MEMORANDUM State of Alaska

Department of Transportation and Public Facilities

TO: Distribution

DATE: May 20, 2025

FROM: Matthew Hansen, P.E.
Contracts Section
(907) 269-0602

FILE NO.: Z580270000

SUBJECT: Whittier Tunnel Standby Generators
PS&E Review

Attached for final review and comments is the contract assembly and design analysis for this project.

Comments are due by 5:00 pm Tuesday, June 3, 2025.

For DOT&PF Employees, navigate to http://web.dot.state.ak.us/nreg/design/des_com/index.cfm, enter your employee name and password as if you are logging into your computer each morning, enter your region, and section, then the program number **Z580270000**. Click on the PS&E tab and follow the instructions to enter your comments. See the following page for instructions on how to enter your comments. Please follow the instructions so that review meetings can proceed in an orderly fashion.

For reviewers outside of DOT&PF, please forward your comments to eric.hershey@alaska.gov using the Excel comment spreadsheet attached to the Outlook meeting invitation.

Review documents (project manual and plan set) are available for viewing and/or download at the following location:
https://dot.alaska.gov/creg/design/aviation/review/Z580270000

A review meeting is scheduled for 10:00 a.m. on Thursday, June 5, 2025, via Microsoft Teams. A Teams link is located in the Outlook calendar meeting invitation.

The following specific replies are requested in addition to any other comments:

Right of Way	Status of project ROW, material agreements, easements, etc.
Utilities	Utility agreement status.
Project Control	Status of funding considering the current estimate.
Environmental	Permits required and an estimated date when they will be acquired.

Please charge review time to Program No.: Z580270000, Phase: TC2000, Template: TTPJ001, and Activity Code _ _ _P (insert your own activity code in the blank spaces).

Instructions for entering comments into the On-line Review Comment System

Front End Document Comments

Cover: Choose General Category and enter "Cover" in the Item field

Table of Contents: Choose General Category and enter "TOC" in the Item field

Invitation to Bid: Choose General Category and enter "ITB" in the Item field

Special Notice to Bidders: Choose General Category and enter "SNB" in the Item field

Engineers Estimate Comments

Engineers Estimate: In the Category field, choose "Engineer's Estimate" and enter Pay Item numbers exactly as they appear in the engineer's estimate in the Pay Item field such as "P165.010.0000" or "D751.010.0048" (without quotation marks). DO NOT enter words. DO NOT enter "Item P165.010.0000" or "Item D751.010.0048 Manhole". Place any other descriptions in the comment field.

Specifications Comments

Standard Mod and special provision: Use specification page only such as: "GCP-20-4" or "P-152-3" NOT "P 152a" or "P-152-2.3e". Describe in the comment field the exact location in the section to which the comment applies. For appendices, Appendix A would be entered as: "Z-A" Appendix B would be: "Z-B", etc. Describe in the comment field where within the appendix your comment applies.

Plans Comments

Plans: In the Category field, choose "Plans" and then enter the plan sheet number only in the Sheet Number field such as "01" or "10" (no quotes) or "E10" or "D-04.21". DO NOT enter words. DO NOT enter: "Sheet 10" or "Plan 10" or "Safety Plan". If your comment extends to other sheets, enter the first sheet the comment applies to in the Sheet Number field and then list the other sheets the comment applies to in the comment. For Standard Plans use the Plan number such as "D-01.02". For Standard Plans with multiple sheets, tell reviewers which sheet in the series the comment refers to in the comment itself.

Engineer's Design Report (EDR) Comments

EDR: Choose the "EDR" tab (If available, there is a pdf document to view/download on the review comment website)

Geotechnical Comments

Geo: Choose the "Geo" tab (If available there is a pdf document to view/download on the review comment website)

Modification to Construction Standards (MCS) Comments

MCS: Choose General Category and enter "MCS" in the Item field. Describe exact location of comment in the comment field.

Plans In Hand Comment Response (PIHCR) Comments

PIHCR: Choose General Category and enter "PIHCR) in the item field. Describe exact location comment refers to in the comment field (ie comment number and name of PIH commenter).

Cross Section (XC) Comments

XC: Choose General Category and enter "XC" Describe what cross section comment refers to in comment field.

Quantity Calculations (QC) Comments

QC: Chose General Category and enter "QC" Describe what location in the Quantity Calculations comment applies to.

Whittier Tunnel Standby Generators
Z580270000

PS&E Review

COMMENTS DUE: **Tuesday, June 3, 2025**
REVIEW MEETING: **Thursday, June 6, 2025 – 10:00 a.m.**

Distribution, (1 copy, MS 2525 unless otherwise noted)

Design:
*Luke Bowland, Preconstruction Engineer
*Jeff Carleton, Electrical Engineer

Central Region Materials (MS 2526):
Mike Yerkes, Regional Materials Eng. **(2)**

Statewide Materials (MS 2538)
*Mike San Angelo, State Materials Engineer

Traffic Safety & Utilities:
Cynthia Ferguson, TS&U Group Chief
David Freese, Acting Regional Utilities Eng.
Michael Mancill, Geographic Utilities Lead
*Anna Bosin, Regional Traffic Engineer

Maintenance & Operations:
*Kirk Warren, CR M&O Group Chief
Burrell Nickeson, CR M&O Manager
Jeremy Thompson, M&O Specialist
Gordon Burton, Facilities Manager, AAMT

Construction:
*Joel G. St. Aubin, Regional Constr. Engineer
*Laren Meyer, Construction Office Engineer
*Athena Marinkovic, ESCP Coordinator

Quality Assurance:
Mahear Abou Eid, Concurrent Review Engineer
Jim Klebesadel, Lead Materials Rover

Contracts:
Sharon Smith, Section Chief
Matthew Hansen, Review Engineer

PD&E:
*Alex Read, PD&E Group Chief
*Brian Elliot, Environmental Manager
Orion LeCroy, Regional Hydraulics Engineer
Elliott Smith, Hydraulics Engineer

Right-of-Way
Melanie Arnolds, Right-of-Way Group Chief
Bob Keiner, ROW Engineering Supervisor
*James Sowerwine, Proj. Coordination Supervisor
Lorraine Kastner, ROW Appr & Acq Supervisor

Surveys
*Travis Test, Survey Manager

Project Control
*Jennifer Coisman, Project Control Chief

Planning
*Ben White, Planning Group Chief
*Philana Miles, Planning Manager
Joselyn Biloon, Area Planner

Facilities
*Christopher Hodgin, Chief, SWPF
*Eric Hershey, Project Manager

* Electronic Only

Mail/FedEx/ZendTo

*Emily Haynes, Engineering & Field Operations Team Leader, FHWA
emily.haynes@dot.gov

*Tyler Johnson, Engineer, ARRC
johnsontr@akrr.com

*Travis Peterson, AAMT Project Manager, Webber
Travis.peterson@wwebber.com

Project Manual For:

Whittier Tunnel Standby Generators
Program No. Z580270000

State of Alaska
Department of Transportation and Public Facilities
Central Region
4111 Aviation Avenue, Anchorage, Alaska 99502

Advertising Date: TBD

Document Fee: $TBD

SPECIFICATION INDEX

END OF INDEX

SECTION 01 11 13
SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. All Contract Documents are related to this Section.

B. Section 01 57 10 – Erosion, Sediment and Pollution Control

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Work under this Contract includes all Work required for the project in Bear Valley and Whittier, Alaska, all in accordance with the terms and conditions of the Contract Documents.

B. The Work in general includes the furnishing and installation of two new standby generators at each portal of the Whittier Tunnel, with related diesel fuel tanks, support pads, sitework, variable frequency drives, PLC control system, electrical systems, and other incidental Work.

1.03 CONTRACT

A. General: Construct all Work through a single LUMP SUM construction contract in accordance with the Contract Documents.

B. Not Used

1.04 WORK BY OTHERS

A. The DEPARTMENT will remove items identified as “By Others” on demolition plans.

B. Chugach Electric Association (CEA) will perform utility work items as described in Section 01 31 14 – Work Coordination.

C. The DEPARTMENT will provide the Systems Integrator throughout construction and commissioning of new graphics and control sequences in accordance with Section 23 09 33 – Process Control and Instrumentation Systems.

1.05 WORK SEQUENCE AND MILESTONES

A. Upon receipt of Notice to Proceed (NTP) the CONTRACTOR will be expected to prepare submittals and begin the purchase of critical materials.

B. The CONTRACTOR shall submit a preliminary Schedule of Values and an Anticipated Construction Schedule at the pre-construction conference. The CONTRACTOR shall submit a final Schedule of Values within 3 weeks of the Notice-to-Proceed.

C. Work sequencing requirements shall include:

1. Completion Dates: Shall be specified in Section 00 08 00 – Supplementary Conditions.

1.06 PARKING

A. Parking shall be limited to designated areas only. If insufficient area exists, the CONTRACTOR shall make other arrangements.

B. Not Used

1.07 SHUTOFFS AND DISRUPTIONS TO UTILITY SERVICE

A. At least two (2) weeks prior to the first planned outage, submit a schedule showing all proposed utility outages. Upon request, submit a written plan describing the justification for the outages and possible impacts to the Using Agency. The CONTRACTOR shall revise the schedule to show any planned changes and shall submit the revised schedule promptly to the DEPARTMENT.

B. Plan work to minimize down time. Work with DEPARTMENT to schedule disruption for time periods that minimize impacts to the Using Agency. Shutoffs and disruption to service shall not be allowed during designated critical operating hours.

C. Constraints: Critical Operation Hours during which disruptions to power, electrical and mechanical equipment for the tunnel, and tunnel traffic shall be allowed are set forth in Section 01 31 14 – Work Coordination.

1.08 CONTRACTOR'S USE OF PREMISES

A. Coordinate use of the premises under direction of DEPARTMENT and per the requirements of Section 01 31 14 – Work Coordination.

B. Assume full responsibility for protection and safekeeping of furnished products.

C. Assume full responsibility for the protection of roads and grounds in the project vicinity from construction related activities.

D. Obtain and pay for use of additional storage, Work, or parking areas needed for construction operations.

E. Do not stop or otherwise impede vehicle or train traffic without prior written approval from the DEPARTMENT. The CONTRACTOR shall make all necessary provisions, including but not limited to detours, bypasses, and permits, to maintain traffic flow. Submit traffic control plan and schedule for approval no less than twenty (20) working days prior to anticipated traffic disruptions.

F. Work and Staging Areas - With the exception of vehicle movement for access to and from Work and Staging Areas, restrict all Work to within the limits of construction designated on the plans.

G. Not Used

1.09 USING AGENCY OCCUPANCY

A. The using agency at the project location is the Department of Transportation and Public Facilities.

B. Upon the issuance of a Certificate of Substantial Completion by the DEPARTMENT, the Using Agency shall take ownership of the facility and may occupy it.

C. Refer to the General Conditions for access following substantial completion.

D. Not Used

1.10 PERMITS

A. Not Used

1.11 HAUL ROUTES

A. Contractor shall determine the requirements for and shall comply with applicable local, municipal, and DOT/PF haul requirements, routes and restrictions.

B. Obtain required approvals for the use of haul routes, and submit to the DEPARTMENT upon request.

C. Not Used

1.12 STORMWATER PREVENTION POLLUTION PLAN (SWPPP)

A. The CONTRACTOR shall constrain its operations for work area, staging area, and parking so that the total disturbed area for the project is less than 1 acre. A Notice of Intent (NOI), and related documentation shall not be required if the CONTRACTOR meets this requirement. If the CONTRACTOR fails to meet this requirement, it shall comply with all the requirements of Section 01 57 10 Erosion Pollution and Sediment Control, file an NOI, comply with related regulatory requirements, schedule its activities to enable compliance, and pay any and all related costs and fines, all at no additional cost to the DEPARTMENT

B. If the CONTACTOR'S activities are kept to an area less than 1 acre, it shall still prepare a Storm Water Pollution Prevention Plan and implement the plan during construction. Comply with applicable portions of Section 01 57 10 Erosion, Sediment and Pollution Control, except for the specified provisions for NOI and related documents.

PART 2 – PRODUCTS **Not Used**

PART 3 – EXECUTION **Not Used**

END OF SECTION

SECTION 01 12 19
CONTRACTOR'S CERTIFICATION OF SUBCONTRACTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparing, submitting and accepting subcontracts.

1.02 RELATED REQUIREMENTS

A. Section 00100 - Instructions to Proposer

B. Section 00430 - Subcontractor List

C. Section 00700 - General Conditions: Subcontractor Certification and Approval

D. Section 00800 – Supplementary Conditions: Subcontract Provisions

E. Section 01 33 00 - Submittals: Submittal Procedures

1.03 PREPARATION OF CERTIFICATION

A. Certification Forms: Use forms provided by DEPARTMENT.

B. CONTRACTOR shall prepare certification form and submit to the DEPARTMENT prior to the start of work. Where required, attach additional information to the certification form.

C. Substitute certification forms will not be considered.

1.04 SUBMITTAL OF CERTIFICATION

A. The CONTRACTOR shall submit certification forms for all subcontractors for review and approval by the DEPARTMENT.

1.05 CONSIDERATION OF CERTIFICATION

A. Following receipt of submitted subcontractor certification forms, the DEPARTMENT will review for the following, at minimum:

1. Completeness of forms and attachments
2. Proper execution (signatures) of forms and attachments

B. Incomplete or improperly executed subcontractor certification forms will be returned to the CONTRACTOR for revision and resubmittal.

C. CONTRACTOR shall remove its subcontractor from the project site until its subcontractor certification form is submitted, reviewed, and approved.

D. The DEPARTMENT will not process payments for work performed by a non-certified subcontractor.

1.06 ACKNOWLEDGMENT OF CERTIFICATION

A. Submittals which have been examined by the DEPARTMENT and are determined to be complete and properly executed shall be acknowledged as such by the Project Engineer's signature.

PART 2 - PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

STATE OF ALASKA DOT & PF STATEWIDE PUBLIC FACILITIES	SUBCONTRACTOR CERTIFICATION	

Note: The Contractor shall provide this form for <u>ALL</u> subcontractors and lower tier subcontractors working on this project. This form is applicable to all projects, including Small Procurement Contracts, and must be completed in full. The Department will not allow the subcontractor to work on the project before the Department has received this signed certification (Form 25D-042A) and supporting documentation.

Project: _____ Project #: _____ Federal Aid #: _____

Prime Contractor: _____ **Subcontract being certified:** _____

Pursuant to the Contract Documents, we hereby stipulate the following concerning the award of Work to the last Subcontractor on the following list:

1. First Tier Subcontractor: _____ DBE? **Yes**☐ **No**☐

   Second Tier: _____ DBE? **Yes**☐ **No**☐

   Third Tier: _____ DBE? **Yes**☐ **No**☐

   Fourth Tier: _____ DBE? **Yes**☐ **No**☐

   If the subcontractor is performing work as a DBE, the dollar amount of DBE work is: $ _____

2. Date of Subcontract: _____

3. Estimated Start Date of Sub-contracted work: _____

4. Amount of Subcontract: $ _____

5. Subcontract amount is ____% of the total Contract Award Amount

   Cumulative signed subcontract amount (including this Agreement) is: ____% of the total Contract Award Amount

6. Scope of Work: _____

   _____

7. Are the following documents kept on file by both the Contractor and the Subcontractor? ([F] = Federal Projects Only)

EEO-1 Certification (Form 25A-304), [F]	**Yes**☐	**No**☐
Contract Minimum Wage Schedule	**Yes**☐	**No**☐
Civil Rights Representative (Form 25A-302) [F]	**Yes**☐	**No**☐
Required Contract Provisions for Federal Aid (Form 25D-55A or 25D-55H) [F]	**Yes**☐	**No**☐
As required to demonstrate conformance with DBE Contract Provisions [F]	**Yes**☐	**No**☐
FAA Required Certification Regarding Tax Delinquency / Felony Convictions (25D-159) [F]	**Yes**☐	**No**☐

8. Is the Subcontractor qualified to do the work, in accordance with all contract documents?

   Yes☐ **No**☐

9. Is the Subcontractor listed on the Bidder's Registration List?

   Yes☐ **No**☐

10. Does the Subcontract contain provisions for prompt payment, release of retainage, and interest on late payment and retainage conforming to AS 36.90.210?

    Yes☐ **No**☐

11. Does the Subcontract specifically bind the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of the Department and does it contain waiver provisions and termination provisions as required by the Contract Documents?

    Yes☐ **No**☐

12. Does the Subcontractor have adequate insurance coverages as specified in the Contract Documents?

Yes☐ **No☐**

a). If not, does the Contractor stipulate that the insurance limits of the Subcontractor are acceptable to the Contractor and that he has notified his insurance carrier of the reduced insurance limits?

Yes☐ **No☐**

b). Does the evidence of insurance certify that the policies described thereon comply with all aspects of the insurance requirements for this project?

Yes☐ **No☐**

c). Does the evidence of insurance list the Department as an "Additional Insured" or “Certificate Holder”?

Yes☐ **No☐**

d). Does the evidence of insurance commit to providing written notice in accordance with the policy provisions before cancellation or reduction of any coverage or reduction in any limits of liability?

Yes☐ **No☐**

e). Insurance Expiration dates:

Comprehensive or Commercial General Liability: _____

Automobile: _____ Workers’ Compensation: _____

(Other): _____

13. Does the Contractor certify firms or individuals debarred or suspended by the Department, FAA, or FHWA are not employed or subcontracted under this construction project?

Yes☐ **No☐**

14. Copies of the following professional certifications, licenses, and registrations are attached (circle all that apply):

Federal Employer Identification Number (EIN) - If no Federal I.D. Number, Use owner’s SSN (all subcontracts)
Business License (all subcontracts)
Contractor License (all subcontracts)
Land Surveyor's License (survey subcontract)
Electrical Administrator's License (electrical subcontract)
Mechanical Administrator’s License (mechanical subcontract)

Phone Number: ( ) _____

Address: _____ City: _____ State: _____

15. Does the Contractor certify the following?:

The Contractor remains responsible for all quality control and proper performance of all requirements of the contract. **Yes☐** **No☐**

For federal projects, the Contractor will continue to perform at least thirty percent (30%) of the contract work with his own organization. **Yes☐** **No☐**

This Contractor Self Certification does not relieve the Contractor and his surety, or either the Contractor or surety from any liability or responsibility under the contract. **Yes☐** **No☐**

Department’s Request for Information – If the Department at any time makes written request for the Agreement, licenses, proof of insurance, or any other information relating to the certifications contained herein, the Contractor will deliver an executed copy of the Agreement and/or requested information to the Department within five calendar days. If the Contractor fails to provide the requested information within five calendar days, or if the Contractor fails to include required language and conditions in the Agreement, the Department may suspend all work relating to the Agreement. The Contractor shall not be due any additional compensation or contract time if the Department suspends work due to the Contractor’s failure to provide requested information or failure to include required language and conditions in the Agreement. **Yes☐** **No☐**

False Statement or Omission – If a false statement or omission is made in connection with this Contractor Self Certification the Contractor will be excluded from participating in the self-certification process for the remainder of this Contract and for the following construction season. Contractors excluded from the self-certification process will be required to submit all necessary information for the Department's approval of proposed Subcontractors or Lower Tier Subcontractors.

Any false statement or omission made in connection with this Contractor Self Certification may be cause for suspension, a determination of non-responsibility on future bids, and may be cause for revocation of award, default, or disbarment. The person or entity making false statement or omission is subject to any and all civil and criminal penalties available pursuant to applicable state and federal law.

Yes☐ **No**☐

16. Exceptions to any of the above are explained as follows: _____

_____

_____

CERTIFICATION (to be completed and signed by PRIME CONTRACTOR): I certify all the above information to be true, correct and complete.

Signature: _____

Printed Name: _____; Title: _____

Company: _____ Date: _____

SUBCONTRACTOR ACKNOWLEDGEMENT: I hereby acknowledge that all requirements and pertinent provisions of the Contract, including but not limited to: Form 25D-55A or 25D-55H (included in the contract), Required Contract Provisions for Federal Aid Construction Contracts, DBE provisions, prompt payment, and minimum wage rates, are included in the agreement and have been received.

Signature: _____

Printed Name: _____; Title: _____

Company: _____ Date: _____

DEPARTMENT'S APPROVAL/DISAPPROVAL

The subject subcontract is **APPROVED**. Nothing in this approval should be construed as relieving the Prime Contractor of the responsibility for complete performance of the work or as a waiver of any right of the Department to reject defective work.

SIGNATURE: _____ **DATE:** _____
Resident Engineer

The subject subcontract is **NOT APPROVED** for the following reasons:

_____

_____

_____

SIGNATURE: _____ **DATE:** _____
Resident Engineer

SECTION 01 26 63
CHANGE PROCEDURES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Section 00312 - Bid Schedule

B. Section 00510 – Construction Contract

C. Section 00700 - General Conditions

D. Section 00800 - Supplementary Conditions: Modifications to General Conditions Section 00700

E. Section 01 32 00 – Work Schedules and Reports

F. Section 01 29 76 – Application for Payment

G. Section 01 29 73 - Schedule of Values

H. Section 01 73 00 – Execution Requirements: Project Record Documents

1.02 SUBMITTALS

A. Submit the name of the individual authorized to accept changes, and to be responsible for informing others in CONTRACTOR's employ of changes in the Work.

B. Submit with each price proposal a complete, detailed, itemized cost breakdown defining all impacts on Contract Price and Contract Time, in sufficient detail to fully explain the basis for the proposal.

C. All change forms shall be provided by the DEPARTMENT.

1.03 CHANGE AUTHORIZATION

A. In accordance with Section 00700 - General Conditions, Part 9 Changes, the DEPARTMENT may authorize changes to the Work. The DEPARTMENT may authorize changes in one of the following ways:

1. Directive (Section 00700, Article 9.3)
2. Change Order (CO) (Section 00700, Article 9.4)
3. Acceptance of Shop Drawing variations, which have been identified by CONTRACTOR. (Section 00700, Article 9.5)
4. Interim Work Authorization (IWA) (Section 00700, Article 9.10)

1.04 CHANGE PROCEDURES

A. The DEPARTMENT may initiate change to the contract by issuing to the CONTRACTOR a Request for Proposal (RFP) document. The RFP may include:

1. Change narrative.
2. Supplementary revised drawings, specifications, additional details, or sketches.
3. Other information as deemed appropriate.

B. The CONTRACTOR shall request a change to the contract by submitting to the DEPARTMENT a written Change Notice on a form provided by the DEPARTMENT. The DEPARTMENT may respond by rejecting it, or with a RFP to initiate contract change. The CONTRACTOR'S Change Notice shall include, at minimum:

1. A description of the proposed change with a statement of the justification of the change.
2. Statement of the effect of the change on Contract Price and Contract Time.
3. The information required in Section 00700 - General Conditions, Part 15 Claims for Adjustments and Disputes.

C. Upon receipt of a Request for Proposal (RFP) from the DEPARTMENT, the CONTRACTOR shall respond with a price proposal. The CONTRACTOR shall make every effort to return its price proposal in response to the RFP within the time frame requested by the DEPARTMENT, but in no event later than 14 calendar days from date the RFP is issued. For work to be performed after the execution of a Change Order, the basis of pricing shall be estimated. For work performed prior to the execution of a Change Order, the pricing shall be based upon documentation of actual incurred costs. The price proposal shall include:

1. A complete, detailed, itemized price breakdown.
2. For the prime contractor and subcontractors, detailed documentation of costs for direct costs, labor, equipment, consultants, sub-contractor markups, overhead and profit, and other items set forth in General Conditions Section 00700, Part 10.
3. Other information as required by the DEPARTMENT.

D. Upon receipt of pricing response to a RFP, the DEPARTMENT may execute a change to the contract. The issuance of an RFP or the receipt of pricing response to an RFP shall not obligate the DEPARTMENT to execute a change to the contract.

1.05 DIRECTIVES

A. The DEPARTMENT may issue Directives as per Section 00700 – General Conditions, Article 9.3.

1.06 INTERIM WORK AUTHORIZATIONS (IWA)

A. The DEPARTMENT may issue Interim Work Authorizations in accordance with Section 00700 – General Conditions, Article 9.10.

B. IWAs may be issued to authorize the commencement of additional work in advance of the execution of a Change Order.

C. Work authorized by IWA shall be converted to a negotiated Change Order.

D. The price on the IWA form shall be an estimated limit not to be exceeded by the CONTRACTOR without prior amendment of the IWA by the DEPARTMENT. The DEPARTMENT shall not be obligated to compensate the CONTRACTOR for costs in excess of the amount on the IWA.

E. Upon the execution of an IWA, the CONTRACTOR is authorized to begin the specified work. The CONTRACTOR shall track its costs using Cost of Work procedures. The CONTRACTOR shall use the DEPARTMENTS's Cost of the Work form and shall submit the data to the DEPARTMENT at the close of each work day. A separate Cost of Work form is required for each IWA.

1.07 CHANGE ORDER

A. Any change in Contract Time, Contract Price, or associated responsibility within the general scope of the Contract, shall be made by Change Order.

B. The CONTRACTOR shall use forms furnished by the DEPARTMENT for Change Orders.

1.08 CHANGE PRICING AND TIME ANALYSIS

A. Unless specified elsewhere, Section 00700 - General Conditions, Part 10 shall be applied to the negotiation of all changes to the scope of the contract.

1. Unit Price, when unit prices are contained in the Contract.
2. Mutually acceptable Lump Sum Price, including overhead and profit.
3. Cost of the Work

B. UNIT PRICE CHANGE - For unit price CHANGE PROCEDURES, prices shall be determined by multiplying the contractual unit price(s) by the estimated quantities of Work associated with changed scope. Payment will be based on the actual installed quantities. Document actual installed quantities and submit information requested by the DEPARTMENT on a daily basis for its approval and certification. Refer to Section 00700 - General Conditions, Part 10 for additional requirements.

C. LUMP SUM PRICE CHANGE - The CONTRACTOR and the DEPARTMENT shall negotiate an equitable price (and time adjustment if appropriate) in good faith. If negotiations do not result in a mutually acceptable lump sum price, the DEPARTMENT may, at its discretion, direct the CONTRACTOR to perform the work under Cost of the Work Change Order.

D. COST OF THE WORK CHANGE – The CONTRACTOR shall document Cost of the Work on forms acceptable to the DEPARTMENT, and shall submit documented costs to the DEPARTMENT daily for verification and certification. Cost of the Work pricing proposals shall be supported by invoices for substantiation of purchase and rental costs and with additional data as may be requested by DEPARTMENT.

E. Time Analysis for CHANGE ORDER PROCEDURES shall be performed as described in Section 01 32 00 – Work Schedules and Reports.

F. The DEPARTMENT shall have the right to audit all records in possession of CONTRACTOR relating to activities covered by CONTRACTOR's pricing of Contract CHANGE ORDER PROCEDURES, including Cost of the Work pricing, as set forth in Section 00700 - General Conditions. If CONTRACTOR is a joint venture, the right of DEPARTMENT shall apply collaterally to the same extent to the records of joint venture sponsor, and of each individual joint venture member.

1.9 FORM EXECUTION

A. Contract forms issued under this section shall be effective the date the DEPARTMENT's authorized person signs the form.

B. For Change Orders, CONTRACTOR signature will indicate acceptance of the terms or acknowledgment of order, depending on box checked. Acknowledgment of Change Order does not substitute for notification requirements of Section 00700 - General Conditions, Article 15.1.

1.10 PAYMENT

A. The CONTRACTOR shall promptly revise its Application for Payment forms to record each authorized Change Order and adjust the Contract Price as shown on the Change Order.

B. The CONTRACTOR shall promptly revise and resubmit its progress schedules to reflect any change in Contract Time, including adjustments for other items of Work affected by the change.

C. Payment for contract changes shall be made only following the execution of Change Orders and the inclusion of these change documents by reference on the Application for Payment form.

D. Payment shall not be made for Work authorized via Interim Work Authorization.

PART 2 – PRODUCTS **Not Used**

PART 3 – EXECUTION **Not Used**

END OF SECTION

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for preparing and submitting the schedule of values.

1.02 RELATED REQUIREMENTS

A. Section 00700 - General Conditions: Schedule of Values.

B. Section 01 11 13 - Summary of Work: Work sequence.

C. Section 01 26 63 – Change Procedures

D. Section 01 29 76 - Applications for Payment: Procedures for Applications for Payment.

E. Section 01 32 00 – Work Schedules and Reports

F. Section 01 33 00 – Submittal Procedures

G. Section 01 77 00 – Contract Closeout Procedures

H. Section 01 71 13 – Mobilization and Demobilization

I. Section 01 91 00 - Commissioning

1.03 FORMAT

A. Form and content must be acceptable to DEPARTMENT.

B. Form shall have a signature block for submission by CONTRACTOR and a signature block for approval by DEPARTMENT.

C. Content shall include the following column headings.

1. CPM Activity Number
2. CPM Activity Description
3. CPM Dollar Value
4. Current Percent Complete
5. Current Dollar Complete
6. Previous Percent Complete
7. Previous Dollar Complete
8. Percent Complete this Period
9. Dollar Complete this Period

1.04 CONTENT

A. List installed value of each activity shown on the submitted and approved CPM Schedule.

B. For items on which payments will be requested for stored products, list sub values for cost of stored products with taxes paid.

C. Limits for specific line item values shall be as specified below and shall be included on all approved Schedules of Values and Applications for Payment.

1. Mobilization and Demobilization: Unless specified elsewhere, the assigned values for mobilization and demobilization shall be based upon the estimated value of specified Work for each of these tasks.
2. Contract Closeout Procedures: Unless specified elsewhere, the assigned values for tasks specified under Contract Closeout Procedures shall be based upon the estimated value of each task. The breakdown shall include separate amounts for the requirements of Final Completion and Final Acceptance, as set forth below:

Contract Price	Value for Final Completion	Value for Final Acceptance
Less than $200,000	$2,000	$2,000
$200,000 - $500,000	$5,000	$5,000
$500,001 - $1,000,000	$10,000	$10,000
$1,000,001 - $5,000,000	$20,000	$20,000
Greater than $5,000,000	$30,000	$30,000

D. The sum of values listed on the Schedule of Values shall equal total Contract Price.

E. A Schedule of Values containing costs for early activities in excess of actual value (“front end loading”) will be rejected by the DEPARTMENT until the CONTRACTOR corrects the deficiency. The DEPARTMENT shall not be obligated to pay the CONTRACTOR until front end loading is eliminated and the Schedule of Values is approved.

1.05 SUBMITTAL

A. Submit proposed Schedule of Values with updated CPM Schedule per specification sections for Summary of Work, Work Schedules and Reports, and Submittals.

B. Submit Schedule of Values with updated completion percentages sufficiently in advance of each Application for Payment to enable the DEPARTMENT to resolve differences.

1.06 SUBSTANTIATING DATA

A. When the DEPARTMENT requires substantiating information, submit data justifying line item amounts in question.

B. Provide one copy of data with cover letter for each copy of the Application for Payment. Show application number and date, and line item by number and description.

PART 2 - PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

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SECTION 01 29 76
APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of Application for Payment.

1.02 RELATED REQUIREMENTS

A. Section 00312 – Bid Schedule

B. Section 00700 - General Conditions

C. Section 00800 – Supplementary Conditions

D. Section 01 11 13 – Summary of Work

E. Section 01 26 63 – Change Order Procedures

F. Section 01 31 13 – Job Site Administration

G. Section 01 32 00 – Work Schedules and Reports

H. Section 01 33 00 –Submittal Procedures

I. Section 01 29 73 - Schedule of Values

J. Section 01 45 00 – Quality Control

K. Section 01 45 29 – Testing Laboratory Services

L. Section 01 51 00 – Construction Facilities

M. Section 01 52 13 – Field Offices and Sheds

N. Section 01 57 10 – Erosion, Sediment and Pollution Control

O. Section 01 71 13 – Mobilization

P. Section 01 77 00 - Contract Closeout Procedures

Q. Section 01 78 39 – Project Record Documents

1.03 FORMAT

A. Submit Application for Payment on form approved by the DEPARTMENT.

1.04 PREPARATION OF APPLICATIONS

A. Type required information on Application for Payment form acceptable to the DEPARTMENT.

B. Execute certification by original signature of authorized officer upon each copy of the Application for Payment.

C. Show breakdown of costs for each item of the Work on accepted Schedule of Values as specified in Section 01 29 73 – Schedule of Values.

D. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.

E. Submit Stored Materials Worksheet with every Application for Payment requesting payment for stored materials. Show only direct costs of materials and freight. Submit documentation in accordance with Section 00700 – General Conditions, Article 13.5 Stored Materials and Equipment, for materials shown in column titled “New Material This Pay Request Period.”

1.05 SUBMITTAL PROCEDURES

A. Submit two originals of each Application for Payment at one-month intervals. Each document shall bear original signature of authorized executive.

B. Submit with DEPARTMENT-approved transmittal letter bearing DEPARTMENT’s project number.

1.06 SUBSTANTIATING DATA

A. When DEPARTMENT requires substantiating information, submit all requested data justifying line item amounts in question.

B. Provide one copy of data with cover letter for each copy of Application for Payment. Show Application for Payment number and date, and line item by number and description.

1.07 SUBMITTALS WITH APPLICATION FOR PAYMENT

A. Submit the following for review sufficiently in advance of Application for Payment to allow detailed review by DEPARTMENT and resolution of differences.

