others or scaled from drawings.

#### 1.12 CLEAN UP

Daily dispose of trash and debris caused by this work. Remove trash from the site and keep emergency egress paths clear. Sweep floors daily in work areas.

#### 1.13 WARRANTY

Keep this work and every part thereof, in perfect condition, usual wear excepted, for a period of one year beginning upon the later of either the date of acceptance of the work by the DU Project Manager (after successful operation has been demonstrated to the satisfaction of the DU Project Manager) or the date of issuance of certificate for final payment, unless another date is established and agreed upon between the DU Project Manager and Contractor. Remedy, without expense to the DU, any and all defects, whether in material, workmanship, or operation, that may become apparent during this period. This warranty shall include all labor, materials, and services necessary to permanently correct the deficiencies.

#### 1.14 GENERAL REQUIREMENTS

- A. Contractor shall conform to all provisions of this contract and is to consider the word "Contractor" or "Subcontractor" to mean himself.

- B. Contractor shall furnish all materials, labor, tools and equipment necessary to install the work specified below and as shown on drawings.
- C. Contractor shall take all his own measurements and be responsible for them, and shall also be responsible for and shall verify in the field all dimensions and elevations of existing work and work provided by others.
- D. Contractor shall consult all the construction drawings to coordinate his work.
- E. Any work requiring the shutting off of steam, water, etc., shall be done at such times as designated by the DU Project Manager to interfere as little as possible with the operations of DU and the US Army. No extra charges shall be made by the Contractor for performing such work during overtime periods.
- F. Contractor shall designate one man on job as his superintendent in charge of and responsible for all the field work under this contract. Adequacy of crew and supervision shall be subject to the DU Project Manager's approval.
- G. Contractor shall secure at his own expense all permits and pay for any inspection charges required by any Government body having jurisdiction over this construction. Any other permits shall be paid for by the particular Contractor whose work is involved.
- H. Contractor shall complete his work or any part thereof at such time as may be designated by the DU Project Manager, so that it can be used for temporary or permanent use. Such use of the system shall not be construed as an acceptance of the work prior to the final written acceptance by the DU Project Manager.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED PRODUCTS

- A. All materials and equipment to be used for this contract shall be standard products of a reputable manufacturer regularly engaged in the production of same. The manufacturer's nameplate indicating model number, serial number and performance data shall be permanently affixed to all equipment furnished under this contract. The equipment shall be the manufacturer's latest model.
- B. All materials and equipment provided under this contract shall be new and in perfect condition, and shall be furnished in ample quantities and at the proper time. All materials used in the fabrication or construction of the various parts of the equipment included in this contract shall be made in accordance with codes, standards or specifications which are applicable.

- C. In some cases, the Drawings are based on the use of particular specified products and materials. If any revision in piping, conduit work, foundations, anchor bolts, connections, etc., is required for the use of other than such particular named products or approved substitutions, it shall be the Contractor's responsibility and at the Contractor's cost to make such revisions at no additional expense to DU.
- D. Provide factory-certified supervision and assistance to the installing Contractors for unit installation, utility connection, and system start-up.
- E. Provide a training course, conducted by factory trained technicians (not sales representatives) to instruct DU's personnel in operation and servicing of this equipment. The course shall be scheduled at the DU's convenience.

### PART 3 - EXECUTION

#### 3.1 EQUIPMENT RECEIVING AND HANDLING

A. Contractor-Furnished, Contractor-Installed Equipment:

For all new equipment for which the Contractor is responsible, he shall receive equipment on site, remove from shipping materials, inspect for damage, verify that all components are provided, convey equipment into position, and install in accordance with the Contract Documents. Report any damage to equipment immediately. Damaged items shall be replaced by the equipment supplier, or the responsible party.

B. DU-Furnished, Contractor-Installed Equipment:

After award of Contract, DU shall assign responsibility for specific DU-furnished equipment to the Contractor. For equipment which the Contractor is responsible, based upon said assignments, he shall receive equipment on site, remove from shipping materials, inspect for damage, verify that all components are provided, convey equipment and materials into position, and install in accordance with the Contract Documents. Report any damage to equipment or materials immediately to DU Project Manager. Damaged items shall be replaced by the equipment supplier, or the responsible party.

#### 3.2 CONCRETE WORK, ANCHOR BOLTS, ETC.

- A. Provide concrete equipment pads and other concrete work as shown, or as required, for all equipment provided. Equipment pads shall be four (4) inches thick (above finished floor, or above grade), unless indicated otherwise. Finished tops of pads shall be flat and level to within  $\frac{1}{8}$  inch tolerance end-to-end and side-to-side, and shall not have "ripples" or other irregularities.

- B. Concrete shall be ASTM C150, Type I or II, and shall have a minimum compressive strength of 3,000 PSI 28 days after pouring.
- C. Formwork shall be preformed galvanized systems.
- D. Reinforcing steel shall be ASTM A615 or ASTM 616, and placement shall conform to requirements of ACI-318.
- E. Fasten equipment to pads with anchor bolts and nuts. Provide anchor bolts of size recommended by manufacturer with 3 inch hook and sleeve.
- F. Equipment pads to receive grouted-in bases shall have a rough level surface.
- G. After installation of equipment, this Contractor shall level equipment with steel shims, tighten anchor bolts and grout between equipment base and concrete pad using grout per Section 03300, Cast in Place Concrete. Minimum grout thickness shall be  $\frac{3}{4}$  inch. Grout shall be mixed and placed in strict accordance with manufacturer's directions.

### 3.3 EQUIPMENT LEVELING AND ALIGNMENT

- A. All equipment provided by Mechanical Contractor shall be set true and plumb and drives shall be in proper alignment.
- B. Mechanical Contractor shall employ the General Contractor to do all grouting required for installation of equipment provided under this contract. After grout has set, base plates shall be tightened in place and alignment rechecked.
- C. After assembly has been finally aligned and shimmed, drill and ream feet and base plate and install taper pins with nut on top for pullout removal. One front foot and diagonally opposite rear foot of motors and pumps shall be pinned to base plate.
- D. No equipment installed by this Contractor shall be placed in service or operated without approval of manufacturer and DU Site Manager.
- E. All major equipment start-up shall be by a factory representative directly employed by the manufacturer.

### 3.4 CUTTING AND PATCHING

- A. Do all cutting and core drilling required for piping work. Core drill openings no larger than required to install the services.
- B. Cutting shall be kept to a minimum. Obtain approval of DU Project Manager before cutting or drilling.



- C. Cutting of any building structural element is prohibited.
- D. Replace and repair any conduit, piping, etc. that is damaged during cutting or drilling.
- E. Cooperate with the other Contractors to insure that openings of the proper size and location are provided for all work.
- F. Patching around openings cut by this Contractor or provided by others for him shall be done in a neat and workmanlike manner. Patching shall be done by an approved qualified Contractor, but shall be paid for by this Contractor. Finished patching shall retain fire and smoke ratings of cut partitions and shall match surrounding finish.

### 3.5 PAINTING

Touch up equipment having factory finishes wherever finish is damaged, and provide other specified painting.

### 3.6 HANDLING, STORAGE AND PROTECTION OF EQUIPMENT

- A. Any damage to the building structure, walls, etc., from this Contractor's, or any of his subcontractor's failure to take proper precautions in handling equipment, storing equipment, etc., shall be repaired at no cost to DU.
- B. Equipment stored at the site shall be protected from the elements and kept in clean condition. Any piping, equipment, etc., that is rusted or damaged in any manner shall be removed and replaced as directed.

### 3.7 INSTALLATION

- A. Equipment and components shall be completely installed in accordance with manufacturer's recommendations and in a manner to insure proper and sequential operation of the equipment and its controls. Installation of equipment not covered herein or in manufacturer's instructions shall be installed as directed by manufacturer's representative. Proper foundations for mounting of equipment, accessories, appurtenances, piping and controls shall be provided, including but not limited to supports, vibration isolators, stands, guides, anchors, clamps and brackets. Foundations for equipment shall conform to equipment manufacturer's recommendation. All equipment shall be bolted to foundations. Provide anchor bolts and sleeves as detailed in the Contract Drawings and recommended by the manufacturer. Set accurately using properly constructed templates.
- B. Equipment shall be located so that working space is available for all necessary servicing.

### 3.8 COMMISSIONING OF SYSTEMS

- A. Contractor shall test and demonstrate the operation of all systems and equipment (for which he is responsible) in the presence of the DU Project Manager, and to make adjustments and systems modifications as required until systems and equipment reliably meet required operational criteria.

END OF SECTION

## SECTION 15092

### PIPE PENETRATIONS, SLEEVES AND PLATES

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. Provide openings for all pipes that penetrate concrete floors, roofs, lids, walls or steel bar grating.

##### 1.2 RELATED SECTIONS:

- A. Basic Mechanical Requirements, Section 15010
- B. Pipe Hangers and Supports – Utilidor, Section 15094
- C. Heat Distribution System Insulation – Utilidor, Section 15250
- D. Water Distribution System Piping – Utilidor, Section 15408
- E. Water Distribution System Insulation – Utilidor, Section 15418
- F. Heat Distribution System Piping – Utilidor, Section 15511
- G. Demolition, Section 15622

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Materials shall conform to the respective specifications and additional requirements specified below.

##### 2.2 PENETRATIONS – CONCRETE ROOFS, LIDS AND WALLS

- A. Penetrations through concrete roof panels and fire resistant walls shall meet ASTM E814 standards and Underwriters Laboratories 1479. Provide UL Classification number to DU Project Manager before penetrations are made.
- B. Penetrations may be made using pre-set sleeves or by core drilling.
- C. Provide Thunderline Corp. "Link Seal" LS series, Calpico, Metraflex, modular wall and casing seals for penetrations through walls below grade and ADEC water swelling elastic sealer.

##### 2.3 SLEEVES

- A. Sleeves shall be standard weight galvanized steel. Weld a steel bar to sleeves in poured concrete.

- B. Use copper sleeves for uninsulated copper pipe utilizing a brass rod in lieu of the steel bar.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Penetration locations and sizes shall be determined in advance and installed during the initial stages of construction. Coordinate penetration locations to avoid interference with other trades.
- B. Do not sleeve beams, joists or other structural members.
- C. Penetrations in concrete shall be sized to provide minimum clearance required to install modular wall seals between the uninsulated pipe and opening. Pipe insulation shall not be continued through sleeves.
- D. After pipes are installed in the penetration, they shall be held centered in opening until modular wall seals are installed.
- E. Cut steel bar grating as required to install pipe sleeves. Weld sleeve in place. Provide supplemental steel to reinforce grating span for all sleeves 3 inches and larger.

END OF SECTION

## SECTION 15094

### PIPE HANGERS AND SUPPORTS - UTILIDOR

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. This specification covers the provision of supports and hangers for all piping.
- B. All pipe hangers, supports and pipe hanger accessories shall be suitable for the load and pipe movements at the specific point where they are installed. In addition, the attachment of pipe hangers to building steel members shall not impose torsional forces on these members.

##### 1.2 RELATED SECTIONS:

- A. Basic Mechanical Requirements, Section 15010
- B. Seismic Restraint for Piping Supports, Section 15095
- C. Heat Distribution System Insulation – Utilidor, Section 15250
- D. Water Distribution System Piping – Utilidor, Section 15408
- E. Water Distribution System Insulation – Utilidor, Section 15418
- F. Heat Distribution System Piping – Utilidor, Section 15511

##### 1.3 SUBMITTALS

- A. Provide drawings to the DU Project Manager indicating the exact location, figure number, and predicted loading of each hanger or support for all piping 4 inch diameter and larger.
- B. Details shall also be furnished for any miscellaneous supplemental steel members required to span between building beams, etc. to create hanger attachment points or to prevent building steel from the imposition of torsional loads due to pipe hangers.

#### PART 2 - PRODUCTS

##### 2.1 GENERAL

- A. All pipe hangers, guides, springs, and supports shall conform to ANSI B31.1; MSS-SP-58 and SP-69; and Fed. Spec. WW-H171.
- B. Pipe hangers, guides, springs, and supports shall be manufactured by Anvil International, Cooper B-Line Systems Inc., Piping Technology & Products, Inc. or approved equal. Anvil figure numbers are given for example unless otherwise indicated.

- C. Provide pipe hangers and supports of the figure numbers listed in this section or as shown on the drawings. Provide custom fabricated welded steel piping supports or support brackets as shown on the drawings and as required for all locations which require additional support or bracing of piping.
- D. Support piping independent of pumps, other piping and equipment.
- E. Angle iron and channel supports shall be designed according to AISC steel handbook. Provide design calculations if requested by DU Project Manager.

## 2.2 INSERTS AND ANCHORS

- A. This section applies when piping is supported from ceiling slabs, concrete walls, columns and other building masonry (except floors).
- B. Where support rod size exceeds  $\frac{7}{8}$  in. diameter or where the load exceeds the recommended load for the insert or anchor, use two inserts or anchors with a trapeze-type connecting member below the concrete.
- C. Where installation can be made before the concrete is poured, use figure nos. 282 or 281 inserts.
- D. Where installation is made after the concrete is in place, use Phillips "Red Head" expansion anchors, Rawl-Studs, Rawl self-drilling anchors, or Hilti Kwik-Bolts.
- E. Plastic, lead or fiber screw anchors, lag screws and expansion shields are not acceptable for this application.
- F. Floor anchors shall be cast-in-place anchors of heavy structural steel.

## 2.3 BEAM ATTACHMENTS

- A. This section applies where piping is supported from overhead building steel.
- B. Provide necessary structural steel members spanning between beams to create hanger attachment points.
- C. Beam attachments for all pipe 3 in. and larger shall be welded figure no. 66.
- D. Beam attachments for pipe 2 in. and smaller shall be non-welding figure nos. 225, 133 or 134 where suitable for the load. Contractor may at his option provide welded attachments.
- E. Repair fireproofing on structural beams where removed for pipe support. Repair shall be done by a qualified tradesman.

## 2.4 WALL ATTACHMENTS

- A. For wall supports on either concrete or steel, figure nos. 194, 195 and 199 welded steel knee brace type brackets may be used where suitable for the load.
- B. Use figure nos. 195 and 199 in conjunction with a backplate of such thickness and size to properly distribute the weight over the wall.
- C. Provide custom fabricated knee brace brackets as required for support locations which exceed the load bearing or wall weight distribution capabilities of the bracket figure numbers listed.