1. Schedule of Values with updated percentages of completion as required by Section 01 29 73 – Schedule of Values.

B. Submit the following with each Application for Payment.

1. Updated construction schedule as required by Section 01 32 00 – Work Schedules and Reports.
2. Updated Project Record Documents as required by Section 01 78 39 – Project Record Documents.

3. Letter certifying that all Project Record Documents, including as-built drawings and submittals are current.

1.08 ADDITIONAL REQUIREMENTS FOR FIRST APPLICATION FOR PAYMENT

A. The first Application for Payment will be processed after the Resident Engineer has received all of the following:

1. Superintendent Data (Section 00700 – General Conditions, Article 6.2)
2. Progress Schedule (Section 00700 – General Conditions, Paragraph 6.6.1, & Section 01 32 00 – Work Schedules and Reports)
3. Schedule of Values (Section 00700 – General Conditions, Paragraph 6.6.2, & Section 01 29 73 – Schedule of Values)
4. Submittal Schedule (Section 00700 – General Conditions, Paragraph 6.6.2)
5. Safety Representative Designation (Section 00700 – General Conditions, Article 6.18)
6. Building Permits (Section 00700 – General Conditions, Article 7.2)
7. Name of Individual Authorized to Accept Changes (Section 01 26 63 – Change Order Procedures)
8. CONTRACTOR's Management Team (Section 01 31 13 – Job Site Administration)
9. CONTRACTOR Quality Control Program and Plan (Section 01 45 00 – Quality Control)
10. National Bureau of Standards Inspection Report (Section 01 45 29 – Testing Laboratory Services)
11. Freeze Protection Plan (Section 01 51 00 – Construction Facilities)
12. Construction Site Layout Plan (Section 01 71 13 – Mobilization and Demobilization)
13. Traffic Control Plan and Haul Routes (Section 01 11 13 – Summary of Work)
14. Schedule for Dust and Air Pollution Abatement (Section 01 57 10 – Erosion, Sediment and Pollution Control)
15. Pre-Construction Property and Structure Assessments (Section 01 51 00 – Construction Facilities)
16. Hazardous Material Control Plan (Section 01 57 10 – Erosion, Sediment and Pollution Control)
17. Notice of Intent (Section 01 57 10 – Erosion, Sediment and Pollution Control)
18. Project Summary (Section 01 57 10 – Erosion, Sediment and Pollution Control)
19. Temporary Facilities Plan. (Section 01 52 13 – Field Offices and Sheds)

PART 2 - PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

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SECTION 01 31 13
JOB SITE ADMINISTRATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General requirements for the administration of the construction contract.

1.02 RELATED REQUIREMENTS

A. Section 00700 – General Conditions

B. Section 01 29 76 – Application for Payment

C. Section 01 31 14 – Work Coordination

D. Section 01 32 00 – Work Schedules and Reports

E. Section 01 33 00 – Submittal Procedures

F. Section 01 45 00 – Quality Control

G. Section 01 77 00 – Contract Closeout Procedures

H. Section 01 79 00 – Demonstration and Training

1.03 DEPARTMENT PROJECT MANAGEMENT TEAM

A. The DEPARTMENT's Contracting Officer will issue a Delegation of Authority letter to the CONTRACTOR after Contract Award.

B. The Delegation of Authority letter will designate the members of the DEPARTMENT's project management team, and delegate levels and limitations of contractual authority, all in accordance with Section 00700 - General Conditions, Article 2.1 Authorities and Limitations.

C. The CONTRACTOR shall sign the Delegation of Authority letter to acknowledge its understanding of the instructions contained therein.

1.04 CONTRACTOR'S PROJECT MANAGEMENT TEAM

A. The CONTRACTOR's Project Management Team shall be capable of performing the following duties, including but not limited to:

1. Maintain the schedule in the progress of Work and resolve construction related issues.
2. Coordinate permitting and construction activities to ensure timely completion of the Work.

3. Maintain a CPM schedule as specified in Section 01 32 00 - Work Schedules and Reports.
4. Coordinate construction activities of suppliers and subcontractors with those of the CONTRACTOR and each other to ensure timely deliveries for installation.
5. Coordinate and effectively manage the construction activities of subcontractors to maintain the Contract schedule and quality requirements.
6. Coordinate necessary inspections with the DEPARTMENT, approved Testing Laboratory, and other agencies as required for the progress of the Work.
7. Participate in Project meetings with the DEPARTMENT and the Architect/Engineering Team to review the progress of the construction, and identify and resolve outstanding construction-related issues.
8. Coordinate the installation, operation and maintenance of temporary utilities required during construction.
9. Prior to submittal of Shop Drawings, Product Data, Samples and other submittals, as specified in Section 01 33 00 -- Submittal Procedures, review for compliance with the Contract Documents and coordination with other work.

    a. Check field dimensions and clearance dimensions.
    b. Check relation to available space.
    c. Check anchor bolt settings.
    d. Review the effect of changes, if any, on the Work of other subcontracts or by others.
    e. Check compatibility of equipment and work of the various trades.
    f. Check motor voltages and control characteristics.
    g. Coordinate controls and interlocks: Voltages and wiring of electric switches and relays.
    h. Coordinate wiring and control diagrams.
    i. Certify compliance with Contract Documents or list differences.

10. Prepare coordination drawings, as specified in Section 01 31 14 - Work Coordination.

    a. Prepare, as required to ensure coordination of Work of, or affected by mechanical and electrical Work, or to resolve conflicts
    b. Reproduce and distribute reviewed copies to all concerned parties

11. Observe required testing and maintain a record of tests. Document in the record:

    a. Testing Laboratory and name of inspector
    b. Subcontractor
    c. Manufacturer’s representative present
    d. Date and time of testing
    e. Type of product or equipment
    f. Type of test, and test results
    g. Location of each test
    h. Retesting required
    i. Other documentation upon request

12. Verify that Subcontractors maintain an accurate and up-to-date set of Contract Documents and record documents.

13. Observe the work for compliance with requirements of the Contract Documents, maintaining a list of observed deficiencies and discrepancies.
14. Equipment Start-up:

    a. Check to ensure that utilities and specified connections are complete and that equipment is in operable condition.
    b. Observe testing, adjusting, and balancing.
    c. Record results, including time and date of start-up.

15. Inspection of Equipment:

    a. Prior to inspection, check that equipment is clean, repainted as required, tested, and operational.
    b. Assist inspector; prepare list of items to be completed or corrected.

16. Assemble Project Record Documents from subcontractors and ensure that completed Project Record Documents are submitted to the DEPARTMENT in accordance with Section 01 77 00 - Contract Closeout Procedures, and other requirements of the Contract Documents.

B. Execute Request for Information (RFI) Procedures.

1. Submit RFIs in writing to the DEPARTMENT in a format approved by the DEPARTMENT.
2. The response to the RFI is formally issued to the CONTRACTOR when the DEPARTMENT signs and issues formal direction to the CONTRACTOR.
3. The DEPARTMENT may request it's Architect/Engineers of record to provide recommendations before the DEPARTMENT issues the RFI response to the CONTRACTOR.

C. Upon request, the CONTRACTOR shall submit all correspondence, including letters, memoranda, meeting minutes, transmittals, Request for Information, technical submittal transmittals, Requests for Change, specified Notices, and any other documentation using forms and format provided by or otherwise approved by the DEPARTMENT.

PART 2 – PRODUCTS **Not Used**

PART 3 – EXECUTION **Not Used**

END OF SECTION

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SECTION 01 31 14
WORK COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project Work coordination, and coordination with work of other contracts.

1.02 RELATED REQUIREMENTS

A. Section 00700 – General Conditions

B. Section 01 11 13 – Summary of Work

C. Section 01 31 13 – Job Site Administration

D. Section 01 72 00 – Utilities Coordination

E. Section 01 73 29 – Cutting and Patching

1.03 REQUIREMENTS

A. Coordinate work of various sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed by DEPARTMENT or under separate contracts.

B. Verify that characteristics of elements of interrelated operating equipment are compatible; coordinate work of various sections that have interdependent responsibilities for installing connection to, and placing such equipment in service.

C. Coordinate space requirements and installation of electrical, mechanical, and other special work, which are indicated diagrammatically on the Contract Drawings. Follow routing shown for ducts, conduits, pipes etc., as closely as practicable; make runs parallel with lines of buildings and roads. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. Conceal ducts, wiring, and pipes in finished areas unless otherwise indicated. Coordinate locations of fixtures and outlets with finish elements.

E. Whenever the Work of a Subcontractor is dependent upon the Work of other Subcontractors, contractors, or utility company contractors installing utilities under contract with the DEPARTMENT, then the CONTRACTOR shall require the Subcontractor to:

1. Coordinate its Work with the dependent work.
2. Provide dependent data and requirements.
3. Supply and install items to be built into dependent work of others.
4. Make provisions for dependent work of others.
5. Examine dependent drawings, specifications and submittals.

6. Examine previously placed dependent work.
7. Check and verify dependent dimensions of previously placed work.
8. Notify CONTRACTOR of previously placed dependent work or dependent dimensions, which are unsatisfactory or will prevent a satisfactory installation of its Work.
9. Not proceed with its Work until the unsatisfactory dependent conditions have been corrected.
10. CONTRACTOR shall require subcontractors to participate in coordination meetings as required by the DEPARTMENT.

F. All work shall be coordinated with Tunnel Operations and Alaska Railroad Corporation (ARRC) Operations and shall not interfere with passage of vehicles or trains through the project area, unless specifically allowed in this section.

1. The tunnel operational area, defined as the area between the ARRC signal hut in Bear Valley to the signal hut in Whittier, is co-operated by the DEPARTMENT and the ARRC. The tunnel area is operated by the DEPARTMENT during the hours scheduled for highway operations. (link to schedule provided)

   http://dot.alaska.gov/creg/whittiertunnel/assets/WhittierSummerSchedule.pdf
   http://dot.alaska.gov/creg/whittiertunnel/assets/WhittierWinterSchedule.pdf

   The ARRC operates the tunnel during all other times before and after highway operations. The Contractor shall not work in the co-operated area while the tunnel is operated by ARRC.
2. All work shall be performed in coordination with the DEPARTMENT'S maintenance/operation's (M/O) contractor, Transfield Services (OPERATOR).
3. All CONTRACTOR employees shall wear the PPE required by the (M/O) contractor, and shall attend any and all required safety briefings.
4. CONTRACTOR shall delineate the work area at each portal with traffic cones or other approved method.
5. CONTRACTOR shall maintain continuous radio communications with the OPERATOR. CONTRACTOR shall not travel to or from the work area without permission and radio clearance from the OPERATOR and shall be coordinated with highway traffic. Once within the work area, CONTRACTOR may freely operate and move about, but shall monitor radio for any communications from the OPERATOR.
6. All traffic control provided by the CONTRACTOR shall meet the requirements of the MUTCD and the Alaska Traffic Manual.
7. Trains may pass through the tunnel at any time. CONTRACTOR shall cease work within a distance of 20 feet from the track when a train passes and all personnel shall remain at least 20 feet away from the track during that time.
8. The contractor shall not cause any delays to scheduled highway traffic, except as allowed per this section for Portal Fans Wiring and Planned Power Outages.
9. Unless noted otherwise, work within the switchgear rooms or within areas outside of the tunnel shall be completed between the hours of 7:00am to 10:00pm. Except as allowed per this section for Portal Fans Wiring, no work shall occur within the tunnel.

10. Portal Fans Wiring: This project will require work within the tunnel for installing wiring to the portal fans. Work within the switchgear rooms is not considered to be work within the tunnel. CONTRACTOR shall provide 14 days advance notice prior to the desired dates of work within the tunnel. Work within the tunnel shall only occur between the hours of 8:00pm and 12:00am from October 1 and April 30 and shall not interfere with train passage. CONTRACTOR shall be allowed two evening work periods within the tunnel at each portal. The CONTRACTOR shall be charged liquidated damages of $3,000 for each additional evening period required.
11. At least one set of portal fans shall remain operational at all times and no single set of portal fans shall be non-operational for more than 7 sequential calendar days. CONTRACTOR shall complete installation of VFDs and ensure portal fans are operational at one portal before disconnecting portal fans at the other portal.
12. When working in the tunnel, CONTRACTOR shall be prepared to vacate the tunnel immediately in the event of an emergency requiring vehicular access through the tunnel. Work shall be staged and organized to allow the CONTRACTOR to vacate the tunnel and remove any equipment or materials that prohibit vehicular access within 10 minutes of being notified of emergency event by the OPERATOR. OPERATOR shall notify CONTRACTOR when it is safe to continue work within the tunnel. CONTRACTOR shall include 4 hours of interrupted work time due to emergencies in their bid.
13. Process Control and Instrumentation Systems Installation and Integration: The CONTRACTOR shall provide at least 30 days advanced notice to the DEPARTMENT to provide adequate time to schedule the System Integrator for work to be completed per Section 23 09 33 Process Control and Instrumentation Systems. This project will require shutdown of the tunnel for installation and integration of Process Control and Instrumentation Systems. The CONTRACTOR shall provide at least 14 days advanced notice to the DEPARTMENT of the planned shutdown. Planned shutdowns shall only occur between 8:00pm and 12:00am from October 1 through April 30 and shall not interfere with planned train passages. The CONTRACTOR shall be allowed two tunnel shutdowns no longer than four hours per outage for this work. The four hour outage includes time required for both the CONTRACTOR's work and any coordination required with the DEPARTMENT. The CONTRACTOR shall be charged liquidated damages of $3,000 for each additional tunnel shutdown required by the CONTRACTOR. Any tunnel shutdown lasting longer than four hours shall result in liquidated damages of $1,000 per hour for each extra hour after the allowable four hours.
14. Planned Power Outages: Power shall be maintained to the tunnel at all times except during power cutover. The CONTRACTOR shall provide at least 14 days advanced notice to the DEPARTMENT of the planned power outage period. Planned power outages shall only occur between 8:00pm and 12:00am from October 1 through April 30 and shall not interfere with planned train passages. Planned outages shall be completed in accordance with an approved Power Cutover Plan. CONTRACTOR shall successfully complete connection to/from temporary power and verify all systems are working at one portal before beginning the temporary power connection at the other portal. The CONTRACTOR shall be allowed two temporary power outages at each portal lasting no longer than four hours per outage. The four hour outage includes time required for both the CONTRACTOR's work and any work

performed by the utility company for the CONTRACTOR or the DEPARTMENT. The CONTRACTOR shall be charged liquidated damages of $3,000 for each additional outage required by the CONTRACTOR. Any power outage lasting longer than four hours shall result in liquidated damages of $1,000 per hour for each extra hour after the allowable four hours.

15. The CONTRACTOR is advised that the area beyond the silver signal huts at either portal as shown on the plans is ARRC Right-of-Way and is subject to a different set of operating requirements governed by ARRC. If it is necessary to operate within these areas, the CONTRACTOR shall be responsible for obtaining all permits, permissions, insurance, and all other requirements of ARRC.

G. Coordination with CEA

1. The DEPARTMENT will contract with CEA to accomplish the following work:
2. CEA will provide a temporary transformer, within 15' of the existing the transformer, to provide temporary power to the tunnel facility. The temporary transformer will be installed by August 1st, 2016. The CONTRACTOR shall not install the temporary meter base until CEA has installed the temporary transformer. The temporary meter base shall be within 10-15 feet from the temporary transformer. The CONTRACTOR shall coordinate the final location of all temporary service equipment with CEA, the DEPARTMENT, and the OPERATOR.
3. Existing service connection shall be disconnected by CEA. The connection shall be disconnected prior to demolition work near the existing service equipment.
4. For the new permanent service connection at each portal: Outside the portal walls, CEA will provide connections for the new service lateral conductors at the permanent service transformer. Inside the portal walls, CEA will provide connections for the new service lateral conductors at the new service switchboard. CONTRACTOR shall complete all required demolition work (i.e. concrete removal, demolition of existing service conduit, and installation of any new service conduits and extension of conduits within the portal). CONTRACTOR will provide the service equipment.
5. All other work required of CEA during construction shall be provided and coordinated by the CONTRACTOR. This includes, but is not limited, to any electrical equipment and labor between the temporary transformer and temporary disconnect.
6. All work performed by CEA, for the DEPARTMENT or the CONTRACTOR, that may cause loss of power to the tunnel shall be completed during the Planned Power Outages allowed per this section.

H. Coordination with ARRC

1. The DEPARTMENT will contract with ARRC to accomplish the following work.
2. ARRC will provide QA inspection and monitoring of the work associated with relocating the communication and power lines between the Whittier portal and the ARRC Signal Hut.
3. The CONTRACTOR shall provide all materials and labor to complete the utility relocation.

4. CONTRACTOR shall not perform work on ARRC equipment within the Portal or Signal Hut without ARRC signal and communications personnel onsite to observe the work.
5. The signal gear must remain operational at all times except when completing new terminations. New conduit, wire/cable, and termination gear shall be installed prior to disconnecting the existing signal gear and completing terminations with new gear. The CONTRACTOR shall be allowed one signal outage, not to exceed 4 hours in duration, to complete terminations.
6. CONTRACTOR shall provide at least 14 days' advanced notice prior to the time the relocation work will begin and at least 10 days' notice advanced notice prior to work within the Portal or Signal Hut.

1.04 SUBMITTAL

I. Portal Power Cutover Work Plan: A plan shall be submitted within 60 days of award for review and approval. Plan shall describe the transition from permanent power to temporary power and from temporary power to permanent power for the portals. The Portal Power Cutover Work Plan shall include the following information:
   i. The sequence of equipment demolition, temporary power hookup, restoration of permanent power at the portals, and new equipment installation.
   ii. A detailed schedule.
   iii. Plan shall be coordinated with CEA, and shall clearly describe CEA and Contractor's responsibilities associated with the electrical service, temporary power, and cutovers.
   iv. If additional power outage(s) are needed, the details of the additional power outage(s) shall be clearly described.

PART 2 – PRODUCTS **Not Used**

PART 3 – EXECUTION **Not Used**

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for various meetings during the construction project.

1.02 RELATED REQUIREMENTS

A. Section 01 11 13 - Summary of Work: Coordination of Work.

B. Section 01 32 00 – Work Schedules and Reports: Progress Schedules.

C. Section 01 33 23 - Shop Drawings, Product Data, and Samples.

D. Section 01 45 00 - Quality Control: CONTRACTOR responsibilities.

E. Section 01 73 00 – Execution Requirements; Project Record Documents; Operation and Maintenance Data.

F. Section 01 79 00 – Demonstration and Training

1.03 PRECONSTRUCTION CONFERENCES

A. DEPARTMENT will administer preconstruction conference for execution of Contract and exchange of preliminary submittals. Attendance by all key CONTRACTOR and Subcontractor project personnel is required. The CONTRACTOR shall notify and invite in writing to the pre-construction conference all serving utilities at least 72 hours in advance of the conference.

B. DEPARTMENT may administer site mobilization conference at Project site for clarification of CONTRACTOR responsibilities in use of site and for review of administrative procedures.

C. DEPARTMENT will document the meeting and distribute minutes within 48-hours of adjournment. Minutes will be typed, reflecting date, list of attendees and in format to facilitate correction of previous meeting minutes. Distribution will be to all attendees and those affected by discussions or decisions made at meeting.

1.04 PREINSTALLATION CONFERENCES

A. When required in an individual specification section, and as shown in the CONTRACTOR's quality control plan, or as directed by the DEPARTMENT, convene a pre-installation conference prior to commencing Work for a specific item.

B. Require attendance of entities directly affecting, or affected by, Work of the section.

C. Review conditions of installation, preparation and installation procedures, and coordination with related Work.

D. Record significant discussions and agreements and disagreements of each conference, and approved schedule. Distribute record of conference to all attendees within 24-hours of adjournment.

1.05 WEEKLY PROGRESS MEETINGS

A. The CONTRACTOR shall administer Weekly Progress Meetings on a regular day and time, which is mutually convenient to both the DEPARTMENT and the CONTRACTOR. These meetings shall be documented by the CONTRACTOR.

B. Weekly Progress Meeting shall be attended by all key CONTRACTOR and, as appropriate, Subcontractor project personnel.

C. The CONTRACTOR shall furnish copies of its current Two Week Look Ahead Schedule, per Section 01 32 00 – Work Schedules and Reports, to all attendees of the meeting. This schedule will be reviewed in detail during the meeting and will be used for the coordination of activities by others.

D. Weekly Progress Meetings will also be used to review other key aspects of the Work, such as safety, quality, critical items, etc.

E. Meeting Minutes: The CONTRACTOR shall document the meetings and distribute minutes within 48-hours of adjournment. Minutes shall be typed, reflecting date, attendees, and in format to facilitate correction of previous meeting minutes. Distribution shall be to all attendees and those affected by discussions or decisions made at meeting.

1.06 SAFETY MEETING

A. The CONTRACTOR shall conduct Safety Meetings as required by its project Safety Program.

B. The CONTRACTOR shall invite the DEPARTMENT to attend Safety Meetings.

1.07 OTHER MEETINGS

A. At various times throughout the duration of the Contract, the CONTRACTOR will be required to attend meetings as requested by the DEPARTMENT. It is anticipated that such meetings will involve coordination with others, project schedule review, problem resolution, change order negotiations, and other topics of mutual importance.

PART 2 – PRODUCTS **Not Used**

PART 3 – EXECUTION **Not Used**

END OF SECTION

SECTION 01 32 00
WORK SCHEDULES AND REPORTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Requirements for the preparation and maintenance of the construction CPM schedule, recovery schedules, time impact evaluation, monthly project status reports, two week look-ahead schedules, and daily construction reports.

1.02 RELATED REQUIREMENTS

A. Section 00700 – General Conditions

B. Section 00800 – Supplementary Conditions

C. Section 01 11 13 – Summary of Work

D. Section 01 26 63 – Change Order Procedures

E. Section 01 29 73 – Schedule of Values

F. Section 01 29 76 – Application for Payment

G. Section 01 31 13 – Job Site Administration

H. Section 01 31 19 – Project Meetings

I. Section 01 33 00 – Submittal Procedures

1.03 SUMMARY

A. Scheduling of Work under this Contract shall be performed by CONTRACTOR in accordance with the requirements of this Section.

B. CPM Schedule shall be based upon, and incorporate, Contract milestone and completion dates as specified in Section 00800, Supplementary Conditions, and Section 01 11 13, Summary of Work.

C. Definitions

1. Project Schedule - The schedule prepared or updated by the CONTRACTOR to the requirements specified herein. The project schedule shall be used to measure the progress of the work and aid in the evaluation of time impacts to the project.
2. Anticipated CPM Schedule - The schedule prepared by the CONTRACTOR defining the planned work in the first 90 calendar days of the contract.
3. Finalized CPM Schedule - The baseline schedule prepared by the CONTRACTOR that shows the sequence and dates in which the CONTRACTOR proposes to

perform the work. Once approved, it becomes the basis upon which the CONTRACTOR performs periodic schedule updates.

4. Periodic Schedule Updates - Progress updates to the approved project schedule, shall occur monthly prior to, and included with, each pay application.
5. Time Impact Evaluation (TIE) - Forward looking schedule analysis technique that adds a modeled delay to an accepted contract schedule to determine the possible impact of that delay to the project completion.
6. Fragnet - A sequence of new activities that are proposed to be added to project schedule to demonstrate the influence of the delay or impact to the project's contractual dates. A Fragnet is created using a 'Reflection' of the approved project schedule that immediately preceded the delay.

D. Required Schedules

1. Anticipated CPM Schedule - Submit the Anticipated CPM Schedule, defining the CONTRACTOR's planned operations for the first 90 Calendar days after Notice-to-Proceed, for approval within 15 Calendar days after the NTP is acknowledged, or at the preconstruction conference, whichever comes first. The approved Anticipated Preliminary Project Schedule will be used for payment purposes not to exceed 90 Calendar days after NTP. It may be summary in nature for the remaining performance period. It must be early start (Start On) and late finish (Finish On or Before) constrained and logically tied as specified in this Section. The Anticipated CPM Schedule forms the basis for the Finalized CPM Schedule specified herein, and must include all of the required Plan and Program preparations, submissions, and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, Environmental Protection Plan, etc.) as well as, if applicable, design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 Calendar days. Schedule any Construction activities planned for the first 90 Calendar days after NTP. DEPARTMENT acceptance of the associated design package(s), if applicable, and all other specified Plan and Program approvals that must occur prior to any planned construction activities by CONTRACTOR. The DEPARTMENT and CONTRACTOR shall meet to discuss the Anticipated CPM Schedule within 10 working days after its submittal. The CONTRACTOR shall make corrections to the schedule necessary to comply with Contract requirements and shall adjust the schedule to incorporate any missing information requested by the DEPARTMENT. The CONTRACTOR shall resubmit the Anticipated CPM Schedule if requested by DEPARTMENT.

2. Finalized CPM Schedule - Submit the Finalized CPM Schedule for approval within 60 Calendar days after NTP. The schedule shall demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. In accordance with Section 00700 - General Conditions, the Finalized CPM Schedule shall be submitted prior to the first progress payment. The DEPARTMENT's review and approval of the Finalized CPM schedule shall be a prerequisite to the application for the second progress payment. The Finalized CPM Schedule shall be at a reasonable level of detail as determined by the DEPARTMENT.

3. Monthly Updates and Status Reports

4. Revision, Time Impact Evaluation (TIE), and Recovery Schedules

5. Record Drawing Schedule

E. Failure of the CONTRACTOR to meet the requirements of this specification may result in the disapproval of the Anticipated, Interim, Finalized, or Periodic Schedule Updates. In the event that the DEPARTMENT directs schedule revisions, and those revisions have not been included in subsequent project schedule revisions or updates, the Contracting Officer may not pay for the applicable activities until such revisions to the project schedule have been made.

F. Basis for Payment and Cost Loading - Inspections of work progress shall be the basis for determining contract earnings during each update period and therefore the amount of each progress payment. The schedule shall be updated to reflect to outcome of these inspections. Activity cost loading shall be reasonable, as determined by the DEPARTMENT. Front loading activities will not be allowed.

G. Schedules and Reports shall be submitted as specified in Sections 01 32 19, 01 33 00, Submittal Schedule and Submittal Procedures.

H. CPM Schedule shall be the basis for Two Week Look Ahead Schedule presentation at Weekly Progress Meeting as specified in Section 01 31 19, Project Meetings.

1.04 SCHEDULER QUALIFICATIONS

A. Designate an authorized representative to be responsible for the creation and maintenance of the project schedule including all updates, narratives, and reports. The authorized representative shall have 2 years experience scheduling projects similar in nature to this project with scheduling software that meets the requirements of this specification. The resume of the authorized representative detailing the qualifying experience shall be submitted and approved by the DEPARTMENT.

1.05 SOFTWARE REQUIREMENTS

A. Development of Schedule, Monthly Payment Requests, Schedule Updates, and Project Status Reporting Requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling, using Primavera P6 Rel 6.2 or later.

1.06 GENERAL REQUIREMENTS

A. Develop the Project Schedule to an appropriate level of detail, as determined by the DEPARTMENT. Failure to develop the Project Schedule to the appropriate level of detail will result in its disapproval. Inaccuracy and/or the omission of any element of the Work by the CONTRACTOR will not relieve the CONTRACTOR of the responsibility for accomplishing the Work, in accordance with Contract Documents. The DEPARTMENT’s acceptance of the schedule shall be for its use in monitoring and evaluating job progress, payment requests, time extension requests, and the like; and shall not, in any manner,

impose a duty of care upon the DEPARTMENT; nor act to relieve the CONTRACTOR of its responsibility for the means and methods of construction. The DEPARTMENT will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

1. Activity Durations - Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. No construction activity shall have Original Durations greater than one month's worth of work (20 working days or 30 calendar days).
2. Design and Permit Activities - Include design and permit activities with the necessary conferences and follow-up actions and design package submission dates. Include the design schedule in the project schedule showing the sequence of events involved in carrying out the project design tasks within the specific contract period. This shall be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. The schedule shall include review and correction periods associated with each item.
3. Procurement Activities - Include activities associated with the submittal, approval, procurement, fabrication and delivery; of critical materials, equipment, fabricated assemblies and supplies. This will include all procurement activities that will have a direct impact on construction activities. Additionally, include activities on all long lead materials, equipment, fabricated assemblies and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 30 calendar days. These activities shall be logically tied to the submission and approval of product info/shop drawings, and the related construction installation activity.
4. Mandatory Task - The following activities shall be included in the initial project schedule and all updates. The CONTRACTOR shall be responsible for all impacts resulting from resubmittal of shop drawings and submittals.

    a. Submission and approval of design packages, if applicable.
    b. Submission and approval of SWPPP
    c. Long material procurement activities.
    d. Submission and approval of mechanical and electrical equipment.
    e. Submission and approval of O&M Manuals.
    f. Submission and approval of Record drawings.
    g. Submission of Certificate of Occupancy.
    h. Submission of Spare Parts & Maintenance Materials.
    i. Submission of Warranties and Bonds.
    j. Submission of Keys and Keying Schedule.
    k. Request for Substantial Completion Inspection as specified in 01 77 00 Contract Closeout Procedures.
    l. Submission and approval of Testing and Air Balance (TAB) results.
    m. Submission and approval of HVAC commissioning/testing plans and data. (Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements.)
    n. Submission and approval of Controls Testing Plan.
    o. Controls Testing.

p. Performance Verification Testing.
q. Other systems testing, if required.
r. Demonstration and Training
s. Final Cleaning.
t. Substantial Completion Inspection.
u. Substantial Completion.
v. Final Completion Inspection.
w. Final Completion.

5. DEPARTMENT Activities - Show DEPARTMENT and other agency activities that could impact progress. These activities include, but are not limited to, DEPARTMENT approvals, design reviews, review conferences, release for construction of design package(s), environmental permit approvals by State regulators, inspections, utility tie-ins, DEPARTMENT furnished equipment and Notice to Proceed (NTP) for phasing requirements. Unless otherwise agreed upon by CONTRACTOR and DEPARTMENT, DEPARTMENT approval activities shall be on a 7 day calendar with an Original Duration of 30 days.

6. Work Break-down Structure (WBS) - The project schedule shall be organized using WBS. (This is separate from, and in addition to, the use of Activity Codes; which are addressed below.) The WBS shall include all major elements of the scope of work including, but not limited to, the following elements:

a. Milestones
b. Modifications
c. Design
d. Submittals
e. Approvals
f. Procurement
g. Construction
h. Commissioning/Testing/Start-up
i. Close-out Submittals
j. Close-out Approvals
k. Inspections

6. Activity Coding - All Activity Codes shall be developed and assigned to activities as detailed herein. Some Activity Codes may not be used, but only at DEPARTMENT's discretion.

RESP Responsible Party (e.g. Prime CONTRACTOR, Subcontractor, DEPARTMENT)
AREA Area of Work
PHAS Phase of Work
MODF Modification to Contract
CATW Category of Work
FOW Feature of Work

a. RESP Responsible Party - Assign responsibility code for all activities to the Prime CONTRACTOR, Subcontractor, or Government agency responsible for

performing the activity. The list of activities to be coded with a DEPARTMENT Responsibility include, but is not limited to, DEPARTMENT approvals, DEPARTMENT design reviews, environmental permit approvals by State regulators, DEPARTMENT furnished property/equipment, Notice to Proceed (NTP). Code all activities not coded to the DEPARTMENT to the Prime CONTRACTOR or Subcontractor responsible to perform the work. Activities shall not have more than one Responsibility Code. Codes should be descriptive of the scope of work, for example DSGN (for designer of record), ELEC (for electrical Subcontractor), MECH (for mechanical Subcontractor), PRIM for Prime CONTRACTOR, and DEPT (for DEPARTMENT activities).

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

c. PHAS Phase of Work Coding - Assign Phase of Work code to all construction activities if the contract specifies phasing with separately defined performance periods. Identify a Phase Code to allow filtering and organizing the schedule accordingly. Each activity shall have only one Phase of Work code.

d. MODF Modification of Contract - Assign a Modification of Contract code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, after approval by DEPARTMENT. An activity can have only one Modification of Contract code.

e. CATW Category of Work - Assign a Category of Work code to all activities. Category of Work codes include, but are not limited to, milestone, design submittal, design approval, design review conference, submittal, approval, procurement, permit, installation, weather sensitive installation, commissioning/testing, inspection, contract requirement. Each activity shall have only one Category of Work Code.

f. FOW Feature of Work - Assign a Feature of Work code to all construction activities based upon the definable feature of work to which the activity belongs. Use the Specification numbering system for the Code Value.

7. Contract Constraints and Milestones - The CONTRACTOR shall follow the parameters as specified herein for all schedules.

   a. Constraints - The schedule shall have no constrained dates other than those specified herein. Additional constraints may be approved by the DEPARTMENT on a case by case basis. The use of artificial float constraints, such as ‘zero free float’ or ‘zero total float,’ are prohibited. Additionally, Mandatory Start, Mandatory Finish, Finish On, and As Late As Possible constraints are prohibited.

i. Project Start Date Constraint - The first activity in the project schedule shall have a Start On constraint equal to the date that the NTP was acknowledged.
ii. Substantial Completion Constraint - The Substantial Completion activity shall have a Finish On or Before constraint equal to the contractual Substantial Completion Date.

b. Milestones - Use of milestone activities shall be held to a minimum. Milestone activities may be used for significant project events including, but not limited to, project phasing, project start and end activities, or interim completion dates. The following are required Milestone activities:

i. Project Start Date Milestone - The first activity in the project schedule shall be a Start Milestone titled 'Start Project (NTP).'
ii. Substantial Completion Milestone - The Substantial Completion activity shall be a Finish Milestone titled 'Substantial Completion DD-MMM-YY.' If the schedule calculates an early finish, then the float calculation for the 'Substantial Completion DD-MMM-YY' milestone shall reflect positive float on the longest path of logic. If the project schedule calculates a late finish, then the 'Substantial Completion DD-MMM-YY' milestone float calculation shall reflect negative float on the longest path. The DEPARTMENT is under no obligation to accelerate DEPARTMENT activities to support CONTRACTOR's early completion. The DEPARTMENT may reject an earlier (advanced) schedule, i.e. one that shows early completion dates for the Contract Milestones.
iii. Final Completion Milestone - The last activity in the schedule shall be a Finish Milestone titled 'Final Completion.

8. The CONTRACTOR shall not be entitled to extra compensation in the event that a schedule is approved showing an earlier completion than is contractually required; but then completes the project, for whatever reason, beyond the completion date shown in the earlier approved schedule; but within the Contract performance period.
9. Ownership of Float - Float available in the schedule, at any time, shall not be considered for the exclusive use of either the DEPARTMENT, nor the CONTRACTOR. This includes Activity Float and Project Float. Activity Float is the length of time that an activity can be delayed without causing a delay to the 'End Project (CCD)' finish milestone. Project Float is the length of time between the CONTRACTOR's projected early finish and the Contract Completion Date milestone.
10. Calendars - Activities will be assigned a Project Specific Calendar to which the activity logically belongs. Calendars should be developed to accommodate any contract defined work period such as a '7-day no holidays' calendar for DEPARTMENT approval periods, concrete cure times, etc. The Default Calendar on the Project Level should be developed to include weekends and holidays. At a minimum, there should be both '7-day no holidays' and a '5-day w/ holidays' Project Specific calendars. For projects that include activities that are affected by adverse weather, an additional Project Specific calendar that includes weekends and holidays, as applicable, should be developed that blocks out the Winter Shut-down period as non-work days. When setting up the Project Specific calendars, with the

'Detailed work hours/day' radio button checked, click on the Workweek button on the bottom right hand side. Set the Standard work hours to be from 0800 to 1600 with no 'lunch' break blocked out. (Elsewhere in this specification, the required project administrative parameters set a 'day' as equivalent to 8 hours. For the purposes of establishing Original Durations, a day is a day. Even if CONTRACTOR intends to work 10 hrs/day or 12 hrs/day, to accurately calculate progress, the Calendars must match the 8 hrs/day setting.)

11. Open Ended Logic - There shall be only two open ended activities; the first activity 'Start Project (NTP)' shall have no Predecessor logic, and the last activity "Final Completion' shall have no Successor logic. Predecessor open ended logic may be allowed in time impact analyses, upon the DEPARTMENT's approval.
12. Default Progress Data Disallowed - Actual Start and Finish dates shall not automatically update with default mechanisms included in the scheduling software. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Program features that calculate one of these parameters from the other shall be disabled. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process shall match those dates provided in the CONTRACTOR Quality Control Reports. Failure of the CONTRACTOR to document the AS and AF dates in the Daily Quality Control report shall result in disapproval of the CONTRACTOR's schedule.
13. Out-of Sequence Progress - Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence progress) are not allowed. Logic must be corrected (e.g. changing the relationship from FS to SS to match actual field conditions) so that the error log is clear of any Out-of-Sequence logic.
14. Original Duration - Activity Original Duration (OD) changes are prohibited unless approved by DEPARTMENT. Remaining duration shall be used to make activity duration changes, after an activity has started, when progressing the project schedule.
15. Negative Lags and Start to Finish (SF) Relationships - Lag durations contained in the project schedule shall not have a negative value under any circumstances. Start to Finish (SF) relationships are prohibited.
16. Retained Logic - Schedule calculations shall retain the logic between predecessors and successors ('Retained Logic' mode) even when the successor activity has started and the predecessor activity has not yet finished (Out-of-Sequence logic). Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ('Progress Override") is not allowed.

B. COST LOADING THE SCHEDULE

1. After the schedule has been approved by DEPARTMENT, create and submit a Schedule of Values (SOV) spreadsheet to cost load each pay activity. The SOV spreadsheet should include the same WBS structure as the approved schedule for ease of reference. Each pay activity should be categorized under the appropriate WBS. Create a Row below the Column Header Row that provides totals for each cost column. The page header shall include the Project Number, Project Name, Date, Pay Application Number, and Project Total Cost. Include the following columns:

a. Activity ID
b. Activity Name
c. Budgeted Total Cost
d. Previous Billings
e. Current Month Billing
f. Remaining Total Cost
g. Percent Complete

2. Each month include on the Narrative Report a list of activities that have had a Budgeted Cost change, including all added and deleted activities, with an explanation each change. Any change to the SOV must be approved by the DEPARTMENT.
3. For Procurement activities, only actual procurement costs are billable. Do not include any profit, overhead, or any other form of markup.
4. The Anticipated CPM and Interim CPM schedules shall be based upon a Schedule of Values approved by the DEPARTMENT, and will be used as basis for monthly progress payments until approval of the Finalized CPM Schedule.
5. The value assigned to each activity shall be an accurate representation of the total cost to perform each activity; including the total for labor, material (unless a separate procurement activity exists), and equipment costs. Front loading the schedule in any way is prohibited. The sum of all tasks shall equal the total Contract price.
6. The SOV spreadsheet must be approved by DEPARTMENT prior to submittal of any pay applications.
7. To allow for proper schedule management, cost load the correction of punch list from DEPARTMENT Substantial Completion Inspection activity not less than 1 percent of the total contract value.

C. PROGRESSING THE SCHEDULE

1. Percent Complete – CONTRACTOR and DEPARTMENT shall on a monthly basis review project progress and establish the approved percent complete for each activity started, based upon the realistic assessment of earned value. CONTRACTOR will then update the schedule with Actual Start, Actual Finish, Percent Complete, and Remaining Duration. Activities which are complete but for remaining minor punch list work, and which do not restrain the initiation of successor activities, may be declared 100 percent complete. The Substantial Completion Inspection activity may be declared 100 percent complete upon completion and correction of all punch list work identified during DEPARTMENT Substantial Completion Inspection(s).
2. Remaining Duration - Update the Remaining Duration on any activity that has started but is not yet finished. Remaining Duration should be a realistic assessment of the amount of days remaining to complete that activity.

D. PROJECT SCHEDULE SUBMISSIONS - Provide the submissions as described below. The data CD, reports, and Network Diagrams required for each submission are contained in paragraph 5.4.2.

1. Periodic Schedule Updates

a. The CONTRACTOR shall update the project schedule on a monthly basis. The updated project schedule shall be submitted to the DEPARTMENT for approval at the periodic schedule update meetings as prescribed in paragraph 5.4.3. These submissions will enable the DEPARTMENT to assess CONTRACTOR's progress. If the CONTRACTOR fails or refuses to furnish the information and schedule updates as set forth herein, then the CONTRACTOR shall be deemed not to have provided an estimate upon which a progress payment can be made.

b. Neither updating, changing or revising of any report, curve, schedule or narrative submitted to the DEPARTMENT by the CONTRACTOR under this Contract, nor the DEPARTMENT's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying, in any way, the Contract Substantial Completion date or milestone dates or of modifying or limiting, in any way, the CONTRACTOR's obligations under this Contract.

2. Submittal Requirements - Each submittal shall have as its face document a completed DEPARTMENT-furnished submittal summary form. Submittals received from sources other than the CONTRACTOR will be returned to the CONTRACTOR without the DEPARTMENT's review. Submit the following items for the Anticipated CPM, Interim CPM, Finalized CPM, and every Periodic Schedule Update throughout the life of the project:

   a. Data CDs - Provide two sets of data CDs or DVDs containing the current project schedule and all previously submitted schedules in the format of the scheduling software (i.e. .xer). Also, include on the data CDs the Narrative Report, Network Diagram Report, SOV spreadsheet, and all required Schedule Reports. Label each CD indicating the type of schedule (Anticipated, Interim, Finalized, Update #), full project number, Data Date, Submittal Number and file name. Each schedule shall have a unique file name and use project specific settings.

   b. Narrative Report - Provide a Narrative Report with each schedule submission. The narrative report is expected to communicate to the DEPARTMENT the CONTRACTOR's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through that analysis. Two hard copies of the Narrative Report shall accompany the submittal package. The Narrative Report shall include the following information as a minimum:

      i. Project number, Date, Data Date, File Name, Update Number
      ii. Critical Path - Show all activities on the critical path. The critical path is defined as the longest path of logic.
      iii. Added Activities - Include Activity ID, Activity Name, Original Duration, Calendar, Predecessor(s), Successor(s), AREA, PHAS, CATW, FOW, and MODF codes.
      iv. Deleted Activities
      v. Duration Changes
      vi. Calendar Changes

vii. Logic Changes
viii. SOV Changes
ix. Current and Anticipated Delays - Include a description of current and anticipated problem areas or delaying factors and their impacts, whether it/they are the responsibility of the DEPARTMENT or CONTRACTOR, and an explanation of corrective actions taken or required to be taken.
x. Scheduler Comments - Explain in narrative form, anything the DEPARTMENT should know or understand as to the reasons for the changes contained herein.

c. Schedule Log Report - Schedule the Project (F9, Enter), Press F9 again and then click Schedule Log. Print Report and submit with schedule updates.
Note: The only activity allowed to not contain a Predecessor is the Start Project (NTP) activity. The only activity allowed to not contain a Successor is the Finish Project (CCD) activity. There are to be no Out-of-Sequence activities, no activities with Actual Dates > the Data Date, and no activities with invalid relationships.

d. Network Diagram Report - The network diagram report is required for the Anticipated, Interim, Finalized, and all Periodic Updates. Two 11”x17” color hard copies of the Network Diagram Report shall accompany the data CDs. Include the following columns:

i. Activity ID
ii. Activity Name
iii. Original Duration
iv. Remaining Duration
v. Start
vi. Late Start
vii. Finish
viii. Late Finish
ix. Percent Complete
x. Total Float

e. SOV Spreadsheet - The SOV Spreadsheet as detailed in Section 5.2, should be updated on a monthly basis to reflect accurate Previous Billings, Current Billing, Remaining Total Cost, and Percent Complete values. Two hard copies, with all columns formatted to fit on a single page, shall be included with the submittal package.

3. Periodic Schedule Update Meetings - Conduct periodic schedule update meetings for the purpose of reviewing the CONTRACTOR’s proposed Periodic Schedule Update, Narrative Report, Schedule Reports, and progress payment. Meetings shall occur at least monthly within five days of the proposed schedule Data Date. The CONTRACTOR shall provide a computer with the scheduling software loaded on the computer and a projector, which allows all meeting participants to view the proposed schedule during the meeting. The CONTRACTOR’s scheduler will be available during the meeting to organize, group, sort, and filter the schedule as requested by

the DEPARTMENT. An electronic version of the proposed schedule update, narrative, and all reports will be provided at least 48 hours in advance of the meeting. The CONTRACTOR's Project Manger, superintendent, foreman, and major Subcontractors shall attend the meeting as required to discuss the project schedule and work. CONTRACTOR will present the current status of the project and will review the narrative report. Following the Periodic Schedule Update Meeting, the CONTRACTOR shall make corrections to its draft submission. Only those changes approved by the DEPARTMENT will be included in the submission and invoice for payment.

4. Update Submission Following Progress Meeting - Submit a complete update of the project schedule containing all approved progress, revisions, and adjustments; pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 working days after the Periodic Schedule Update meeting.

E. REQUESTS FOR TIME EXTENSIONS

Provide a justification of delay to the Contracting Officer in accordance with the contract provisions and clauses for approval within 10 days of a delay occurring. The CONTRACTOR shall also prepare a Time Impact Evaluation (TIE) for each DEPARTMENT request for proposal (RFP) to justify time extensions.

1. Justification of Delay - The CONTRACTOR shall provide a description of the event(s) that caused the delay and/or impact to the CONTRACTOR's work. As part of the description, the CONTRACTOR must identify all schedule activities that were impacted. The CONTRACTOR must show the event that caused the delay/impact was the responsibility of the DEPARTMENT. The CONTRACTOR shall also provide a Time Impact Evaluation (TIE) that demonstrates the effects of the delay or impact on the project completion date or interim completion date(s). Multiple impacts shall be evaluated chronologically; each with its own justification of delay. The sum of all delays shall be cumulative. A time extension and the schedule fragnet shall become part of the project schedule and all future schedule updates upon approval by the Contracting Officer.
2. Time Impact Evaluation (TIE) - The CONTRACTOR shall prepare a time impact evaluation for approval by the DEPARTMENT. The CONTRACTOR shall utilize a copy of the last approved schedule prior to the first day of the impact or delay for the time impact analysis. If DEPARTMENT determines the time frame between the last approved schedule and the first day of impact is too great, the CONTRACTOR shall prepare an interim updated schedule to perform the time impact evaluation. Unless approved by the DEPARTMENT, no other changes will be incorporated into the schedule being used to justify the time impact. Pending change orders shall not be incorporated into the schedule unless the TIE has been approved by the DEPARTMENT.
3. Fragmentary Network (Fragnet) - The CONTRACTOR shall prepare a proposed fragnet for its time impact evaluation. The proposed fragnet shall consist of a sequence of new activities that are proposed to be added to project schedule to demonstrate the influence of the delay or impact to the project's contractual dates. The CONTRACTOR shall clearly show how the proposed fragnet is to be tied into the project schedule including all predecessors and successors to the fragnet activities.

The proposed fragnet shall be approved by the DEPARTMENT prior to incorporation into the project schedule.

4. Time Extension - The Contracting Officer must approve the CONTRACTOR's justification of Delay including the time impact evaluation before a time extension will be granted. The time extension shall be given in calendar days. No time shall be grantewd under this Contract for cumulative effect of changes.
5. Recovery Plan - Should the CONTRACTOR's progress fall behind the approved project schedule for reasons other than those that are excusable within the terms of the contract, the DEPARTMENT may require the CONTRACTOR to provide a written recovery plan to DEPARTMENT for approval. The plan shall detail how progress will be made-up to include which activities will be accelerated by adding additional crews, longer work hours, extra work days, etc.
6. Artificially Improving Progress - The CONTRACTOR shall not artificially improve progress by simply revising the schedule logic, modifying or adding constraints, shortening activity durations, or changing calendars in the project schedule. The CONTRACTOR shall indicate assumptions made and the basis for any logic, constraint, duration and calendar changes used in the creation of the recovery plan. Any additional resources, manpower, or daily and weekly work hour changes proposed in the recovery plan must be evident at the work site and documented in the CONTRACTOR's daily report.
7. Failure to Perform - Failure to perform work and maintain progress in accordance with the supplemental recovery plan, may result in an interim and final unsatisfactory performance rating and/or may result in corrective action by the DEPARTMENT in accordance with the contract provisions.
8. The CONTRACTOR shall be responsible for all costs associated with the preparation of Time Impact Evaluations, and the process of incorporating them into the current schedule update. The CONTRACTOR shall provide the DEPARTMENT four (4) copies of each TIE.

F. WEEKLY PROGRESS MEETINGS - The CONTRACTOR shall meet weekly with the DEPARTMENT (or as otherwise mutually agreed to) between the meetings described in paragraph PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress, and to review planned activities for the upcoming two weeks. The current approved schedule update shall be used for the purposes of this meeting and for the production and review of reports. The weekly progress meeting will address the status of RFI's, RFP's and Submittals. CONTRACTOR shall provide and present a time scaled two-week look ahead schedule that is based and correlated to the current CPM schedule. The schedule shall look out two weeks from the day of the Weekly Progress Meeting.

G. PRIMAVERA P6 MANDATORY REQUIREMENTS - The following settings are mandatory and required in Anticipated, Interim, and Finalized CPM schedule submissions to the DEPARTMENT.

1. Activity Codes shall be Project Level not Global or EPS level.
2. Calendars shall be Project Level not Global or Resource level.
3. Activity Duration Types must be set to "Fixed Duration & Units". (note: Milestones default to Fixed Duration & Units/Time)

4. Percent Complete Types must be set to "Physical".
5. Time Period Admin Preferences must remain the default "8.0 hr/day, 40 hr/week, 172 hr/month, 2000 hr/year". Calendar Work Hours/Day must be set to 8.0 Hour days.
6. Schedule Option for defining Critical Activities shall be set to "Longest Path".
7. Schedule Option for defining progressed activities shall be set to "Retained Logic".
8. Activity ID's shall not exceed 10 characters.
9. Activity Names shall have the most defining and detailed description within the first 30 characters.

H. SUBCONTRACTOR AGREEMENT - Submit for each Subcontractor and supplier on their corporate letterhead, a statement certifying that the Subcontractor or supplier accepts the CONTRACTOR's Finalized CPM Schedule, and that the Subcontractors' or suppliers' related schedules have been properly incorporated. Include with the certification a copy of each Subcontractors' or suppliers' schedules upon which the proposed Finalized CPM Schedule was built. The certification statements shall confirm that task durations, cost and resource loading variables have been correctly included in the Finalized CPM schedule. Failure to provide Subcontractor agreements may result in denial of the project schedule submission.

I. DAILY CONSTRUCTION REPORTS - The CONTRACTOR shall, on a daily basis, submit a daily task report to the DEPARTMENT for each working day, including weekends and holidays, when worked. The CONTRACTOR shall develop the daily construction reports on a computer-generated database capable of sorting daily Work, manpower and labor hours by the CONTRACTOR, Subcontractor, area, and Change Order. Upon request of the DEPARTMENT, the CONTRACTOR shall furnish computer disk of this database. The CONTRACTOR shall obtain the DEPARTMENT's written approval of database format for daily construction reports prior to implementation. The following shall be included in report:

1. Project name and Project number
2. CONTRACTOR's name and address
3. Weather, temperature and any unusual site conditions.
4. Was this day adversely affected by the weather?
5. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work implemented by Subcontractors.
6. Activities Started today.
7. Activities Completed today.
8. Worker quantities for prime and for Subcontractors of any tier. Include the trade of the worker, ie. Superintendent, Quality Control, Electrician, Operator, etc., and number of hours worked.
9. Equipment, other than hand tools, utilized by CONTRACTOR and Subcontractors. Include equipment identification, number of hours in service and number of hours idle. Include any equipment inspections and equipment maintenance performed, if any.

PART 2 – PRODUCTS **Not Used**

PART 3 – EXECUTION **Not Used**

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Procedures for the preparation, tracking, and review of submittals for the project.

1.02 RELATED REQUIREMENTS

A. Section 00700 – General Requirements

B. Section 00800 – Supplementary Conditions

C. Section 01 11 13 - Summary of Work: Work sequence

D. Section 01 12 19 – Subcontractor Certifications

E. Section 01 29 73 - Schedule of Values: Submittal of Schedule of Values

F. Section 01 29 76 - Applications for Payment: Submittal of Applications

G. Section 01 31 13 – Job Site Administration

H. Section 01 32 00 – Work Schedules and Reports

I. Section 01 33 23 – Shop Drawings Product Data and Samples.

J. Section 01 45 00 - Quality Control: Manufacturers' field service reports, Testing laboratory reports

K. Section 01 45 29 – Testing Laboratory Services

L. Section 01 60 00 - Material and Equipment: Substitutions

M. Section 01 71 23 – Field Engineering

N. Section 01 73 00 – Execution Requirements: Project Record Documents, Warranties and Bonds: Closeout submittals

O. Section 01 77 00 - Contract Closeout Procedures: Closeout submittals

P. Section 01 79 00 – Demonstration and Training

Q. Technical Product Specifications

R. Commissioning Specifications

S. Operations and Maintenance Manuals

T. Equipment Installation Data

1.03 SCHEDULE OF SUBMITTALS

A. Submit preliminary Schedule of Submittals as required by Section 00700 - General Conditions. In addition to shop drawing submissions, include all submittals required by the Contract Documents in the Schedule of Submittals.

B. Schedule of Submittals will be used by the DEPARTMENT to schedule time in their activities relating to review of submittals. Schedule of Submittals shall portray an orderly sequence of submittals, early submittals for long lead-time items, and submittals which require extensive review.

C. Schedule of Submittals shall be reviewed by the DEPARTMENT and shall be revised and resubmitted until accepted by the DEPARTMENT.

1.04 CONTRACTOR REVIEW

A. The CONTRACTOR shall prepare and review submittals as required by the provisions of Section 00700 – General Conditions and Section 00800 – Supplementary Conditions.

1.05 SUBMITTAL REQUIREMENTS

A. Number of copies: Submit the number of copies of submittals which the CONTRACTOR requires to be returned to it following review, plus four (4) copies for retention by the DEPARTMENT.

B. Submit each submittal with a Submittal Summary form as its face document. Use a Submittal Summary form provided by the DEPARTMENT, or a substitute approved by the DEPARTMENT.

C. Label submittals with a numbering system approved by the DEPARTMENT. Identify the project by title and DEPARTMENT'S project number; identify Work and product by Specification section and Article number.

D. Submit items required by individual specification sections. Sequence the submission of submittals to correspond with the approved Schedule of Submittals.

E. Before the submission of each submittal, the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each submittal with other submittals and with the requirements of the Work and the Contract Documents, upon which the CONTRACTOR shall certify in writing on each submittal that it has made this determination. The failure to review and certify a submittal shall be cause for the DEPARTMENT to return the submittal without review.

F. On the submittal, notify the DEPARTMENT in writing of any deviations from requirements of the Contract Documents.

G. Organize the submittals into logical groupings to facilitate the processing of related submittals, such as:

1. Finishes which involve DEPARTMENT selection of colors, textures, or patterns.
2. Items required by the individual Technical Product Specification Sections.
3. Associated items, which require correlation for efficient function or for installation.

H. Submit all required color and finish samples in order to receive approval for colors and finishes.

1.06 RESUBMITTALS

A. Provide the same number of submittals required for the first submission. For example, if 6 are required and 2 are returned marked “rejected” or “revise and resubmit”, re-submit 6 copies. The DEPARTMENT will not return any of its copies from the prior submittal for the CONTRACTOR’S use in preparing the re-submittal.

B. Provide complete copies of re-submittals. Do not re-submit partial copies of submittals for incorporation into the DEPARTMENT’S retained submittals from the prior submission.

C. If drawings, product submittals, samples, mockups, or other required submittals are incomplete or not properly submitted, the DEPARTMENT will not review the submittal and will return it to the CONTRACTOR. The DEPARTMENT will review a submittal no more than 2 times without additional charge to the CONTRACTOR (incomplete or improperly submitted submittals count as one). The CONTRACTOR shall pay all review costs associated with more than 2 reviews.

1.07 DEPARTMENT REVIEW

A. The DEPARTMENT will review submittals and re-submittals, and return submittal comments within 30 calendar days of receipt.

B. The DEPARTMENT or authorized agent will receive, review and return submittals to the CONTRACTOR with one of the following dispositions noted:

“No Exceptions Taken” – denotes that the submittal is generally consistent with the requirements of the Contract Documents. A resubmittal is not required.

“Make Corrections Noted” – denotes that the submittal is generally consistent with the requirements of the Contract Documents but only as conditioned by notes and corrections made on the submittal. A resubmittal is not required provided the CONTRACTOR understands the review comments and desires no further clarification.

“Revise and Resubmit” – denotes that revisions are required in the submittal in order for the submittal to be generally consistent with the requirements of the Contract Documents. The DEPARTMENT will indicate on the returned submittal what revisions are necessary. A resubmittal is required.

“Rejected” – denotes that the submittal does not meet the requirements of the Contract Documents and shall not be used in the Work. The DEPARTMENT will indicate on the returned submittal the reasons for its rejection. A resubmittal is required

A. Review by the DEPARTMENT of submittals shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is consistent with the requirements of the Contract Documents. Review of submittals shall not relieve the CONTRACTOR of the responsibility for compliance with the requirements of the Contract Documents or for errors, dimensions, and quantities unless specific exception is requested and approved on the submittal.

B. The DEPARTMENT's review shall not extend to the means, methods, techniques, sequences or procedures of construction or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.08 DISTRIBUTION

A. The CONTRACTOR shall be responsible for making and distributing any reproductions of approved submittals that it may require for its use.

B. The CONTRACTOR shall perform work in accordance with approved submittals.

PART 2 – PRODUCTS **Not Used**

PART 3 – EXECUTION **Not Used**

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Section 00700 - General Conditions

B. Section 01 11 13 - Summary of Work

C. Section 01 31 19 – Project Meetings

D. Section 01 33 00 - Submittals: Schedules for submittals and submittal requirements

E. Section 01 45 00 - Quality Control: Mockups and samples for testing

F. Section 01 60 00 - Material and Equipment

G. Section 01 73 00 - Execution Requirements

H. Section 01 78 39 – Project Record Documents

I. Technical Specifications: Identification of submittal requirements

1.02 SHOP DRAWINGS

A. Present in a clear and thorough manner. Label each Shop Drawing with DEPARTMENT's Project name, Project number and date of submittal. Identify each element of the Shop Drawings by reference to specification section, sheet number and detail, schedule, or room number of Contract Documents.

B. The data shown on the Shop Drawings shall be complete with respect to specified performance and design criteria, materials and similar data to show the DEPARTMENT materials and equipment the CONTRACTOR proposes to provide.

C. Identify dimensions; show relation to adjacent or critical features or Work or products.

D. Designation of work “by others,” if shown in submittals, shall mean that work will be responsibility of CONTRACTOR rather than subcontractor or supplier who has prepared submittals.

E. Minimum Sheet Size: 11"x17".

1.03 PRODUCT DATA

A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification section and Article number. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.

C. Submit manufacturer's instructions for storage, preparation, assembly, installation, start up, adjusting, balancing, and finishing.

1.04 SAMPLES

A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures and patterns, for DEPARTMENT selection as specified in technical product sections.

B. Submit samples to illustrate functional characteristics of products, including parts and attachments.

C. Approved samples, which may be used in the Work, are indicated in the Specification section.

D. Samples shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which they are intended and otherwise as the DEPARTMENT may require, to enable the DEPARTMENT to review the submittal.

E. Label each sample with identification required for transmittal letter.

F. Provide field sample mockup of finishes at Project, at location acceptable to DEPARTMENT, as required by individual Specification section. Install each sample complete and finished. Acceptable finishes in place may be retained in completed Work.

1.05 HIGHWAY MASTER MATERIALS CERTIFICATION LIST

A. Comply with requirements of the Highway Master Materials Certification List as contained herein.

PART 2 – PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

SECTION 01 41 00
SPECIAL REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Compliance with Governmental Regulatory Permit requirements and conditions.

1.02 RELATED REQUIREMENTS

A. Section 00700 - General Conditions

1.03 SPECIAL REGULATORY REQUIREMENTS

A. The CONTRACTOR shall comply with all the requirements enumerated in the Contract Documents. In addition, the CONTRACTOR shall comply with the following codes and permits, as amended by the Authority Having Jurisdiction.

1. Current Edition of the International Building Code
2. Current Edition of the International Fire Code
3. Current edition of Uniform Plumbing Code
4. Current edition of International Mechanical Code
5. Current edition of NFPA 70 National Electric Code
6. Current Edition of Americans with Disability Act Guidelines
7. Current edition of Occupational safety and Health Administration standards
8. NFPA 101 – Life Safety Code
9. ASCE 7-05
10. Required Permits of the Authority Having Jurisdiction
11. Environmental Protection Agency (EPA), Section 402/40 CFR 125, National Pollutant Discharge Elimination System (NPDES) Nationwide Permit Compliance, with compliance with all permit requirements; Storm Water Pollution Prevention (SWPP) Plan, Notice of Intent (NOI), and Notice of Termination (NOT)
12. Not Used

PART 2 – PRODUCTS **NOT USED**

PART 3 – EXECUTION **NOT USED**

END OF SECTION

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SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Section 00700 - General Conditions

1.02 QUALITY ASSURANCE

A. For Products or workmanship specified by association, trade, or other technical standards: comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of bid advertisement, unless otherwise stated in the Contract Documents.

C. Provide copies of standards through the submittal process when required by the Contract Documents. Maintain a copy of each reference standard on site during construction.

D. Should specified reference standards conflict with Contract Documents, request clarification from the DEPARTMENT before proceeding. Local code requirements, where more stringent than referenced standards, shall govern.

E. Neither the contractual relationship, duties, and responsibilities of the parties to the Contract, nor those of the Architect/Engineer, shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 - PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

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SECTION 01 45 00
QUALITY CONTROL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Quality Control program requirements

B. Manufacturer field services requirements

C. Testing laboratory requirements

D. Record keeping for quality control

E. Quality surveillance by DEPARTMENT

1.02 RELATED SECTIONS

A. Section 00700 - General Conditions

B. Section 01 29 76 – Application for Payment

C. Section 01 31 19 – Project Meetings

D. Section 01 33 00 – Submittal Schedule, Submittal Procedures

E. Section 01 33 23 – Shop Drawings, Product Data, and Samples

F. Section 01 42 19 – Reference Standards

G. Section 01 45 23 – Departmental Inspection Service

H. Section 01 45 29 – Testing Laboratory Services

I. Section 01 60 00 – Material and Equipment

J. Section 01 77 00 – Contract Closeout

K. Individual Specification Sections: Quality Control

1.03 REFERENCES

A. Comply with Section 01 42 19 – Reference Standards and the individual technical product specification sections.

1.04 DESCRIPTION

A. The CONTRACTOR shall provide and maintain an effective Quality Control Program related to testing and inspection. The CONTRACTOR shall perform Quality Control Testing

as specified and shall provide copies of all results to the DEPARTMENT for use in observing contract compliance.

B. The CONTRACTOR's Quality Control Program shall include, but is not limited to: administration, management, supervision, reports, record-keeping, submittals, services of independent testing agencies and labs, and other related services.

C. Quality Control is the sole responsibility of the CONTRACTOR.

D. The CONTRACTOR's Quality Control program does not include I.B.C. required special inspection performed by the DEPARTMENT as described in Section 01 45 23 – Departmental Inspection Service.

E. Quality Control services are required to verify compliance with requirements specified or indicated and do not relieve the CONTRACTOR of responsibility for compliance with the Contract Documents.

F. Specific Quality Control requirements for individual construction fabrication and procurement activities are included in the Technical Product Specifications. General Quality Control requirements entail ensuring that all aspects of the Work conform to the technical requirements of the Contract Documents.

G. The CONTRACTOR's Quality Control Program described herein is not intended to limit the CONTRACTOR's Quality Control activities, which may be necessary to achieve compliance with the Contract Documents.

H. The CONTRACTOR shall have a full-time Quality Control Manager whose sole responsibility is to ensure compliance with Contract Documents and manage the CONTRACTOR Quality Control Program, except that the Quality Control Manager may also serve as the site safety officer.

1.05 JOB CONDITIONS

A. Where Specifications require work to be field-tested or approved, it shall be tested in the presence of the DEPARTMENT after timely notice of its readiness for inspection and testing, and the work after testing shall be concealed only upon approval of DEPARTMENT.

B. The DEPARTMENT shall have the right to witness all off site tests. The CONTRACTOR shall notify the DEPARTMENT at least seven (7) calendar days prior to testing.

C. The results of tests are for use by the DEPARTMENT to evaluate the acceptability of materials with respect to specified testing requirements. Regardless of the test results, CONTRACTOR is solely responsible for quality of workmanship and materials and for compliance with requirements of Contract Documents.

D. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality. Verify applicability and follow all manufacturers' recommendations and instructions for assembly, installation and testing of materials and equipment. In any case where the CONTRACTOR believes that such

recommendations or instructions are not applicable, the CONTRACTOR shall so notify the DEPARTMENT and state the reasons for the CONTRACTOR's determination. The CONTRACTOR shall then follow the DEPARTMENT's written direction on whether to follow manufacturer's recommendations and instructions.

E. Upon failure of materials and equipment, which have been tested or inspected, previous acceptance may be withdrawn and material may be subject to removal and replacement with material meeting Specification requirements, at no cost to the DEPARTMENT.

1.06 MANUFACTURER'S FIELD SERVICES

A. Required when technical specifications require the manufacturer or supplier to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, and to start, test, and adjust equipment as applicable.

B. Submit to the DEPARTMENT the manufacturer representative's written reports containing observations and recommendations. Provide three (3) copies and a digital version.

1.07 TESTING LABORATORY DUTIES

A. Testing laboratories retained by the CONTRACTOR shall comply with the requirements of Section 01 45 29 – Testing Laboratory Services.

PART 2 – PRODUCTS **Not Used**

PART 3 - EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall provide full and complete documentation of Quality Control procedures and activities in a Quality Control Program and Plan.

3.02 QUALITY CONTROL

A. The CONTRACTOR shall establish a Quality Control Program (Program) which shall establish an independent organization and a methodology to perform the CONTRACTOR's inspection and tests of all items including that of its subcontractors. The Program shall ensure conformance to applicable technical specifications and drawings with respect to the materials, codes, workmanship, storage, installation, construction, finishes, functional performance, and identification. The Program shall be established for all construction work performed under this Contract, including assigned subcontract work. The Program shall specifically include surveillance and tests required in the technical specifications.

B. The CONTRACTOR shall coordinate all work requiring special inspection with the DEPARTMENT to ensure full access by the DEPARTMENT's Special Inspectors and Quality Assurance testing personnel to work, work performance, and testing preparation, operations and results.