## 2.5 HANGER RODS

- A. Hanger rods shall be hot rolled steel with cut coarse threads. All eye rods used for hangers shall have welded eyes.
- B. Where rod sizes are listed in the catalog for a type of fitting, that size shall govern.
- C. Where rod sizes are not listed, the rod size shall conform to the following table (based on spacing shown in Section 3.1):

| Pipe Size<br>(In.) | Rod Size<br>(In.) |
|--------------------|-------------------|
| 2 and smaller      | $\frac{3}{8}$     |
| 2½ - 3             | $\frac{1}{2}$     |
| 4 and 5            | $\frac{5}{8}$     |
| 6                  | $\frac{3}{4}$     |
| 8 thru 12          | $\frac{7}{8}$     |
| 14 and 16          | 1                 |

## 2.6 HANGERS AND SUPPORTS

- A. General
  - 1. Hangers and supports for tubing (if required) shall be specified for tubing in order to be of the proper diameter.
  - 2. Hangers and supports that are in direct contact with copper shall be copper-plated or plastic-coated to prevent any electrolytic reaction.
- B. Provide supports and hangers as follows:
  - 1. Piping systems conveying product at ambient to 120°F

- a. Hangers: fig. no. 260 adjustable clevis hanger
  - b. Supports: fig. nos. 258, 259 and 264 pipe stanchion saddle supports.
2. Piping systems conveying hot product from 120°F to 400° F
- a. Insulated - Insignificant Thermal Movement:
    - i. Applies where thermal movement will not cause the hanger rod to deviate more than 5 deg. from the vertical, or where longitudinal expansion will not cause a movement of more than ½ in. in the piping supported from below.
    - ii. Hangers: figure no. 260 and 300
    - iii. Supports: figure nos. 258, 259 and 264.
  - b. Insulated - Thermal Movement:
    - i. Hangers: figure no. 181 adjustable steel yoke pipe roll, figure no. 177 adjustable pipe roll support.
    - ii. Supports: figure no. 271 pipe roll stand, figure no. 274 adjustable pipe roll stand.
    - iii. Saddles (piping): fig. nos. 160 thru 164 (weld to pipe)
3. Special Materials
- a. Trapeze Hangers: Steel angle or channel construction with suspended adjustable steel thread rods and nuts.
  - b. Spring Supports: For support of piping where vertical movement occurs, use figure B268 variable spring hanger.
4. Supports and hangers on insulated lines shall accommodate insulation thicknesses specified under Sections 15250 and 15418 of this specification.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Contractor shall provide all structural supports, anchors and hangers required for installation of piping in accordance with ANSI/ASME B31.1. Pipe hangers and supports shall be installed to allow for expansion and contraction, and placed close to fittings, valves, and heavy equipment. They shall be installed so that piping will be free from vibration, sagging or



movement other than that caused by heat expansion or contraction. Piping shall be pitched as specified in individual service specification or as indicated.

- B. Pipe may be supported by trapeze hangers and/or in tiers, but there shall be sufficient room for installation of fittings, insulation, etc., and for future rearrangement work or maintenance.
- C. Unless shown otherwise on the drawings, there shall be no cutting or drilling on existing building steel.
- D. Maximum spans between hangers for straight horizontal runs of steel and copper pipe shall be in compliance with the following table:

| Nominal<br>Pipe Size<br>(In.) | Maximum<br>Span<br>(Ft.) | Nominal<br>Pipe Size<br>(In.) | Maximum<br>Span<br>(Ft.) |
|-------------------------------|--------------------------|-------------------------------|--------------------------|
| ½                             | 5                        | 6                             | 17                       |
| ¾                             | 6                        | 8                             | 19                       |
| 1                             | 7                        | 10                            | 22                       |
| 1½                            | 9                        | 12                            | 23                       |
| 2                             | 10                       | 14                            | 25                       |
| 2½                            | 11                       | 16                            | 27                       |
| 3                             | 12                       | 18                            | 28                       |
| 3½                            | 13                       | 20                            | 30                       |
| 4                             | 14                       | 24                            | 32                       |

Refer to appropriate table reference in the case of stainless steel or ductile iron piping.

- E. Additional hangers shall be provided where concentrated weights such as valves or heavy fittings occur, and where changes in direction of the piping system occur between hangers.
- F. Hanger rods shall be connected to beam clamps, beam attachments, concrete inserts or expansion anchors. "C" clamps shall not be allowed. Offset suspension by hangers is not permitted. Hanger rods shall be installed with a double nut arrangement both at the lower end where the hanger is attached, and the top where it fastens to the clamp or insert. Inserts shall be provided as specified elsewhere in this specification. When through-bolts are used, plates or large washers shall be provided under the heads.

- G. All piping shall be properly braced to prevent vibration and also to prevent lateral movement where necessary.
- H. If, after Contractor completes his work, DU Project Manager requires that Contractor provide additional hangers, supports or brackets to more adequately support or brace the piping system, this shall be done without added cost to DU.

END OF SECTION

## SECTION 15095

### SEISMIC RESTRAINT FOR MECHANICAL SUPPORTS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Seismic restraint requirements for piping system hanger supports.

##### 1.2 RELATED SECTIONS:

- A. Basic Mechanical Requirements, Section 15010
- B. Pipe Hangers and Supports – Utilidor, Section 15094
- C. Water Distribution System Piping – Utilidor, Section 15408
- D. Heat Distribution System Piping – Utilidor, Section 15511
- E. Demolition, Section 15622

##### 1.3 REFERENCES

- A. International Mechanical Code 2006
- B. DOD- Unified Facilities Criteria
- C. City of Fairbanks Building Department Requirements

##### 1.4 QUALITY ASSURANCE

###### A. General:

- 1. Contractor shall provide seismic pipe supports to meet total design lateral force requirements for support and restraint of piping where required by the applicable building code. Use DU standards supplied as a part of these construction documents.
- 2. For situations not covered by DU standards, provide supports meeting seismic requirements for the Fairbanks, Alaska area.

###### B. Manufacturer:

- 1. System Supports/Restraints: Firms regularly engaged in the manufacture of seismic pipe support products, whose products have been in satisfactory use in similar service for not less than 5 years.

##### 1.5 SUBMITTALS

- A. Submit to DU Project Manager manufacturer's product data for types, materials, finishes, gauge thickness, and hole patterns.
- B. Material certification sheets and test reports must be made available by the manufacturer upon request of DU Project Manager.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipe hangers and components carefully to avoid breakage, denting, and scoring finishes. Do not install damaged equipment.
- B. Store pipe hangers and components in original cartons and in clean dry space; protect from weather and construction traffic.

## PART 2 - PRODUCTS

### 2.1 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

- A. General:
  - 1. For situations not covered by DU standards, seismic restraint designer shall coordinate all attachments with DU Project Manager.
    - a. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
    - b. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Seismic Restraint of Piping:
  - 1. All seismic restraint systems shall be installed in strict accordance with the manufacturer's seismic restraint guidelines manual and all certified submittal data.
  - 2. Transverse piping restraints shall be at 40-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
  - 3. Longitudinal restraints shall be at 80-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
  - 4. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24-inches of the elbow or tee or combined stresses are within allowable limits at longer distances.
  - 5. Branch lines may not be used to restrain main lines.
  - 6. Piping crossing building seismic or expansion joints, passing from utilidor to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections,

or support connections. Pipe offsets, loops, anchors, and guides shall be installed as required to provide specified motion capability and limit motion of adjacent piping.

7. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.
8. Installation of seismic restraints shall not cause any change in position of equipment or piping, resulting in stresses or misalignment.
9. Overstressing of structures shall not occur from overhead support of equipment. Bracing attached to structural members may present additional stresses.
10. Brace support rods when necessary to accept compressive loads. Welding of compressive braces to the vertical support rods is not acceptable.
11. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.

END OF SECTION

## SECTION 15250

### HEAT DISTRIBUTION SYSTEM INSULATION – UTILIDOR

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. This section includes providing insulation and covering for HDS equipment and piping.

##### 1.2 RELATED SECTIONS:

- A. Basic Mechanical Requirements, Section 15010
- B. Pipe Hangers and Supports – Utilidor, Section 15094
- C. Water Distribution System Insulation – Utilidor, Section 15418
- D. Heat Distribution System Piping – Utilidor, Section 15511

##### 1.3 SURFACE BURNING CHARACTERISTICS

- A. Insulation materials, adhesives, coatings and other accessories shall have surface burning characteristics as determined by ASTM E 84 not to exceed 25 for flame spread and 50 for smoke developed.

#### PART 2 - PRODUCTS

##### 2.1 GENERAL

- A. Covering materials shall be as manufactured by Manville, Owens-Corning, Armstrong, Knauf, or approved equal. Fiberglass insulation is not acceptable for use on this project.

##### 2.2 INSULATION MATERIALS

- A. Piping
  - 1. Mineral wool shall be board or wrap, suitable for surface temperature up to 800 deg. F. Insulation density shall be 8 lb per cu. ft conforming to ASTM C612.
  - 2. Valves 3 in. and larger shall be insulated with removable, flexible insulating jackets. Flexible jackets shall be Insulation Technology, Inc., Insulation Fabricators, Inc., Performance Contracting, Inc., or equal. Jackets shall have a mineral wool core with PTFE coated mineral wool inner and outer jacket. Insulation thickness shall match adjacent pipe insulation. Seam construction shall be PTFE or Kevlar thread. Closures shall be Velcro hook and loop closure strips or 304 stainless steel lacing and hooks.

3. The following are specific material and thickness requirements:

| System   | Pipe Size (in.) | Material     | Thickness (in.) |
|----------|-----------------|--------------|-----------------|
| MPS, PCR | ½ - 1½          | Mineral Wool | 2               |
|          | 1½ - 4          | Mineral Wool | 2½              |
|          | 6 - 14          | Mineral Wool | 3               |

## 2.3 METAL JACKETING

- A. Metal jacketing shall be 0.016 in. thick ASTM B209 embossed aluminum jacketing with factory attached vapor barrier as manufactured by Childers or approved equal.
- B. Insulation for all piping systems shall be provided with chloride free vapor barrier coated with 1 mil thick polyethylene film.
- C. All piping insulation shall be covered with a metal jacket unless specified otherwise.

## PART 3 - EXECUTION

### 3.1 INSULATION OF PIPING

- A. All surfaces must be clean and dry and pipe lines tested before applying pipe insulation. If insulation is applied prior to testing, and defects appear at or before the time of inspection and tests, the insulation shall be removed, and after defects have been corrected, shall be reinstalled at Contractor's expense.
- B. Insulation shall be dry when installed and during the application of any finish. Surfaces of covering shall be smooth, even and substantially flush to adjacent pipe covering.
- C. Follow manufacturer's application instructions for all materials. All joints shall be tight with insulation lengths and segments tightly butted against each other. Where lengths or segments are cut, cuts must be smooth and square, and without breakage of end surfaces. All insulation shall be continuous through wall and ceiling openings and sleeves.
- D. Do not apply insulation over steam traps, pipe plugs, blind nipples, nameplates, inspection stamps or identification tags.
- E. Hot lines such as safety valve vents, or any miscellaneous piping which may at any time have a surface temperature above 140 deg. F, shall be insulated for personnel protection even though the specifications may not otherwise require insulation of the piping. Such insulation shall be of the thickness

specified above and shall extend up to a minimum of 7 ft. 0 in. above the nearest floor or platform.

- F. Exercise extreme caution in the storage and application of flammable adhesives.

### 3.2 INSULATION OF FITTINGS, VALVES, FLANGES AND STRAINERS

- A. All fittings 4 in. and larger shall be insulated with commercially available molded fitting covers or with nested and/or mitered sectional pipe covering of the same material and thickness as the adjacent pipe insulation. Insulation shall then receive one coat of finishing cement reinforcing cloth applied to form a smooth finish in accordance with manufacturer's recommendations.
- B. Flanges shall be insulated with nesting pipe insulation. Flange insulation shall extend not less than 2 in. over the adjacent pipe insulation on each side of the flange. Insulation on pipes shall be stopped short of flanges to permit removal of flange bolts. Flange insulation shall be applied in such a manner that it may be removed without damage to the adjacent pipe insulation.
- C. Wherever nested or sectional covering is used, it shall be cut to fit in a neat and workmanlike manner with all joints butted and held securely in place.
- D. Fittings and valve bodies 3 in. and smaller shall be covered with insulation to a thickness equal to adjoining pipe insulation. Wrap with vapor sealing tape and apply ¼ in. layer of combination insulating and finishing cement and insulation.
- E. Valves 4 in. and larger shall have bodies up to the bonnets insulated with nesting pipe insulation of appropriate size and of the same material and thickness as the adjacent pipe insulation. Packing nuts of valves shall not be insulated.
- F. Unions and traps shall not be insulated.

### 3.3 INSTALLATION OF MINERAL WOOL INSULATION

- A. For large equipment, wherever stiffener bars or stiffener angles extend beyond plane surface being insulated, provide 1 in. minimum thickness of insulation over stiffeners.

### 3.4 JACKETING

- A. Aluminum jacketing shall be applied with 2 in. horizontal and vertical laps. Jacket shall be secured with pop rivets with stainless steel stem and mandrel on 4 in. centers or with ¾ in. stainless steel bands on 18 in. centers.



- B. Seal all points where the jacket terminates or where access doors protrude through the jacket.
- C. Remove all burrs and sharp edges from metal jacketing immediately around access door handles or other manually operated devices to avoid injury to operating personnel.
- D. Aluminum jacketing covering pipe insulation shall have axial seams overlapped a minimum of 2 in. Longitudinal seam overlap shall be secured with stainless steel screws on 6 in. centers maximum. Jacket shall be installed so as to provide a weather-tight cover. Fittings, flanges and valves shall be covered with preformed aluminum covers. Pre-molded PVC fitting covers are also acceptable.

END OF SECTION

## SECTION 15408

### WATER DISTRIBUTION SYSTEM PIPING

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES:

- A. Provide all piping, valves, and specialties for the domestic cold water distribution system mains and service laterals as specified and shown in the Contract documents.
- B. DU will provide to Contractor a quantity of new piping materials as indicated in Attachment B-2 (Water Distribution Piping Material List) for installation under this project. Contractor shall provide all additional piping materials to provide a complete working system.

##### 1.2 RELATED SECTIONS:

- A. Basic Mechanical Requirements, Section 15010
- B. Pipe Openings, Sleeves and Plates, Section 15092
- C. Pipe Hangers and Supports – Utilidor, Section 15094
- D. Seismic Restraint for Mechanical Supports, Section 15095
- E. Heat Distribution System Insulation – Utilidor, Section 15250
- F. Piping Identification – Utilidor, Section 15417
- G. Water Distribution System Insulation – Utilidor, Section 15418
- H. Heat Distribution System Piping – Utilidor, Section 15511
- I. Demolition, Section 15622

#### PART 2 - PRODUCTS

##### 2.1 PIPING, VALVES & ACCESSORIES

- A. Refer to DU Engineering and Construction Standards – UES-TS-W002

##### 2.2 EXPANSION JOINTS, GUIDES AND ANCHORS

- A. Provide joints or loops, guides and anchors in piping to allow for expansion and contraction. Guides shall be B-line series B3281, Grinnell, installed on either side of loop and supported from building structure with bracing. Anchors shall be B-Line B3256, Grinnell, Elcen.
- B. Secure water piping to avoid movement due to pressure fluctuations (water hammer effects).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install pipe to prevent noise or water hammer.
- B. Tighten flanges and packing glands after system has been placed in operation. Replace gaskets in flanges that show any signs of leakage after tightening.
- C. Every service lateral pipe shall be controlled by an isolation valve where it connects to supply main.
- D. Provide drain valves at low points.
- E. No cross connections shall be installed between domestic water systems and polluted supply or waste systems.
- F. Provide unions or flanges at automatic valves.
- G. Disassemble three piece ball valves before soldering.
- H. Clean copper tubing and fittings with steel wool to remove traces of oxidation.

### 3.2 TESTING

- A. Test water piping under a hydrostatic pressure of 150 psi.

### 3.3 DISINFECTION OF POTABLE WATER SYSTEM

- A. Contractor to submit flushing and disinfection plan that complies with ADEC and AWWA requirements to the DU Project Manager for review and approval.
- B. Disposal of this chlorinated water and flush shall be accomplished by dechlorination using sodium thiosulfate and then disposing of the new solution at an upland location.
- C. Contractor to include disposal of the all flushing and disinfection solutions in the SWPP and coordinate with local DPW Environmental department.
- D. Provide valves, caps, etc., to isolate new piping system from existing system and take precautions to prevent chlorine solution from entering existing system.
- E. Sterilize the domestic water distributing system piping using 50 PPM chlorine solution with a residual at least 25 PPM at the end of the 24 hours, in accordance with AWWA C-652-86, Alaska Department of Environmental Compliance and Alaska Department of Health standards.
- F. Flush the chlorine solution from the system with clear water until the residual chlorine content is equal to that of the clear water.

END OF SECTION

## SECTION 15417

### PIPING IDENTIFICATION - UTILIDOR

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Identification
- B. Valve Tags

##### 1.2 RELATED SECTIONS

- A. Basic Mechanical Requirements, Section 15010
- B. Heat Distribution System Insulation – Utilidor, Section 15250
- C. Water Distribution System Piping – Utilidor, Section 15408
- D. Water Distribution System Insulation – Utilidor, Section 15418
- E. Heat Distribution System Piping – Utilidor, Section 15511

#### PART 2 - PRODUCTS

##### 2.1 PIPE IDENTIFICATION

- A. Provide Brady B-350, Seton, MSI, film pipe markers and directional single head arrows on all piping under this contract.
- B. Provide Brady B-550, 1½ inch banding tape at each marker and arrow.
- C. Markers, arrows and tape shall be the same color and as follows:

| Legend                          | Color of Lettering/Background |
|---------------------------------|-------------------------------|
| Domestic Cold Water             | White/Green                   |
| Medium Pressure Steam (60 PSIG) | Black/Yellow                  |
| Pumped Condensate Return        | Black/Yellow                  |
| Deluge Fire Protection Water    | White/Red                     |

- D. Verify with DU Project Manager method of identification and colors selected prior to application, otherwise system shall be in accordance with ANSI A13.1.

## 2.2 VALVE TAGS AND CHART

- A. Provide for each valve in this Contract, Seton M4506, Brady, MSI, heavy brass tag. Tag shall have stamped thereon the number of valve.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories as recommended by the Manufacturer.
- B. Provide temporary pipe markers on piping to be insulated.
- C. Install markers as the job progresses.
- D. Mount markers close to valves, at service branch line takeoffs, where pipes pass through floors and walls, and at connections to equipment.
- E. Locate markers and arrows where readily visible.
- F. Secure tag to valve by brass chain.
- G. Provide a complete chart in Acrobat.pdf format giving the full list of valves in this Contract, with location of valves and designation of lines controlled. The numbering system shall be the same as that used on the Contract documents.

END OF SECTION

## SECTION 15418

### WATER DISTRIBUTION SYSTEM INSULATION – UTILIDOR

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Insulation for utilidor domestic cold water piping.

##### 1.2 RELATED SECTIONS

- A. Basic Mechanical Requirements, Section 15010
- B. Pipe Openings, Sleeves and Plates, Section 15092
- C. Pipe Hangers and Supports – Utilidor, Section 15094
- D. Seismic Restraint for Mechanical Supports, Section 15095
- E. Heat Distribution System Insulation – Utilidor, Section 15250
- F. Water Distribution System Piping – Utilidor, Section 15408
- G. Piping Identification – Utilidor, Section 15417
- H. Heat Distribution System Piping – Utilidor, Section 15511
- I. Demolition, Section 15622

##### 1.3 DESIGN

- A. Insulation shall be provided by an approved qualified tradesman in accordance with the Commercial & Industrial Insulation Standards.
- B. Insulation thickness shall be equal to or greater than the requirement of ASHRAE "Code for Energy Conservation in New Building Construction" North American Manufacturer's Association (NAIMS), but not less than specified herein.
- C. Do not insulate piping built into masonry walls, piping through sleeves, pumps, meters or backflow preventers.

#### PART 2 - PRODUCTS

##### 2.1 FLEXIBLE ELASTOMERIC INSULATION

- A. Flexible elastomeric closed-cell insulation, AP Armaflex, shall have a K factor of not more than 27 at 75 deg. F mean temperature. Apply Armstrong 520 adhesive to butt joints and seams or provide self sealing seams.

- B. Provide two coats of "Armaflex Finish" to exterior insulated piping of color selected by the Architect or provide 0.016 aluminum jacketing.
- C. Elastomeric insulation shall have composite fire and smoke hazard ratings according to ASTM E-84, NFPA 255 and UL 723 having flame spread rating not exceeding 25 and smoke developed rating not exceeding 50.
- D. Water temperature designed at 50 degrees and Utilidor ambient temperature at 70 degrees.

2.2 FITTING COVERS: "Zeston", Knauf "Proto", "Speedline", 25/50.

### 2.3 JACKET

- A. Insulation on exposed piping less than 8 feet above the floor shall have Childers field applied, secured, corrugated, 0.016 thick aluminum jacket ASTM B-209, fastened with bands and seals on 9 in. centers.

### 2.4 ADHESIVES

- A. Adhesives shall be Benjamin Foster 85-20 flame retardant type suitable for operating and service conditions on which they are used.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that piping has been tested before application of insulation.
- B. Verify that surfaces are clean and dry.

### 3.2 INSTALLATION

- A. Flexible Elastomeric Insulation
  - 1. Insulate hot and cold water fitting and valves with mitered sections of pipe insulation or sheet insulation using template patterns recommended by the manufacturer. Provide oversize insulation or insulate as recommended by the manufacturer for threaded fittings.
- B. Provide removable section of insulation at flanges on domestic water system.

### 3.3 APPLICATION

- A. Insulate water piping subject to freezing with one 1 in. thickness of flexible elastomeric closed cell insulation.
- B. Extend insulation up to fire stopping.



- C. Do not use flexible elastomeric insulation not having 50 or less smoke development rating.
- D. Repair or replace damaged or dirty insulation.

END OF SECTION

## SECTION 15510

### DIRECT BURIED HEAT DISTRIBUTION SYSTEM PIPING INSTALLATION

(Installation Of Doyon Utilities-Furnished Piping Systems)

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. DU will provide to Contractor a quantity of new piping materials as indicated in Attachment A-1 (Heat Distribution Piping Material List) and Attachment A-6 (HDS Expansion Joint Data Sheets) for installation under this project.
- B. Mechanical Contractor shall provide all additional piping materials, valves, accessories, supports, and specialties for the heat distribution system mains and service laterals as specified and shown on the contract documents, and as required to provide complete working systems, and install all piping in accordance with manufacturer's recommendations.

##### 1.2 RELATED SECTIONS:

- A. Basic Mechanical Requirements, Section 15010
- B. Pipe Hangers and Supports – Utilidor, Section 15094
- C. Seismic Restraint for Piping Supports, Section 15095
- D. Heat Distribution System Insulation – Utilidor, Section 15250
- E. Heat Distribution System Piping – Utilidor, Section 15511

#### PART 2 - PRODUCTS

##### 2.1 DIRECT BURIED PIPING, VALVES & ACCESSORIES

- A. Refer to DU Standards UES-TS-H002, UES-TS-H003, and to manufacturer's information provided as attachments.

#### PART 3 - EXECUTION

##### 3.1 INSTALLATION

- A. The Doyon-Utilities-furnished piping system materials shall be shipped to the site by the manufacturer. The Mechanical Contractor shall receive, handle, rig, store, convey into place, install, assemble, and test the piping systems where shown on the Drawings, in strict accordance with the manufacturer's instructions.
  - 1. Typical direct buried piping manufacturer's installation instructions will be provided upon request, for Contractors' reference and use in preparing proposals for the piping assembly and installation work. When Doyon Utilities makes final selection of the actual direct buried piping to be purchased, copies of instructions and submittals from the manufacturer of the actual piping systems materials to be supplied will be provided to all contractors as they become available from the manufacturer, for reference and use during installation.

- B. Piping manufacturer shall label all components in a clear manner to indicate the assembly configurations, and shall provide complete factory-certified assembly instructions, directions, and instructional assistance to the Mechanical Contractor.
- C. In general, Mechanical Contractor shall be required to provide all trenches and backfill for piping systems, and assemble all direct buried piping in trenches and all exposed piping through utilidor vaults as shown on the drawings, and in accordance with manufacturer's instructions.
- D. The Mechanical Contractor shall coordinate with the piping manufacturer all methods to be used for moving, handling, and storing the piping system pieces, and provide all necessary equipment (e.g., crane, rigging, etc.).
- E. Piping Manufacturer's Field Services
  - 1. Piping Manufacturer's representative shall certify that final piping assemblies meet all manufacturers' tolerances and warranty requirements. Provide factory certified instructions to the Mechanical contractors for piping installation.
  - 2. The manufacturer's requirements and recommendations shall be strictly followed by all installing contractors. The final piping assemblies shall meet all manufacturer's tolerances and specifications, and shall in no way compromise the warranty conditions or components' performance. The Mechanical Contractor shall coordinate with the manufacturer's representative and the representative shall inspect and approve the final installation and reassembly of each section of piping. Mechanical Contractor shall obtain manufacturer's written confirmation that each section of piping work has been installed in accordance with manufacturer's requirements before proceeding to next section of work.
  - 3. The piping system manufacturer's representative shall be a person who regularly performs the duties specified herein. The person shall be certified by the system supplier, technically qualified and experienced in the installation of the system. Manufacturer will be required to provide verification of certification of the representative prior to the beginning of the work. The manufacturer's representative shall be present at the job site when the following work is performed. The manufacturer's representative shall certify in writing that all the requirements have been performed. The manufacturer's representative shall perform the following:
    - a. Inspection of trench and bedding material installation prior to piping installation.
    - b. Inspection of thrust blocking.
    - c. Inspection of cold springing.
    - d. Hydrostatic testing of carrier piping.
    - e. Inspection of all holiday testing.
    - f. Inspection of all field joint work.

- g. Air test of outer conduit.
  - h. Inspection of any coating patchwork.
  - i. Inspection of all backfill up to 24 inches above the top of the outer casing.
- 4. The Contractor shall coordinate and schedule the work so as to achieve all services required by the manufacturer's representative, as stated above.
- 5. The installation contractor shall be responsible to make all necessary arrangements to be trained in the installation of the pre-insulation piping system by the system manufacturer prior to the beginning of any installation.
- F. All work shall be performed in accordance with the Drawings and Specifications, and to the satisfaction of DU and Engineer.
- G. All piping shall follow the general arrangement shown, cut accurately to measurements established for the work by the Contractor and worked into place without springing or forcing, except where cold-springing is indicated.
- H. Welding, brazing and soldering shall conform to ANSI B31.1 and as specified herein.
  - 1. Welding shall be performed only by certified welders and shall comply with the requirements of ANSI/ASME B31.1.
  - 2. If requested, the contractor shall submit to the Owner for each welder, evidence of qualification consisting of forms Q-1C "Record of Welder Qualification Tests on Groove Welds" certifying compliance with Section IX of the ASME code. Test papers shall be not more than five years old.
  - 3. Welds found to be defective shall be removed and shall be replaced with new welds without additional cost to the Owner. Peening of defective welds or the application of additional beads to such defective welds will not be considered acceptable methods of repair.
  - 4. Provide protective curtains and shields to protect personnel from welder's flash.
- I. Provision for expansion and contraction of pipe lines shall be made by installing expansion joints and anchors as indicated upon the Drawings.
- J. Piping shall not be concealed or insulated until it has been inspected, tested and approved. Protect materials and equipment from the weather.
- K. Long radius ells shall be used wherever possible to reduce pressure drops. Do not miter pipe to form elbows or notch straight runs to form full sized tees or any similar construction.
- L. Each section of pipe, fittings and valves shall be thoroughly cleaned and kept positively free of all foreign matter before erection. Prior to erection, each piece of pipe shall be held in an inclined position and thoroughly tapped to loosen sand, mill scale and foreign matter. Before all final connections are made to equipment

wash the interior of all piping thoroughly with water. Blow out piping with compressed air to remove rust chips, oil and debris. Plug or cap open ends of mains during all shut-down periods. Lines shall not be left open at any place where foreign matter might accidentally enter pipe.