C. CONTRACTOR shall describe the Program in a detailed Quality Control Plan that must be approved by the DEPARTMENT prior to the start of any construction or offsite fabrication.

D. The Program shall include, as a minimum, the following components for all definable features of work:

1. Preparatory Inspection Meeting: CONTRACTOR shall schedule and attend a preparatory meeting to review testing procedures a minimum of a week prior to beginning work on any element of Work which has been identified in the Contract Documents to require testing and inspection by the CONTRACTOR testing and inspection by the DEPARTMENT, or code-required inspections. Subsequent meetings shall be conducted as necessary to ensure continued accuracy of testing procedures.
2. Document Control: CONTRACTOR's Program to include procedure for ensuring that all Work is performed in accordance with the following:

    a. Conformed sets of Contract Drawings and Specifications
    b. Contract Change Order documents
    c. Approved Submittals, most current revision
    d. Applicable Requests for Information (RFI's)
    e. Manufacturer's Instruction.

3. In Progress Inspection: CONTRACTOR shall perform in-progress inspections as work progresses on the Work which shall include, but not be limited to:

    a. Examination of the quality of workmanship with respect to Contract Drawings, Technical Specifications and Approved Submittals.
    b. Review of control testing for compliance with Contract requirements.
    c. Inspection for use of defective or damaged materials, omissions and dimensional requirements.
    d. Review of timeliness and scheduling requirements for all tests, retests and eventual approvals.
    e. CONTRACTOR Deficiency Reports and punch lists as appropriate to the level of completion of the work.

4. Non-Conformance Procedure: CONTRACTOR's program shall include procedure for identifying, documenting, tracking, and resolving items in the Work which do not comply with Contract Documents, Specifications, Approved Submittals, or Manufacturer's Instructions. If a quality control test indicates that the tested material does not conform to the requirements of the contract documents, the CONTRACTOR shall eventually take supplemental tests at the same location from which the non-conforming result was obtained, to document conformance and acceptability for payment. Otherwise, the DEPARTMENT reserves the right to reject materials for which final Quality Control tests indicate non-conformance with the contract documents.
5. Code Required Inspection: CONTRACTOR shall coordinate and make timely requests for inspections, tests and other activities required by codes and regulations as specified, which are to be provided by others. This requirement includes coordinating with and providing access to the Authority Having Jurisdiction. (AHJ)

3.03 RECORD KEEPING

A. The CONTRACTOR shall maintain current Quality Control records, on forms acceptable to the DEPARTMENT, of all inspections and tests performed. The records shall include factual evidence that the required inspections or tests have been performed, including, but not limited to, the following information for each such test and inspection: specification reference, date, type and number of inspections or test involved; results of the inspections, tests or retests; the nature of defect, causes for rejection, proposed remedial action, corrective action(s) taken, and similar information related to any reinspection.

B. The CONTRACTOR shall maintain and submit to the DEPARTMENT the following Quality Control records and reports:

1. Daily Reports: The CONTRACTOR shall maintain a daily log of all inspections performed for both CONTRACTOR and subcontractor operations. The Daily Log shall include compliance with shop submittals, identification by specification section and schedule activity of inspections, tests, and retests conducted, results of inspections and tests, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed. One copy of Daily Reports shall be submitted to the DEPARTMENT by 12:00 noon of the next business day.
2. Immediate Notification of Deficiencies: CONTRACTOR shall provide immediate notification to the DEPARTMENT whenever a failed nonconforming test or inspection occurs. This immediate notification shall be followed up with the required written reports.
3. Nonconformance Report: CONTRACTOR shall submit three copies of a weekly Nonconformance Report to the DEPARTMENT identifying all substandard inspections and tests taken during the week including identification by specification section and schedule activity of the inspection or test, location and nature of defects, causes for rejection and remedial actions taken or proposed. The Nonconformance Report shall also identify corrective actions taken or proposed for any open items on prior Nonconformance Reports including a scheduled date for resolution of each item. The Nonconformance Report shall be submitted and discussed in each Weekly Progress Meeting.
4. Inspection Control Log: CONTRACTOR shall maintain an inspection control log chronologically recording each inspection and test performed by the CONTRACTOR, including the nature of the inspection, test or retest, the date performed, the results, causes for rejection, remedial action or corrective action taken and dates of subsequent inspections and retests, and final acceptance. The CONTRACTOR shall submit three (3) copies plus an electronic copy of the updated Inspection Control Log weekly to the DEPARTMENT; the Log will be discussed in each Weekly Progress Meeting.
5. Testing Laboratory Data: Maintain and submit to DEPARTMENT in accordance with Section 01 45 29.

3.04 ORGANIZATION

A. The Program shall be implemented by the establishment of a Quality Control Organization which shall as a minimum, consist of the following: Quality Control personnel shall be

dedicated to Quality Control duties only, and independent of the production and commercial aspects of the CONTRACTOR's full organization.

1. Quality Control Manager: The Quality Control Manager shall have the following qualifications: Minimum of 5 years experience in a supervisory Quality Control position whose sole responsibility is to ensure compliance with the Contract Documents. This person shall be employed on this Project only, shall be physically on the Project site during performance of all Contract Work, and shall be in charge of the CONTRACTOR's Quality Control Organization. The Quality Control Manager shall report directly to the responsible corporate officer of the firm.
2. Quality Control Inspectors: The Quality Control Inspectors shall report directly to the Quality Control Manager. Quality Control Inspectors shall be provided as required to meet requirements of the Contract Documents for CONTRACTOR testing and inspection and as needed to verify that all aspects of the Work comply with the technical requirements of the Contract. Inspectors shall have minimum 5 years experience inspecting the type of work being inspected. Submit qualifications as part of the Quality Control Plan.
3. Independent Testing and Inspection Laboratories: Provide and pay for an industry-recognized, independent laboratory or laboratories to perform all Quality Control tests and/or inspections as may be indicated by the nature of the construction or as specifically required under the terms of the Contract.
4. Electrical and Mechanical Testing: If specified elsewhere, provide and pay for an independent testing firm (or firms) performing electrical and mechanical testing. The testing firm shall be a corporately and financially independent testing organization that can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm. Follow Technical Product Specifications Quality Control requirements and testing responsibilities.
5. Manufacturers' Representative: Provide review and inspection by qualified technical non-sales manufacturers' representatives for specific work as appropriate, or as directed by the DEPARTMENT including but not limited to, roofing, waterproofing, skylights, window wall and building system, and fireproofing.

B. Staffing Levels: Provide sufficient qualified personnel to monitor the work quality at all times. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity.

1. In cases where multiple trades, disciplines or subcontractors are on site at the same time, each activity shall be inspected and tested by personnel skilled in that portion of the work.
2. In cases where multiple shifts are employed, the Quality Control staff shall be increased as required to monitor the work on each shift.

3.05 QUALITY CONTROL PLAN

A. Provide a Quality Control Plan to the DEPARTMENT as soon as practicable, and in no event later than 15 days after Notice to Proceed. Plan shall be updated as required by "Detailed Quality Control Procedures" below, and approved by the DEPARTMENT prior to construction.

B. Quality Control Plan Contents: Include the personnel, procedures, instructions and documents to be used.

1. Organization: A description of the CONTRACTOR's Quality Control Organization, including:

   a. An organization chart showing lines of authority and relationship of the quality control organization to other CONTRACTOR management and project personnel.
   b. Names and resumes of work experience and qualifications of personnel in the quality control organization.
   c. Area of responsibility and authority of each individual in the quality control organization.

2. Inspection:

   a. Methods of performing quality control inspections including those for each subcontractor's work.
   b. Detailed lists of inspection activities for each specification section. See "Detailed Quality Control Procedures" below.

3. Testing:

   a. Description of how testing will be performed including identification and qualifications of the industry recognized testing laboratory or laboratories proposed for the work.
   b. Identify the testing methods, frequency, and number to be taken of each type of material requiring Quality Control testing. To facilitate the development of a testing plan, the DEPARTMENT will provide a tabular schedule of minimum testing requirements, to be derived from the requirements contained in the contract documents. The CONTRACTOR shall be responsible for taking the tests summarized in the schedule, in conjunction with any other tests that may be required in the contract documents.

4. Documentation: Method of documenting Quality Control operation, inspection and testing.
5. Administration: Methods of administering Quality Control operations document control, non-conformance procedure, inspection and testing.
6. Letter of Authority: A copy of a letter of direction to the CONTRACTOR's Quality Control Manager responsible for quality control outlining that person's duties and responsibilities and signed by responsible officer of the firm. This letter shall include the authority to halt construction and direct removal and replacement of work not in compliance with the Contract.
7. Forms: Sample copies of all forms and reports to be used, a flow chart describing their distribution, and identification of those documents to be retained by the CONTRACTOR.
8. Subcontractor's Quality Control: The CONTRACTOR shall include, as part of its Quality Control Plan, specific methods of performing quality control inspections of onsite and offsite subcontractors.

9. Detailed Quality Control Procedures: Detailed descriptions of quality control activities for work under each section of the specifications. Include list of all tests, inspection and frequencies, personnel, and instruction prior to starting such work. The procedures shall be updated each month incorporating any changes. Changes shall be submitted at least one month prior to Work effected by any change.

C. Quality Control Plan Approval

1. Before the CONTRACTOR's Quality Control Plan is officially submitted, the CONTRACTOR shall meet with the DEPARTMENT and discuss the CONTRACTOR's Quality Control Plan. The CONTRACTOR and the DEPARTMENT shall jointly develop a mutual understanding of the details of the plan, including the forms to be used for recording the quality control operations, inspections, administration of the plan for both onsite and offsite work, and the interrelationship of CONTRACTOR and DEPARTMENT inspection. The CONTRACTOR shall prepare minutes of the meeting, which shall be incorporated in the CONTRACTOR's Quality Control Plan, which shall then be officially submitted for approval.
2. If the DEPARTMENT determines that the Quality Control Plan, personnel, inspections, tests, or records are not adequate, corrective actions shall be taken as directed prior to payment of the next monthly CONTRACTOR's Progress Report.
3. Notify the DEPARTMENT in writing of any proposed change to the CONTRACTOR's Quality Control Plan; no such change shall be implemented prior to approval in writing by the DEPARTMENT.

D. Quality Control Plan Implementation: Implementation of the Quality Control Plan is the responsibility of the CONTRACTOR. This implementation will be monitored by the DEPARTMENT and deficiencies therein will be corrected at the sole expense of the CONTRACTOR.

3.06 QUALITY SURVEILLANCE BY THE DEPARTMENT

A. All items of materials and equipment shall be subject to surveillance testing and inspection by the DEPARTMENT at the point of production, manufacture or shipment to determine if the producer, manufacturer or shipper maintains an adequate inspection system which insures conformance to the applicable specifications and drawings with respect to materials, workmanship, construction, finish, functional performance and identification. In addition, all items or materials, equipment and work in place shall be subject to surveillance testing and inspection by the DEPARTMENT at the site for the same purposes. Surveillance by the DEPARTMENT does not relieve the CONTRACTOR of performing Quality Control inspections and testing of either onsite or offsite CONTRACTOR's or subcontractor's workplace or manufacturing assembly plant.

END OF SECTION

SECTION 01 45 23
DEPARTMENTAL INSPECTION SERVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Testing and inspection services provided by the DEPARTMENT.

1.02 RELATED REQUIREMENTS

A. Section 00700 - General Conditions

B. Section 00700 - General Conditions: Article 13, Substantial Completion, Final Inspection.

C. Section 01 45 00 - Quality Control

D. Section 01 45 29 - Testing Laboratory Services

E. Section 01 73 00 - Execution Requirements

F. Individual Specifications Sections: Inspections and tests required, and standards for testing.

1.03 REFERENCES

A. International Building Code

B. Special Inspection Program as approved by Authority Having Jurisdiction (AHJ)

1.04 DESCRIPTION

A. In accordance with the International Building Code, the DEPARTMENT will provide Special Inspection Services. These services are in addition to those inspection and testing services provided by the CONTRACTOR under Section 01 45 00 – Quality Control and Section 01 45 29 – Testing Laboratory Services and AHJ permit inspections.

B. The CONTRACTOR is responsible for requesting Special Inspection Services from the DEPARTMENT for the following work activities:

1. Soil compaction: Special Inspector to monitor the soils compaction process and review soils compaction testing data provided by the CONTRACTOR.
2. Asphalt: Special Inspector to monitor placement of asphalt and review asphalt testing data provided by the CONTRACTOR.
3. Concrete and concrete reinforcement: Special Inspector to monitor placement of concrete reinforcing steel, review concrete sampling and testing data provided by the CONTRACTOR, perform other related inspections as required by the IBC.
4. Concrete post-tensioned assemblies: Special Inspector to monitor placement of post tension assemblies and review post tensioning test data as provided by the CONTRACTOR (strand sampling, jacking and elongation records).
5. Structural steel field bolting and welding: Special Inspector to monitor placement of post installed anchors and bolts and provide high strength bolt tension testing. The Special Inspector will monitor erection of structural assemblies and provide weld testing.

6. Pile and pier foundations: The special inspector will provide inspections during installation and testing, as set forth in the IBC.
7. Masonry and masonry reinforcement: The special inspector will inspect masonry reinforcement, masonry and grouting procedures.
8. Wind requirements: The special inspector will inspect for wind requirements as required for cold-formed steel light-frame construction, wood construction, roof and wall cladding.
9. Seismic resistance: Special inspections will be performed for seismic resistance elements as required by the IBC.
10. Sprayed fire resistive materials, mastic and intumescent fire-resistant coatings: The special inspector will inspect these materials applied to structural elements and decks, in accordance with the IBC.
11. Exterior insulation and finish systems (EIFS): Require inspection as set forth by the IBC.
12. Smoke control systems: Require inspection and testing as set forth by the IBC.
13. Other special inspections and activities required by the IBC and Authority Having Jurisdiction (AHJ)

1.05 REQUEST AND PAYMENT

A. The CONTRACTOR shall request services provided by the DEPARTMENT to perform specified inspection and testing.

B. Inspection by the DEPARTMENT or its agents shall in no way relieve CONTRACTOR of obligation to perform Work in accordance with requirements of Contract Documents

1.06 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall coordinate with the DEPARTMENT to provide adequate advance notice to enable the DEPARTMENT'S special inspector(s) to be present when necessary.

B. A Materials Placement Schedule shall also be submitted each Thursday for the work scheduled for the following week, if requested by the DEPARTMENT. This schedule shall include the date and time each material, required to have materials testing or inspection, is scheduled for placement or observation. A schedule of material deliveries to the site of materials stored for incorporation into work items, which require Special Inspection, may also be required upon notification from the Department.

C. The CONTRACTOR shall provide a minimum of 8 hours written notification counting only working hours and working days of a change in the Special Inspection schedule of time and/or date. Submit written notification, which provides the Project name and location, CONTRACTOR's name, and phone number, inspection cancelled, time changed or added, and reason for the change. Failure to provide this notification will result in a reduction of the Contract value for extra costs incurred by the DEPARTMENT.

D. A CONTRACTOR request for re inspection of previous Work shall include the DEPARTMENT's prior report, listing of deficiencies, and remedies provided since prior inspection.

1.07 DEPARTMENT RESPONSIBILITIES

A. Review schedules and request for inspections as submitted by CONTRACTOR for timeliness and conformance.

B. Provide qualified personnel at site after due notice; cooperate with CONTRACTOR in performance of services.

C. Perform specified inspection, inventorying, and testing of products in accordance with specified standards.

D. Promptly notify CONTRACTOR of observed irregularities or non-conformance of Work or products.

E. Perform additional inspections and re-tests required by the Contract Documents.

F. When applicable provide to the CONTRACTOR a written description of the DEPARTMENT's costs attributed to the inspection.

1.08 DEPARTMENT REPORTS

A. After each inspection or test, the DEPARTMENT will promptly submit one copy of inspection report to the CONTRACTOR. The report will include: date issued, project title, DEPARTMENT project number, name of inspector(s), date and time of inspection, identification of product and Specifications section, location in the Project, type of inspection or test, results of inspection or tests, and conformance with Contract Documents. When requested in writing by the CONTRACTOR, the DEPARTMENT will interpret the results.

1.09 LIMITS ON AUTHORITY RESULTING FROM INSPECTIONS

A. The DEPARTMENT may not release, revoke, alter, or enlarge on requirements of the Contract Documents through the issuance of an inspection report.

B. The DEPARTMENT may not approve or accept any portion of the Work through the issuance of an inspection report.

C. The DEPARTMENT may not assume any duties of the CONTRACTOR through the issuance of an inspection report.

D. The DEPARTMENT inspection report shall not constitute a stop work order.

1.10 CONTRACTOR RESPONSIBILITIES

A. Pre-construction Inspection Meeting. The CONTRACTOR shall arrange a meeting of all parties involved with Special Inspection, Inspection, and testing to be conducted by the Authority Having Jurisdiction (AHJ), to review all inspection requirements, particularly those involving Special Inspection.

B. Special Inspection Notification: The CONTRACTOR shall notify the DEPARTMENT 72 hours in advance of each required special inspection. The CONTRACTOR is responsible for notifying the DEPARTMENT in a timely manner regarding individual inspections for items listed in the Specifications and as noted in the Special Inspection Program approved by the AHJ. Adequate notice shall also be provided so that the Special Inspector has time to become familiar with the project.

C. Inspector access to approved plans: The CONTRACTOR shall be responsible for providing the Special Inspector access to or copies of approved plans at the job site.

D. Availability of Test Reports: The CONTRACTOR shall make copies of all test reports that are pertinent to the responsibilities of the Special Inspector available to that individual.

E. Access to Areas of Work: The CONTRACTOR shall provide adequate, safe means for the Special Inspector to access the areas to be inspected.

F. Retention of Special Inspection Records.: The CONTRACTOR shall be responsible for retaining at the job site copies of all special Inspection records submitted by the Special Inspector and copies of test reports, material ticket, etc. These records shall be available for review by the AHJ upon request.

G. Cooperate with DEPARTMENT personnel, and provide access to work and to manufacturer's facilities.

H. Provide incidental labor and facilities to provide safe access to work to be inspected, to obtain and furnish incidental supplies at the site or at source of products to be inspected, to facilitate tests and inspections, and for storage and curing of test samples when appropriate.

I. Notify the DEPARTMENT as required above in CONTRACTOR Submittals for operations requiring inspection, special inspection and testing services.

J. Pay costs of DEPARTMENT furnished services for all re-inspections as required by Contract Documents.

PART 2 - PRODUCTS **Not Used**

PART 3 – EXECUTION **Not Used**

END OF SECTION

SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. CONTRACTOR'S requirements for quality control inspections and testing.

1.02 RELATED REQUIREMENTS

A. Section 00700 General Conditions: Inspections, testing, and approvals required by public authorities

B. Section 01 33 00- Submittal Procedure

C. Section 01 45 00 Quality Control

D. Section 01 45 23 – Departmental Inspection Service.

E. Section 01 73 00 – Execution Requirements

F. Individual Specification Sections: Inspections and tests required, and standards for testing

1.03 REFERENCES

A. ANSI/ASTM E329 – Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction.

1.04 SELECTION AND PAYMENT

A. The CONTRACTOR shall employ and pay for the services of an independent, industry-recognized testing laboratory or laboratories to perform specified inspection and testing. The laboratory shall be corporately and financially independent of the CONTRACTOR's organization, as well as of any organization which is associated with performing the Work, such that it can offer an unbiased professional appraisal of compliance with the technical requirements of the Contract. The qualifications of the proposed testing laboratory and personnel shall be submitted to the DEPARTMENT for review and approval, 30 days prior to any inspection or testing by the laboratory.

B. Employment of testing laboratory shall in no way relieve the CONTRACTOR of obligation to perform Work in accordance with requirements of the Contract Documents.

1.05 QUALITY ASSURANCE

A. Comply with requirements of ANSI/ASTM E329.

B. The testing laboratory shall maintain an Alaska registered Engineer on staff to review services.

C. The laboratory shall be authorized to operate in State in which testing is performed.

D. Testing equipment shall be calibrated at reasonable intervals with devices of having an accuracy traceable to either NBS Standards or accepted values of natural physical constants.

1.06 CONTRACTOR SUBMITTALS

A. Prior to the start of Work, submit testing laboratory name, address, and telephone number, and names of registered Engineer and responsible officer.

B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.07 LABORATORY RESPONSIBILITIES

A. Test samples of materials and mixes submitted by CONTRACTOR.

B. Provide qualified personnel at site after due notice; cooperate with the DEPARTMENT and the CONTRACTOR for the performance of services.

C. Perform specified inspection, sampling, and testing of products and installations in accordance with specified standards. When requested, perform these services at locations designated by the DEPARTMENT.

D. Ascertain compliance of materials and mixes with requirements of the Contract Documents.

E. Promptly notify the DEPARTMENT and the CONTRACTOR of observed irregularities or non-conforming Work or products.

F. Perform additional inspections and tests required by the DEPARTMENT.

G. Attend pre-construction conferences and progress meetings.

1.08 LABORATORY REPORTS

A. Inspection reports shall be transmitted in duplicate each day to the DEPARTMENT and the Engineer of Record.

B. Reports for tests conducted shall be submitted to the DEPARTMENT immediately after the results are determined and no later than when the testing agency leaves the site for the day.

C. Within 24 hours of the completion of each inspection and test, submit ONE copy of the laboratory report directly to the DEPARTMENT in addition to copies required by the CONTRACTOR. Include: date issued, project title and DEPARTMENT project number, name of inspector, date and time of sampling or inspection, identification of product and specifications section, location in the Project, type of inspection or test, date of test, results of tests, and conformance with Contract Documents. When requested by the DEPARTMENT, provide written interpretations of test results.

1.09 LIMITS ON TESTING LABORATORY AUTHORITY

A. The testing laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. The laboratory may not approve or accept any portion of the Work.

C. The laboratory may not assume any duties specified to be performed directly by the CONTRACTOR.

D. The laboratory has no authority to stop Work.

1.10 CONTRACTOR RESPONSIBILITIES

A. Deliver to the testing laboratory, at a designated location, adequate samples of materials proposed to be used which require testing, together with proposed mix designs.

B. Cooperate with laboratory personnel, and provide safe access to Work.

C. Provide incidental labor and facilities to provide safe access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

D. Notify the DEPARTMENT and the CONTRACTOR's laboratory 48 hours prior to expected time for operations requiring inspection and testing services.

E. Provide the DEPARTMENT 4 hours written notification of change in date and/or time of inspection and/or testing services.

F. Pay costs of testing laboratory services for all tests.

PART 2 - PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

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SECTION 01 51 00
CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for furnishing and maintaining construction facilities during the project.

1.02 RELATED REQUIREMENTS

A. Section 01 11 13 – Summary of Work

B. Section 01 29 76 – Application for Payment

C. Section 01 52 13 – Field Offices and Sheds

D. Section 01 71 13 – Mobilization and Demobilization

E. Section 01 71 23 – Field Engineering

F. Section 01 73 00 – Execution Requirements

1.03 TEMPORARY ELECTRICITY

A. Unless specified elsewhere, the CONTRACTOR shall make its own provisions for temporary electrical service.

B. Provide lighting for construction operations.

1.04 TEMPORARY HEAT

A. Provide and pay for heat devices, insulated enclosure, tenting, and heat as required to maintain specified conditions for construction operations, to protect materials and finishes from damage due to temperature or humidity.

B. Heating with resistance electric heat shall not be allowed.

1.05 TEMPORARY VENTILATION

A. Provide and pay for ventilation of enclosed areas to cure materials, to disperse humidity, to prevent accumulations of dust, fumes, vapors, or gases, and to maintain a safe work environment.

1.06 TEMPORARY WATER SERVICE

A. Unless specified elsewhere, the CONTRACTOR shall make its own provisions for temporary water service.

1.07 TEMPORARY SANITARY FACILITIES

A. Unless specified elsewhere, provide and maintain required facilities and enclosures. Use of existing toilet facilities by CONTRACTOR is prohibited.

1.08 TEMPORARY TELEPHONE SERVICE

A. Unless specified elsewhere, provide, maintain and pay for telephone service to the CONTRACTOR field offices.

1.09 BARRIERS

A. Provide as required to prevent entry to construction areas and to protect adjacent properties from damage from construction operations

B. Maintain lights of such size and location each night between the hours of sunset and sunrise upon all obstructions resulting from work which may endanger or obstruct vehicle traffic, and be responsible for all damages to persons and property resulting from failure to maintain lights. Designate personnel to replace or relight markers or barricades and provide the DEPARTMENT with their names and telephone numbers for use in summoning them as necessary.

1.10 FREEZE PROTECTION

A. Provide freeze protection for all water service piping, valves, and other components.

B. Prior to submitting the first application for payment, the CONTRACTOR shall submit a Freeze Protection Plan. The plan shall describe when freeze protection will be implemented during construction, and the methods to be used.

C. Permanent building heating equipment furnished and installed as part of this Contract shall not be used for the purpose of freeze protection during construction. When the permanent building heating equipment is started up and commissioned as scheduled for service for building occupancy, the CONTRACTOR is allowed to realize the incidental benefit of freeze protection. Reference applicable Division 15 Sections for permanent heating equipment and system requirements.

D. Freeze Protection shall be maintained in place throughout the season when freezing temperatures may exist and affect the work.

E. The CONTRACTOR shall remove all freeze protection materials and equipment when no longer required unless it is required to remain in place by other provisions of this Contract.

F. All costs for freeze protection shall be incidental to the CONTRACTOR’s contract price.

1.12 CONSTRUCTION FENCES

A. Include all supplementary parts necessary or required for a complete and satisfactory installation of temporary fences. All runs of the fence shall present the same general appearance.

B. Material requirements, unless shown otherwise on the Drawings:

1. Fabric: No. 9 ASW gage zinc coated or approved equal.
2. Barbed Wire (Zinc-coated): 3-strand twisted No. 12 ½ ASW gage galvanized steel wire with 4-point barbs of No. 14 ASW gage galvanized steel wire, or approved equal. The barbs shall be spaced approximately 4 inches apart.
3. Wire ties and tension wire: No. 7 ASW gage marcelled steel wire with same coating as fabric and conforming to ASTM A824.
4. Plywood, if used shall be painted.

C. Other requirements:

1. Used materials may be installed provided the used materials are good, sound, and are suitable for the purpose intended.
2. Posts and braces shall be galvanized steel pipe conforming to the requirements of ASTM F1038 and sized in accordance with Tables 1 through VI of Federal Specifications RR-F-191/3. Posts shall be spaced more than 10 feet apart.
3. Galvanizing of steel items will be required.
4. Temporary fences that are damaged from any cause during the progress of the work shall be repaired or replaced by the CONTRACTOR at the CONTRACTOR's expense.
5. If no longer required for the Work as determined by the DEPARTMENT, temporary fences shall be removed. Removed facilities shall become the property of the CONTRACTOR and shall be removed from the site of the work.
6. In secure areas away from traffic, fence shall be 8 feet high. Fence construction shall include top and bottom tension wires. All fabric tension wire and barbed wire shall be installed taught with no more than 2 inch open gaps between bottom of fence and underlying surface.

1.13 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Not Used

1.14 SECURITY

A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.

1.15 REMOVAL OF UTILITIES AND FACILITIES

A. Remove CONSTRUCTION FACILITIES, equipment (including temporary boiler stack), facilities, and materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 3 feet below finish grades. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore permanent facilities used during construction to specified condition.

1.16 SHORING AND BRACING

A. The CONTRACTOR is responsible for designing and providing shoring and bracing permit required to accomplish the work. This includes shoring adjacent facilities, shoring for excavation work, and shoring and bracing for installation of concrete, masonry, and steel.

B. The CONTRACTOR's shoring and bracing for protecting existing facilities, for stabilizing excavations, for supporting elevated slabs, and for resisting loads that could result in

damage to existing construction or injury to workers, shall be designed by an Alaska registered civil engineer.

C. Provide a sealed and signed copy of shoring and bracing calculations and drawings to the DEPARTMENT for informational purposes only. The submission of calculations to the DEPARTMENT shall not transfer responsibility for the design of shoring and bracing to the DEPARTMENT. Rather, the DEPARTMENT will receive the calculations to verify they have been done by a registered engineer.

1.17 PRE-CONSTRUCTION PROPERTY AND STRUCTURE ASSESSMENTS

A. The CONTRACTOR shall perform pre-construction condition assessments of adjacent properties and structures to the site.

B. The assessments shall be performed by a qualified company with 5 years of experience performing commercial building condition assessments. Submit qualifications to the Department.

C. Assessments shall be provided in written and DVD format.

1.18 COST RESPONSIBILITY

A. Except as otherwise noted, the cost of construction facilities and utilities shall be the responsibility of CONTRACTOR.

PART 2 - PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

SECTION 01 52 13
FIELD OFFICES AND SHEDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for field offices and sheds for use by the CONTRACTOR and the DEPARTMENT during construction.

1.02 RELATED REQUIREMENTS

A. Section 01 11 13 – Summary of Work

B. Section 01 29 76 – Application for Payment

C. Section 01 51 00 – Construction Facilities

D. Section 01 71 13 – Mobilization and Demobilization

1.03 CONSTRUCTION

A. Coordinate Construction of Field offices with to meet the requirements of the Authority Having Jurisdiction.

1.04 CONTRACTOR OFFICE

A. Provide field office(s) to provide adequate office space for the CONTRACTOR'S on-site administrative personnel. Offices shall be weather-tight, with lighting, electrical outlets, and heat.

B. The CONTRACTOR shall provide any office equipment, supplies, and utilities that it deems necessary to support its on-site operations.

1.05 STORAGE SHED

A. Storage sheds are optional for this project. If storage sheds are desired by the CONTRACTOR, provide as desired for Tools, Materials, and Equipment. The sheds shall be Weather-tight, with adequate heat and ventilation for products requiring controlled conditions, with adequate space for organized storage and access, and adequate lighting for inspection of stored materials.

B. Provide adequate security to protect the contents of storage sheds.

1.06 DEPARTMENT FIELD OFFICE

A. Provide field office trailer for use by DEPARTMENT. Trailer shall be a minimum of 12 feet long, shall contain heat, lighting and power.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

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SECTION 01 57 10
EROSION, SEDIMENT AND POLLUTION CONTROL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Provide project administration and Work relating to control of erosion, sedimentation, and discharge of pollutants, according to this section and applicable local, state, and federal requirements, including the APDES Construction General Permit. The state APDES program is administered by DEC. Section 301(a) of the Clean Water Act (CWA) and 18AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except in accordance with the permit.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections apply to this Section.

1.03 DEFINITIONS

These definitions apply only to Section 01 57 10

A. **Active Treatment System Operator**. CGP, Appendix C.

B. **Alaska Certified Erosion and Sediment Control Lead (AK-CESCL)**. A person who has completed training, testing, and other requirements of, and is currently certified as, an AK-CESCL from an AK-CESCL Training Program (a program developed under a Memorandum of Understanding between the Department and others). The Department recognizes AK-CESCLs as “qualified personnel” required by the CGP. An AK-CESCL must be recertified every three years.

C. **Alaska Department of Environmental Conservation (DEC)**. The state agency authorized by EPA to administer the Clean Water Act’s National Pollutant Discharge Elimination System.

D. **Alaska Excavation, Dewatering General Permit (EDGP).** The permit authorizing excavation dewatering discharges from Construction Activities.

E. **Alaska Pollutant Discharge Elimination System (APDES)**. A system administered by DEC that issues and tracks permits for storm water discharges.

F. **Best Management Practices (BMPs)**. CGP, Appendix C.

G. **Clean Water Act (CWA)**. Federal Water Pollution Control Amendments of 1972, as amended (33 U.S.C. 1251 et seq.).

H. **Construction Activity.** Physical activity by the Contractor, Subcontractor or utility company within the Project Zone; that may result in erosion, sedimentation, or a discharge of pollutants into storm water. Construction Activity includes soil disturbing activities (e.g. clearing, grading, excavating); and construction materials or equipment storage or maintenance (e.g. material piles, borrow area, concrete truck chute washdown, fueling); and other industrial storm water directly related to the construction process (e.g. concrete or asphalt batch plants).

I. **Construction General Permit (CGP)**. The permit authorizing storm water discharges from Construction Activities, issued and enforced by DEC. The CGP is available online at: https://dec.alaska.gov/water/wastewater/stormwater.

J. **Electronic Notice of Intent (eNOI)**. The electronic Notice of Intent submitted to DEC, to obtain coverage under the CGP.

K. **Electronic Notice of Termination (eNOT)**. The electronic Notice of Termination submitted to DEC, to end coverage under the CGP.

L. **Environmental Protection Agency (EPA)**. A federal agency charged to protect human health and the environment.

M. **Erosion and Sediment Control Plan (ESCP)**. The Department's project specific document that illustrates measures to control erosion and sediment on the project. The ESCP provides bidders with the basis for cost estimating and guidance for developing an acceptable Storm Water Pollutant Prevention Plan (SWPPP).

N. **Erodible Stockpile.** The material storage or stockpile of material, organic and mineral aggregate, with greater than five percent passing the #200 sieve, wind or water transport, Engineer determined potential for material transport, or a combination thereof.

O. **Final Stabilization.** CGP Part 4.5 and Appendix C.

P. **Hazardous Material Control Plan (HMCP)**. The Contractor's detailed project specific plan for prevention of pollution from storage, use, transfer, containment, cleanup, and disposal of hazardous material (including, but are not limited to, petroleum products related to construction activities and equipment). The HMCP is included as an appendix to the SWPPP.

Q. **Inspection.** An inspection required by the CGP or the SWPPP, usually performed together by the Contractor's SWPPP Manager and Department's Stormwater Inspector.

R. **Low-Erodible Stockpile**. The material storage or stockpile of material identified in the CGP definition for Final Stabilization with no more than five percent organic and/or mineral aggregate passing the #200 sieve, unless approved. Sediment transport due to water or wind erosion is not permitted.

S. **Municipal Separate Storm Sewer System (MS4) Permit**. An DEC storm water discharge permit issued to certain local governments and other public bodies, for operation of storm water conveyances and drainage systems. See CGP for further definition.

T. **Multi-Sector General Permit (MSGP)**. The Alaska Pollutant Discharge Elimination System General Permit for storm water discharges associated with industrial activity.

U. **Operator(s).** The party(s) responsible to obtain CGP permit coverage. CGP, Appendix:

1. Contractor – is an Operator inside and outside the Project Zone.

2. Department – is an Operator inside the Project Zone.

V. **Pollutant**. Includes sediments and defined in the CGP, Appendix C.

W. **Project Zone**. The Contract furnished physical area for construction.

X. **Qualified Person.** CGP, Appendix C, and Subsection 01 57 10 1.05

Y. **Records**. Any record, report, information, document or photograph required to be created or maintained pursuant to the requirements of the CGP, the CGP storm water requirements of the Clean Water Act; and applicable local, state, and federal laws and regulations regarding document preservation.

Z. **Spill Prevention, Control and Countermeasure Plan (SPCC Plan)**. The Contractor's detailed plan for petroleum spill prevention and control measures that meet the requirements of 40 CFR 112.

AA. **Spill Response Field Representative.** The Contractor's representative with authority and responsibility for managing, implementing, and executing the HMCP and SPCC Plan.

BB. **Storm Event.** CGP, Appendix C.

CC. **Storm Water Pollution Prevention Plan (SWPPP).** CGP, Appendix C.

DD. **Storm Water Pollution Prevention Plan Two (SWPPP2).** The Contractor's detailed project specific plan to comply with CGP or MSGP requirements, for Contractor construction-related activities outside the Project Zone.

EE. **Subcontractor Spill Response Coordinator.** The subcontractor's representative with authority and responsibility for coordinating the subcontractor's activities in compliance with the HMCP and SPCC Plan.

FF. **Subcontractor SWPPP Coordinator.** The subcontractor's representative with authority to direct the subcontractor's work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the subcontractor's compliance with the SWPPP.

GG. **Superintendent.** The Contractor's duly authorized representative in responsible charge of the work. The Superintendent has responsibility and authority for the overall operation of the Project and for Contractor furnished sites and facilities directly related to the Project.

HH. **SWPPP Amendment.** A modification to the SWPPP, CGP Part 5.0.

II. **SWPPP Manager.** The Contractor's qualified representative with authority and responsibility. CPP, Appendix C.

JJ. **SWPPP Preparer.** The Contractor's qualified representative who is responsible for developing the initial SWPPP.

KK. **Temporary Stabilization.** CGP, Appendix C.

LL. **U.S. Corp of Engineers Permit (USACOE Permit).** A U.S. Army Corp of Engineers Permit for construction in waters of the US. Such permit may be issued under Section 10 of the Rivers and Harbors Act of 1899, or Section 404 of the Clean Water Act.

MM. **Utility Spill Response Coordinator.** The Utility's representative with authority and responsibility for coordinating the Utility's activities in compliance with the HMCP and SPCC Plan.

NN. **Utility SWPPP Coordinator.** The Utility's representative with authority to direct the Utility's work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the Utility's compliance with the SWPPP.

1.04 PLAN AND PERMIT SUBMITTALS.

A. Partial and incomplete submittals will not be accepted for review. Any submittal that is re-submitted or revised after submission, but before the review is completed, will restart the submittal review timeline. No additional Contract time or additional compensation will be allowed due to delays caused by partial or incomplete submittals, or required re-submittals.

1. Storm Water Pollution Prevention Plan. Submit an electronic copy and three hard copies of the SWPPP to the Department for approval. Deliver these documents to the Department at least 21 days before beginning Construction Activity. Organize and bind the SWPPP and related documents for submittal according to the requirements of Subsection 01 57 10 3.01 B.

   The Department will review the SWPPP submittals within 14-calander days after they are received. Submittals will be returned to the Contractor, and marked as either "rejected" with reasons listed or as "approved" by the Department. When the submittal is rejected, the Contractor must revise and resubmit the SWPPP. The 14-day review period will restart when the contractor submits an electronic copy and three hard copies of the revised SWPPP to the Department for approval.

   After the SWPPP is approved and certified by the Department using Form 25D-109, the Contractor will certify the approved SWPPP Form 25D-111. See Item 4 of this list for further SWPPP submittal requirements.

2. Hazardous Material Control Plan. The HMCP Template can be found in the forms section at the following webpage: http://www.dot.state.ak.ust/stwddes/dcsconst/pop_constforms.shtml. Submit an electronic copy and one hard copy of the HMCP, as an appendix to the SWPPP, to the Department for approval. The HMCP submittal and review timeline, and signature requirements are the same as the SWPPP.

3. Spill Prevention, Control and Countermeasure Plan. When a SPCC Plan is required under Subsection 01 57 10 3.03, submit an electronic copy and three signed hard copies of the SPCC Plan to the Department. Deliver these documents to the Department at least 21 days before beginning Construction Activity. The Department reserves the right to review the SPCC Plan and require modifications.

4. Construction General Permit Coverage. The Contractor is responsible for permitting of Contractor and subcontractor Construction Activities related to the Project. The Contractor cannot use the SWPPP for construction activities outside the Project Zone where the Department is not an operator.

   After the Department certifies the SWPPP and prior to beginning Construction Activity, submit an eNOI with the required fee to DEC for coverage under the Construction General Permit (CGP). Submit a copy of the signed eNOI and DEC's written acknowledgement (by letter or other document) to the Department as soon as practicable and no later than three days after filing eNOI or receiving a written response. For projects less than one acre refrain from filing for an eNOI, unless directed by the Department or DEC.

   Do not begin Construction Activity until the conditions listed in Subsection 01 57 10 3.06 (B) are completed.

   The Department will submit an eNOI to DEC for Construction Activities inside the Project Zone. The Department will provide the Contractor with a copy of the Department's eNOI and DEC's written acknowledgment (by letter or other document), for inclusion in the SWPPP.

   Before Construction Activities occur, transmit to the Department an electronic copy of the approved and certified SWPPP, with signed Delegation of Signature Authorities Forms 25D-107 and 25D-108, SWPPP Certifications 25D-111 and 25D-109, both permitee's signed eNOIs and DEC's written acknowledgement.

5. Ending CGP Coverage. Submit an eNOT to DEC within 30 days after the Department has determined the conditions listed in Subsection 01 57 10 3.06 G have been met. Submit a copy of the signed eNOT and DEC's acknowledgement to the Department within three days of filing the eNOT or receiving a written response.

6. DEC SWPPP Review. When CGP, Part 2.1.3 requires DEC SWPPP review:

    a. Transmit a copy of the Department-approved SWPPP to DEC using delivery receipt confirmation;

    b. Transmit a copy of the delivery receipt confirmation to the Department within seven days of receiving the confirmation; and

    c. Retain a copy of delivery receipt confirmation in the SWPPP.

    Local Government SWPPP Review. When CGP, Part 2.1.4 requires local government review:

    a. Transmit a copy of the Department-approved SWPPP and other information as required to local government, with the required fee. Use delivery receipt confirmation;

    b. Transmit a copy of the delivery receipt confirmation to the Department within seven days of receiving the confirmation;

    c. Transmit a copy of any comments by the local government to the Department within seven days of receipt;

    d. Amend the SWPPP as necessary to address local government comments and transmit SWPPP Amendments to the Department within seven days of receipt of the comments; and

    e. Include a copy of local government SWPPP review letter in the SWPPP; and

    f. File a notification with local government that the project is ending.

7. Modifying Contractor's eNOI.

    a. When required by the CGP Part 2.7.1, modify the Contractor's eNOI to update or correct information within 30 calendar days of the change. Reasons for modification include change in start or end dates, change in Owner/Operator address and contact information, change in site information, any changes in number of acres to be disturbed, change in decision to use or not use treatment chemicals, or change in location of SWPPP Records.

    b. The Contractor must submit an eNOT and then submit a new eNOI instead of an eNOI modification when:

        1. The operator has changed

1.05 PERSONNEL QUALIFICATIONS

A. Provide documentation in the SWPPP that the individuals serving in these positions meet the personnel qualifications. The Department accepts the following certificates as equivalent to AK-CESCL: CPESC, Certified Professional in Erosion and Sediment Control or CISEC, Certified

Inspector in Sediment and Erosion Control, which are found in the CGP Appendix C and repeated below.

Table 01 57 01
Personal Qualifications

Personnel Title	Required Qualifications
SWPPP Preparer	Current certification as a Certified Professional in Erosion and Sediment Control (CPESC); OR Current certification as AK-CESCL, and at least two years' experience in erosion and sediment control, as a SWPPP Manager or SWPPP writer, or equivalent. OR Professional Engineer registered in the State of Alaska with current certification as AK-CESCL.
Superintendent	Current AK-CESCL or substitute training from CGP Appendix C Qualified Person Table 4
SWPPP Manager	Current AK-CESCL or substitute training from CGP Appendix C Qualified Person Table 4
Active Treatment System Operator	Current AK-CESCL or substitute training from CGP Appendix C Qualified Person Table 4. ATS operator should possess a recognized certification, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated the ability to meet the ATS requirement.

1.06 SIGNATURE/CERTIFICATION REQUIREMENTS AND DELEGATIONS

A. eNOI and eNOT. The eNOI and eNOT must be signed and certified by a responsible corporate officer according to CGP Appendix A, Part 1.12. Signature and certification authority for the eNOI and eNOT cannot be delegated.

B. Delegation of Signature Authority for Other SWPPP Documents and Reports. Use Form 25D-108 to delegate signature authority and certification authority to the Superintendent position, according to CGP Appendix A, Part 1.12.3, for the SWPPP, Inspection Reports and other reports required by the CGP. The Superintendent position is responsible for signing and certifying the SWPPP, Inspection Report, and other reports required by the CGP, except the eNOI, eNOT, and NOI Modifications.

C. The Department's delegation Form 25D-107, which the Contractor must include in the SWPPP will be provided.

D. Subcontractor Certification. Subcontractors must certify that they have read and will abide by the CGP and the conditions of the project SWPPP Form 25D-105.

E. Signature and Initials. Handwrite signatures or initials on CGP documents and SWPPP forms, wherever a signature or initial is required.

1.07 RESPONSIBILITY FOR STORM WATER PERMIT COVERAGE

A. The Department and the Contractor are jointly responsible for permitting and permit compliance within the Project Zone.

B. The Contractor is responsible for permitting and permit compliance outside the Project Zone. The Contractor has sole responsibility for compliance with DEC, USACOE and other applicable federal, state, and local requirements, and for securing all necessary clearances, rights, and permits. The Contractor shall be responsible for protection, care, and upkeep of all work, and all associated off-site zones.

C. The Contractor is responsible for obtaining a DEC General Permit for Excavation Dewatering (AKG0020000) if construction activities are within 1,500 feet of a DEC-identified contaminated site or groundwater plume.

D. An entity that owns or operates, a commercial plant or material source or disposal site outside the Project Zone, is responsible for permitting and permit compliance. The Contractor has sole responsibility to verify that the entity has appropriate permit coverage.

E. The Department is not responsible for permitting or permit compliance, and is not liable for fines resulting from noncompliance with permit conditions:

1. For Construction Activity and Support Activities outside the Project Zone; and

2. For commercial plants, commercial material sources, and commercial disposal sites.

1.08 UTILITY. (Reserved)

PART 2 – PRODUCTS

2.01 MATERIALS

A. Use materials suitable to withstand hydraulic, wind, and soil forces, and to control erosion and trap sediments according to the requirements of the CGP and the Specifications.

B. Use seed mixture specified in the contract or as directed by the Engineer.

C. Use soil stabilization material as specified.

D. Use silt fences as specified.

E. Use straw and straw product certified weed free of prohibited and restricted noxious weed seed and quarantined pests, according to Alaska Administrative Code, Title 11, Chapter 34 (11 AAC 34). When straw or straw products certified according to 11 AAC 34 are not available, use non-certified products manufactured within Alaska before certified products manufactured in another state, country, or territory. Non-certified straw or straw products manufactured in another state, country, or territory shall not be used. Grass, legumes, or any other herbaceous plants produced as hay, shall not be substituted for straw or straw products.

F. Use Oregon Scientific RGR126 wireless rain gauge with temperature, or Taylor 2751 Digital Wireless Rain Gauge with Thermometer, or approved equivalent.

PART 3 – EXECUTION

3.01 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS

A. SWPPP Preparer and Pre-Construction Site Visit.

1. Use a SWPPP Preparer to develop the SWPPP and associated documents, according to the requirements of the CGP and USACOE permit. The SWPPP Preparer must put their name, qualifications (including the expiration date of any certifications), title and company name in the SWPPP.

2. The SWPPP Preparer must conduct a pre-construction inspection at the Project site before construction activity begins. If the SWPPP Preparer is not a Contractor employee, the SWPPP Preparer must visit the site accompanied by the Contractor. Give the Department at least seven days' notice of the site visit, so that the Department may participate.

3. During the pre-construction inspection, the SWPPP Preparer must identify, or if a draft of the SWPPP has already been prepared verify that the SWPPP fully addresses and describes:

   a. Opportunities to phase construction activities;

   b. Appropriate BMPs and their sequencing; and

   c. Sediment controls that must be installed prior to beginning Construction Activities.

4. Document the SWPPP Preparer's pre-construction inspection in the SWPPP on Form 25D-106, SWPPP Pre-Construction Site Visit, including the names of attendees and the date.

B. Developing the SWPPP.

1. Use the Department's ESCP, Environmental Commitments, and other Contract documents as a starting point for developing the SWPPP. The approved SWPPP will be based on the current ESCP. BMPs identified in the ESCP must be addressed in the SWPPP.

2. Develop the SWPPP with sections and appendices, according to the current DOT&PF SWPPP template. Included information required by the Contract and described in the CGP, Part 5.0.

   a. Obtain the following forms after they have been completed by the Department and include them in the SWPPP:

      i. SWPPP Delegation of Signature Authority – DOT&PF (25D-107)
      ii. SWPPP Certification for DOT&PF (25D-109)
      iii. SWPPP Delayed Action Item Report (25D-113) completed by the Department, if needed.

   b. Use the following Department forms for recording information in the SWPPP:

      i. SWPPP Amendment Log (25D-114)
      ii. SWPPP Certification for Contractor (25D-111)
      iii. SWPPP Construction Site Inspection Report (25D-100)
      iv. SWPPP Corrective Action Log (25D-112)
      v. SWPPP Daily Record of Rainfall (25D-115)
      vi. SWPPP Delegation of Signature Authority – Contractor (25D-108)
      vii. SWPPP Grading and Stabilization Activities Log (25D-110)
      viii. SWPPP Pre-Construction Site Visit (25D-106)
      ix. SWPPP Project Staff Tracking (25D-127)
      x. SWPPP Subcontractor Certification (25D-105)
      xi. SWPPP Training Log (25D-125)
      xii. SWPPP Noncompliance (25D-143)

   c. SWPPP Template, Forms, and Instructions are available online at:

      https://dot.alaska.gov/stwddes/dcsconst/index.shtml Compile the SWPPP in three ring binders with tabbed and labeled dividers for each section and appendix.

C. SWPPP Considerations and Contents.

1. The SWPPP must provide erosion and sediment control measures for all Construction Activity within the Project Zone. Construction activity outside the Project Zone must have permit coverage, using separate SWPPP2(s), using a separate SWPPP2, and separate Contractor Inspections.

2. The SWPPP must consider the activities of the Contractor and all subcontractors and utility companies performing work in the Project Zone. The SWPPP must describe the roles and responsibilities of the Contractor, subcontractors, utility companies, and the Department with regard to implementation of the SWPPP. The SWPPP must identify all operators for the Project, including utility companies performing Construction Activity, and identify the areas:

   a. Over which each operator has operational control; and
   b. Where the Department and Contractor are co-operators.

3. For work outside the Project Zone the SWPPP must identify the entity that has stormwater permit coverage, the operator, and the areas that are:

   a. Dedicated to the Project and where the Department is not an operator; and
   b. Not dedicated to the project, but used for the project.

4. Develop the SWPPP according to the requirements of the CGP Part 5.0 and this specification. Utilize the DEC CGP SWPPP Template in conjunction with the DOT&PF SWPPP Template to develop the SWPPP. Account for the Contractor's construction methods and phasing. Identify the amount of mean annual precipitation.

5. Comply with the CGP Part 1.4.3 Authorized Non-Storm Water Discharges. List locations where authorized non-storm water will be used, including the types of water that will be used on-site.

6. If the project discharges to a Tier III, Outstanding Natural Resource Water, comply with CGP Part 2.1.6. Submittal deadlines apply prior to filing an eNOI and beginning construction activities. As noted, none have been designated in the state of Alaska as of the issuance of the 2021 CGP.

7. There are special requirements in the CGP Part 3.2, for storm water discharges into an impaired water body, and they may include monitoring of storm water discharges. For Projects meetings the permit criteria, the Contractor will implement a monitoring plan approved by the Department for the storm water within the Project Zone and will provide the required information and reports for inclusion in the SWPPP. The Contractor is responsible for monitoring and reporting outside the Project Zone.

8. Minimize the amount of soil exposed and preserve topsoil on site, unless infeasible according to the CPG Part 4.2.2.

9. Delineate the site according to CGP Part 4.2.1.

10. The SWPPP must identify specific areas where potential erosion, sedimentation, or pollution may occur. The potential for wind erosion must be addressed. The potential for erosion at drainage structures must be addressed.

    Describe methods and time limits, to initiate temporary or final soil stabilization.

11. Include in the "Stabilize Soils" section of the SWPPP, a description of how you will minimize the amount of disturbed and unstabilized ground in the fall season. Identify anticipated dates of fall freeze-up and spring thaw. Describe how you will stabilize areas when it is close to or past the seasonal time of snow cover or frozen conditions, and before the first seasonal thaw. Include a plan for final stabilization

12. Plans for Active Treatment Systems (ATS) must meet with the requirements in the CGP Part 2.1.5.

13. The SWPPP must provide designated area for equipment and wheel washing, equipment fueling and maintenance, chemical storage, staging or material storage, waste or disposal sites, concrete washouts, paint and stucco washouts, and sanitary toilets. These activities must be done in designated areas that are located, to the extent practicable, away from drain inlets, conveyance channels, and waters of the US. No discharges are allowed from concrete washouts, paint and stucco washout; or from release oils, curing compounds, fuels, oils, soaps, and solvents. Equipment and wheel washing water that does not contain detergency may be discharged on-site if it is treated before discharge.

14. Design temporary BMPs to accommodate a two year 24 hour storm event. . All installed control measures must be described and documented in the SWPPP according to the CGP Part 5.3.6. Amendments, including source controls, sediment controls, discharge points, and all temporary and permanent stabilization measures. Describe the design, placement, installation, and maintenance of each BMP, using words and drawings as appropriate. Describe the design capacity of sediment basins (including sediment ponds and traps). Provide a citation to the BMP Manual or publication used as a source for the BMP, including the manufacturers or BMP manual specifications for installation CGP Part 5.3.6.2. If no published source was used to select or design a BMP, then the SWPPP or SWPPP amendment must state that “No BMP manual or publication was used for this design.”

15. Describe the sequence and timing of activities that disturb soils and of BMP implementation and removal. Phase earth disturbing activities to minimize unstabilized areas, and to achieve temporary or final stabilization quickly. Whenever practicable incorporate final stabilization work into excavation, embankment and grading activities.

16. Provide a legible site map or set of maps in the SWPPP, showing the entire site and identify boundaries of the property where construction and earth-disturbing activities will occur. Include all the elements described in the CGP Part 5.3.5 and the DEC CGP SWPPP Template Section 5.0.

17. Identify the inspection frequency in the SWPPP according to the CGP Part 6.1.

18. Linear Projects Inspections, described in CGP Part 6.5, are not applicable to this contract.

19. The SWPPP must cite and incorporate applicable requirements of the Project permits, environmental commitments, USACOE permit and commitments related to historic preservation. Make additional consultations or obtain permits as necessary for Contractor specific activities which were not included in the Department’s permitting and consultation.

20. The SWPPP is a dynamic document. Keep the SWPPP current by noting installation, modification, and removal of BMPs, and by using amendments, SWPPP amendment logs, Inspection Reports, corrective action logs, records of land disturbance and stabilization, and any other records necessary to document storm water pollution prevention activities and to satisfy the requirements of the CGP and this specification. See Subsection 01 57 10, 3.08 for more information.

D. Recording Personnel and Contact Information in the SWPPP.

1. Identify the SWPPP Manager as the Storm Water Lead and Strom Water Inspector positions in the SWPPP. Document the SWPPP Manager’s responsibilities in Section 2.0 Storm Water Contacts, of the SWPPP template and:

    a. Identify that the SWPPP Manager does not have the authority to sign inspection reports (unless the SWPPP Manager is also the designated Project Superintendent).

b. Identify that the SWPPP Manager cannot prepare the SWPPP unless the SWPPP Manger meets the Contract requirements for the SWPPP Preparer.

2. Include in the SWPPP, proof of AK-CESCL or equivalent certifications for the Superintendent and SWPPP Manager, and for any acting Superintendent and acting SWPPP Managers. If the Superintendent or SWPPP Manager is replaced permanently or temporarily, by an acting Superintendent or acting SWPPP Manager; record in the SWPPP (use Form 25D-127) the names of the replacement personnel, the date of the replacement. For temporary personnel record their beginning and ending dates.

3. Provide 24-hour contact information for the Superintendent and SWPPP Manager. The Superintendent and SWPPP Manager must have 24-hour contact information for all Subcontractor SWPPP Coordinators and Utility SWPPP Coordinators.

4. Include in the SWPPP, proof of AK-CESCL, or equivalent certifications of ATS operators. Record names of ATS operators and their beginning and ending dates on Form 25D-127.

5. The Department will provide proof of AK-CESCL or equivalent certifications for the Project Engineer the Stormwater Inspectors, and Monitoring Person (if applicable), and names and dates they are acting in that position. Include the Department's Records in the SWPPP Appendix E. Include the Department's Storm Water Inspector and Storm Water Monitoring Person (if applicable) in Section 2.0 of the SWPPP.

3.02 HAZARDOUS MATERIAL CONTROL PLAN (HMCP) REQUIREMENTS

A. Prepare the HMCP using the DOTPF template for the prevention of pollution from storage, use, containment, cleanup, and disposal of all hazardous material, including petroleum products related to construction activities and equipment. Include the HMCP as an appendix to the SWPPP. Compile Material Safety Data Sheets in one location and reference that location in the HMCP.

B. Designate a Contractor's Spill Response Field Representative with 24-hour contact information. Designate a Subcontractor Spill Response Coordinator for each subcontractor. The Superintendent and Contractor's Spill Response Field Representative must have 24-hour contact information for each Subcontractor Spill Response Coordinator and the Utility Spill Response Coordinator.

C. List and give the location and estimated quantities of hazardous materials (Including materials or substances listed in 40 CFR 117 and 302, and petroleum products) to be used or stored on the Project. Hazardous materials must be stored in covered storage areas. Include secondary containment for all hazardous material storage areas.

D. Identify the locations where fueling and maintenance activities will take place, describe the activities, and list controls to prevent the accidental spillage of petroleum products and other hazardous materials. Controls include placing absorbent pads or other suitable containment under fill ports while fueling, and under equipment during maintenance or repairs.

E. Use secondary containment under all stationary equipment (equipment that does not have a seat for driving) that contains petroleum products. Use secondary containment under pumps, compressors, and generators.

F. List the types and approximate quantities of response equipment and cleanup materials available on the Project. Include a list and location map of cleanup materials, at each different work site and readily available off site (materials sources, material processing sites, disposal sites, staging areas, etc.). Spill response materials must be stored in sufficient quantity at each work location, appropriate to the hazards associated with that site.

G. Describe procedures for containment and cleanup of hazardous materials. Describe a plan for the prevention, containment, cleanup, and disposal of soil and water contaminated by spills. Describe a plan for dealing with contaminated soil and water encountered during construction. Clean up spills or contaminated surfaces immediately.

H. Describe methods of disposing of waste petroleum products and other hazardous materials generated by the Project, including routine maintenance. Identify haul methods and final disposal areas. Assure final disposal areas are permitted for hazardous material disposal.

I. Describe methods of complying with the requirements of AS 46.04.010-900, Oil and Hazardous Substances Pollution Control, and 18 AAC 75. Include contact information for reporting hazardous materials and petroleum product spills to the Department and reporting to federal, state and local agencies.

3.03 SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN (SPCC Plan) REQUIREMENTS

A. Prepare and implement an SPCC Plan when required by 40 CFR 112; when both of the following conditions are present on the Project:

1. Oil or petroleum products from a spill may reach navigable waters (as defined in 40 CFR 112); and

2. Total above ground storage capacity for oil and any petroleum products is greater than 1,320 gallons (not including onboard tanks for fuel or hydraulic fluid used primarily to power the movement of a motor vehicle or ancillary onboard oil-filled operational equipment, and not including containers with a storage capacity of less than 55 gallons).

B. Reference the SPCC Plan in the HMCP and SWPPP.

3.04 RESPONSIBILITY AND AUTHORITY OF THE SUPERINTENDENT AND SWPPP MANAGER

A. The Superintendent is responsible for the overall operation of the Project and all Contractor furnished sites and facilities directly related to the Project. The Superintendent shall sign and certify the SWPPP, Inspection Reports, and other reports required by the CGP, except the eNOI and eNOT. The Superintendent may not delegate the task or responsibility of signing and certifying the SWPPP submitted under Subsection 01 57 10 1.04, Inspection Reports, and other reports required by the CGP.

B. The Superintendent may assign certain duties to the SWPPP Manager; those duties may include:

1. Ensuring Contractor’s and subcontractor’s compliance with the SWPPP and CGP;

2. Ensuring the control of erosion, sedimentation, or discharge of pollutants;

3. Directing and overseeing installation, maintenance, and removal of BMPs;

4. Performing Inspections; and

5. Updating the SWPPP including adding amendments and forms.

C. If the Contactor utilizes a SWPPP Manager, the SWPPP Manager must be available at all times to administer SWPPP requirements, be physically present within the Project Zone or the project office, for at least eight hours per day when construction activities are occurring.

D. The Superintendent and SWPPP Manager shall be knowledgeable in the requirements of this Section, the SWPPP, CGP, BMPs, HMCP, SPCC Plan, environmental permits, environmental commitments, and historic preservation commitments.

E. The Superintendent and SWPPP Manager shall have the Contractor's complete authority and be responsible for suspending construction activities that do not conform to the SWPPP or CGP.

3.05 CONTRACTOR REQUIREMENTS

A. The Contractor must be familiar with the conditions and requirements of the CGP because Contractor's employees will be conducting duties that relate to compliance with the CGP.

3.06 CONSTRUCTION REQUIREMENTS

A. Comply with the SWPPP and the requirements of the CGP Part 5.0.

B. Before Construction Activity may Begin.

1. The following actions must be completed before Construction Activity begins:

   a. The SWPPP Preparer must visit the Project, the visit must be documented in the SWPPP (Form 25D-106), and the SWPPP must be developed (or amended) with findings from the visit.
   b. The SWPPP must be approved by the Department (Form 25D-109).
   c. The Contractor must be authorized to begin by the Department.
   d. The Project eNOIs for the Department and for the Contractor, as well as any other eNOIs if there are additional operators, must be listed as Active Status on the DEC website.
   e. The Department approved SWPPP must be submitted to DEC and Local Government per CGP Part 2.1.2 Part 2.1.3, Part 2.4.1, or when required.
   f. The Contractor has transmitted to the Department an electronic copy of the approved SWPPP.
   g. The Delegation of Authority Form for both the Contractor and the Department are signed (25D-108 and 25D-107).

2. Main entrance signage must meet requirements of GCP Part 5.10.2. Post notices must contain the following information:

   a. Permit authorization number assigned to the eNOIs;
   b. Operator contact name and phone number;
   c. Location of the SWPPP or the name and phone number of the contact person for scheduling SWPPP reviewing times.

   d. Post notices on the outside wall of the Contractor's project office, and near the main entrance of the construction project. Do not use retroreflective signs for the SWPPP posting. Do not locate SWPPP signs in locations where signs may be confused with traffic control signs or devices. Update the notices if the listed information changes.

3. Track precipitation according to CGP Part 7.3.9. Submit the method to track precipitation to the Engineer for approval.

4. Delineate the site according to the CGP Part 4.2.1. Install sediment control and other BMPs that must be placed prior to the initiation of ground disturbance.

C. During Construction.

1. Before subcontractors or utility companies begin soil disturbing activities, provide copies of applicable portions of the SWPPP, and require them to sign a SWPPP Subcontractor Certification (Form 25D-105). Include SWPPP Subcontractor Certifications as an appendix to the SWPPP. Ensure subcontractors and utility companies understand and comply with the SWPPP and the CGP. Inform subcontractors and utility companies of SWPPP amendments that affect them in a timely manner. Coordinate with subcontractors and utility companies doing work in the Project Zone so BMPs, including temporary and permanent stabilization are installed, maintained, and protected from damage.

2. Provide on-going training to employees, subcontractors, and utility companies on control measures at the site and applicable storm water pollution prevention procedures according to CGP Part 4.14. Training must be given at a frequency that will be adequate to ensure proper implementation and protection of control measures, no less frequently than once a month during construction activity. Document on the SWPPP Training Log. Form 25D-125, the dates and attendees to these trainings. Include the SWPPP Training Log in the SWPPP Appendix I.

3. Notify the Department immediately if the actions of any utility company or subcontractor do not comply with the SWPPP and the CGP.

4. Comply with the CGP Part 4.8.4 and Section 00700 Articles 6.14 and 6.17 for concrete washout. Do not install concrete washout containment within 100 feet of wetlands and/or other water bodies.

5. Comply with CGP Part 4.8.2 for Fueling and Maintenance activities. Place absorbent pads or other suitable containment under fill ports while fueling, and under equipment during maintenance or repairs. Install secondary containment under all stationary equipment that contains petroleum products.

6. Comply with requirements of the HMCP and SPCC Plan, and all local, state and federal regulations that pertain to the handling, storage, containment, cleanup, and disposal of petroleum products or other hazardous materials.

7. Keep the SWPPP and HMCP current (refer to Paragraph 3.01 (C), SWPPP Considerations and Contents)

D. Pollutant and Hazardous Materials Reporting Requirements.

1. Any release of hazardous substance must be reported immediately to the Engineer as soon as the person has knowledge of the discharge. Report spills of petroleum products or other hazardous materials to the Engineer and other agencies as required by law, and according to CGP Part 9.3.

    a. To water, any amount released must be reported immediately to the Engineer, DEC, and the Coast Guard.

    b. To land:

        i. Any release of a petroleum product in excess of 55 gallons must be reported as soon as the person has knowledge of the discharge CGP Part 9.3.2.
        ii. Any release of a petroleum product in excess of 10 gallons but less than 55 gallons must be reported to the Engineer and must be reported to DEC within 48 hours after the person has knowledge of the discharge CGP Part 9.3.2.
        iii. Any release of a petroleum product in excess of 1 gallon to 10 gallons must be recorded and logged and provided to DEC on a monthly basis.

c. Use the HMCP and SPCC Plan (if available) for contact information to report spills to regulatory agencies.

d. Implement measures to prevent the reoccurrence of and to respond to such releases.

e. Prior to disposal of contaminated material, submit a Contaminated Media Transport and Treatment Disposal Approval Form to DEC Spill Prevention and Response. Dispose as approved by DEC.

E. Corrective Action and Maintenance of BMPs.

1. Implement maintenance as required by the CGP Part 4.13 and Part 8.0, SWPPP, and manufacturer's specification, whichever is more restrictive.

2. Implement corrective action:

a. To comply CGP Part 8.0, Part 8.2, and the SWPPP.
b. If identified in an Inspection or the Department identifies the SWPPP or any part of the SWPPP is ineffective in preventing erosion, sedimentation or the discharge of pollutants
c. If a required BMP was not installed according to the SWPPP schedule or phasing, or was installed incorrectly, or was not installed according to the CGP Part 4.0;
d. If BMP is not operating as intended, has not been maintained in an effective operation condition, or is unable to effectively perform the intended function;
e. If a prohibited discharge of pollutants, as specified in CGP Part 4.7, is occurring or will occur;
f. If there is accumulation of sediment or other pollutants, that is in or near any storm water conveyance channels, or that may enter a discharge point or storm sewer system. If there is accumulation of sediment or other pollutants that is being tracked outside the project zone.

3. If a corrective action is not completed according to the CGP 8.2, document the conditions in the Corrective Action Log, notify the Engineer, and implemented the corrective action as soon as possible.

4. If a corrective Action could affect a subcontractor, notify the subcontractor within three days of taking the corrective action. Require in your written subcontract, that subcontractors must notify the Contractor within 24 hours of becoming aware of a condition that requires a corrective action.