- M. Flanged Joints: Faced true, square, tight and used where necessary for normal maintenance and where required to match valves and equipment. Mate with valves and the various equipment connections. Select gaskets, packing and thread compounds for suitability with the particular fluid with which they shall be in contact.
- N. Reducing Fittings: Shall be used to connect changes of sizes in piping lines. Use eccentric reducers, flat side down, on steam piping, and concentric reducers on all other piping. Branch connections shall be made with tees except that factory made forged steel welding branch outlets or nozzles having integral reinforcements and conforming to ANSI B31.1 may be used if the nominal diameter of the piping system branch is at least two pipe sizes smaller than the piping segment which contains the fitting.
- O. Dielectric Unions or Flanges: Provide between ferrous and non-ferrous piping, equipment and fittings; except that bronze valves and fittings may be used without dielectric couplings for ferrous-to-ferrous or non-ferrous to non-ferrous connections.

### 3.2 TESTING OF SYSTEMS

- A. Test piping system hydrostatically using water not exceeding 100 deg. F. Conduct tests in accordance with the requirements of ANSI B31.1 and as follows. Test piping system after lines have been flushed and cleaned. Test piping system to 1½ times design pressure, but never exceed test pressure of any material included in system. In all tests remove or valve off from system gages, traps and other equipment which may be damaged by tests before tests are made. Install calibrated test pressure gage in system to observe any loss in pressure. Maintain required test pressure for a sufficient length of time to enable an inspection to be made of all joints and connections. Water for making test will be furnished by DU, but Contractor shall furnish pump, piping, hose, etc. Tests shall be made in presence of DU Project Manager.
- B. Design pressures of steam and condensate return piping are 150 PSIG.

END OF SECTION

## SECTION 15511

### HEAT DISTRIBUTION SYSTEM PIPING – UTILIDOR

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. Provide all piping, valves, and specialties for the heat distribution system mains and service laterals as specified and shown on the contract documents.
- B. DU will provide to Contractor a quantity of new piping materials as indicated in Attachment B-1 (Heat Distribution Piping Material List) for installation under this project. Contractor shall provide all additional piping materials to provide a complete working system.

##### 1.1 RELATED SECTIONS:

- A. Basic Mechanical Requirements, Section 15010
- B. Pipe Hangers and Supports – Utilidor, Section 15094
- C. Seismic Restraint for Piping Supports, Section 15095
- D. Heat Distribution System Insulation – Utilidor, Section 15250
- E. Water Distribution System Piping – Utilidor, Section 15408
- F. Water Distribution System Insulation – Utilidor, Section 15418
- G. Demolition, Section 15622

#### PART 2 - PRODUCTS

##### 2.1 PIPING, VALVES & ACCESSORIES

- A. Refer to DU Standard – UES-TS-H002

#### PART 3 - EXECUTION

##### 3.1 FABRICATION AND ASSEMBLY OF PIPING COMPONENTS

- A. Piping:
  - 1. All piping shall follow the general arrangement shown, cut accurately to measurements established for the work by the Contractor and worked into place without springing or forcing, except where cold-springing is indicated.
  - 2. Welding, brazing and soldering shall conform to ANSI B31.1 and as specified herein. Horizontal runs of piping shall pitch at not less than

1 in. in 20 ft. Provide drain valves at low points of piping system and air vent valves at high points where air pockets would occur.

3. All piping and equipment within building shall be entirely out of the way of electrical conduit, lighting fixtures, equipment and doors, windows and other openings. Provide adequate clearance from walls, ceilings and floors to permit the welding of joints; at least 6 in. for pipe sizes 4 in. and less, 10 in. for pipe sizes over 4 in., and in corners provide sufficient clearance to permit the welder to work between the pipe and one wall. Provision for expansion and contraction of pipe lines shall be made. All pipe to be insulated shall be run as shown and as required with sufficient clearance to permit application of insulation.
  4. Piping shall not be concealed or insulated until it has been inspected, tested and approved. Protect materials and equipment from the weather. Where pipe passes through building structure, pipe joints shall not be concealed but shall be located where they may be readily inspected.
  5. Long radius ells shall be used wherever possible to reduce pressure drops. Do not miter pipe to form elbows or notch straight runs to form full sized tees or any similar construction.
  6. Except where specifically shown otherwise, run vertical piping plumb and straight and parallel to walls. Trapping of lines shall not be permitted except as otherwise indicated. Provide sleeves of suitable size for all lines passing through building structure.
  7. Piping connected to equipment shall be installed to provide flexibility for thermal stresses and for vibration and shall be adequately supported and anchored so that strain from weight and thermal movement of piping is not imposed on the equipment.
  8. Each section of pipe, fittings and valves shall be thoroughly cleaned and positively free of all foreign matter before erection. Prior to erection, each piece of pipe shall be held in an inclined position and thoroughly tapped to loosen sand, mill scale and foreign matter. Before all final connections are made to equipment wash the interior of all piping thoroughly with water. Blow out piping with compressed air to remove rust chips, oil and debris. Plug or cap open ends of mains during all shut-down periods. Lines shall not be left open at any place where foreign matter might accidentally enter pipe.
- B. Flanged Joints: Faced true, square, tight and used where necessary for normal maintenance and where required to match valves and equipment. Mate with valves and the various equipment connections. Select gaskets,

packing and thread compounds for suitability with the particular fluid with which they shall be in contact.

- C. Reducing Fittings: Shall be used to connect changes of sizes in piping lines. Use eccentric reducers, flat side down, on steam piping, and concentric reducers on all other piping. Branch connections shall be made with tees except that factory made forged steel welding branch outlets or nozzles having integral reinforcements and conforming to ANSI B31.1 may be used if the nominal diameter of the piping system branch is at least two pipe sizes smaller than the piping segment which contains the fitting.
- D. Dielectric Unions or Flanges: Provide between ferrous and non-ferrous piping, equipment and fittings; except that bronze valves and fittings may be used without dielectric couplings for ferrous-to-ferrous or non-ferrous to non-ferrous connections.
- E. Strainers: Install strainers with screen drum and in the direction of flow, as marked on the strainer body. Provide clearance for removal and replacing of strainer screens. The strainers shall have screens of ample net free area and shall be composed of materials which shall be compatible with the fluid being used. Reducer fittings shall be used for changes in pipeline sizes and strainer connection sizes.
- F. Unions shall be located adjacent to each control valve, trap, filter and strainer, or wherever shown on the Contract Drawings.
- G. Valves: Install at equipment to allow maintenance or isolation, and to establish proper and sequential operation of the complete system. Remove valve bonnets where valve construction permits removal when connecting valves by brazing to copper tubing. Install globe valves with stems horizontal where necessary to avoid trapping of fluid.

### 3.2 TESTING OF SYSTEMS

- A. Test piping system hydrostatically using water not exceeding 100 deg. F. Conduct tests in accordance with the requirements of ANSI B31.1 and as follows. Test piping system after lines have been flushed and cleaned. Test piping system to 1½ times design pressure, but never exceed test pressure of any material included in system. In all tests remove or valve off from system gages, traps and other equipment which may be damaged by tests before tests are made. Install calibrated test pressure gage in system to observe any loss in pressure. Maintain required test pressure for a sufficient length of time to enable an inspection to be made of all joints and connections. Water for making test will be furnished by DU, but Contractor shall furnish pump, piping, hose, etc. Tests shall be made in presence of DU Project Manager.



- B. Design pressures of steam and condensate return piping are 150 PSIG.

END OF SECTION

## SECTION 15950

### INSTRUMENTS AND FIELD DEVICES

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. This specification includes the installation of field transmitters and flow measurement devices.
- B. Refer to Section 15010 "BASIC MECHANICAL REQUIREMENTS."
- C. Install all equipment, instruments, devices, thermocouples, transmitters, and accessories as specified herein and on the Instrument Tabulation included as Attachment B-3 to these construction documents.
- D. Furnish and install all tubing, piping, fittings, valves, and insulation required to install, connect, and complete the instrumentation and control system as specified and indicated.
- E. Connect, tube, pipe, and support all equipment, devices and their appurtenances in strict accordance with the provisions of this Section and manufacturer's recommendations.
- F. Furnish and erect racks, mounting plates, brackets, and supports for all instruments as specified and indicated.
- G. Contractor shall furnish and install conduit and wiring in accordance with the provisions of this Section and Division 16.

##### 1.2 QUALIFICATIONS

- A. All work described in this section shall be installed by mechanics qualified for this work and in the regular employment of the responsible contractor.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

##### 1.3 DELIVERY, HANDLING, AND STORAGE

- A. In addition to the requirements specified in Section 15010 "BASIC MECHANICAL REQUIREMENTS," Contractor shall maintain a complete inventory of all items received, verify all tag numbers, and have manufacturer tag each device prior to shipment with the tag number on the data sheet or as listed on the instrument list (Contractor shall provide and attach a tag to any device received without a tag).

## PART 2 - PRODUCTS

### 2.1 Instrument Tubing, Fittings, and Valves

- A. All instrument sensing lines shall be stainless steel tubing. Tubing shall be seamless 316L stainless steel meeting the requirements of ASTM A213 with a minimum wall thickness of 0.049 inches.
- B. Fittings shall be compression type and guaranteed gas bubble tight. Acceptable Manufacturers: Swagelok, Parker, SSP Fittings
- C. All instrument isolation valves shall be compression end ball valves, 316 stainless steel. Acceptable Manufacturers: Swagelok, Parker, SSP Fittings

### 2.2 Instrument Piping

- A. Instrument piping shall be provided in accordance with DU Standards UES-TS-H002 and UES-TS-W002.

### 2.3 Instrument Supports

- A. Steel supports, plates, angle, channel, brackets, clips, etc. shall be provided in accordance with Section 05500 – Miscellaneous Metal Fabrication.

## PART 3 - EXECUTION

### 3.3 GENERAL

- A. Furnish all labor, materials, equipment, and service necessary for the complete installation of the devices listed on the Instrument Tabulation included as Attachment B-3 to these construction documents. This includes all electronic interface and actuation devices, as shown on the drawings and specified herein.
- B. All work described in this section shall be installed, tested, and calibrated by factory-trained mechanics qualified for this work and in the regular employment of the installing contractor.
- C. Provide and install interconnecting conduit and wiring for power and signal to the devices as shown and required by the PC-series drawings.
- D. Perform all work necessary to install, connect and make instruments and controls ready for operation.
- E. Provide all required equipment, materials, scaffolding, rigging and tools.
- F. Provide all labor, including expert and common, specialized personnel, fitters, and instrument technicians.
- G. Perform all welding and fabrication required to complete the piping and tubing in strict accordance with the manufacturer's recommendations.
- H. Mount and connect instruments and control devices in strict accordance with the manufacturer's recommendations.
- I. Assist the DU Project Manager and service representatives in calibration of all instruments herein, including local instruments. Provide skilled labor and technical

assistance to manufacturer's service representatives for the calibration and start-up of control systems and equipment.

- J. Assist DU Project Manager and service representatives during checkout and tuning of the control systems.
- K. Coordinate all installation activities involving other Contracts with those contractors. Identify restraints caused by others, which affect performance of the Work. Resolve such restraints where possible, and notify DU Project Manager when additional action is required.
- L. Apply an approved lubricant to threads of screwed transmitter covers prior to installation.
- M. Coordinate and consult with DU Project Manager as required.

### 3.4 TRANSMITTERS

- A. Each transmitter shall be adjusted for the service and operating conditions required.
- B. Furnish transmitter mounting brackets suitable for either surface or pipe mounting depending on the location requirements.
- C. Mounting location:
  - 1. Unless otherwise indicated on the drawings, all instrument transmitters shall be accessible without the use of a ladder or lifting device.
  - 2. When possible, logically group transmitters on a field fabricated 2" diameter pipe stand.

### 3.5 INSTRUMENT RACKS, MISCELLANEOUS INSTRUMENT MOUNTINGS

- A. Install gauge boards, instrument racks, mounting plates, floor stands, and other instrument supports and mounting brackets as indicated. Minor relocations will be permitted to avoid interference or to improve operation and maintenance if approved by DU Project Manager.
- B. Freestanding gauge boards, racks, and stands shall be suitably braced and attached to the wall to provide a rigid mounting structure for the instruments.
- C. Mounting plates and miscellaneous supports shall be attached to rigid structures.
- D. Furnish and install wireway, terminal box with terminal blocks, and conduit between each instrument and the wireway on gauge boards having instruments which require wiring. Furnish and install junction box connected to wireway.
- E. Testing
  - 1. Cooperate and coordinate with other Contractors as required when the testing of any device, as outlined below, involves such other Contractors. This shall include, but not be limited to, coordinating the following:
    - a. Scheduling as directed by DU Project Manager.
    - b. Manpower requirements, including expert and common labor,

specialized personnel and supervision.

- c. All equipment and testing devices required.
- 2. Loop checking and functional testing, including any modifications to software configuration, will be performed by DU Project Manager or by manufacturer's service representatives under direction of DU Project Manager.

END OF SECTION

## SECTION 16010

### BASIC ELECTRICAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Basic Electrical Requirements specifically applicable to all Division 16 Sections. These are in addition to the requirements of Division 1 - General Requirements.

##### 1.2 FORM OF SPECIFICATIONS

- A. These Specifications and the notes on the drawings are of the brief type and include incomplete sentences. Omission of words or phrases such as "The Contractor shall", "as noted on Drawings", "furnish and install", "a", "an", "the", "and", "of", and "all", are intentional. Omitted words or phrases shall be supplied by inference in same manner as they are when a "note" occurs on Drawings. Words "shall be", "shall have", "will be", "will have" or "will" shall be supplied by inference where a colon (:) is used within sentences or phrases.
- B. Whenever words "approved", "satisfactory", "directed", "submitted", "inspected", "referred" or similar words or phrases are used, it shall be assumed that words "DU Project Manager" follow the verb as object of the verb, such as "approved by the DU Project Manager" and "submitted to the DU Project Manager".
- C. The word "provide" shall mean furnish and install. The word "approved" shall mean approved in writing by the DU Project Manager. The phrase "as shown" shall mean as shown on the drawings. The phrase "this work" refers to work included in this Section of the specifications and on the associated drawings. "This contractor" refers to the contractor for this work.

##### 1.3 SCOPE OF WORK

- A. Provide labor, equipment, and materials necessary for the installation of the work specified herein and/or shown on the drawings. Labor shall be performed by qualified tradesmen. Equipment and materials shall be new and of manufacturers most recent model or type, installed in a neat workmanlike manner.

- B. Systems and equipment included in this work shall be provided such that they are complete and operable. Provide all work including work of other trades (e.g. concrete, carpentry, etc.) required to render systems and equipment complete and operable unless such items are specifically included in the work of another contractor, as defined by the contract documents. Work other than that normally performed by the electrical trades shall be performed by an approved tradesman or subcontractor. Work of other trades included in this contract shall comply with the applicable Sections of these Specifications.
- C. Examine the drawings and specifications for this branch of the work and all the drawings and specifications for the other branches of the work. Visit the site to become familiar with existing conditions. Attend pre-bid meetings and submit requests for clarification in writing. Read answers to requests for clarification submitted by all contractors. Submitting a bid signifies that all conditions which have a bearing in any way on the manner of providing the work are known and included in the bid.
- D. This contract includes work made necessary by field conditions that may not be shown or described in the Contract Documents but that are apparent during an inspection of the construction site.
- E. Coordinate this work with that of all other trades that affect or are affected by this work. Cooperate with all other trade contractors to assure the steady progress of the work in accordance with the Construction Schedule.
- F. The accompanying drawings are diagrammatic representations of the work to be done. Do not scale the drawings to determine exact locations or distances. Refer to dimensioned drawings and take field measurements to make these determinations.
- G. Electrical Drawings and Specifications complement each other. Furnish all material and labor called for in one even if not specifically mentioned in both. Refer any conflict between specifications and drawings to DU Project Manager for clarification. Where resolution of a conflict is not known at the time of bidding, Contractor shall include the cost of the more expensive scope of work in his bid. Furnish material and labor necessary to complete work which is a component part of and usually included in work of similar character.
- H. DU Project Manager reserves the right to make minor changes in location of conduit, bus-way and equipment up to time of rough-in, without additional cost to DU.

- I. Install and connect equipment, services and material in accordance with best engineering and construction practice, and in accordance with manufacturer's written instructions and recommendations. Provide complete electrical connections, controls, etc., recommended by manufacturer or required for proper operation of the equipment.
- J. Plan all work in buildings, including alterations to existing facilities and connection to existing services, to permit continuation of normal building functions. When it is necessary to interrupt a service, the DU Project Manager will select a time for the service interruption that he has determined to be the least disruptive to normal building operations. For bidding purposes only, assume such work will be done during normal working hours.
- K. Provide temporary electric work, where necessary, to maintain existing building functions.

#### 1.4 ACCEPTABLE PRODUCTS AND BASIS OF DESIGN

- A. Wherever in the contract documents products are specified by manufacturers' names, base bidding on the named products. Where more than one manufacturer's name is mentioned, the first listed establishes the standard and basis of design for that product. If a product of a manufacturer other than that listed first is used, it must be the equivalent of the one listed first and approved prior to purchase. If revisions in equipment layouts, wiring and conduit connections, etc., are required by other named products or approved substitutions, then all additional costs of engineering and installing such revisions will be included within the bid price.
- B. The inclusion of a manufacturer's name in the specifications does not imply that all of the manufacturer's standard products and options are acceptable. Manufacturer's shall modify their standard offerings, if necessary, to comply with the documents.

#### 1.5 SUBMITTALS

- A. Submit shop drawings for review by the DU Project Manager showing fabrication details, equipment configuration, dimensions, finish details, and connection details. Provide drawings of sufficient detail to indicate all components and critical dimensions. Do not release equipment for fabrication until DU Project Manager affixes his stamp to the drawings indicating "No Exceptions Noted". DU Project Manager will mark-up, stamp, and return six (6) copies of shop drawings. Where additional



copies are required, Contractor shall provide a reproducible drawing or catalog cut sheets that can be copied.

- B. Contractor shall stamp, initial and date submittals before submitting them for DU Project Manager's review. Submittals shall be marked to show specification reference including section and paragraph numbers. Contractor's stamp will affirm that the Contractor has reviewed the submittal and certifies that it complies with the contract documents and is suitable for the job requirements. DU Project Manager's review will not be a thorough review for contract compliance, and no change in the contract requirements shall be inferred from the DU Project Manager's notations, or the affixing of the "No Exceptions Noted" stamp to a submittal.
- C. The following information shall be included with the data submitted:
  - 1. Electrical characteristics, wiring diagrams, voltages, phases, loads, duty cycle, and connection details.
  - 2. Dimensional drawings, including weights and construction details.
  - 3. Materials and finishes.
  - 4. All submittals shall have pertaining numbers of the specification section prominently displayed on the cover page. Additionally, specific device name or type shall be included on all submitted information.
- D. Submit samples of products or materials if requested to do so.
- E. Include submittals for products as specified in each section.
- F. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. All submittals shall have the specification section number prominently displayed on the cover page.

## 1.6 REGULATORY REQUIREMENTS

- A. See permits/Fees in Specifications Section 01010.
- B. Provide evidence that electrical equipment and materials meet the standards of Underwriter Laboratories, Inc. (UL). The listing Mark or Classification Marking of UL displayed on the equipment will be accepted as evidence of such compliance. Third party certification, by an approved

and certified testing organization, shall be provided if UL certification is not available.

- C. Work shall comply as a minimum, with the following codes, standards and requirements where applicable. If no edition or date is listed, the latest published edition shall be used.
  - 1. NFPA 70-2008 - National Electrical Code.
  - 2. IBC – International Building Code
  - 3. OSHA - Occupational Safety and Health Act
  - 4. UL - Underwriters Laboratories, Inc.
  - 5. NFPA-101 - Life Safety Code.

## 1.7 WORK IN EXISTING BUILDINGS

- A. The adjacent buildings and site will be occupied during the construction period. Cooperate with DU Project Manager and coordinate work with that of other contractors to minimize the length of shutdowns and maintain normal building operations. Equipment shutdowns may occur only at times approved in writing by the DU Project Manager. Provide a minimum of 72 hours notice of any service interruption. Provide temporary connections if possible to keep existing systems in use during construction.
- B. Work shown in concealed spaces was taken from the original drawings for the building and site and must be verified in the field after furring, ceilings, walls, and ground cover have been removed to expose the existing work. Anticipate and provide for minor deviations in routing and configuration. No extra costs will be allowed for such deviations.
- C. If existing systems are in a deteriorated condition requiring repair or replacement, cease work on those systems and report such findings to the DU Project Manager.
- D. If asbestos, PCB's, or other hazardous materials are encountered in the course of the work, stop work in the vicinity of such materials and report their presence to the DU Project Manager. DU Project Manager will arrange for proper removal and disposal of hazardous materials.
- E. Enact measures to reduce noise and vibration generation that may disrupt laboratory operations during concrete demolition and excavation work.

## 1.8 EXISTING EQUIPMENT, FIXTURES AND SERVICES

- A. Certain electrical equipment, conduit, etc., in existing building will be removed, relocated and/or rerouted to accommodate remodeling of

existing areas. Except where otherwise noted or specified, all such materials, fixtures and equipment removed shall not be reused. Unless requested by DU Project Manager, all such materials, fixtures and equipment shall become property of the Contractor and shall be promptly removed from the premises.

- B. Disconnect electrical services to items to be remodeled or revised. Remove exposed conduit and cap concealed conduit outside of finished room surfaces.

## 1.9 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on drawings, unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, Submit for review and approval by DU Project Manager.

## 1.10 EQUIPMENT PADS

- A. Provide 4 inch high concrete equipment pads for floor mounted electrical equipment.
- B. Pads shall be 4 inches larger than outside dimensions of equipment. Edges shall be beveled.
- C. Concrete shall consist of ASTM C150 cement, Type I or II and shall have a minimum compressive strength of 4,000 psi 28 days after pouring. Concrete shall have 6% +/- 1.5% air entrainment.
- D. Mix shall be very dense so as to be waterproof after setting.
- E. Level equipment with rails per manufacturer's installation manual. See SECTION 16191 - EQUIPMENT PADS AND LEVELING RAILS for additional requirements.

## 1.11 PENETRATIONS - FLOORS AND WALLS

- A. If penetration of floors and walls are required for work under this contract, the Contractor shall obtain the approval before any cutting or core drilling is done. Openings shall be no larger than necessary.
- B. For conduit penetrations, core drill holes through existing concrete construction and provide approved penetration sleeves. Fill space

between conduit and sleeve with approved insulation for rated floors and walls. Fill space between conduit and sleeve with approved insulation for all other walls to reduce sound transmission. Install penetration sleeves in accordance with manufacturer's recommendations.

- C. Provide Beacor split plates around conduits where they pass through walls, floors or ceiling in exposed areas.

#### 1.12 CUTTING AND PATCHING

- A. Cut walls, floors, ceilings, partitions, etc., required for the installation of this work in a neat and careful manner. Openings shall be no larger than required to install the services.
- B. Cutting shall be kept to a minimum. Obtain approval before cutting or drilling.
- C. Replace and repair any ductwork, conduit, piping, etc., that is damaged during cutting or drilling.
- D. Cooperate with the other contractors to insure that openings of the proper size and location are provided for all work.
- E. Patching of openings cut by this contractor or provided by others for him shall be done in a neat and workmanlike manner. Patching shall be done by an approved qualified contractor, but shall be paid for by this contractor. Finished patching shall retain fire and smoke ratings of cut partitions and shall match surrounding finish.

#### 1.13 PAINTING

- A. Equipment having factory finishes shall be touched up by this contractor wherever finish is damaged, using matching paint obtained from the equipment manufacturer.
- B. Equipment that arrives at the job site with only a prime coat shall be painted with two coats of oil based paint of approved color.

#### 1.14 CLEAN UP

- A. Remove trash and debris caused by this work each day and dispose of off site. Keep emergency egress paths clear at all times. Sweep floors and remove debris from hidden surfaces above drop ceilings daily in work areas.

## 1.15 WARRANTY

- A. All equipment, labor, and material shall have one year warranty from date of substantial completion unless otherwise specified. In addition, extend manufacturer's warranties that exceed one year to DU. Keep work included under this contract, and each and every part thereof, in perfect condition, usual wear excepted, during warranty period and remedy, without expense to DU, and remedy any and all defects, whether in material, workmanship, or operation, that may become apparent during this period.

## 1.16 EQUIPMENT RECEIVING AND HANDLING

- A. Contractor-Furnished, Contractor-Installed Equipment:
  - 1. For all new equipment for which the Contractor is responsible, he shall receive equipment on site, remove from shipping materials, inspect for damage, verify that all components are provided, convey equipment into position, and install in accordance with the Contract Documents. Report any damage to equipment immediately. Damaged items shall be replaced by the equipment supplier, or the responsible party.
- B. DU-Furnished, Contractor-Installed Equipment:
  - 1. For all equipment for which the Contractor is responsible, he shall receive equipment on site, remove from shipping materials, inspect for damage, verify that all components are provided, convey equipment into position, and install in accordance with the Contract Documents. Report any damage to equipment immediately.

## 1.17 RECORD DRAWINGS

- A. Keep a set of the contract drawings at the job site on which a running record of changes in routing, arrangement, connections, wiring and location of equipment shall be kept in a neat and legible manner. DU Project Manager may require evidence that record drawings are up to date prior to approval of pay requests.
- B. At the completion of the job, deliver one reproducible and three sets of prints of marked-up drawings to DU Project Manager.

## 1.18 OPERATING AND MAINTENANCE MANUAL (O&M)

- A. Provide operating and maintenance manuals bound in 8 ½ inch x 11 inch hardback, three-post binders.

1. General: Manuals shall contain final: written instructions for each system, shop drawings, schematic drawings, equipment catalog cuts and operational set ups and settings, and manufacturers' instructions.
  2. Binders: One binder shall be prepared for each major system, such as Power Distribution, Lighting, controls, emergency equipment, etc. A single binder may be prepared if all of the data from the Contractor will fit into a binder that is 3" or smaller.
  3. Cover sheet/Spine: A cover sheet shall be placed inside a clear plastic cover on the exterior front of the binder. The following information shall be displayed on the cover page: project title; DU's name and address, date of submittal; Contractor's name, address, phone numbers, and point of contact; Fosdick & Hilmer's name, address, phone number, job number, and index. The Spine of the binder shall show the following information: DU's name, project name, F&H project number, and date.
  4. Sections: A clearly marked section shall be provided for each component and/or system. The following information shall be contained in each section: approved shop drawings, operating instructions, schematic drawings, catalog cuts and information, specification sheets, Material Safety Data Sheets, all data that is pertinent to the installation, operation, and maintenance of all components.
  5. Section cover sheet: Each section shall contain a typed cover sheet containing the following information: suppliers' name, address, phone numbers, and point of contact; date of startup of each piece of equipment, make, model and serial numbers, nameplate data, emergency procedures.
- B. Submit one hard copy, and one electronic portable document format for review. One copy in electronic portable document format on CD-ROM shall be given to the DU Project Manager. The electronic portable document format version shall be fixed image and shall be tabbed and cross linked to depict the various items of inclusion. Tabbing and cross linking shall be setup to depict sub-heading within the main item. Outline file with thumbnail presentation of information. The submittal shall be one continuous non-protected file on a re-writeable media. Make required corrections, and submit two electronic record copies.
- C. All information shall be in typed format.
- D. Project will not be considered as a complete until final copies of maintenance and operating manuals are provided.

END OF SECTION

## SECTION 16060

### GROUNDING AND BONDING

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. Grounding electrode conductors.
- B. Equipment grounding conductors.
- C. Bonding.

##### 1.2 REFERENCES

- A. ANSI/NFPA 70 - 2008 - National Electrical Code.