F. Stabilization.

1. All soil stabilization requirements must be met in accordance with CGP Part 4.5 and the SWPPP.

2. When temporary or permanent seeding is required, provide a working hydro seeding equipment located within 100 miles of the project by road; with 1,000 gallon or more tank capacity, paddle agitation of tank, and the capability to reach the seed areas with an uniform mixture of water, seed, mulch and tackifier. If the project is located in an isolated community the hydro-seeder must be located at the project.

3. Apply temporary seed and stabilization measures after preparing the surface to reduce erosion potential and to facilitate germination and growth of vegetative cover. Apply seed and maintain seeded areas. Reseed areas where growth of temporary vegetative cover is inadequate to stabilize disturbed ground.

4. Apply permanent seed and stabilization measures after ground disturbing activity has permanently ceased. Comply with the CGP, SWPPP, and Contract requirements.

5. Incorporate final or temporary stabilization immediately after installing culverts or other drainage structures to satisfy CGP Part 4.5, the SWPPP, and the Engineer. Stabilization in areas upstream and downstream of culverts, drainages and areas disturbed by related construction activities after installation, or before deactivating stream bypass or diversion.

6. Stabilization before Fall Freeze up and Spring Thaw.

    a. Stabilize Construction Activities within the Project Zone with appropriate BMPs prior to the anticipated date of fall freeze up, in accordance with the SWPPP and CGP Part 4.12.

    b. Exceptions to stabilization prior to anticipated date of fall freeze up include:

        i. Where temporary stabilization activities are precluded by snow cover or frozen ground conditions prior to the anticipated date of fall freeze up, stabilization measures must be initiated as soon as practicable following the actual spring thaw.

        ii. When winter construction activity is authorized by the Engineer and conducted according to the contract9.

G. Ending CGP Coverage

1. The Engineer will determine the date that all the following conditions for ending CGP coverage have been met within the Project Zone:

    a. Land disturbing activities have ceased;
    b. Final Stabilization has been achieved on all portions of the Project Zone, in accordance with CGP Part 4.5.2 (including at Department furnished material sources, disposal sites, staging areas, equipment areas, etc.); and
    c. Temporary BMPs have been removed.

2. After the Engineer has determined the conditions for ending CGP coverage have been met according to CGP Part 10.2, the Department will:

    a. Send written notice to the Contractor with the date that the conditions were met;
    b. Submit an eNOT to DEC within 30 days; and
    c. Provide a copy of the eNOT and DEC's acknowledgement letter to the Contractor.

3. The Contractor is responsible for ending permit coverage within the Project Zone, by submitting an eNOT to DEC within 30 days of meeting the conditions for ending CGP coverage. The Contractor is responsible for BMP maintenance and SWPPP updates until permit coverage is ended.

4. If the Contractor's CGP eNOI acreage includes areas where the Department is not an Operator, the Contractor may not be able to file an eNOT at the same time as the Department. In this case, the Contractor must amend the SWPPP and separate SWPPP2(s), to indicate the Department's CGP coverage has ended, and the Department is no longer an Operator within the Project Zone.

5. The Contractor must indicate in the SWPPP the areas that have reached Final Stabilization, and the dates land disturbing activities ended, and Final Stabilization was achieved. The Contractor must submit an eNOT to DEC, and insert copies of the Department's and the Contractor's eNOTs with DEC's acknowledgement letters in the appendix of the SWPPP.

6. The Contractor must submit a copy of each signed eNOT and DEC's acknowledgement letter to the Department within three days of filling the eNOT or receiving a written response.

7. The Contractor is responsible for coordinating local government inspection of work and ending permit coverage with local government.

H. Transmit final SWPPP.

1. Transmit one copy of the final SWPPP, including all amendments and appendices, to the Department when the project eNOTs are filed, or within 30 days of the Department's eNOT being filed, whichever is sooner. Transmittal must be by both electronic and hard copy.

3.07 SWPPP DOCUMENTS, LOCATION ON-SITE AND RECORD RETENTION

A. The SWPPP and related documents maintained by the Contractor are the Record for demonstrating compliance with the CGP. Copies of SWPPP documents transmitted to the Department under the requirements of this specification are informational and do not relieve the Contractor's responsibility to maintain complete records as required by the CGP and this specification.

B. Keep the SWPPP, HMCP and SPCC Plan at the on-site project office. If there is not an on-site project office, keep the documents at a locally available location that meets CGP requirements and is approved by the Department. Records may be moved to another office for record retention after the eNOTs are filed. Records may be moved to another office during winter shutdown. Update on-site postings if records are relocated during winter shutdown. Provide the Department with copies of all Records

C. Retain Records and a copy of the SWPPP, for at least three years after the date of eNOT. If EPA or DEC inspects the project, issues a Notice of Violation (NOV), or begins investigation for a potential NOV before the retention period expires, retain the SWPPP and all Records related to the SWPPP and CGP until at least three years after EPA and/or DEC has determined all issues related to the investigation are settled.

D. The SWPPP and related documents must be made available for review and copy, to the Department and other regulatory agencies that request them. See CGP Part 5.10, CGP Part 6.6 and CGP Part 9.5.

3.08 SWPPP INSPECTIONS, AMENDMENTS, REPORTS, AND LOGS

A. Perform Inspections, prepare Inspection Reports, and prepare SWPPP Amendments in compliance with the SWPPP and the CGP using Department forms found at the DOT&PF Construction Forms website.

B. Inspection during Construction.

1. Conduct Inspections according to the schedule and requirements of the SWPPP and CGP Part 6.0. When the project is on a 14-calendar day inspection frequency, conduct Post-Storm Event Inspections within 24 hours of the end of a storm event, as required in addition to the 14-day predetermined inspection cycle.

2. Inspections required by the CGP and SWPPP must be performed by the Contractor's SWPPP Manager and the Department's Stormwater Inspector jointly, unless approved by the Engineer when:

a. One inspector is not on site, access is only by air, and weather delayed or canceled flights;

b. One of the inspectors is sick;
c. The project is on a reduced frequency inspection schedule with no staff on site, the only access to the site is by air, and it is economical to send only one inspector, or;
d. When the Engineer determines a safety concern that makes joint inspection impracticable.

3. When this is the case, the Operator who conducts the inspection must provide a copy of the Inspection Report to the other Operator within three days of the inspection date and document the date of the report transmittal in the SWPPP Appendix K.

C. Inspection Reports.

1. Use only the DOT&PF SWPPP Construction Site Inspection Report, Form 25D-100 to record Inspections. Changes or revisions to Form 25D-100 are not permitted; except for adding or deleting data fields that list: Location of Discharge Points, and Site Specific BMPs. Complete all fields included on the Inspection Report form; do not leave any field blank. Refer to the DOT&PF Construction Forms webpage for instructions to complete Form 25D-100.

2. Insert a Complete-by-Date for each corrective action listed that complies with:

a. Section 01 57 10 3.06 E.
b. The CGP Part 8.2.

3. Provide a copy of the completed, unsigned Inspection Report to the Department by the end of the next business day following the inspection.

4. The Superintendent must review, correct errors, and sign and certify the Inspection Report, within three days of the date of Inspection. The Project Engineer may coordinate with the Superintendent to review and correct any errors or omissions before the Superintendent signs the report. Corrections are limited to adding missing information or correcting entries to match field notes and conditions present at the time the Inspection was performed. Deliver the signed and certified Inspection Report to the Project Engineer on the same day the Superintendent signs it.

5. The Project Engineer will sign and certify the Inspection Report and will return the original to the Contractor within three working days.

6. The Project Engineer may make corrections after the Superintendent has signed and certified the Inspection Report. The Project Engineer will initial and date each correction. If the Project Engineer makes corrections, the Superintendent must recertify the Inspection Report by entering a new signature and date in the white space below the original signature and date lines. Send a copy of the recertified Inspection Report to the Project Engineer on the day it is recertified.

7. If subsequent corrections to the certified Inspection Report are needed, document the corrections in an amendment that addresses only the omitted or erroneous portions of the original Inspection Report. The Superintendent and the Project Engineer must both sign and certify the amendment. The issuance of an amendment does note relieve the Contractor of liquidated damages that may have been incurred as a result of the error on the original certified inspection report.

D. Inspection before Seasonal Suspension of Work.

1. Conduct an Inspection before seasonal suspension of work to confirm BMPs are installed and functioning according to the requirements of the SWPPP and CGP.

E. Reduced Inspection Frequencies.

1. Conduct Inspections according to the inspection schedule indicated in the approved SWPPP. Any change in inspection frequency must be approved by the Department and beginning and ending dates documented as an amendment to the SWPPP.

2. If the Engineer approves and the entire site is stabilized, the frequency of inspections may be reduced in accordance to the CGP Part 6.2.1. At actively staffed sites, inspect within two business days of the end of a storm event that results in a discharge from the site.

F. Winter Shutdown Inspections

1. Conduct winter shutdown inspection 14 calendar days after the anticipated fall freeze up date and conditions under the CGP Parts 4.12 and 6.2.3, and the SWPPP are met. The Engineer may approve suspension of inspections and waive requirements for updating the Grading and Stabilization Activities Log and Daily Record of Rainfall Form during Winter Shutdown.

2. Inspections must resume on a regular frequency or reduced inspection frequency identified in the SWPPP, at least 21 days before anticipated spring thaw CGP Part 6.2.3. Resume updating the Daily Record of Rainfall Form at the start of the 21-day spring thaw inspection.

G. Inspection before Project Completion

1. Conduct inspection to ensure Final Stabilization is complete throughout the Project, and temporary BMPs that are required to be removed are removed. Temporary BMPs that are biodegradable and are specifically designed and installed with the intent of remaining in place until they degrade, may remain in place after project completion if approved by the Project Engineer.

H. SWPPP Amendments and SWPPP Amendment Log.

1. The SWPPP Amendment Log Form 25D-114 must be filled out by an individual who holds a current AK-CESCL, or equivalent certification. The Superintendent or the SWPPP Manager must sign and date amendments to the SWPPP and updates to the SWPPP Amendment Log.

2. SWPPP Amendments must be approved by the Project Engineer.

3. Amendments must occur:

a. Whenever there is a change in design, construction operation, or maintenance at the construction site that has or could cause erosion, sedimentation or the discharge of pollutants that has not been previously addressed in the SWPPP;

b. If an Inspection identifies that any portion of the SWPPP is ineffective in preventing erosion, sedimentation, or the discharge of pollutants;

c. Whenever an Inspection identifies a problem that requires additional or modified BMPs;

d. Whenever a BMP is modified during construction, or a BMP not shown in the original SWPPP is added;

e. If the Inspection frequency is modified (note beginning and ending dates); or

f. When there is a change in personnel who are named in the SWPPP, according to Subsection 01 57 10 3.01 D;

g. When an inspection is not conducted jointly;

h. When a NOI modification is filed;

i. When a Noncompliance Report is filed with DEC.

4. Place all correspondence with DEC, EPA or MS4s in Appendix Q.

5. Amend the SWPPP narrative as soon as practicable after any change or modification, but in no case, later than seven days following identification of the need for an amendment. All SWPPP Amendments must be signed and dated. Cross-reference the amendment number with the Corrective Action Log or SWPPP page number, as applicable. When a BMP is modified or added, describe the BMP according to Subsection 01 57 10 3.01 C 14.

6. Keep the SWPPP Amendment Log current. Prior to performing each scheduled Inspection, submit to the Department a copy of the pages of the Amendment Log that contain new entries since the last submittal. Include copies of any documents amending the SWPPP.

7. Keep the SWPPP Amendment Log in Appendix M.

I. Site Maps.

1. Maintain site maps in accordance with CGP Part 5.3.5 and the SWPPP template 5.0. It is acceptable to have separate site maps for BMPs and grading and stabilization activities.

J. Corrective Action Log.

1. The Superintendent and SWPPP Manager are the only persons authorized to make entries on the SWPPP Corrective Action Log, Form 25D-112. Document the need for corrective action within 24 hours of either:

a. Identification during an inspection; or

b. Discovery by the Department's or Contractor's staff, a subcontractor, or a regulatory agency inspector.

c. If a corrective action is discovered outside of an inspection, update the log with the date of discovery, the proposed corrective action, and the date the corrective action was completed.

2. Modification or replacement of a BMP, installation of a new BMP not shown in the original SWPPP, or overdue maintenance is a corrective action and must be documented on the Corrective Action Log. Maintenance includes but not limited to sediment accumulated in sediment basins (including sediment traps or ponds) exceeds 50% of design capacity; or after sediment accumulates to more than half the above ground height on check dams or berms, or when sediment accumulates to more than one-third the above ground height on silt fences. Do not record removal of BMPs on the Corrective Action Log.

3. Keep the Corrective Action Log current and submit a copy to the Department prior to performing each scheduled SWPPP Inspection.

4. Keep the Corrective Action Log as an Appendix J to the SWPPP.

K. Grading and Stabilization Activities Log.

1. The Superintendent and SWPPP Manager are the only persons authorized to date and initial entries on the SWPPP Grading and Stabilization Activities Log, Form 25D-110. Use the SWPPP Grading and Stabilization Activities Log, to record land disturbance and stabilization activities.

2. Keep the Grading and Stabilization Activities Log current and submit a copy to the Department prior to performing each scheduled SWPPP Inspection. Keep the Grading and Stabilization Activities Log organized and completed to demonstrate compliance with CGP Part 4.5.

3. Keep the Grading and Stabilization Activities Log as an Appendix G of the SWPPP.

L. Daily Record of Rainfall.

1. Use SWPPP Daily Record of Rainfall, Form 25D-115, to comply with CGP Part 7.3.9. Submit a copy to the Engineer with each completed Inspection Report. Keep the Daily Record of Rainfall current in Appendix N of the SWPPP

M. Staff Tracking Log

1. Use the SWPPP Project Staff Tracking Form 25D-127, to identify project staff that are required to be AK-CESCL certified or hold an equivalent qualification CGP Appendix C. Complete this form to document the following positions; Superintendent, SWPPP Manager, Project Engineer, DOT&PF Stormwater Inspector, and when positions have changed in personnel, either permanent or temporary. Update the SWPPP Tracking Log within 24 hours of any changes in personnel, qualifications, or other staffing items related to administration of the CGP or Specification 10 57 10.

3.09 FAILURE TO PERFORM WORK

A. The Department has authority to suspend work and withhold monies, for an incident of non-compliance with the CGP, or SWPPP, that may endanger health or the environment or for failure to perform work related to Section 01 57 10. If the suspension is to protect workers, the public, or the environment from imminent harm, the Department may orally order the suspension of work. Following an oral order of suspension, the Department will promptly give written notice of suspension. In other circumstances, the Department will give the Contractor written notice of suspension before suspension of work. A notice of suspension will state the defects or reasons for a suspension, the corrective actions required to stop suspension, and the time allowed to complete corrective actions. If the Contractor fails to take the corrective action within the specified time, the Department may:

1. Suspend the work until corrective action is completed;

2. Withhold monies due the Contractor until corrective action is completed;

3. Assess damages or equitable adjustments against the Contract Amount; and

4. Employ others to perform the corrective action and deduct the cost from the Contract amount.

B. Reasons for the Department to take action under this section include, but are not limited to, the Contractor's failure to:

1. Obtain appropriate permits before Construction Activities occur;

2. Perform SWPPP Administration;

3. Perform timely Inspections;

4. Update the SWPPP;

5. Transmit updated SWPPP, Inspection Reports, and other updated SWPPP forms to the Department;

6. Maintain effective BMPs to control erosion, sedimentation, and pollution in accordance with the SWPPP, the CGP, and applicable local, state, and federal requirements;

7. Perform duties according to the requirements of Section 01 57 10; or

8. Meet requirements of the CGP, SWPPP, or other permits, laws, and regulations related to erosion, sediment, or pollution control.

C. No additional Contract time or additional compensation will be allowed due to delays caused by the Department's suspension of work under this section.

3.10 ACCESS TO WORK

A. The Project, including any related off-site areas of support activities, must be made available for inspection, or sampling and monitoring, by the Department and other regulatory agencies. See CGP Part 6.6.

3.11 LIQUIDATED DAMAGES FOR VIOLATING TERMS OF THE CGP

A. Liquidated Damages assessed according to Table 01 57 10-1 Version B are not an adjustment to the Contract amount. These damages charges are related to Contract performance but are billed by the Department to the Contractor, independent of the Contract amount. An amount equal to the Liquidated Damages may be withheld for unsatisfactory performance, from payment due under the Contract, until the Contractor remits payment for billed Liquidated Damages.

TABLE 01 57 10-1 Version B
EROSION, SEDIMENT AND POLLUTION CONTROL – LIQUIDATED DAMAGES

Code	Specification Subsection Number and Description	Deductible Amount in Dollars	Cumulative Deductible Amounts in Dollars
A	01 57 10 1.05 Failure to have a qualified (AK-CESCL or equivalent) Superintendent or SWPPP Manager	Calculated in Code B or F	
B	Failure to meet SWPPP requirements of: (1) 01 57 10 3.01 A Name of SWPPP Preparer (2) Not Applicable (3) 01 57 10 3.08 I Sign and Date SWPPP amendments with qualified person. 01 57 10 3.01 D SWPPP Include approving person's name and AK-CESCL expiration date. (4) 01 57 10 3.07 Records maintained at project and made available for review	$750 per omission	
C	Not Applicable		
D	01 57 10 3.06 F Failure to stabilize a Project prior to Fall Freeze Up	$5,000 per Project per year	
E	01 57 10 3.01 A Failure to conduct pre-construction inspections before Construction Activities on all projects greater than 1 acre	$2,000 per Project	
F*	01 57 10 3.08 A Failure to conduct and record CGP Inspections 01 57 10 3.08 B Personnel conducting Inspections and Frequency 01 57 10 3.08 C Inspection Reports, use Form 25D-100, completed with all required information	$750 per Inspection	Additional $750 for every additional 7 day period without completing the required inspection

G	01 57 10 3.06 E Corrective Action, Failure to timely accomplish BMP maintenance and/or repairs, In effect until BMP maintenance and/or repair is completed.	$500 per Project per day	
H	01 57 10 3.06 D Failure to provide to the Department and DEC a timely oral noncompliance report of violations or for a deficient oral endangerment report.	$750 for the first day the report is late or deficient	Additional $750 for every 14 day period without the required information
I	01 57 10 3.06 D Failure to provide to the Department and DEC a timely written noncompliance report, Form 25D-143, of violations or for a deficient written endangerment report.	$750 for the first day the report is late or deficient	Additional $750 for every 14 day period without the required information
J	01 57 10 3.09 Failure to comply with the requirements of the CGP, approved SWPPP, or Specification 01 57 10, except as listed above	$750 per occurrence for the first day	Additional $750 for every day the deficiency remains uncorrected

CODE F* Liquidated Damages according to Code F will not be billed for typographic errors and minor data entry errors except the liquidated damages will be assessed for the errors when:

a. The contractor has previously been notified and subsequent inspection reports repeat the same or similar error

b. Multiple inspection reports are submitted after submission due date and the same or similar errors are repeated on multiple overdue reports,

c. An error in recording the inspector's AK-CESCL certification date results in an inspector performing the inspection during a period when their certification was lapse or was otherwise invalid.

END OF SECTION

SECTION 01 60 00
MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for transportation and handling, storage and protection, substitutions, and product options.

1.02 RELATED REQUIREMENTS

A. Section 00700 – General Conditions

B. Section 01 33 23 – Shop Drawings

C. Section 01 42 19 Reference Standards

D. Section 01 33 00 - Submittal Procedures

E. Section 01 45 00 – Quality Control

F. Section 01 51 00 – Construction Facilities

G. Section 01 60 00A – Substitution Request Form

H. Section 01 73 00 – Execution Requirements

1.03 TRANSPORTATION AND HANDLING

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

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

C. Immediately on delivery, inspect shipment to assure:

1. Product complies with requirements of Contract Documents and reviewed submittals.
2. Quantities are correct.
3. Accessories and installation hardware are correct.
4. Containers and packages are intact and labels legible.
5. Products are protected and undamaged.

1.04 STORAGE AND PROTECTION

A. Handle and store materials for construction, products of demolition, and other items to avoid damage to existing buildings, and infrastructure. All materials stored or staged on the roof shall be properly covered and anchored to prevent materials from being blown off the roof. Do not overload the structure.

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

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

D. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter. Cover such material to prevent material from being blown or transported away from the stockpile.

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

1.05 SUBSTITUTIONS

A. Substitutions shall be allowed during the Bidding period only if Document 00100, Information to Bidders, designates a time for submitting requests for substitutions under requirements specified in this Section.

B. Only one request for substitution will be considered for each product from each Prime Bidder/CONTRACTOR. When substitution is not accepted, Prime Bidder/CONTRACTOR shall provide specified product.

C. DEPARTMENT will consider requests for Substitutions only within 90 days after date established in Notice to Proceed.

D. Substitutions may be considered when a Product becomes unavailable through no fault of the CONTRACTOR.

E. Document each request with complete data substantiating compatibility of proposed Substitution with Contract Documents.

F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

1.06 SUBSTITUTION SUBMITTAL PROCEDURE:

A. Submit four copies of Request for Substitution for consideration on Substitution Request form provided by DEPARTMENT (Section 01 60 00-A). Limit each request to one proposed Substitution.

B. Submit certification signed by the CONTRACTOR: that the CONTRACTOR:

1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product. List similar projects using proposed product, dates of installation and user telephone number.
2. Will provide an equivalent warranty for the Substitution as for the specified Product.
3. Will coordinate installation and make changes to other Work, which may be required for the Work to be complete with no additional cost to DEPARTMENT.
4. Waives claims for additional costs or time extension, which may subsequently become apparent from indirect costs.
5. Will reimburse Department for review or redesign services associated with re-approval by Authorities.

C. Submit shop drawings, manufacturers' product data, and certified test results attesting to the proposed Product equivalence and variations between substitute and specified product. The burden of proof is on proposer.

D. The DEPARTMENT will notify CONTRACTOR in writing of decision to accept or reject request.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

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

D. Do not use materials and equipment removed from existing structure, except as specifically required, or allowed, by Contract Documents.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers followed by the term "No Substitutions": use only specified manufacturers, no substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named that meets the description specifications of the named manufacturers.

PART 3 - EXECUTION **Not Used**

END OF SECTION

STATE OF ALASKA DOT & PF STATEWIDE PUBLIC FACILITIES	SUBSTITUTION REQUEST FORM (after Award)	

Project: Whittier Tunnel Standby Generators Project No.: 0496(13) / Z580270000

Contractor: _____

Specified item for which substitution is requested: _____
(reference specification section and paragraph)

The following product is submitted for substitution: _____
(describe proposed substitution and differences from specified item; attach complete technical, performance, and test data; state whether substitution affects dimensions and functional clearances shown on drawings or affects other trades, and include complete information for changes to drawings and/or specifications which proposed substitution will require for its proper installation.)

I certify the following:

Yes	No	
❑	❑	The substitute will perform adequately and achieve the results called for by the general design.
❑	❑	The substitute is similar, of equal substance, suited to the same use, and will provide the same warranty as the product specified.
❑	❑	An equivalent source of replacement parts is available.
❑	❑	The evaluation and approval of the proposed substitute will not delay the Substantial or Final Completion of the project.
❑	❑	Any change in the design necessitated by the proposed substitution will not delay the Substantial or Final Completion of the project.
❑	❑	The cost of any change in the design necessitated by the proposed substitution, including engineering and detailing costs, and construction costs caused by the substitution will be paid by the contractor at no cost to the State.
❑	❑	The cost of any license fee or royalty necessitated by the proposed substitution will be paid by the contractor at no cost to the State.

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Signed: _____ Date: _____
Authorized Contractor Signature

Architect/Engineer Recommendation:

❑ Accepted ❑ Accepted as Noted ❑ Not Accepted ❑ Received Too Late

Remarks:

Signed: _____ Date: _____
Architect/Engineer

Recommend Acceptance / Rejection _____ Date: _____
(circle one) Resident Engineer

❑ Accepted
❑ Rejected _____ Date: _____
Project Manager

SECTION 01 71 13
MOBILIZATION AND DEMOBILIZATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for mobilization and demobilization.

1.02 RELATED REQUIREMENTS

A. Section 01 11 13 – Summary of Work

B. Section 01 29 73 – Schedule of Values

C. Section 01 29 76 – Application for Payment

D. Section 01 51 00 – Construction Facilities

E. Section 01 52 13 – Field Office and Sheds

F. Section 01 77 00 – Contract Closeout

1.03 DEFINITIONS

A. Mobilization and Demobilization includes:

1. CONTRACTOR's work to prepare Site for Work under Contract and to marshal workers, materials and equipment, and those of subcontractors, to accomplish the Work.
2. Mobilization of all construction equipment, materials, suppliers, appurtenances, and the like, staffed and ready for commencing and prosecuting the Work, and the subsequent demobilization and removal from the site of said equipment, appurtenances, and the like upon completion of the Work.
3. Assembly and delivery to the site of plant, equipment, materials, and supplies necessary for the prosecution of Work which are not intended to be incorporated in the work; the clearing of and preparation of the CONTRACTOR's work area; the complete assembly, in working order, of equipment necessary to perform the required work; personnel services preparatory to commencing actual work; all other preparatory work required to permit commencement of the actual work on construction items for which payment is provided under the Contract.

1.04 REQUIREMENTS

A. Haul routes, staging areas, and security guard and flagger positions will be designated and/or subject to approval by DEPARTMENT, who will coordinate with CONTRACTOR to determine requirements and locations.

B. Cooperate with DEPARTMENT in allocation and use of MOBILIZATION AND DEMOBILIZATION areas of Site, field offices and sheds, materials storage, traffic, and parking facilities.

C. During construction, coordinate use of Site and facilities through DEPARTMENT.

D. Comply with DEPARTMENT'S procedures of contract communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of DEPARTMENT for use of utilities and construction facilities.

F. Coordinate field engineering and layout Work under instructions of DEPARTMENT.

G. Walk through Site with DEPARTMENT prior to start of Work.

1.05 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedure, for submittal requirements.

B. If requested by DEPARTMENT, submit a plan of the proposed layout of the construction site, including fences, roads, parking, buildings, staging, and storage areas, within seven (7) days after Notice to Proceed.

PART 2 – PRODUCTS **Not used**

PART 3 - EXECUTION

3.01 Delivery: Delivery to the jobsite of construction tools, equipment, materials, and supplies shall be accomplished in conformance with local governing ordinances and regulations and the requirements of the Contract Documents.

3.02 Upon completion of the Work, remove construction tools, apparatus, equipment, unused materials and supplies, plant, and personnel from the jobsite.

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for field surveying.

1.02 PERFORMANCE REQUIREMENTS:

A. The CONTRACTOR shall conduct pre-construction inspection and documentation surveys, accompanied by a representative of the DEPARTMENT, prior to start of work.

1.03 RELATED REQUIREMENTS

A. Section 00700 - General Conditions: Basic requirements.

B. Section 01 11 13 - Summary of Work: Work sequence, Use of premises, and Using Agency occupancy

C. Section 01 33 00 –Submittal Procedures

D. Section 01 51 00 – Construction Facilities

E. Section 01 73 00 – Execution Requirements

1.04 QUALITY CONTROL

A. Land Surveyor: Registered in the State of Alaska, and acceptable to DEPARTMENT.

B. Professional Engineer: Registered Professional Engineer of the discipline required elsewhere in the Contract Documents for specific service on Project, licensed in the State of Alaska.

C. DEPARTMENT reserves the right to field verify all survey data provided by the CONTRACTOR.

1.05 SUBMITTALS

A. Submit name, address, and telephone number of Surveyor/ Engineer before starting survey Work.

B. Submit survey notes as required by Sections 00700 and 00800.

C. On request, submit documentation verifying accuracy of survey Work.

1. Submit certificate signed by CONTRACTOR's Surveyor and Engineer, certifying that elevations and locations of improvements constructed under this contract are in conformance, or non-conformance, with Contract Documents.

D. Submit two copies of each survey or inspection report. The DEPARTMENT will retain both copies.

1.06 SURVEY RECORD DOCUMENTS

A. Maintain complete, accurate log of control and survey Work as it progresses.

B. On completion of foundation walls, buried utilities, and major site improvements, prepare a certified survey showing dimensions, locations, angles, and elevations of Work completed to permanent surface features, sufficient to develop a certified as-built plot plan and to obtain a certificate of occupancy from the Authority Having Jurisdiction.

C. Submit record documents under provisions of Section 01 78 39 – Project Record Documents.

PART 2 – PRODUCTS Not Used

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify locations of survey control points prior to starting Work. Promptly notify DEPARTMENT of any discrepancies discovered.

3.02 SURVEY REFERENCE POINTS

A. Protect survey control points prior to starting site Work; preserve permanent reference points during construction. Make no changes without prior written notice to DEPARTMENT.

B. Promptly report to DEPARTMENT the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated survey control points based on original survey control.

3.03 SURVEY REQUIREMENTS

A. Establish a minimum of one permanent bench mark on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

B. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:

1. Site improvements, including pavements; stakes for grading, fill and topsoil replacement; and utility locations, slopes, invert elevations, switch cabinets, etc.

2. Grid or axis for structures.
3. Building foundation, column locations, and ground floor elevations.

A. Periodically verify layouts by same means.

B. The CONTRACTOR shall obtain all field measurements for the accurate fabrication and installation of the work included in the Contract. Exact measurements are the CONTRACTOR's responsibility.

C. The CONTRACTOR shall furnish or obtain templates, patterns, and installation instructions as required for the installation of work. All dimensions shall be verified in the field.

D. Establish and maintain records of all existing and new utility locations.

3.04 SURVEYING ACCURACY AND TOLERANCES

A. Control Traverse surveys, computations and staking of the building grid control points shall be performed to the Third Order, Class I traverse surveys (1:10,000) as specified in the "Standards and Specifications for Geodetic Control Surveys," Federal Geodetic Control Committee.

B. Vertical Accuracy requirements for building foundations will meet the Survey Accuracy Requirements for Bridges as defined in "Construction Surveying Requirements," State of Alaska Department of Transportation and Public Facilities.

C. All other construction survey will be performed in accordance with "Construction Surveying Requirements".

3.05 DEPARTMENT AS-BUILT SURVEY

A. Department completed a boundary survey as part of the project. Survey will be made available to CONTRACTOR in cad and/or hard copy upon request.

END OF SECTION

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SECTION 01 72 00
UTILITIES COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Coordination of utilities to be provided by the CONTRACTOR, DEPARTMENT, and others, and utility locates.

1.02 RELATED DOCUMENTS

A. Section 00700 – General Conditions

B. Section 01 11 13 – Summary of Work

C. Section 01 31 14 – Work Coordination

D. Related Technical Specification Sections

1.03 UTILITIES PROVIDED BY OTHERS

A. The DEPARTMENT will provide permanent utilities listed in this section, to points of demarcation shown in the Contract Documents, under separate agreements with utility companies. The CONTRACTOR shall coordinate with the DEPARTMENT to sequence the provision of utilities provided by others with its Work.

B. Utilities to be provided by the DEPARTMENT are described below.

1. Disconnection of existing service lateral connections from the existing service equipment at each portal.
2. Temporary CEA transformer, within 15’ of the existing transformer, and associated primary feeder at each portal for temporary power to the tunnel facility.
3. Permanent CEA service lateral connections and conductors from the existing transformer to the new service equipment at each portal.
4. Refer to Section 01 31 14 Work Coordination for additional requirements
5. Not Used

C. The CONTRACTOR shall notify the DEPARTMENT at least Thirty (30) calendar days before it needs utility companies retained by the DEPARTMENT to begin work on the site. Coordinate with the DEPARTMENT to enable the utilities to be installed as per the requirements of the CONTRACTOR’S schedule.

D. Refer to Section 01 31 14 Work Coordination for additional requirements

E. Not Used

1.04 UTILITIES PROVIDED BY CONTRACTOR

A. The CONTRACTOR shall provide permanent utilities listed in this section and as shown in the contract documents.

B. Utilities to be provided by the CONTRACTOR are described below.

1. All temporary equipment, materials, and associated labor not listed in Part 1.03 of this section.
2. For temporary power to the tunnel facilities at each portal, CONTRACTOR shall provide temporary meter base, conduit, and wiring from the temporary transformer and temporary meter CT enclosure to the service equipment inside the portal. Contractor shall provide a temporary service disconnect (if necessary) inside the portal in a protected location.
3. All new electrical service equipment.
4. Replacement and relocation of the ARRC communication and power lines to the Signal Hut near the Whittier Portal.
5. Power for CONTRACTOR's use during construction shall be provided separately from the power for the tunnel facility.

C. Refer to Section 01 31 14 Work Coordination for additional requirements

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.01 UTILITY LOCATES

A. The CONTRACTOR shall request field locates from all utilities having facilities in the area a minimum of seven (7) calendar days prior to excavation. Utility company telephone numbers are summarized below:

Dig Line - 1-800-478-3121

Alaska DOT&PF Maintenance & Operations - 1-907-269-0760

B. For utilities within the footprint of the portal structures, the CONTRACTOR shall use x-ray, or other similar methods, to accurately locate utilities embedded in concrete.

C. The location and elevation of existing utilities shown on the Plans are approximate only. Additional utilities may exist that are not shown on the Plans. Before starting construction, the CONTRACTOR shall request all utility owners to locate their utilities and, at points of possible conflict, the CONTRACTOR shall uncover the located utilities.

D. The CONTRACTOR shall repair any damage caused to utilities by the CONTRACTOR's operations at no cost to the DEPARTMENT.