##### 1.3 GROUNDING ELECTRODE SYSTEM

- A. Metal underground water pipe.
- B. Ground rods and ground ring under R Level switchgear room installed under a previous contract.
- C. Ground rods and ground ring under and around Loc S installed under a previous contract.
- D. Supplemental Copperweld  $\frac{3}{4}$  in. dia. X 10 ft. long rods as shown on drawings.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.

#### PART 2 - PRODUCTS

##### 2.1 MECHANICAL CONNECTORS

- A. Material: Bronze.

##### 2.2 EXOTHERMIC CONNECTIONS

- A. Manufacturers:
  - 1. Cadweld or approved equal.

##### 2.3 WIRE

- A. Material: Stranded copper.
- B. Grounding Electrode Conductor: 4/0 AWG minimum unless called out

separately.

- C. Equipment grounding conductor: Sized per NEC 250.

## 2.4 UNDERGROUND WARNING TAPE

- A. 4 inch wide yellow plastic tape with "CAUTION-ELECTRIC LINES BELOW" marked at 24 inch intervals.
- B. Place warning tape 12 inches above final conductor location and below finished grade on center of all trenches for buried grounding electrode conductors

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Provide no. 4/0 cable ground connections from grounding grid below R Level electric equipment room floor to ground buses in substations and switchgear as shown and noted on drawings.
- C. Provide dedicated 4/0, or sized as called out on drawings, cable ground connections from grounding grid below R Level electric equipment room floor to ground buses in substations or transformers where neutral bonding points are established. Common riser tapped ground conductors are not acceptable.
- D. Provide no. 4/0 cable ground connection to water service main as shown on drawings.
- E. Provide bonding to meet Regulatory Requirements.
- F. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing. Bond ground wires to all junction boxes, to ground busses of all equipment provided with same, to motor frames, and non-current carrying metal parts of all other equipment to which electrical connections are made.
- G. Ground all receptacles by bonding ground wire to outlet box and then extending a jumper to the device grounding pole. Do not rely on self-grounding type mounting screws alone to establish ground.
- H. Bond all metallic conduit using ground bushings or other approved means.
- I. In each electric closet or grouping of panels, bond all panelboard ground busses together using a green insulated copper conductor of no. 10AWG minimum size.



- J. Connect all steel conduits and ground bars in bus ducts entering switchgear assemblies to switchgear ground bus.
- K. Contractor shall provide grounding electrode conductors and connections between all transformer secondaries and the building grounding electrode system as required by NEC 250-5(d). Conductors shall be sized and installed in accordance with NEC 250.

### 3.2 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION

## SECTION 16070

### SUPPORTING DEVICES

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

##### 1.2 REFERENCES

- A. NECA - National Electrical Contractors Association.
- B. ANSI/NFPA 70 - National Electrical Code.

#### PART 2 - PRODUCTS

##### 2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
  - 1. Concrete Structural Elements: Use expansion anchors – lead and plastic anchors prohibited.
  - 2. Steel Structural Elements: Use beam clamps.
  - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors– lead and plastic anchors prohibited.
  - 4. Solid Masonry Walls: Use expansion anchors– lead and plastic anchors prohibited.

#### PART 3 - EXECUTION

##### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

- D. Do not use spring steel clips and clamps.
- E. Obtain permission from Construction Manager before using powder-actuated anchors.
- F. Do not drill or cut structural members.
- G. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.

END OF SECTION

SECTION 16075  
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit identification.
- D. Conductor identification.

1.2 REFERENCES

- A. ANSI/NFPA 70-2008 - National Electrical Code.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

- A. Nameplates: Engraved two-layer laminated plastic, black letters on white background for normal system equipment and white letters on red background for emergency system equipment. Edges shall be beveled.
- B. Locations:
  - 1. Each electrical distribution and control equipment enclosure.
- C. Letter Size:
  - 1. Use 3/16 inch letters for identifying individual equipment and loads.
  - 2. Use ¼ inch letters for identifying grouped equipment and loads.
- D. Description:
  - 1. Nameplates shall indicate the equipment name on the top line, the system voltage on the middle line, and the cable color coding on the bottom line.

Example: **CRITICAL SWITCHBOARD**

**208Y/120V**

**COLOR ID: Black/ Red/ Blue**

2.2 WIRE MARKERS

- A. Description: Tape type wire markers.
- B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes and each load connection.

C. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.3 CONDUIT IDENTIFICATION

A. Location: Paint all conduit couplings and box connectors. All fire alarm conduits shall be factory color coded red, overall the entire length of the conduit.

B. Color:

1. Normal Power System: Not Marked
2. Emergency Power System: Orange
3. Fire Alarm: Red
4. Computer/Data: Blue
5. Telephone: Green
6. CATV/MATV: Yellow

C. Legend:

1. Normal Power System: NORM.
2. Emergency Power System: EMERG.
3. Fire Alarm: F.A.
4. Computer/Data: DATA
5. Telephone: TEL
6. CATV/MATV: T.V.

2.4 CONDUCTOR IDENTIFICATION

A. Location

1. Grounded Conductor (Ground)
2. Equipment Grounding Conductor (Neutral)
3. Ungrounded Conductors (Phase)

B. Requirements

1. Identify in accordance with NEC paragraphs 210.5 and 215.12.

C. Color Coding

1. 480Y/277 Volt System: Orange/ Yellow/ Brown/ Gray/ Green  
(Phase A/ Phase B/ Phase C/ Neutral/ Ground)
2. 208Y/120 Volt System: Black/ Red/ Blue/ White/ Green  
(Phase A/ Phase B/ Phase C/ Neutral/ Ground)

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Clean cable before applying color coded phasing tape.

### 3.2 APPLICATION

- A. Install nameplate parallel to equipment lines.
- B. Secure nameplate to equipment front using stainless steel self-tapping sheet metal screws and adhesive. Use of adhesive only will not be acceptable.
- C. Paint all conduit couplings and connectors.

END OF SECTION

SECTION 16095  
MINOR ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition.

1.2 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NECA 1 (National Electrical Contractors Association) - Standard Practices for Good Workmanship in Electrical Contracting.

1.3 GENERAL

- A. The other Contract Documents complement requirements of this Section. The General Requirements apply to work of this Section.
- B. Provide labor and material necessary to complete the demolition of Electrical Work as specified herein and indicated on the accompanying drawings.
- C. Examine not only the drawings and specifications for this branch of work, but plans and specifications of other branches of work and visit site to become acquainted with existing conditions. Submitting a proposal signifies that conditions which have a bearing in any way on the removal of work herein specified are known and included in proposal.
- D. Contractor shall obtain, at his own expense, all necessary permits and pay all charges for inspection of his work.
- E. Drawings do not necessarily depict actual quantities and job conditions. Contractor shall visit site to determine actual scope of work.

1.4 SCOPE OF WORK

- A. Disconnect and remove electrical distribution equipment, light fixtures, wiring devices, boxes, conduit, and wire.
- B. Disconnect and remove wire and conduit from mechanical equipment.
- C. Remove and salvage designated items.
- D. Provide temporary electric.
- E. Dispose of demolished items.
- F. Contractor shall plug, seal, and firestop all penetrations of fire rated and acoustically sensitive walls and floors due to abandoned openings created by electrical demolition.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: as specified in individual Sections.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition work is based on casual field observation and existing record documents. Report discrepancies to DU Project Manager before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.
- E. Before disconnecting any electrical risers, feeders, or branch circuits, verify that they do not serve any other areas.

### 3.2 PREPARATION

- A. Coordinate utility service outages with DU Project Manager and Site Manager.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- C. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Site Manager at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- D. Disconnect electrical systems in walls, floors and ceilings scheduled for removal.
- E. Provide temporary wiring and connections to maintain lighting and power during demolition.
- F. Provide temporary barricades and other necessary protection to protect others from demolition work. This Contractor shall keep others informed of electric equipment which is energized to prevent injury due to electric shock.

### 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of this Section.
- B. Perform electric demolition work in an orderly and careful manner. Disconnect and remove all electrical distribution equipment, light fixtures, wiring devices, boxes, fittings, hangers, supports, conduit and wire unless otherwise noted.
- C. Remove debris, rubbish, and other materials resulting from demolition work, from building and site on a daily basis.

### 3.4 SALVAGE EQUIPMENT

- A. Where items are tagged by DU Project Manager, items will remain property of DU and Contractor shall carefully remove items and store in area on site where designated by DU Project Manager.
- B. Remove, relocate, and extend existing installations to accommodate new construction.



- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- G. Extend existing installations using materials and methods as specified.

### 3.5 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.

END OF SECTION

## SECTION 16111

### CONDUIT

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquid-tight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Nonmetal conduit.
- F. Fittings and conduit bodies.

##### 1.2 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. ANSI/NFPA 70 - National Electrical Code.
- E. NECA "Standard of Installation."
- F. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

##### 1.3 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

##### 1.4 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

#### PART 2 - PRODUCTS

##### 2.1 CONDUIT REQUIREMENTS

- A. Minimum Size:  $\frac{3}{4}$  inch unless otherwise specified.

B. Underground Installations:

1. More than Five Feet from Foundation Wall: Use Schedule 40 nonmetallic conduit.
2. Within Five Feet from Foundation Wall: Use galvanized rigid steel conduit.
3. Under Slab on Grade: Use Schedule 40 nonmetallic conduit with rigid steel elbows up through slab.
4. Minimum Size: 1 inch.

C. Installations in concrete or masonry walls: Use rigid steel conduit.

D. Outdoor Locations, Above Grade: Use rigid steel conduit.

E. Wet and Damp Locations: Use rigid steel conduit.

F. Dry Locations:

1. Concealed: Use electrical metallic tubing.
2. Exposed: Use electrical metallic tubing.

G. Feeders over 600 volts: Use rigid steel conduit.

H. Conduit for fire pump room: Use rigid steel conduit covered in 2 inches of concrete.

I. Connections to motors, transformers and other equipment subject to vibration: Use Liquidtight flexible metal conduit.

2.2 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: ANSI/NEMA FB 1.

## 2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron set screw type.

## 2.6 NONMETALLIC CONDUIT

- A. Description: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install conduit in accordance with NECA "Standard of Installation" and manufacturer's instructions.
- B. Conduit shall not block access to equipment.
- C. Install nonmetallic conduit in accordance with manufacturer's instructions.
- D. Arrange supports to prevent misalignment during wiring installation.
- E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- G. Fasten conduit supports to building structure and surfaces under provisions of Section 16070 "SUPPORTING DEVICES".
- H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports
- I. Do not attach conduit to ceiling support wires.
- J. Arrange conduit to maintain headroom and present neat appearance.
- K. Route exposed conduit parallel and perpendicular to walls.
- L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- M. Route conduit under slab from point-to-point.
- N. Maintain adequate clearance between conduit and piping.
- O. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

- P. Cut conduit square using saw or pipecutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- S. Where conduits enter boxes or cabinets, install double locknuts and insulated metallic bushings. Use "Liqua-Tite" insulated fittings to terminate all flexible conduit.
- T. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Conduit bends shall be of long radius and shall be made using benders approved by the conduit manufacturer for the purpose. Bends shall not cause kinking, cross sectional deformation or reduction of inside diameter.
- U. Contractor shall install pull boxes where required to meet NEC requirements for maximum number of bends in a conduit run.
- V. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- W. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints. Maintain ground continuity across fittings.
- X. Provide suitable pull string in each empty conduit except sleeves and nipples.
- Y. Use suitable caps to protect installed conduit against entrance of dirt and moisture until wires are pulled.

### 3.2 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods approved by DU Project Manager.

END OF SECTION

SECTION 16123  
BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SCOPE

- A. Building wire and cable.
- B. Wiring connectors and connections.

1.2 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NECA (National Electrical Contractor's Association) - NECA 1-2006  
"Standard Practices for Good Workmanship in Electrical Contracting."

1.3 PROJECT CONDITIONS

- A. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- B. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.4 COORDINATION

- A. Determine required separation between cable and other work.
- B. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 BUILDING WIRE AND CABLE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THHN/THWN-2 or XHHW-2.
- E. For auxiliary systems such as fire alarm, process controls, etc., use cable specified under the appropriate heading or cable recommended by system manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire has been completed.
- C. Verify that all raceways and equipment are complete and installed prior to installing wires.

### 3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

### 3.3 WIRING METHODS

- A. Concealed Dry Interior Locations: Use building wire, Type THHN/THWN-2 or XHHW-2 insulation, in raceway.
- B. Exposed Dry Interior Locations: Use building wire, Type THHN/THWN-2 or XHHW-2 insulation, in raceway.
- C. Above Accessible Ceilings: Use building wire, Type THHN/THWN-2 or XHHW-2 insulation, in raceway.
- D. Wet or Damp Interior Locations: Use only building wire, Type XHHW-2 insulation, in raceway.
- E. Exterior Locations: Use only building wire, Type XHHW-2 insulation, in raceway.
- F. Underground Installations: Use only building wire, Type XHHW-2 insulation, in raceway.
- G. Use wiring methods indicated on Drawings.
- H. Computer Room Locations: Use only building wire, Type XHHW-2 insulation, in raceway.
- I. All wire for light, power and control systems shall be stranded, with 600 volt type THHN, THWN or XHHW insulation and copper conductors unless otherwise noted on drawings or specified herein.
- J. Cords for makeup connections shall contain an identified ground conductor and shall be composed of 600 volt heat resistant, rubber insulated, portable cable with neoprene jacket, type SO or W, with extra flexible stranded copper conductors.
- K. Branch circuit wiring in fluorescent fixtures, within 6 inches of boiler breeching, and in other high temperature locations, shall be rated 90 deg. C.