E. The CONTRACTOR shall protect and work around existing underground utilities.

F. Comply with requirements of utility companies when working with, in, or around their utilities.

3.02 NOTIFICATION FOR COORDINATION WITH UTILITY COMPANIES

A. Provide the DEPARTMENT and affected utility companies a minimum of thirty (30) calendar days advance written notice of any work requiring coordination with utility companies, or longer notification as required by the utility companies. The utility companies will not be required to work at more than one location at a time, and shall be allowed to complete work at a specific location prior to commencing with work at another specific location.

B. Not Used

3.03 STAGING DURING THE WORK

A. Coordinate with utility companies, whether retained by the DEPARTMENT or the CONTRACTOR, to allow adequate staging area on-site for utility companies to perform their work.

B. Designate and dedicate area seven calendar days prior to required Utility mobilization. Allow for multiple mobilizations as required to accommodate Contractor schedule.

C. Not Used

END OF SECTION

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SECTION 01 73 00
EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for addressing defects, cleaning, operating and maintenance manuals, spare parts, training, warranties and bonds, and maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 00700 - General Conditions: Fiscal provisions, legal submittals, and other administrative requirements

B. Section 01 26 63 – Change Procedures

C. Section 01 31 19 – Project Meetings

D. Section 01 33 00 –Submittal Procedures

E. Section 01 33 23 – Submittal Procedures

F. Section 01 45 23 – Departmental Inspection Services

G. Section 01 45 29 – Testing Laboratory Services

H. Section 01 60 00 – Material and Equipment

I. Section 01 71 23 – Field Engineering

J. Section 01 79 00 – Demonstration and Training.

1.03 CLOSEOUT PROCEDURES

A. Comply with Section 01 77 00 - Contract Closeout Procedures.

1.04 DEFECTS

A. Product defects shall be all items that affect the visual appearance or function of the Products. Defects shall be as identified below unless more stringent requirements are specified within specific sections.

B. Products shall be shall typically be viewed from a distance of 30.0 inches (760 mm).

C. Defects shall be solely determined by the Project Manager.

D. Defects, Product:

1. Cuts, Scrapes, Gouges Abrasions 0.250 inch (6 mm) long or longer than and 0.03125 inches (0.79375 mm) wide or wider that are visible at a distance of 30.0 inches (762 mm) shall be considered defects.
2. Abrasions less than the above shall be accepted.
3. Burns of any size that permanently discolor the surface material shall be considered defects.
4. Product color variation.

E. Defects, Joint:
1. Non-alignment of Products. Visual defects and non-alignment of joints shall be considered defective.

F. Defects, Structural:

1. Bent members or other structural damage shall be considered defective.
2. Incorrectly manufactured members shall be considered defective.

G. Defects, Corrosion:

1. Surface corrosion not exceeding one percent (1%) of the surface area shall be considered a visual defect.
2. Surface corrosion exceeding one percent (1%) and not exceeding five percent (5%) of the surface area shall be evaluated by the Project Manager.
3. Surface corrosion exceeding five percent (5%) of the surface area shall be shall be considered a structural defect.

H. Defects shall be repaired or replaced as solely determined by the Project Manager at no additional cost to the DEPARTMENT.

1. Structural defects shall be replaced, no exceptions.
2. Visual defects shall be repaired or replaced as solely determined by the Project Manager.

1.05 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain work and storage areas free of waste materials, debris, and rubbish. Maintain site in a neat and orderly condition to maintain safe passage and exits and to avoid fire hazard. Provide covered containers for deposit of waste materials.
B. Collect and remove waste materials, debris, and rubbish from site periodically and at least weekly, and dispose off-site. Have equipment and personnel available on-site daily to sweep and scrub roads and parking areas, which are work sites or haul routes.
C. Pavement striping and markings that cannot be effectively cleaned shall be replaced at expense of CONTRACTOR.

1.06 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion inspection.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances.

C. Use materials which will not create hazards to health or property, and which will not damage surfaces. Follow manufacturer's recommendations.

D. Maintain cleaning until DEPARTMENT issues certificate of Substantial Completion.

E. Remove waste, debris, and surplus materials from site. Clean grounds; remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.

1.08 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.09 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 3-ring slant “D” presentation ring binders, maximum 11-5/5” high and 11-1/4” deep. Spine, front, and back shall be heavy virgin vinyl sealed over heavy board. Binders shall have clear, full size pockets on spine and front cover. Thickness of content shall not exceed 75% of binder manufacturer’s stated capacity. All pages shall be 8 ½” x 11”, or 11” x 17” folded to 8 ½” x 11” in a manner to permit unfolding without removal from binder.

B. O&M Manual binders shall be black, clearly and permanently labeled as follows:

a. Spine

Project Name

Project Number

Operations & Maintenance Manual, Volume ____of _____

Building Name:

b. Front Cover:

Project Name:

Project No.:

Building Name:

CONTRACTOR:

Address

City, State, ZIP

Phone:

Fax:

Consultant:

Address

City, State, ZIP

Phone:

Fax:

Operations & Maintenance Manual, Volume ____of_____

Discipline:

Date:

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 24 pound white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, CONTRACTOR, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system process flow and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component.
    d. Operating instructions.
    e. Maintenance instructions for equipment and systems.
    f. Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:

    a. Shop drawings and product data.
    b. Air and water balance reports.
    c. Certificates.
    d. Originals of warranties and bonds.

E. Submit 1 draft copy of completed volumes 90 working days prior to Training or Substantial Completion inspection, whichever is earliest. This copy will be reviewed and returned, with DEPARTMENT comments. Revise content of all document sets as required prior to final submission.

F. Submit three sets of revised final volumes 45 days prior to Training or Substantial Completion inspection, whichever is earliest.

G. In addition to required hard copies, provide electronic copy on .pdf format with table of contents hyperlinked to all referenced sections.

1.10 TRAINING

A. Before Substantial Completion, instruct DEPARTMENT designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times. For equipment requiring seasonal operation, or placed into operation subsequent to Final Completion, perform instructions within six months.

B. Refer to Section 01 79 00 for additional training requirements.

C. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Unless specified elsewhere, the duration of on-site instruction shall be as specified.

E. Provide digital video recordings of all provided instruction in format approved by DEPARTMENT. Training videos shall be submitted prior to Substantial Completion.

F. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.11 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra Products in quantities specified in individual specification sections. These shall be labeled and stored per manufacturer's recommendations.

B. Deliver to Project site and place in location as directed; obtain receipt prior to Substantial Completion payment.

1.12 WARRANTIES AND BONDS

A. Provide duplicate notarized copies.

B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.13 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in specification sections for one year from date of Substantial Completion.

B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the DEPARTMENT.

PART 2 - PRODUCTS **Not Used**

PART 3 - EXECUTION REQUIREMENTS **Not Used**

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Related Documents and Requirements

B. General Requirements

C. Submittals

D. Structural Work

E. Operational Systems

F. Visual Requirements

G. Existing Warranties

H. Materials

I. Inspection

J. Preparation

K. Performance

L. Cleaning

1.02 RELATED REQUIREMENTS

A. Section 01 11 13 - Summary of Work

B. Section 01 31 14 - Work Coordination

C. Section 01 33 00 – Submittal Procedures

D. Section 01 60 00 - Material and Equipment

1.03 REQUIREMENTS

A. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Repairs and Patching: CONTRACTOR shall repair or patch all cut or disturbed areas as incidental to the Work. All patching and repairs shall match adjacent areas in texture, color, materials, and quality of workmanship.

C. Employ skilled and qualified workers to perform cutting and patching.

1.04 SUBMITTALS

A. Cutting and Patching Proposal: Prior to proceeding with cutting and patching, submit and obtain DEPARTMENT'S review of proposed cutting and patching procedures.

B. Include the following information, as applicable, in proposal:

1. Describe extent of cutting and patching required. Show how it will be performed and indicate why it is unavoidable.
2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates and times when cutting and patching will be performed.
5. Describe how the Work may affect operations of the facility user and what measures will be taken to mitigate them.
6. Utilities: List utilities cutting and patching procedures will disturb or affect. Describe how service from affected utilities will be bypassed if necessary to maintain uninterrupted service.
7. Structural: Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
8. Roofing and Exterior Architectural Systems: Submit information on proposed cutting and patching procedures adequate for the DEPARTMENT to obtain in writing from the manufacturer of the existing system that the proposed procedures will not void the manufacturer's warranty. Work shall be performed by an installer authorized by the existing system manufacturer.

C. The DEPARTMENT'S review of cutting and patching proposals does not waive its right to later require complete removal and replacement of unsatisfactory work.

1.05 STRUCTURAL

A. Requirements for Structural Work: Do not cut and patch structural elements in manner that would change their load-carrying capacity or load-deflection ratio.

B. Obtain approval of cutting and patching proposal before cutting and patching following structural elements:

1. Foundations
2. bearing and retaining walls
3. structural concrete and masonry units

4. structural steel
5. Lintels
6. timber and primary wood framing
7. structural decking
8. stair systems
9. miscellaneous structural metals
10. exterior curtain-wall constructions
11. equipment supports
12. piping, ductwork, vessel, and equipment
13. structural systems of special construction
14. others as deemed necessary by the DEPARTMENT

1.06 OPERATIONAL SYSTEMS

A. Obtain approval of cutting and patching proposal before performing cutting and patching work affecting the following operating elements or safety related systems:

1. primary operational system and equipment
2. air or smoke barriers
3. water, moisture or vapor barriers
4. membranes and flashings
5. fire protection system
6. noise and vibration control elements and systems
7. control systems
8. communication systems
9. conveying systems
10. electrical wiring systems
11. operating system of special construction
12. others as deemed necessary by the DEPARTMENT

B. Provide bypass or backup systems to minimize downtime and operational impact to existing facility.

1.07 EXISTING WARRANTIES

A. Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

B. Work on existing roofing and other items covered by warranty shall be done by firm or craftsman authorized by warranty issuer.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 INSPECTION

A. Before proceeding meet at Project Site with DEPARTMENT'S representative and parties involved in cutting and patching, including related trades.

B. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed.

C. Review areas of potential interference and conflict; coordinate procedures and resolve before proceeding.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.03 PERFORMANCE

A. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

B. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition and ensures thermal and moisture integrity of building enclosure.

3.04 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

END OF SECTION

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SECTION 01 77 00
CONTRACT CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for Substantial Completion

B. Requirements for Final Completion

C. Requirements for Final Payment and Final Acceptance

1.02 RELATED SECTIONS

A. Section 00700 - General Conditions: Substantial Completion, Final Completion, Final Payment, Final Acceptance

B. Section 01 11 13 - Summary of Work: Using Agency occupancy

C. Section 01 33 00 – Submittal Procedures

D. Section 01 29 73 – Schedule of Values

E. Section 01 29 76 – Application for Payment

F. Section 01 31 13 – Job Site Administration

G. Section 01 45 23 – Departmental Inspection Service: CONTRACTOR'S Responsibilities

H. Section 01 71 13 – Mobilization and Demobilization

I. Section 01 73 00 – Execution Requirements: Final cleaning, Project Record Documents, Operation and Maintenance Data, Warranties and Bonds, Spare Parts and Maintenance Materials

J. Section 01 78 39 – Project Record Documents

K. Section 01 79 00 – Demonstration and Training

L. Section 01 91 00 - Commissioning

1.03 SUBSTANTIAL COMPLETION SUBMITTALS

Submit the following prior to requesting the Substantial Completion Inspection:

A. Evidence of Compliance with Requirements of Authority Having Jurisdiction:

1. Certificate of Occupancy
2. Required Certificates of Inspection
3. Other approvals as may be required

B. Project Record Documents

C. Operation and Maintenance Data

D. Spare Parts and Maintenance Materials

E. Warranties and Bonds

F. Keys and Keying Schedule

G. No progress payments will be made for Substantial Completion until all required submittals have been submitted and accepted by the DEPARTMENT.

1.04 SUBSTANTIAL COMPLETION

A. In accordance with Section 00700 - General Conditions, Article 13.10 Substantial Completion, the CONTRACTOR shall notify the DEPARTMENT in writing that the Work or a portion of the Work which has been specifically identified in the Contract Documents (except for items specifically listed by the CONTRACTOR as incomplete) is substantially complete and request that the DEPARTMENT issue a Certificate of Substantial Completion. The DEPARTMENT will consider the CONTRACTOR'S request for Substantial Completion only when:

1. Written request for Substantial Completion is provided at least 14 calendar days in advance of the DEPARTMENT'S scheduled Substantial Completion inspection date.
2. List of items to be completed or corrected is submitted.
3. All Operation and Maintenance Manuals are submitted and approved by the DEPARTMENT.
4. All commissioning requirements have been met.
5. All equipment and systems have been tested, adjusted, balanced and are fully operational.
6. All demonstration and training requirements have been met.
7. All automated and manual controls are fully operational.
8. Operation of all equipment and systems has been demonstrated to DEPARTMENT.
9. Certificate of Occupancy is submitted.
10. Certificates of Inspection for required inspections have been submitted.
11. Project Record Documents for the Work or the portion of the Work being accepted are submitted and approved.
12. Spare parts and maintenance materials are turned over to DEPARTMENT.
13. All keys are turned over to the DEPARTMENT.
14. All warranties and bonds are submitted and approved.
15. Final cleaning has been completed to the satisfaction of the DEPARTMENT.

B. When all of the preceding requirements for the consideration of Substantial Completion have been met, the DEPARTMENT will conduct a scheduled Substantial Completion inspection with its Architect/Engineers and Using Agency representatives. If upon the completion of the inspection, the DEPARTMENT should find that the Work is not substantially complete, DEPARTMENT will promptly notify CONTRACTOR in writing, listing observed deficiencies.

C. The CONTRACTOR shall remedy deficiencies and send a second written notice of Substantial Completion.

D. When the DEPARTMENT finds the Work is substantially complete, it will have 14 days to issue a certificate of Substantial Completion with an attached punch list of deficiencies, all in accordance with the provisions of the General Conditions.

E. The CONTRACTOR shall be responsible for scheduling the activities required for Substantial Completion to enable completion within the Contract Time.

1.05 FINAL COMPLETION

A. In accordance with Section 00700 – General Conditions, Article 13.13 Final Completion, when the CONTRACTOR considers that it has completed all the deficiencies listed on the Substantial Completion punch list, and that the Work is otherwise complete, it shall submit written certification that:

1. Contract Documents have been reviewed
2. Work has been completed in accordance with Contract Documents, and deficiencies listed with certificate of Substantial Completion have been corrected
3. Work is complete and ready for final inspection

B. Upon the receipt of the preceding written notice, the DEPARTMENT will conduct a Final Completion inspection. If the DEPARTMENT should then find the Work to be incomplete, it will promptly notify the CONTRACTOR in writing with a list of observed deficiencies.

C. The CONTRACTOR shall remedy deficiencies and transmit to the DEPARTMENT a second certification of Final Completion.

D. When the DEPARTMENT determines the Work is complete, all in accordance with the General Conditions article, “Final Completion and Application for Payment”, the CONTRACTOR may make application for Final Payment.

1.06 REINSPECTION FEES

A. In accordance with Section 00700 – General Conditions, Articles 13.10 Substantial Completion and 13.12 Final Inspection, the CONTRACTOR shall pay for all costs incurred by the DEPARTMENT for re-inspection.

B. The DEPARTMENT may deduct the re-inspection costs from the application for final payment.

1.07 FINAL ACCEPTANCE

A. Following the issuance of Final Completion, and subject to the completion of requirements specified in Section 00700 - General Conditions, Articles 13.14 Final Payment and 13.15 Final Acceptance, the DEPARTMENT will review the project files for completeness. The DEPARTMENT may require the CONTRACTOR to submit or re-submit any of the following documents, upon request:

1. Contractor's transmittal letter: O&M Manuals
2. Contractor's transmittal letter: Warranty/Bonds
3. Contractor's transmittal letter: Record Documents
4. Spare parts, maintenance materials receipts
5. Contractor's transmittal letter: keys & keying schedule
6. Contractor's certification of insurance
7. EEO compliance certification (Federally funded projects only)
8. Submittals and miscellaneous registers
9. Original final pay estimate
10. Contractor's release
11. Department of Labor Notice of Completion (NOC)
12. Other documentation as required by the DEPARTMENT

B. Statement of Adjustment of Accounts – The DEPARTMENT may require the CONTRACTOR to submit a final statement reflecting adjustments to the Contract Price showing:

1. Original Contract Price
2. Previous Change Orders
3. Changes under allowances
4. Changes under Unit Prices
5. Deductions for uncorrected Work
6. Penalties and bonuses
7. Deductions for liquidated damages
8. Deductions for re-inspection fees
9. Other adjustments to Contract Price
10. Total Contract Price as adjusted
11. Previous payments
12. Sum remaining due

C. DEPARTMENT will issue a final Change Order reflecting all remaining adjustments to Contract Price not previously made by Change Orders.

D. See Section 01 29 73 - Schedule of Values for minimum value that shall be assigned for Final Acceptance.

E. The CONTRACTOR shall cooperate with the DEPARTMENT and shall provide the requested documentation.

F. When the DEPARTMENT determines its files are complete, it may make final payment and issue a letter of Final Acceptance.

PART 2 - PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

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SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Maintenance of Record Documents and Samples

B. Submittal of Record Documents and Samples

1.02 RELATED REQUIREMENTS

A. Section 00700 - General Conditions: Record Documents

B. Section 01 11 13 – Summary of Work: Record survey

C. Section 01 29 76 – Application for Payment

D. Section 01 33 23 – Shop Drawings, Product Data, and Samples

E. Section 01 77 00 – Contract Closeout Procedures

F. Individual Specifications Sections: Manufacturer's certificates and certificates of inspection

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. In addition to requirements in General Conditions, maintain at the site for DEPARTMENT one accurate record copy of:

1. Contract Drawings
2. Specifications
3. Addenda
4. Change Orders and other modifications to the Contract
5. Reviewed Shop Drawings, product data, and samples
6. Survey and field records
7. Field test records
8. Inspection certificates
9. Manufacturer's certificates

B. Prior to Substantial Completion, provide original or legible copies of each item maintained by CONTRACTOR as listed in 01 78 39.1.02.B,C, and D above.

C. Delegate responsibility for management of maintenance of Record Documents to one person on CONTRACTOR's staff as approved in advance by Contracting Officer.

D. Promptly following award of Contract, secure from DEPARTMENT, at no cost to the CONTRACTOR, one complete set of all Documents comprising the Contract.

E. Immediately upon receipt of job set described above, identify each Document with title "RECORD DOCUMENTS - JOB SET".

F. Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage for record documents and samples.

G. Label and file record documents and samples in accordance with section number listings in table of contents of this Project manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

H. Maintain record documents in a clean, dry and legible condition. Do not use record documents for construction purposes.

I. Use all means necessary to maintain job set of Record Documents completely protected from deterioration and from loss and damage until completion of Work and transfer of recorded data to Contracting Officer.

J. Keep record documents and samples available for inspection by DEPARTMENT.

K. Upon request by the DEPARTMENT and at time of each Application for Payment enable inspection of record documents by the DEPARTMENT for review as to completeness.

L. Contracting Officer's approval of current status of Record Documents will be prerequisite to Contracting Officer's approval of requests for progress payments and request for final payment.

1. Prior to submitting each request for progress payment, secure Contracting Officer's approval of Record Documents as currently maintained.
2. Prior to submitting request for Final Payment, obtain Contracting Officer's approval of final Record Documents.

M. Do not use job set for any purpose except entry of new data and for review and copying by Contracting Officer.

1.04 RECORDING

A. Record information on a set of blue line opaque Drawings, and in a copy of a Project manual, provided by DEPARTMENT.

B. Using felt tip marking pens or colored pencil, maintaining separate colors for each major system, clearly describe changes by note and by graphic line, as required. Date all entries. Call attention to entry by a "cloud" around area or areas affected.

C. Thoroughly coordinate all changes within Record Documents, making adequate and proper entries on each Specification Section and each sheet of Drawings and other Documents where such entry is required to properly show change or selection.

D. When a change within Record Documents is referenced to another document, such as a RFI, Shop Drawing or Change Order, attach a copy of the referenced document to the respective Record Drawing or Record Specification where the entry is made.

E. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:

1. Measured depths of elements of foundation in relation to finish first floor datum. Accurate to the nearest inch.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Accurate to the nearest inch.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
4. Field changes of dimension and detail.
5. Changes made by modifications.
6. Details not on original Contract Drawings.
7. References to related Shop Drawings and modifications
8. Clearly label all changes and show dimensions to establish size and location. All identifications shall be sufficiently descriptive to relate reliably to Specifications.

F. Other Documents: Maintain manufacturer's certifications, inspection certifications, and field test records required by individual Specifications sections.

1.05 SUBMITTALS

A. Upon submittal of the completed Record Documents, make changes in Record Documents as required by the Contracting Officer.

B. Transmit with cover letter in duplicate, listing:

1. Date
2. DEPARTMENT's Project title and number
3. CONTRACTOR's name, address, and telephone number
4. Number and title of each record document
5. Signature of CONTRACTOR or authorized representative.

C. Final Record Documents shall include both hard copies and digitally scanned copies in .pdf format (high quality greyscale scans, minimum 200 pixels/inch). Scans shall include front and back of drawings/documents where information occurs on both sides.

PART 2 – PRODUCTS **Not Used**

PART 3 - EXECUTION **Not Used**

END OF SECTION

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SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for instructing DEPARTMENT's personnel. Major topics include the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

1.02 RELATED REQUREMENTS

A. Section 00700 – General Conditions

B. Section 01 11 13 – Summary of Work

C. Section 01 31 13 – Job Site Administration

D. Section 01 31 19 – Project Meetings

E. Section 01 33 00 – Submittal Procedures

F. Section 01 73 00 – Execution Requirements

G. Section 01 77 00 – Contract Closeout Procedures

H. Section 01 91 00 – Commissioning

1.03 SUBMITTALS

A. Instruction Program: Submit three copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit two complete training manual(s) for DEPARTMENT's use.

B. Qualification Data: For facilitator and instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.04 QUALITY ASSURANCE

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

B. **Instructor Qualifications**: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. **Pre-instruction Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.05 COORDINATION

A. Coordinate instruction schedule with DEPARTMENT's operations. Adjust schedule as required to minimize disrupting DEPARTMENT's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Department.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Door hardware
2. Equipment, including projection screens, A/V, and laboratory fume hoods
3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems
4. Intrusion detection and security systems

5. Laboratory equipment, including laboratory air and vacuum equipment and piping, and laboratory fume hoods
6. Heat generation, including boilers, feed water equipment, pumps, and water distribution piping
7. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices
8. HVAC instrumentation and controls
9. Electrical service and distribution, including transformers, switchboards, panel boards, uninterruptible power supplies and motor controls
10. Packaged engine generators, including transfer switches
11. Lighting equipment and controls
12. Communication systems, including intercommunication and voice and data equipment.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions
    b. Performance and design criteria if CONTRACTOR is delegated design responsibility
    c. Operating standards
    d. Regulatory requirements
    e. Equipment function
    f. Operating characteristics
    g. Limiting conditions
    h. Performance curves

2. Documentation: Review the following items in detail:

    a. Emergency manuals
    b. Operations manuals
    c. Maintenance manuals
    d. Project Record Documents
    e. Identification systems
    f. Warranties and bonds
    g. Maintenance service agreements and similar continuing commitments

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages
    b. Instructions on stopping
    c. Shutdown instructions for each type of emergency
    d. Operating instructions for conditions outside of normal operating limits
    e. Sequences for electric or electronic systems

f. Special operating instructions and procedures

4. Operations: Include the following, as applicable:

   a. Startup procedures
   b. Equipment or system break-in procedures
   c. Routine and normal operating instructions
   d. Regulation and control procedures
   e. Control sequences
   f. Safety procedures
   g. Instructions on stopping
   h. Normal shutdown instructions
   i. Operating procedures for emergencies
   j. Operating procedures for system, subsystem, or equipment failure
   k. Seasonal and weekend operating instructions
   l. Required sequences for electric or electronic systems
   m. Special operating instructions and procedures

5. Adjustments: Include the following:

   a. Alignments
   b. Checking adjustments
   c. Noise and vibration adjustments
   d. Economy and efficiency adjustments

6. Troubleshooting: Include the following:

   a. Diagnostic instructions
   b. Test and inspection procedures

7. Maintenance: Include the following:

   a. Inspection procedures
   b. Types of cleaning agents to be used and methods of cleaning
   c. List of cleaning agents and methods of cleaning detrimental to product
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance
   f. Procedures for routine maintenance
   g. Instruction on use of special tools

8. Repairs: Include the following:

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

PART 3 - EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between CONTRACTOR and DEPARTMENT for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct DEPARTMENT's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect/Engineer will furnish a representative to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. DEPARTMENT will furnish an instructor to describe DEPARTMENT's operational philosophy.
3. DEPARTMENT will furnish CONTRACTOR with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with DEPARTMENT with at least 14 days' advance notice.

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

END OF SECTION

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SECTION 01 91 00
COMMISSIONING

PART 1 - GENERAL

Not Used

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SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 01 11 13 "Summary Of Work" for restrictions on use of the premises, DEPARTMENT-occupancy requirements, and phasing requirements.
2. Section 01 73 29 "Cutting and Patching" for cutting and patching procedures.
3. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to DEPARTMENT ready for reuse.

C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 MATERIALS OWNERSHIP

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

1.05 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
4. Review areas where existing construction is to remain and requires protection.

1.06 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure DEPARTMENT's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before Work begins.

1.07 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.08 FIELD CONDITIONS

A. Conduct selective demolition so DEPARTMENT's operation will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by DEPARTMENT as far as practical.

1. Before selective demolition, DEPARTMENT will remove the following items:
   a. Existing fuel tank.

C. Notify DEPARTMENT of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials:

1. Hazardous materials will be removed by DEPARTMENT before start of the Work.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.09 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with DEPARTMENT's operations.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by DEPARTMENT. DEPARTMENT does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings

1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. DEPARTMENT will arrange to shut off indicated services/systems when requested by Contractor. Contractor shall provide written request with a minimum of 72-hour notice.

3.03 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

B. Remove temporary barricades and protections where hazards no longer exist.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 73 00 "Execution Requirements".

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with tunnel operations and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to DEPARTMENT.
4. Transport items to DEPARTMENT's storage area designated by DEPARTMENT
5. Protect items from damage during transport and storage.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by DEPARTMENT, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 73 00 "Execution Requirements."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Comply with requirements specified in Section 01 73 00 "Execution Requirements."

B. Burning: Do not burn demolished materials.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 02 60 00
CONTAMINATED SITE MATERIAL REMOVAL

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this Section consists of safety and training requirements, notification requirements, and handling of potentially-contaminated soils, if encountered during project activities.

1.02 SITE SAFETY REQUIREMENTS

A. The CONTRACTOR will be responsible to make sure that all site workers are aware of, and adhere to the safety aspects of the contract and, if contamination is encountered, Occupational Safety and Health Administration (OSHA) Standards listed in 29 Code of Federal Regulations (CFR) 1910.120.

1.03 DEFINITIONS

A. Backfill: Soil materials that are removed from the excavation and meet the requirements for use as backfill, or imported soil that is not contaminated

B. Contaminated soil: "Contaminated soil" means soil containing a concentration of a hazardous substance that exceeds the applicable cleanup level determined under the Alaska Department of Environmental Conservation (ADEC) site cleanup rules as defined in 18 Alaska Administrative Code (AAC) 75.

C. Potentially-contaminated soil: Soils that exhibit visual or olfactory evidence of contamination.

1.04 CONTRACTOR EXPERIENCE AND QUALIFICATIONS

A. If potential contamination is encountered, the CONTRACTOR will need to have personnel trained in accordance with 29 CFR 1910.

1.05 CONSTRUCTION

A. General

1. The CONTRACTOR shall comply with all environmental, health and safety regulations governing project work including regulations established by the United States Environmental Protection Agency (USEPA), ADEC, OSHA, and the DEPARTMENT's Environmental Requirements.
2. The CONTRACTOR will coordinate with the ENGINEER to complete the work below as described.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SUBMITTALS

A. If potentially-contaminated soils are encountered the CONTRACTOR shall hire a Qualified Person as defined in 18 AAC 75.990 (100) and 18 AAC 78.995 (118)

B. If potentially-contaminated soils are encountered, the CONTRACTOR shall immediately notify the ENGINEER and DEPARTMENT and in consultation with the ENGINEER, the DEPARTMENT, and the CONTRACTOR, will determine if the soil contamination and/or spill is a reportable quantity as defined by the ADEC.

3.02 PREPARATION

A. Work under this section includes the CONTRACTOR preparing for handling potentially-contaminated soils, if encountered, and includes but is not limited to the following tasks.

1. Preparing required submittals;

2. Obtaining permits and submitting forms, if necessary;

3. Preparing work plans and reports by a Qualified Person (QP), if necessary;

4. Acquiring and calibrating testing and sampling equipment, if necessary;

5. Work will be performed by a QP as described in this Section.

3.03 PERMITS

A. The CONTRACTOR shall be responsible for obtaining and complying with the permits as specified herein. The CONTRACTOR shall pay all applicable permitting fees and provide the DEPARTMENT and ENGINEER with copies of permits obtained. After completion of work, CONTRACTOR shall provide all final reporting that may be required. Permits include, but are not limited to;

1. Dewatering permit, ADEC, Alaska Department of Natural Resources (ADNR), as applicable if necessary.

3.05 QUALIFIED PERSON RESPOSIBILITIES

A. If potential contamination is encountered, the CONTRACTOR will coordinate with and as directed by the DEPARTMENT'S QP. The CONTRACTOR shall prepare reports; make interpretations regarding field data, exercise onsite control over all work that requires assessment, investigation, characterization, reporting, or interpretation associated with contamination. The CONTRACTOR shall develop a work plan (if necessary) to be submitted to the ADEC, which will include provisions for contaminant assessment, remediation, and disposal as applicable. At a minimum, and as applicable, the CONTRACTOR shall be responsible for; field screening excavated soils, sampling of excavated soil stockpiles, documentation of work site and excavation atmospheric conditions, coordination of requests for offsite soil disposal and treatment with the ADEC, coordination of disposal of soil with the facility receiving contaminated soils, verifying adherence to ADEC requirements for stockpile liners and covers, and documenting contaminated soil returned to approximate position of origin, if applicable.

3.06 EROSION, SEDIMENT, AND POLLUTION CONTROL

A. The CONTRACTOR shall provide control of erosion, sedimentation, and discharge of pollutants, according to Section 01 57 10, and applicable local, state, and federal requirements.

1. BEST MANAGEMENT PRACTICES (BMPs). The CONTRACTOR shall implement temporary or permanent structural and non-structural devices, schedules of activities, prohibition of practices, maintenance procedures, and other management practices to prevent or minimize the discharge of pollutants to waters of the United States. BMPs include, but are not limited to, treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from material storage.

3.07 SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN (SPCC PLAN)

A. If on-site storage of fuel requires preparation of a SPCC Plan, as specified in 40 CFR 112, then the CONTRACTOR shall prepare a detailed plan for petroleum spill prevention and control measures that meet the requirements of that regulation.

3.08 HAZARDOUS MATERIAL CONTROL PLAN (HMCP)

A. The Contractor shall prepare a detailed project-specific plan for prevention of pollution from storage, use, or the transfer of hazardous materials (including, but not limited to, petroleum products related to construction activities and equipment), containment, cleanup, and disposal of hazardous material.

3.09 SPILL CONTINGENCY PLAN

A. A spill can be associated with many activities required by the work being conducted for this contract. Spills can occur during operation of equipment (punctured fuel tank, ruptured hydraulic lines, etc.), during excavation of the generator foundation, or during refueling operations. All persons working on site will be apprised of the requirements of spill reporting as defined in this section.

1. Measures to stop the release will be undertaken first, followed by measures to contain the spill. Such containment measures could include creating a soil berm around the spill area, using oleophilic sorbent pads to soak up spilled product or absorbent materials to mix with spilled product. Excavation of soils impacted by minor releases should occur as soon as possible using the excavator, a loader, or a shovel, with these soils being placed in a 55-gallon drum(s) or a 5-gallon bucket(s). The spill response materials listed above should be maintained on site in a readily available manner.

2. The person observing the spill must notify the ENGINEER;

3. The CONTRACTOR and ENGINEER will record the event in the appropriate paperwork (daily log, storm water pollution prevention plan inspection reports, etc.);

4. The CONTRACTOR will immediately contact the DEPARTMENT;

5. The ENGINEER, in consultation with the DEPARTMENT (and CONTRACTOR), will determine if the spill is a reportable quantity as defined by the ADEC.

6. If deemed reportable, the ADEC can be contacted via phone at: (907) 269-3063; or (800) 478-9300; or by completing a spill reporting form, which is available on the ADEC's web site;
   a. http://dec.alaska.gov/spar/perp/docs/ADEC%20Spill%20Notification%20Form_rev06162014.pdf. The form can be faxed to (907) 269-7648.