### 3.4 INSTALLATION

- A. All wiring and products shall be installed in conduit unless otherwise indicated on drawings.
- B. Use wiring methods indicated on Drawings.
- C. Install products in accordance with manufacturer's instructions.
- D. Cables installed in vertical raceways shall be supported in accordance with ART. 300 of the NFPA 70. Supports shall be Kellems Heavy duty wire mesh type conduit riser support grips.
- E. All wiring shall be stranded unless noted otherwise in these specifications.
- F. Use conductor not smaller than 12 AWG for power and lighting circuits.
- G. Use conductor not smaller than 14 AWG for control circuits.
- H. All wires of any one circuit shall be run in the same conduit. No more than three current carrying conductors (exclusive of grounds and common neutrals) shall be run in the same conduit, unless otherwise noted.
- I. Whenever possible, unless otherwise noted, utilize common neutrals to minimize number of wires in lighting and receptacle circuits. This will result in three wires for two circuits in single phase systems and four wires for three circuits in three phase four wire systems. Common neutrals for two or more 20 ampere circuits shall be no. 10 AWG minimum wire size.
- J. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.
- K. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- L. Pull all conductors into raceway at same time.
- M. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- N. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- O. Clean conductor surfaces before installing lugs and connectors.
- P. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- Q. Use split bolt connectors or long barrel compression lugs installed with a minimum of two crimps per termination for copper conductor splices and taps, 8 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor or provide U.L. approved heat shrink tubing insulating system, Ray Chem WCSM or



approved equal.

- R. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller. Fixed spring connectors and self-stripping tap connectors shall not be used.

### 3.5 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable under provisions of Section 16075.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

### 3.6 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- C. Verify continuity of each branch circuit conductor.

END OF SECTION

## SECTION 16130

### BOXES

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.
- C. Fabricated medium voltage pull boxes.

##### 1.2 REFERENCES

- A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- B. ANSI/NEMA OS 1 – Sheet steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. ANSI/NFPA 70 - National Electrical Code.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

##### 1.3 PROJECT CONDITIONS

- A. Verify locations of outlets prior to rough-in.
- B. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Refer to dimensioned architectural drawings and elevations. Install at location required for box to serve intended purpose or as directed in field.

#### PART 2 - PRODUCTS

##### 2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported.
- B. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

##### 2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Surface mounted cast metal boxes shall be NEMA 250, Type 4; flat-flanged.
  - 1. Material: Galvanized cast iron.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- C. In Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
  1. Material: Galvanized cast iron.
  2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
  3. Cover Legend: ELECTRIC.
- D. Fabricated medium- voltage pull boxes, constructed of ¼-inch universal mill steel plates, ASTM A36, and steel angle stock.
  1. Provide mounting holes for attachment of box sides to concrete wall surfaces.
  2. See drawings for dimensions.
  3. Clean steel surfaces, prime and paint.
  4. Box assembly must be UL rated and have a UL sticker affixed.
  5. Top shall be removable for wire pulling.
  6. Front cover plate shall be removable for wire pulling. Individual covers shall not weigh more than 100-lbs.
  7. Where multiple cover plates are provided, reinforce floating edges internally with angle stock.
  8. Provide welded steel bosses with bolt for both sides for grounding and bonding wire lug connections.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- B. Comply with NEC 314.71 for sizing of medium voltage pull boxes. Install boxes to best maintain clearances in the direction of pull with covers removed.
- C. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

- D. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods approved by DU Project Manager.
- E. Outlets adjacent to one another in any room or corridor shall be in horizontal or vertical alignment, unless otherwise shown.
- F. Support boxes independently of conduit.
- G. Use gang box where more than one device is mounted together. Do not use sectional box.
- H. Use cast outlet box in exterior locations and wet locations.
- I. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
  - 1. Interior Dry Locations: Use hinged enclosure under provisions of Section 16160.
  - 2. Other Locations: Use surface mounted cast metal box.

### 3.2 ADJUSTING

- A. Install knockout closure in unused box opening.

END OF SECTION

SECTION 16141  
WIRING DEVICES

PART 1 - GENERAL

1.1 SCOPE

- A. Wall switches.
- B. Receptacles.
- C. Device plates and box covers.

1.2 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.

1.3 SUBMITTALS

- A. Submit under provisions of Section 16010 - BASIC ELECTRICAL REQUIREMENTS
- B. Product Data: Provide manufacturer's catalog information showing ratings, dimensions, colors and configurations.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:
  - 1. Pass & Seymour
  - 2. Hubbell
  - 3. Cooper
  - 4. Carlon
- B. Description: Carlon E98TSCN-CAR, toggle switch
- C. Device Body and Handle: Grey polycarbonate with toggle.
- D. Voltage Rating: 120-277 volts, AC.
- E. Current Rating: 20 amperes.

## 2.2 RECEPTACLES

- A. Manufacturers:
  - 1. Pass & Seymour
  - 2. Hubbell
  - 3. Cooper
  - 4. General Electric
- B. All 15 and 20 amp 125V receptacles shall be Specification Grade or better. Duplex receptacles shall be 15A, 125V, with back and side wiring and nylon or Lexan face.
- C. Simplex receptacles shall be Heavy Duty Specification Grade, 20A, 125V, with back and side wiring and nylon or Lexan face, non-GFI.
- D. Receptacles identified on drawings as "GFI" or "GFCI" shall be "AutoGuard" type, GFCI type, duplex, 125V, 15 or 20 amps as required by number of outlets on circuit.
- E. Heavy duty receptacles, 250V and/or 30 ampere and above, shall be straight-blade type, of voltage and ampere ratings indicated on drawings.

## 2.3 COVER PLATES

- A. Manufacturers:
  - 1. Hubbell
  - 2. Carlon
- B. Cover plates for flush mounted devices shall be impact-resistant polycarbonate, single gang vertical mount. Cover plates for normal service receptacles shall be grey color and for emergency service receptacles shall be red. Two or more devices indicated side by side shall have a common cover plate.
- C. Duplex covers- Carlon E98GFCN (typical).
- D. Simplex covers- Carlon E98G20N (typical).
- E. Provide weatherproof cast aluminum gasketed coverplates with gasketed self-closing lids for the devices noted on the drawing as weatherproof. Install the devices in weatherproof cast aluminum boxes UL listed for wet/damp locations.
- F. Surface mounted devices shall have cadmium plated steel cover plates.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions.
- B. Verify outlet boxes are installed at proper height.
- C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

### 3.2 PREPARATION

- A. Clean debris from outlet boxes.

### 3.3 INSTALLATION

- A. Receptacles in multigang installations shall be installed with wiring pigtails attached for connecting the receptacles to the branch circuit wiring. Jumper wires shall not be used between receptacles.
- B. Install products in accordance with manufacturer's instructions.
- C. Install devices plumb and level.
- D. Install switches with OFF position down.
- E. Do not share neutral conductor on load side of dimmers.
- F. Install receptacles with grounding pole on bottom.
- G. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- H. All receptacles located in the utilidors, access vaults or outside shall be GFI type whether or not indicated on drawings.
- I. Install devices in weatherproof cast aluminum boxes, UL listed for wet/damp locations, at the locations noted on the drawing.

### 3.4 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on drawings.
- B. Install wall switch 48 inches above finished floor unless otherwise noted.
- C. Install convenience receptacle 18 inches above finished floor unless otherwise noted.

### 3.5 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFI/ GFCI receptacle device for proper operation.
- F. Verify that each data jack is properly connected and circuit is operational.

### 3.6 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

END OF SECTION



SECTION 16160  
CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 SCOPE

- A. Hinged cover enclosures.
- B. Cabinets.

1.2 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. ANSI/NFPA 70 - National Electrical Code.
- C. NECA (National Electrical Contractor's Association) - NECA 1-2006  
"Standard Practices for Good Workmanship in Electrical Contracting."

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Hoffman
- B. Rittal
- C. Square D Co.

2.2 CABINETS AND ENCLOSURES

- A. Construction: NEMA 4X, 304 stainless steel enclosure.
- B. Covers: Continuous left-hand hinge. Held closed by 2 x 1/4" turn latches with slotted head inserts.
- C. Provide interior enclosure manufacturer-supplied steel galvanized sub-panel for mounting terminal blocks and electrical components. Provide 304 stainless steel mounting brackets for wall mounting.
- D. Enclosure Finish: Brushed stainless steel, #4 or better.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive Work.

### 3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.
- C. Install cabinet fronts plumb.

END OF SECTION

## SECTION 16442

### PANELBOARDS

#### PART 1 - GENERAL

##### 1.1 SECTIONS INCLUDES

- A. Lighting and Appliance Branch-Circuit Panelboards
- B. Power Panelboards

##### 1.2 RELATED SECTIONS

- A. Section 16010 - Basic Electrical Requirements
- B. Section 16060 - Grounding and Bonding
- C. Section 16070 – Supporting Devices
- D. Section 16075 - Electrical Identification

##### 1.3 REFERENCES

- A. NEMA AB 1 (National Electrical Manufacturers Association) - Molded Case Circuit Breakers.
- B. NEMA FU 1 (National Electrical Manufacturers Association) - Fuses.
- C. NEMA ICS 2 (National Electrical Manufacturers Association) - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC.
- D. NEMA ICS 5 (National Electrical Manufacturers Association) - Industrial Control and Systems: Control Circuit and Pilot Devices.
- E. NEMA KS 1 (National Electrical Manufacturers Association) - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- F. NEMA PB 1 (National Electrical Manufacturers Association) - Panelboards.
- G. NEMA PB 1.1 (National Electrical Manufacturers Association) - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- H. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
- I. ANSI/NFPA 70 - National Electrical Code.
- J. NECA 1 (National Electrical Contractors Association) - Standard Practices for Good Workmanship in Electrical Contracting.
- K. UL 67 Safety for Panelboards.

##### 1.4 SYSTEM DESCRIPTION

- A. Panelboards are located as indicated on the drawings. Refer to the panelboard schedules on the drawings for ratings, characteristics, main circuit breaker, and feeder or branch circuit breaker requirements.

## 1.5 SUBMITTALS

- A. Submit under provisions of Sections 01330 and 16010.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, neutral bus ampacity, ground bus, integrated short circuit ampere rating and circuit breaker arrangements.
- C. Product Data: Submit catalog data showing specified features of standard products.

## 1.6 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Sections 01780 and 16010.
- B. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangement for all circuits.
- C. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts, and recommended maintenance procedures and intervals.
- D. Provide two of each panelboard key. All panelboards shall be keyed alike using the DU's current keying system.

## 1.7 QUALITY ASSURANCE

- A. Perform work in accordance with NECA 1.

## PART 2 - PRODUCTS

### 2.1 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Approved Manufacturer
  - 1. Square D Company - NQOD and NF Series
- B. Panelboards shall have a 200 percent rated neutral and be UL listed as suitable for non-linear loads.
- C. Panelboard phase, neutral, and ground buses shall be copper.
- D. Circuit breaker interrupting ratings shall be as noted on the drawings.
- E. Branch circuit breakers shall be bolt-on type. Plug-on type breakers will not be acceptable.
- F. Circuit breakers shall be arranged in panels in accordance with trip settings and circuit numbers indicated on drawings. Connections to the bus shall be distributed phase style.
- G. Cabinets shall be fabricated of code gauge galvanized steel, with substantial concealed hinges, flush pull, Square D Co. lock and catch, arranged for surface or flush mounting as noted on drawings.
- H. Panelboards shall be equipped with separate ground and neutral busses to which access will not be blocked by feeder or branch circuit wiring.
- I. On outside of door of panel, mount nameplate lettered in accordance with identification shown on drawings. Nameplates shall be as described in Section 16075.

- J. At the operating lever of each circuit breaker shall be numeral designating the pole number. A typewritten directory shall be mounted in frame inside the door behind a clear acrylic plastic panel.
- K. Panelboard cabinets, doors, and trims shall be finished with manufacturer's standard light gray enamel.

## 2.2 POWER PANELBOARDS

### A. APPROVED MANUFACTURER

- 1. Square D Company - I-Line type HCWM
- B. Panels shall have copper bus and main lugs rated at 400 or 600 amperes as noted on the riser diagram and panelboard schedules.
- C. Branch circuit breakers shall be thermal-magnetic molded case type of frame sizes indicated on drawings.
- D. Circuit breaker interrupting ratings shall be as noted on the drawings.
- E. Cabinets shall be fabricated of code gauge galvanized steel, with substantial concealed hinges, flush pull, and standard Square D Co. lock and catch, arranged for surface mounting, and of NEMA 1 construction.
- F. On outside at top of panel, mount nameplates with panel number lettered in accordance with identification shown on riser diagram. Also provide nameplates adjacent to branch circuit breakers to identify branch circuit panelboard loads.
- G. Nameplates shall comply with Section 16075.
- H. Panelboards shall be equipped with separate ground and neutral busses to which access will not be blocked by feeder or branch circuit wiring.
- I. Panelboard cabinets and trim shall be finished with manufacturer's standard light gray enamel.

## PART 3 - PRODUCTS

### 3.1 EXISTING WORK

- A. Disconnect abandoned panelboards. Remove abandoned panelboards.
- B. Ensure access to existing panelboard which remain active. Modify installation or provide access panel as appropriate.
- C. Clean and repair existing panelboards which remain or are to be reinstalled.

### 3.2 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1 and the NECA 1.
- B. Install panelboards plumb.
- C. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. The circuit directory is to be placed in a holder on the inside of the door. Revise directory to reflect circuiting changes required to balance phase loads.

- F. Provide engraved plastic nameplates under the provisions of Section 16075.
- G. Ground and bond panelboard enclosure according to Section 16060. Connect equipment ground bars of panels as required by NEC Article 250.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.
- C. Perform switch inspections and tests listed in NETA ATS, Section 7.5.
- D. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.4 ADJUSTING

- A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 16990  
ELECTRICAL TESTING

PART 1 - GENERAL

1.1 GENERAL SCOPE

- A. The contractor shall engage the services of an independent testing firm for the purpose of performing inspections and tests as herein specified.
- B. The testing firm shall provide all material, equipment, labor and technical supervision to perform such tests and inspections.
- C. The purpose of these tests are to assure that all tested electrical equipment, both contractor and DU supplied, is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.
- D. Equipment to be inspected and tested is as follows:
  - 1. Building wire, cable, and bus duct
  - 2. Enclosed circuit breakers
  - 3. Safety disconnect switches
  - 4. Panelboards
  - 5. Transformers

1.2 RELATED SECTIONS

- A. Section 16060 - Grounding and Bonding
- B. Section 16123 - Building Wire and Cable
- C. Section 16442 - Panelboards

1.3 COPYRIGHT

- A. Portions of this Section are copyright 1995 by InterNational Electrical Testing Association, P.O. Box 687, 231 Red Rocks Vista Drive, Morrison, CO 80465. Do not reproduce without providing notice of copyright.

1.4 REFERENCES

- A. All inspections and tests shall be in accordance with the following codes and standards except as provided otherwise herein:
  - 1. National Electrical Manufacturer's Association – NEMA
  - 2. American Society for Testing and Materials – ASTM
  - 3. Institute of Electrical and Electronic Engineers – IEEE
  - 4. InterNational Electrical Testing Association - NETA Acceptance Testing Specifications - ATS
  - 5. American National Standards Institute - ANSI C2: National Electrical Safety Code
  - 6. State and local codes and ordinances
  - 7. Insulated Cable Engineers Association – ICEA

8. Association of Edison Illuminating Companies – AEIC
  9. Occupational Safety and Health Administration – OSHA
  10. National Fire Protection Association – NFPA
    - a. ANSI/NFPA 70: National Electrical Code
    - b. ANSI/NFPA 70B: Electrical Equipment Maintenance
    - c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces
    - d. ANSI/NFPA 78: Lightning Protection Code
    - e. ANSI/NFPA 101: Life Safety Code
- B. All inspections and tests shall utilize the following references:
1. Project design specifications
  2. Project design drawings
  3. Project short-circuit and coordination study.
  4. Manufacturer's instruction manuals applicable to each particular apparatus
  5. Project list of equipment to be inspected and tested

#### 1.5 QUALIFICATIONS

- A. The testing firm shall be an independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.
- B. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations and systems.
- C. The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services.
- D. The testing firm shall submit proof of the above qualifications with bid documents, when requested.
- E. The terms used here within, such as test agency, test contractor, testing laboratory, or contractor test company, shall be construed to mean the testing firm.

#### 1.6 DIVISION OF RESPONSIBILITY

- A. The contractor shall perform routine insulation-resistance, continuity, and rotation tests for all distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein.
- B. Contractor shall supply a suitable and stable source of electrical power to each test site. The testing firm shall specify the specific power requirements.
- C. Contractor shall notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.



- D. Testing firm shall notify DU Project Manager prior to commencement of any testing.
- E. Any system, material or workmanship which is found defective on the basis of acceptance tests shall be reported to DU Project Manager.
- F. Testing firm shall maintain a written record of all tests and, upon completion of project, shall assemble and certify a final test report.
- G. Safety and Precautions
  - 1. Safety practices shall include, but are not limited to, the following requirements:
    - a. Occupational Safety and Health Act
    - b. Accident Prevention Manual for Industrial Operations, National Safety Council
    - c. Applicable state and local safety operating procedures
    - d. Doyon Utilities' safety practices
    - e. National Fire Protection Association - NFPA 70E
    - f. American National Standards for Personnel Protection
  - 2. All tests shall be performed with apparatus de-energized. Exceptions must be thoroughly reviewed to identify safety hazards and devise adequate safeguards.
  - 3. The testing firm shall have a designated safety representative on the project to supervise the testing operations with respect to safety.

## 1.7 GENERAL

- A. Suitability of Test Equipment
  - 1. All test equipment shall be in good mechanical and electrical condition.
  - 2. Selection of metering equipment should be based on knowledge of the waveform of the variable being measured. Digital multi-meters may be average or RMS sensing and may include or exclude the dc component. When the variable contains harmonics or dc offset and, in general, any deviation from a pure sine wave, average sensing, average measuring RMS scaled meters may be misleading. Use of RMS measuring meters is recommended.
  - 3. Field test metering used to check power system meter calibration must have accuracy higher than of the instrument being checked.
  - 4. Accuracy of metering in test equipment shall be appropriate for the test being performed.
  - 5. Waveshape and frequency of test equipment output waveforms shall be appropriate for the test and tested equipment.

B. Test Instrument Standards

1. All equipment used for testing and calibration procedures shall exhibit the following characteristics:
  - a. Maintained in good visual and mechanical condition
  - b. Maintained in safe operating condition
2. Test equipment should have operating accuracy equal to, or better than, the following limits:
  - a. Portable multimeters should be true RMS measuring.
  - b. Multimeters should have the following accuracy limits, or better:
    - 1) AC voltage ranges: .75% +/-3 last single digits @ 60 Hz
    - 2) AC current ranges: .90% +/-3 last single digits @ 60 Hz, including adapters, transducers
    - 3) DC voltage ranges: .25% +/-1 last single digit
    - 4) DC current ranges: .75% +/-1 last single digit
    - 5) Resistance ranges: .50% +/-1 last single digit
    - 6) Frequency range: .10% +/-1 last single digit @ 60 Hz
  - c. Clamp-on ammeters: ac current +/-3% of range +/-1 last single digit @ 60 Hz
  - d. Dissipation/power factor field equipment
    - 1) +/-0.1% power factor for power factor values up to 2.0%
    - 2) 5% of the reading for power factor values above 2.0%
  - e. Low-range dc resistance equipment: 1.0% of reading, +/-2 last single digits
  - f. Transformer turns-ratio test equipment: 0.5% or better @ 60 Hz
  - g. Ground electrode test equipment: +/-2% of range
  - h. Insulation test sets: 0-1000V dc +/-20% of reading at mid-scale
  - i. Electrical load survey equipment
    - 1) +/-5% total error, including sensors
    - 2) 1% resolution
    - 3) Current transformers +/-2% of range @ 60 Hz
    - 4) Voltage transformers +/-0.5% of range @ 60 Hz
  - j. Liquid dielectric strength test equipment: +/-2% of scale
  - k. Infrared scanning equipment: sensitivity of 2 degrees
  - l. Phase shifting equipment: +/-1.0 degrees over entire range
  - m. High-current test equipment: +/-2% of range
  - n. DC high potential test equipment: +/-2% of full scale
  - o. AC high potential test equipment (60 Hz): +/-2% of full scale

C. Test Instrument Calibration

1. The testing firm shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.
2. The accuracy shall be directly traceable to the National Institute of Standards and Technology.
3. Instruments shall be calibrated in accordance with the following frequency schedule:
  - a. Field instruments: 6 months maximum
  - b. Laboratory instruments: 12 months
  - c. Leased specialty equipment: 12 months (Where accuracy is guaranteed by lessor)
4. Dated calibration labels shall be visible on all test equipment.
5. Records, which show date and results of instruments calibrated or tested, must be kept up-to-date.
6. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument.
7. Calibrating standard shall be of higher accuracy than that of the instrument tested.

D. Test Report

1. The test report shall include the following:
  - a. Summary of project
  - b. Listing of equipment tested
  - c. Test results
  - d. Recommendations
2. Furnish three copies of the complete report to DU Project Manager.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 INSPECTION AND TEST PROCEDURES

- A. Transformers - Small Dry-Type, Air-Cooled (600 volt and Below) (less than 100 kVA single-phase or 300 kVA three-phase)
  1. Inspect for physical damage, broken insulation, tightness of connections, defective wiring, and general condition.
  2. Thoroughly clean unit prior to making any tests.
  3. Perform insulation-resistance test. Calculate dielectric absorption ratio and polarization index. Make measurements from winding-to-winding and windings-to-ground. Test voltages and minimum resistance. Results shall be temperature corrected.

4. Verify taps and connect transformer to desired tap, if applicable.
  5. Energize primary winding with system voltage. Measure secondary voltage with the secondary load disconnected. Record results.
- B. Cables - Low-Voltage - 600V Maximum
1. Visual and Mechanical Inspection
    - a. Inspect cables for physical damage and proper connection in accordance with single-line diagram.
    - b. Test cable mechanical connections to manufacturer's recommended values using a calibrated torque wrench.
    - c. Check cable color coding with applicable specification sections and National Electrical Code standards.
  2. Electrical Tests
    - a. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 1 minute.
    - b. Perform continuity test to insure proper cable connection.
  3. Test Values

Evaluate results by comparison with cables of same length and type. Investigate any values less than 50 megohms.
- C. Circuit Breakers - Low-Voltage - Insulated-Case
1. Visual and Mechanical Inspection
    - a. Check circuit breaker for proper mounting and compare name-plate data to drawings and specifications.
    - b. Operate circuit breaker to ensure smooth operation.
    - c. Inspect case for cracks or other defects.
    - d. Check tightness of connections using calibrated torque wrench. Refer to manufacturer's instructions for proper torque levels.
  2. Electrical Tests
    - a. Perform a contact-resistance test.
    - b. Perform an insulation-resistance test at 1000 volts dc from pole to pole and from each pole to ground with breaker closed and across open contacts of each phase.
    - c. Determine long-time minimum pickup current by primary current injection where practical.
    - d. Perform long-time delay time-current characteristic tests by passing three hundred percent (300%) rated current through each pole separately. Record trip time.
    - e. Determine short-time pickup and delay by primary current injection, if applicable.

- f. Determine ground-fault pickup and time delay by primary current injection, if applicable.
- g. Determine instantaneous pickup current by primary injection using run-up or pulse method.

3. Test Valves

- a. Compare contact resistance or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than fifty percent (50%). Investigate any value exceeding manufacturer's recommendations.
- b. Insulation resistance shall not be less than 100 megohms.
- c. Trip characteristic of breakers shall fall within manufacturer's published time-current characteristic tolerance band, including adjustment factors.
- d. Circuit breakers exceeding specified trip time at three hundred percent (300%) of pickup shall be tagged defective.

D. Circuit Breakers - Low-Voltage – Power

1. Visual and Mechanical Inspection

- a. Inspect for physical damage and compare nameplate data with drawings and specifications.
- b. Perform mechanical operational test in accordance with manufacturer's instructions.
- c. Check cell fit and element alignment and proper operation of racking interlocks.
- d. Check tightness of connections using calibrated torque wrench. Refer to manufacturer's instructions for proper torque levels.
- e. Check arc chutes for damage.
- f. Clean entire circuit breaker using approved methods and materials.
- g. Lubricate as required.

2. Electrical Tests

- a. Perform a contact-resistance test.
- b. Perform an insulation-resistance test at 1000 volts dc from pole-to-pole and from each pole-to-ground with breaker closed and across open contacts of each phase.
- c. Determine long-time minimum pickup current by primary current injection.
- d. Determine long-time delay by primary injection.
- e. Determine short-time pickup and delay by primary current injection.

- f. Determine ground-fault pickup and delay by primary current injection.
- g. Make adjustments for final settings in accordance with breaker setting sheet.
- h. Activate auxiliary protective devices, such as ground-fault or under voltage relays, to ensure operation of shunt trip devices. Check the operation of electrically-operated breakers in their cubicle.
- i. Check charging mechanism.

3. Test Values

- a. Compare contact resistance or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than fifty percent (50%).
- b. Insulation resistance shall not be less than 100 megohms. Investigate values less than 100 megohms.
- c. Trip characteristics of breakers when adjusted to setting sheet parameters shall fall within manufacturer's published time-current tolerance band.

E. Grounding Systems

1. Visual and Mechanical Inspection

- a. Inspect ground system for compliance with drawings and specifications.

2. Electrical Tests (Small Systems)

- a. Perform good-impedance measurements utilizing the fall-of-potential method per ANSI/IEEE Standard 81 "IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System." Instrumentation utilized shall be as defined in Section 12 of the above guide and shall be specifically designed for ground impedance testing. Provide sufficient spacing so that plotted curves flatten in the 62% area of the distance between the item under test and the current electrode.

3. Electrical Test (Large Systems)

- a. Perform ground impedance measurements utilizing either the intersecting curves methods or the slope method. (Ref. Nos. 40 and 41 in IEEE Std. 81.)

4. Equipment Grounds

- a. Utilize two-point method of IEEE Std. 81. Measure between equipment ground being tested and known low-impedance grounding electrode system.

5. Test Values

- a. The main ground electrode system impedance-to-ground should be no greater than five (5) ohms for commercial or industrial

systems and one (1) ohm or less for generating stations, transmission stations, and large industrial systems. Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.

F. Ground-Fault Systems (NEC 230-95)

1. Visual and Mechanical Inspection

- a. Inspect for physical damage and compliance with drawings and specifications.
- b. Inspect neutral main bonding connection to assure:
  - 1) Zero-sequence sensing system is grounded.
  - 2) Ground-strap sensing systems are grounded through sensing device.
  - 3) Ground connection is made ahead of neutral disconnect link on zero-sequence sensing systems.
  - 4) Grounded conductor (neutral) is solidly grounded.
- c. Inspect control power transformer to ensure adequate capacity for system.
- d. Manually operate monitor panels (if present) for:
  - 1) Trip test
  - 2) No trip test
  - 3) Nonautomatic reset
- e. Record proper operation and test sequence.
- f. Set pickup and time-delay settings in accordance with the settings provided by DU Project Manager.

2. Electrical Tests

- a. Measure system neutral insulation resistance to ensure no shunt ground paths exist. Remove neutral-ground disconnect link. Measure neutral insulation resistance and replace link.
- b. Determine the relay pickup current by current injection at the sensor and operate the circuit interrupting device.
- c. Test the relay timing by injecting three hundred percent (300%) of pickup current, or as specified by manufacturer.
- d. Test the system operation at fifty-seven percent (57%) rated control voltage, if applicable.
- e. Test zone interlock systems by simultaneous sensor current injection and monitoring zone blocking function.
- f. On multiple sources, tie breaker, etc., systems, devise a simulation scheme that fully proves correct operation.

3. Test Parameters

- a. System neutral insulation shall be a minimum of one hundred (100) ohms, preferably one (1) megohm or greater.
  - b. Relay timing shall be in accordance with manufacturer's published time-current characteristics curves in no case longer than one (1) second for fault currents equal to or greater than 3,000 amperes.
  - c. Relay pickup value shall be within +/-10% of setting and in no case greater than 1200A.
- 3.2 Test all power, control, lighting and signal systems for proper operation.
- 3.3 Test every receptacle to be sure power is available at it, and for proper polarity and ground connection.
- 3.4 Take voltage readings on various portions of the distribution system if so directed by DU Project Manager, and, if deemed necessary by DU Project Manager, reset taps in transformers.
- 3.5 Insure that power and lighting loads are balanced between phases of service entrances, distribution feeders and/or transformers as closely as possible.
- 3.6 Assist Contractors for other work in testing their equipment if required to do so.
- 3.7 If deficiencies are found in any of the testing, correct same and retest. Repeat process until all systems are functioning properly.

END OF SECTION