3.10 POTENTIALLY-CONTAMINATED SOIL STOCKPILE AREA

A. If potentially-contaminated soil is encountered, then soils should be placed on a 10-mil liner and covered with a minimum of a 6-mil liner at the end of each day's activities. Additionally, a berm should be constructed around the stockpile to prevent precipitation or liquids from discharging from, or entering the stockpile. The cover should be weighed down with tires, netting, sand bags or other similar non-sharp objects. The DEPARTMENT, ENGINEER, and the CONTRACTOR representatives will provide direction for appropriate locations for the stockpiles within the project boundary. The stockpiles should be constructed as follows:

   1. A 10-mil and a 6-mil chemically-resistant geomembrane liner, free of holes and other damage, will be used for the bottom liner and top cover, respectively, in accordance with specifications listed in 18 AAC 75.370, in a manner to prevent precipitation from infiltrating or liquids exiting the stockpile.

   2. Scrim reinforced geomembrane covers shall have a minimum weight of 26 lbs. per 1,000 square feet.

   3. The cover material shall be extended over the berms and anchored or ballasted to prevent it from being removed or damaged by wind.

   4. Berms will be constructed surrounding the stockpile, to a minimum of 12 inches in height. Vehicle access points shall also be bermed

   5. The liner system shall be sloped to allow collection of leachate, if applicable.

3.11 POTENTIALLY-CONTAMINATED SOIL MANAGEMENT

A. The CONTRACTOR will open and close the stockpiles and provide access to the stockpiles for field-screening and sampling. The CONTRACTOR will field screen, sample and test the excavated soil in accordance with an approved Work Plan (if necessary) to determine if it meets the criteria for contaminated soil. Soil that is not contaminated shall be handled as described in the Contract Documents.

B. Soil that is contaminated and does not meet the requirements for backfill, if allowed by the ADEC, shall be disposed of in accordance with an approved Contaminated Soil Work Plan to be prepared by others. This soil will need to be transported to the Contaminated Soil Stockpile Area established by the DEPARTMENT and ENGINEER, for temporary storage as discussed in Item 2.11 above.

C. The project's QP will sample the stockpiled soils and in consultation with the ENGINEER and the DEPARTMENT, will determine the appropriate disposal options for the soils. All off-site transport of contaminated soil shall be conducted only after prior approval is received from the ADEC, and will be accomplished in covered loads, and in accordance with an approved Work Plan as discussed above.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-grade.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.03 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.05 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1.

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.

2.02 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.03 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.04 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type II, gray.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
2. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Water: ASTM C 94/C 94M.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.06 RELATED MATERIALS

A. Expansion- and Isolation-Joints

1. Joint Filler Strips: AASHTO M 213.
2. Silicone Joint Sealant: ASTM D 5893.
3. Hot Pour Joint Sealant (Asphalt, Concrete): ASTM D 6690, Type IV

2.07 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.08 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Normal-Weight Concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 3 inches, plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

2.09 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

PART 3 - EXECUTION

3.01 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.02 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.04 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Expansion joints: Make expansion joints to the dimensions and location shown on the Plans and fill with the type of preformed expansion joint filler specified. Apply joint sealer evenly to completely seal all joints.

3.05 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.06 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view,.

3.07 FINISHING SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

C. Broom Finish: Apply a broom finish to exterior concrete slabs, platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.08 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

3.09 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by ENGINEER. Remove and replace concrete that cannot be repaired and patched to ENGINEER's approval.

3.10 FIELD QUALITY CONTROL

A. Contractor shall perform necessary field Quality Control testing during construction using qualified and experienced personnel.

B. Samples for slump, air entrainment, and strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than 150 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for walls and slabs. Include the following tests, at minimum:

1. Concrete compressive strength per AASHTO T 22 “Compressive Strength of Cylindrical Concrete Specimens”.

2. Concrete slump per WAQTC FOP for AASHTO T 119 “Slump of Hydraulic Cement Concrete”

3. Concrete air content per WAQTC FOP for AASHTO T 152 “Air Content of Freshly Mixed Concrete by the Pressure Method”

END OF SECTION

SECTION 09 96 00
HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all materials and labor necessary to install high performance coating system on fuel oil and natural gas piping, in accordance with project drawings, specifications and current manufacturer's application instructions.

1.02 SYSTEM DESCRIPTION

A. Basis-of-Design: The Rust-Oleum SC9100 System 100 VOC DTM Epoxy Mastic is a two component, epoxy coating manufactured by Rust-Oleum Corporation, located at 11 Hawthorn Parkway, Vernon Hills, IL 60061 (847) 367-7700. With a single coat application, the SC9100 System 100 VOC DTM Epoxy Mastic is suitable for direct to metal application in a mild to moderate industrial environment. The SC9100 System 100 VOC DTM Epoxy Mastic is a coating system composed of selected standard finish colors, tint bases, and activator.

1.03 SUBSTITUTION REQUIREMENTS

A. Equivalent materials of other manufacturers may be substituted on approval of the Department. These requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended dry film thickness and a list of a minimum of ten (10) projects where the coating system has been applied and performed to expectations for at least three (3) years service. No requests for substitution shall be considered that lower system film thickness, number of coats and/or offer a change in the generic type of coating herein specified. Requests for review of equivalency will be accepted only from the Contractor and will be considered only after the contract has been awarded. Request for review submitted directly to the Department by coating suppliers will not be considered.

1.04 SURFACE PREPARATION AND APPLICATION DESCRIPTION

A. Substrate cleaning, surface preparation, coating application and dry film thickness shall be as specified herein and shall meet or exceed manufacturer's recommendations.

B. All application equipment shall be clean and maintained in proper working order in accordance with the equipment manufacturer's recommendations.

C. The coating system shall be applied in accordance with the air and surface temperature limits and work areas shall be reasonably free of airborne dust during application and drying time.

1.05 PERFORMANCE REQUIREMENTS

A. Basis-of-Design SC9100 System has the following physical properties and these are published on the Rust-Oleum Corporation Technical Data Sheet.

1. Activated Material Volume Solids: 75-80%
2. Recommended Dry Film Thickness (DFT): 5-8 mils
3. Practical Coverage (assumes 15% material loss): 130-220 sq ft/gal
4. VOC: <100 g/l (<0.83 lbs/gal)
5. Mixing Ratio: 1:1 base to activator by Volume
6. Induction Period: None required
7. Pot Life (@70°F & 50%RH): 2-4 hours, less at higher temperatures or with greater than 10 gallons of activated material
8. Dry Time (@ 70F/21C and 50% RH)
   a. Tack Free 8-10 hours
   b. Handle 10-16 hours
   c. Recoat 24 hours – 30 days

1.06 QUALITY ASSURANCE

A. Applicator Qualifications:

1. Shall be knowledgeable in the proper installation of, and experienced in the application of two-component epoxy systems.
2. Shall provide a minimum of one (1) year workmanship warranty for the application of the coating system.

1.07 SUBMITTALS

A. Product Data: Coating system, application and related equipment information.

B. Applicator: Provide certified contractor documentation showing proof of familiarity with the two-component epoxy systems.

1.08 DELIVERY STORAGE AND HANDLING

A. Deliver Coating system on-site in manufacturer’s labeled, original, unopened containers.

B. Store materials inside or under cover at ambient temperature. Keep materials dry, protected from weather, direct sunlight, surface contamination, aging corrosion, extreme temperatures and other damage.

1.09 PROJECT CONDITIONS

A. Protect adjacent work from damage and overspray during application of the coating system.

PART 2 - EXECUTION

2.01 PAINT SCHEDULE

A. All fuel pipe and pipe fittings from fuel tank to generators. All fuel tank vent pipe and pipe fittings. Fuel system valves, flexible piping, and vent caps shall not be painted.

B. All fuel pipe and pipe fittings within the generator enclosure. Fuel system valves, flexible piping, and vent caps shall not be painted.

C. Paint color white.

2.02 SURFACE PREPARATION

A. All cleaning and surface preparations specified herein are minimums.

B. All surfaces to be coated shall be free of cracks, pits, fins, projections, or other imperfections that would interfere with the formation of a uniform, unbroken coating film. The coating contractor is to examine the substrate to determine if it is in satisfactory condition to receive the coating system. Obtain coating contractor's written report listing conditions detrimental to performance of work in this specification. Do not proceed with the application of the coating system until unsatisfactory conditions have been corrected.

C. All oil, grease, and chalking shall be completely removed with biodegradable degreasers prior to mechanical cleaning begins. (Basis-of-Design: Rust-Oleum 3599 Cleaner Degreaser) D. At minimal, all steel surfaces shall be cleaned in accordance to SSPC-SP-3.

E. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter.

F. Previously coated surfaces shall be repaired to be relatively free of surface imperfections. A check for loosely held, delaminating coating shall be performed as per ASTM 3359. The gloss shall be dulled by mechanical means to promote proper adhesion of the coating system. All previous coatings damaged by welding shall be completely removed.

G. If abrasive blast cleaning is going to be employed, the blasted profile depth shall be uniform and not greater than 20% of final total dry film thickness of the coating system.

H. The coating contractor is to examine the substrate to determine if it is in satisfactory condition to receive the coasting system. Obtain coating contractor's written report listing conditions detrimental to performance of work in this specification. Do not proceed with the application of coating system until unsatisfactory conditions have been corrected.

2.03 MIXING AND THINNING

A. MIXING

1. The coating system colored base component shall be thoroughly mixed to uniform color.

2. The selected coating system Activator shall be thoroughly mixed to uniform appearance.
3. In a separate container, combine the base and activator components under mechanical agitation. Completely mix for 3-5 minutes. Observe any required induction time prior to application of the coating.

B. THINNING

1. Thinning shall be done in accordance with applicable local air quality regulations.
2. Thinning, if needed, shall be done only with manufacturer's thinner.

2.04 APPLICATION

A. Weather Conditions

1. Apply when air and surface temperatures are between 60-100° F (15-38°C) and surface temperature is at least 5° F (3°C) above the dew point.
2. The relative humidity should not be greater than 85%.

B. Coating Application.

1. Application by airless spray is the recommended method. Care must be taken to ensure the recommended dry film thickness is achieved, if the coating system is applied by brush or roller. The minimum dry film thickness must be achieved per coat.
2. Apply one coat of the select coating system finish at the recommended dry film thickness.
3. In no instance shall the coating system be applied greater than 8 mils dry film thickness per coat.
4. Sags, checks, blisters, skips, teardrops, or rolled edges shall not be accepted and shall be completely removed and recoated.

C. Protection of surfaces

1. The Coating Contractor shall be responsible for protecting all adjacent surfaces from spills, drips, overspray, or any other form of coating damage.
2. The coating contractor and its subcontractors shall be responsible for removing spots or repairing damaged surfaces to the satisfaction of the Department.

2.05 CLEAN-UP

A. Clean-up shall be done to remove all spills, drips, overspray, or other unwanted coating from all surfaces not intended to be coated.

B. All used rags, brushes, roller covers, and other application related materials shall be removed from the work site and disposed in a proper manner and in accordance with local waste regulations.

C. All equipment, staging, ladders, and other contractor materials brought onto the jobsite by the contractor shall be remove at the conclusion of the job in a timely manner.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.

B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.02 RELATED SECTIONS

A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

B. Division 01 – General Requirements.

C. Section 01 11 13 – Summary of Work.

D. Section 01 31 14 – Work Coordination.

E. Section 01 72 00 – Utilities Coordination.

F. Division 26 – Electrical Specifications.

G. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all mechanical equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 23 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.

H. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.03 REFERENCES

A. NFPA 70 National Electrical Code (NEC).

B. IMC International Mechanical Code.

C. UPC Uniform Plumbing Code.

D. IECC International Energy Conservation Code.

E. IFC International Fire Code.

F. IBC International Building Code.

1.04 SUBMITTALS

A. See Section 00700 General Conditions, Section 00800 Supplementary Conditions, and the General Requirements in Division 01 regarding submittals.

B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. Electronic bookmarks shall be provided per each major specified item.

C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.

D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

E. Submit product data for:

1. Process Control and Instrumentation Systems.
2. Hangers and Supports for Piping and Equipment.
3. Fuel piping systems, valves, and accessories.
4. Above ground fuel tank and accessories.
5. Vibration and Seismic controls for all new equipment weighing more than 400 lbs.

F. Provide shop drawings with calculations for design and selection of seismic/wind restraints in accordance with IBC and ASCE 7, certified by a qualified professional engineer, licensed in the State of Alaska. Seismic calculations shall be based upon Seismic Category D. All components shall utilize an IP of 1.0 for seismic calculations. Refer to civil drawings and specifications for concrete pad details.

1.05 PROJECT RECORD DRAWINGS

A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.

B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the Project Manager.

C. Show the location of all valves and their appropriate tag identification.

D. At completion of project, deliver these drawings to the DOT Project Manager and obtain a written receipt.

1.06 OPERATING AND MAINTENANCE MANUALS

A. Submit Operations and Maintenance data under provisions of Division 01.

B. Submit maintenance manuals to the Department covering all equipment, devices, etc. installed by the Contractor.

C. Programmable Logic Controls O&M manuals shall be submitted under a separate cover per Section 23 09 33.

D. The operation and maintenance manuals shall be submitted by specification section complete and all at one time; partial operations and maintenance manual submittals will not be considered. The Operation and maintenance manuals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. The manual shall contain, but not limited to, the following types of information:

1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
2. Catalog cuts of all equipment, etc. installed (Marked to identify the specific items used).
3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
4. Identification numbers of all parts and nearest sources for obtaining parts and services.
5. Reduced scale drawings of the control system and a verbal description of how these controls operate.
6. Written summary of instructions to Owner on systems operation.
7. Written summary of maintenance requirements for systems including frequency for routine maintenance.
8. All manufacturers' warranties and guarantees.
9. Contractors Warranty Letter.

1.07 HANDLING

A. See the General Requirements in Division 01 regarding material handling.

B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.08 SUBSTITUTIONS

A. See General Conditions in Division 00 and the General Requirements in Division 01 for substitution request procedures.

B. In accordance with the 00700 General Conditions, Section 00800 Supplementary Conditions, and the General Requirements in Division 01, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The Department shall be the final authority regarding acceptability of substitutes.

1.09 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.

B. Any differences, which may be found, shall be submitted to the Department for consideration before proceeding with the work.

1.10 MANUFACTURER'S DIRECTIONS

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the Department of any such conflicts before installation.

1.11 PERMITS, FEES, ETC.

A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.12 TESTING

A. The Contractor under each section shall at his own expenses perform the various tests as specified and required by the Department and as required by applicable code, the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests.

1.13 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.14 SCHEDULE OF WORK

A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The Department will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

1.15 COOPERATION AND CLEANING UP

A. The contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Department, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.16 WARRANTY

A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Department, shall be repaired and/or replaced to the complete satisfaction of the Department. Guarantee shall be in accordance with Division 01.

1.17 COMPLETION REQUIREMENTS

A. In accordance with the Section 00700 General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:

1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
2. Contractors One Year Warranty.
3. All Manufacturers' Guarantees.
4. Test Reports.
5. Operation and Maintenance Manuals.

1.18 INSPECTION OF SITE - REMODEL PROJECTS

A. The accompanying plans do not indicate completely the existing mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.19 RELOCATION OF EXISTING INSTALLATIONS

A. There are portions of the existing mechanical systems, and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of his particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.20 SALVAGE MATERIALS

A. The Contractor shall remove existing equipment, duct, grilles and other items associated with the mechanical systems where no longer required for the project. Where such items are exposed to view or uncovered by any cutting or removal of general construction and has no continuing function, they shall be removed.

B. All items or materials removed from the project shall be made available for the Owner's inspection. The Owner retains the option to claim any item or material. Contractor shall deliver any claimed item or material in good condition to the place designated by the Owner. All items not claimed become the property of the contractor and shall be removed from the site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.

B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.02 RESTRICTED MATERIALS

A. No materials containing asbestos in any form shall be allowed.

B. No solder or flux containing lead shall be used on this project.

C. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.03 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

A. Plastic Nameplates: Laminated plastic with engraved letters.

B. Plastic Tags: Laminated plastic with engraved letters, minimum 1-1/2 inches diameter.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Nameplates, tags and markers shall be suitable for exterior installation.

2.04 PIPE HANGERS AND SUPPORTS

A. Conform to ANSI/MSS SP58.

B. Multiple or Trapeze Hangers: strut channel with galvanized steel hanger rods.

C. Vertical Supports: Strut triangular bracket with galvanized steel pipe clamp and cushion insulator.

D. Design hangers to allow installation without disengagement of supported pipe.

E. Strut Type Pipe Hanging System: Unistrut P-1000 series; framing members shall be No. 12 gage formed steel channels, 1-5/8 inch square, conforming to ASTM A 570 GR33, one side of channel shall have a continuous slot with inturned lips; framing nut with grooves and spring 1/2 inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A 307; fittings conforming to ASTM A 575; all parts enamel painted or electro-galvanized.

2.05 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, or continuous threaded, electro-galvanized.

2.06 ANCHOR BOLTS

A. Anchor (Expansion) Bolts: Shall be carbon steel to ASTM A 307; nut shall conform to ASTM A194; shall be drilled-in type. Design values for shear and tension shall be not more than 80 percent of the allowable load.

2.07 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the structural engineer of record.
2. 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.
3. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
4. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in installation requirements.
5. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

2.08 SEISMIC BRACING COMPONENTS

A. Steel strut shall be 1-5/8 wide in varying heights and mig-welded combinations as required to meet load capacities and designs indicated. A material heat code, part number, and manufacturer's name shall be stamped on all strut and fittings to maintain traceability to material test reports.

1. Material for epoxy painted strut: ASTM A1011, SS, Grade 33.
2. Material for pre-galvanized strut: ASTM A653, SS, Gr. 33.
3. Material for Hot-Dip Galvanized strut: ASTM A1011, SS, Grade 33 and hot-dip galvanized after fabrication in accordance with ASTM A123.
4. Material for fittings and accessories: ASTM A907 Gr. 33, Structural Quality or ASTM A1011, SS. Gr.33.
5. Fittings and accessories: Products shall be of the same manufacturer as strut and designed for use with that product.

PART 3 - EXECUTION

3.01 DRAWINGS

A. The mechanical drawings are generally diagrammatic. Complete details which affect the mechanical installation may not be shown. For additional details, see Structural, Civil, and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.02 INSTALLATION

A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC, IBC, NFPA, IECC, IFGC and IFC Standards; all local and state amendments to all codes and standards.

B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.03 MEASUREMENTS

A. Verify all measurements on the job site.

B. Locate all equipment on the centers of walls, openings, spaces, etc., unless specified otherwise.

C. Check all piping, ducts, etc. to clear openings.

3.04 OPERATING INSTRUCTIONS

A. Before the facility is turned over to the Owner, instruct the Owner or Owner's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Mechanical Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.

B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of eight hours of onsite instruction to the owner designated personnel.

C. When required by individual specification sections provide additional training on systems and equipment as indicated in the respective specification section.

D. Provide schedule for training activities for review prior to start of training.

3.05 SYSTEM ADJUSTING

A. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all controls, elimination of noise and vibration.

3.06 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.07 PAINTING

A. Perform all of the following painting in accordance with specification 09 96 00.

3.08 IDENTIFICATION

A. Tag all valves with heat resistant laminated plastic with readily legible letters. Securely fasten to the valve stem or bonnet with beaded chain. Provide complete record drawings that show all valves with their appropriate label. Seton 250-BL-G, or 2961.20-G, 2" round or equal.

B. Label all equipment with heat resistant laminated plastic labels having engraved lettering ½" high. If items are not specifically listed on the schedules, consult the Engineer concerning designation to use. Seton engraved Seton-Ply nameplates or equal.

C. Identify piping to indicate contents and flow direction of each pipe exposed to view by a labeled sleeve in letters readable from ground, install on pipe every 10'. Coloring scheme in accordance with ANSI A13.1-1981, Seton Opti-Code or equal.

3.09 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
½ to 1-¼ inch	6'-0"	3/8"
1-½ to 2 inch	10'-0"	3/8"

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-½ inch minimum vertical adjustment.

E. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

F. Support riser piping independently of connected horizontal piping.

G. Provide transverse seismic support for all piping systems.

3.10 SLEEVES

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Set sleeves in position in construction. Provide reinforcing around sleeves.

C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

D. Where piping penetrates a wall, install sleeve, close off space between pipe caulk seal. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons.

3.11 SEISMIC RESTRAINT

A. General:

1. All equipment, piping and ductwork shall be restrained to resist seismic/wind forces per the applicable building code(s) as a minimum. Restraint attachments shall be made by bolts, welds or a positive fastening method. Friction shall not be considered. All attachments shall be proven capable of accepting the required wind load by calculations. Additional requirements specified herein are included specifically for this project.
2. Install seismic and wind restraint devices per the manufacturer's submittals. Any deviation from the manufacturer's instructions shall be reviewed and approved by the manufacturer.
3. Attachment to structure for suspended equipment, pipe and duct: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
4. Wall penetrations may be used as bracing locations provided the wall can provide adequate resistance without significant damage.
5. Coordinate sizes and locations of cast-in-place inserts for post-tensioned slabs with seismic restraint manufacturer.
6. Provide hanger rod stiffeners where indicated or as required to prevent buckling of rods due to seismic forces.
7. Where rigid restraints are used on equipment, ductwork or piping, support rods for the equipment, ductwork or piping at restraint locations must be supported by anchors rated for seismic use. Post-installed concrete anchors must be in accordance with ACI 355.2.
8. Ensure housekeeping pads have adequate space to mount equipment and seismic restraint devices and shall also be large enough to ensure adequate edge distance for restraint anchor bolts to avoid housekeeping pad breakout failure.

B. Concrete Anchor Bolts:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre- or post-tensioned tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the

hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.

C. Equipment Restraints:

1. Seismically restrain equipment all equipment. Install fasteners, straps and brackets as required to secure the equipment.
2. Install neoprene grommet washers on equipment anchor bolts where clearance between anchor and equipment support hole exceeds 1/8" (3.2 mm).

D. Piping Systems:

E. For projects with a Seismic Design Category of D, E or F, provide seismic cable restraints on the following:

1. All piping greater than 3" nominal diameter.
2. All piping systems assigned a component importance factor, Ip, of 1.5 with a nominal pipe diameter greater than 1" or trapeze-supported piping with combined operating weight over 10 lbs/ft.

F. "12-inch rule", where pipe can be exempted from seismic restraint based on the length of the support rods, is accepted if one of the following conditions are met:

1. Hangers are detailed to avoid bending of the hangers and their attachment; and provisions are made for piping to accommodate expected deflections. The maximum stress due to combined loading including bending in the hangers must be less than 21.6 ksi.
2. Isolation hangers are added to hanger rod to provide swivel joint and to prevent bending moment in hanger.

G. Restraint spacing:

1. For ductile piping, space lateral supports a maximum of 40' o.c., and longitudinal supports a maximum of 80' o.c.
2. For non-ductile piping (e.g., cast iron, PVC) space lateral supports a maximum of 20' o.c., and longitudinal supports a maximum of 40' o.c.
3. For piping with hazardous material inside (e.g., natural gas, medical gas) space lateral supports a maximum of 20' o.c., and longitudinal supports a maximum of 40' o.c.
4. For pipe risers, restrain the piping at floor penetrations using the same spacing requirements as above.

H. Brace a change of direction longer than 12'.

I. Longitudinal restraints for single pipe supports shall be attached directly to the pipe, not to the pipe hanger.

J. For supports with multiple pipes (trapezes), secure pipes to trapeze member with clamps approved for application.

K. Piping on roller supports shall include a second roller support located on top of the pipe at each restraint location to provide vertical restraint.

L. Install restraint cables so they do not bend across edges of adjacent equipment or building structure.

M. Install flexible metal hose loops in piping which crosses building seismic joints, sized for the anticipated amount of movement.

N. Install flexible piping connectors where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

O. Coordinate seismic restraints with thermal expansion compensators, guides and anchor points. Thermal expansion anchor points shall be designed to accommodate seismic forces.

3.12 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacture recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.

E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all equipment furnished under this Contract.

END OF SECTION

SECTION 23 09 33
PROCESS CONTROL AND INSTRUMENTATION SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The contractor shall provide all Process Control and Instrumentation Systems (PCIS), fully programmed, complete and operable, in accordance with the Contract Documents and the Sequences of Operations.

B. The requirements of this Section apply to all components of the PCIS, unless indicated otherwise.

C. Responsibilities

1. The contractor, through the use of an instrumentation supplier, panel fabricator, and qualified electrical and mechanical installers, shall be responsible to the owner for the implementation of the PCIS and the integration of the PCIS with other required instrumentation and control devices.
2. The contractor shall coordinate with and fully support the efforts of the Owner's systems integrator throughout construction and commissioning.
3. The contractor shall visit the site to inspect the existing installations and verify existing PLC panel locations, configuration, components, wiring, programming and available expansion area. The contractor shall thoroughly acquaint themselves with conditions to be met and the work to be accomplished in modifying the existing PLC, and in installing the new work. The contractor shall be responsible to download and retrieve the existing ladder logic program for modification as well as maintaining existing ladder logic programming intact and operational. Accurate and complete PLC panel, wiring and programming documentation is not available.
4. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that the Instrumentation Supplier be responsible to the contractor for the integration of the PCIS with devices provided under other sections, with the objective of providing a completely integrated control system free of signal incompatibilities.
5. As a minimum, the Instrumentation supplier shall perform the following work:

    a. Implementation of the PCIS

        1) Asbuilt existing PLC panels and hardware as required to interconnect new hardware and control points.
        2) Prepare analog hardware submittals.
        3) Prepare the test plan, the training plan, and the spare parts submittals.
        4) Procure hardware.
        5) Oversee and certify hardware installation.
        6) Oversee, document, and certify loop testing.
        7) Prepare Technical Manuals.

8) Prepare edited set of record drawings.
9) Coordinate with Owner's Systems Integrator throughout construction and commissioning of new graphics and control sequences.
10) Provide training to owners personnel in the use of the system.

6. Any Instrumentation Supplier responsibilities in addition to the list above are at the discretion of the contractor and the Instrumentation Supplier. Additional requirements in this Section and throughout Division 23 which are stated to be the contractor's responsibility may be performed by the Instrumentation Supplier if the contractor and Instrumentation Supplier so agree.

D. Control System Panel Designer and Fabricator

1. Control System Panel Designer and Fabricator (CSPDF): The control system panel, and all other panels that have PLC hardware or communication hardware within them, shall be modified by the CSPDF. The CSPDF shall perform the following work:

a. Provide loop drawings and control panel designs to show any and all changes to the design and existing system.

2. CSPDF Qualifications: The CSPDF shall have the resources, and personnel needed to design and modify the existing panels. The CSPDF shall meet the following minimum qualifications:

a. The CSPDF shall make all wiring changes to existing control panels. The changes shall be made to UL standard 508, or equal standard. The CSPDF shall provide a UL engineer, or equal testing lab engineer that is acceptable to the State of Alaska, to inspect the changes and certify that the panel meets the standard, or provide a list of deficiencies.
b. The CSPDF shall be responsible to make all ladder logic programming changes to the PLC including providing all equipment necessary to access and downloading the existing logic program for modification per the sequences of operation. The CSPDF shall be responsible to ensure the existing ladder logic programming remains in-tact and operational throughout construction.
c. Existing ladder logic software is Studio 5000.

E. Systems Integrator: The Systems Integration service shall be provided by the owner. It is the intent of these Specifications that the Systems Integrator, in coordination with the contractor, shall assume full responsibility for the following:

1. The systems integrator shall be responsible for the programming modifications to the Supervisory Control and Data Acquisition (SCADA) graphical software required by the sequences of operation and ensuring existing SCADA programming and graphics remain in-tact and operational throughout construction.
2. Perform all required SCADA software tests, adjustments, and calibrations.
3. Existing SCADA graphics software is Wonderware 2017.
4. Owner's Qualified Systems Integrator is Tek Pro (907-348-1800).

1.02 RELATED SECTIONS

A. Section 01 11 13 – Summary of Work.

B. Section 01 31 14 – Work Coordination.

C. Section 01 72 00 – Utilities Coordination.

D. Section 23 05 00 – Common Work Results for HVAC.

E. Section 23 09 34 – Control Panels.

F. Section 23 09 35 – PLC-Based Control Systems Hardware.

G. Section 23 09 94 – Sequence of Operations for PLC Controls.

H. Section 26 05 00 – Common Work Results for Electrical.

I. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

1.03 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 23 05 00.

B. All equipment tags used in the submittals, O&M manuals, and field identification shall be the complete tag and shall consist of the plant acronym prepended to the instrument tag shown on the drawings.

C. The contractor shall coordinate the instrumentation work so that the complete instrumentation and control system will be provided and will be supported by accurate Shop Drawings and record drawings.

D. Shop Drawings

1. General

a. Shop Drawings shall include the letterhead or title block of the Instrumentation Supplier. The title block shall include, as a minimum, the Instrumentation Supplier's registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing. The quantity of submittal sets shall be as indicated in Division 01 – Contractor Submittals.

b. Organization of the Shop Drawing submittals shall be compatible with eventual submittals for later inclusion in the Technical Manual.

c. Shop Drawing information shall be bound in standard size, three-ring, loose-leaf, vinyl plastic, hard cover binders suitable for bookshelf storage. One set of drawings for each facility is to be hung inside the SCADA panel. The drawings are to be enclosed in PVC pockets suitable for hanging from a 3-ring binder, two drawings per pocket. The ring binder is to be attached to the inside of the front panel door.

d. Interfaces between instruments, motor starters, control valves, variable speed drives, flow meters, and other equipment related to the PCIS shall be included in the Shop Drawing submittal.

2. Analog Hardware Submittal: The contractor shall submit an analog hardware submittal as a complete bound package at one time within 60 calendar days after the commencement date stated in the Notice to Proceed, including:

   a. A complete index which lists each device by tag number, type, and manufacturer. A separate technical brochure or bulletin shall be included with each instrument data sheet (original documents only – photocopies are not acceptable and will be rejected). The data sheets shall be indexed in the submittal by systems or loops, as a separate group for each system or loop. If, within a single system or loop, a single instrument is employed more than once, one data sheet with one brochure or bulletin may cover all identical uses of that instrument in that system. Each brochure or bulletin shall include a list of tag numbers for which it applies. System groups shall be separated by labeled tags.
   b. Fully executed data sheets - Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, for each component, together with a technical product brochure or bulletin. The technical product brochures shall be complete enough to verify conformance to all Contract Document requirements. The data sheets, as a minimum, shall show:

      1) Component functional description used in the Contract Documents
      2) Manufacturer's model number or other product designation
      3) Project tag number used in the Contract Documents
      4) Project system or loop of which the component is a part
      5) Project location or assembly at which the component is to be installed
      6) Input and output characteristics
      7) Scale, range, units, and multiplier (if any)
      8) Requirements for electric supply (if any)
      9) Requirements for air supply (if any)
      10) Materials of component parts to be in contact with or otherwise exposed to process media and corrosive ambient air
      11) Special requirements or features

   c. Priced list of all spare parts for all devices.

3. Test Procedure Submittals

   a. The CONTRACTOR shall submit the proposed procedures to be followed during tests of the PCIS and its components.
   b. Preliminary Submittal: Outlines of the specific proposed tests and examples of proposed forms and checklists.

4. The CONTRACTOR shall provide a submittal of the CSPDF's certifications, and project history before submitting any Shop Drawings or commencing any work on the control panels.

E. Technical Manual

1. General: Information in the Technical Manual shall be based upon the approved Shop Drawing submittals as modified for conditions encountered in the field during the WORK.
2. The Technical Manual shall have the following organization for each process:

    a. Section C – Edited As Built Drawings
    b. Section D – Instrument Summary
    c. Section E – Instrument Data Sheets
    d. Section H – Test Results

3. Signed results from Loop Testing.
4. Initially, two sets of draft Technical Manuals shall be submitted for review after return of favorably reviewed Shop Drawings and data required herein. Following the engineer's review, one set will be returned to the contractor with comments. The Manuals shall be revised and amended as required and the final Manuals shall be submitted 15 days prior to start-up of systems.
5. The contractor shall provide Instrument Equipment Summary Form for all instruments, PLC hardware, devices, control hardware, and miscellaneous equipment. The data shall be provided in electronic format and included in the technical manual preceding early instrument or equipment technical data section. Instrument equipment summary form shall include the following items:

    a. Manufacturer.
    b. Serial Number.
    c. Model/Part Number.
    d. Size.
    e. Function.
    f. Span.
    g. Set Point.
    h. Reset Time.
    i. Ration/Factor.
    j. Input.
    k. Output.
    l. Rev/Dir.
    m. Warranty Start Date.
    n. Warranty End Date.
    o. Comments.

F. Record Drawings

1. The contractor shall keep current a set of complete loop and schematic diagrams which shall include all field and panel wiring, piping and tubing runs, routing,

mounting details, point-to-point diagrams with cable, wire, tube, and termination numbers. These drawings shall include all instruments and instrument elements. Two sets of drawings electronically formatted in AUTOCAD on CD-ROM and two hard copies shall be submitted after completion of all commissioning tasks. All such drawings shall be submitted for review prior to acceptance of the completed work by the owner.

1.04 WARRANTY

A. The warranty shall start from the date of final acceptance of the completed project, and shall extend for 1 year, in accordance Division 10.

PART 2 - PRODUCTS

2.01 GENERAL

A. Code and Regulatory Compliance: PCIS work shall conform to or exceed the applicable requirements of the National Electrical Code and local building codes.

B. Current Technology: Meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings, unless otherwise required to match existing equipment.

C. Hardware Commonality: Instruments which utilize a common measurement principle (for example, d/p cells, pressure transmitters, level transmitters which monitor hydrostatic head) shall be furnished by a single manufacturer. Panel-mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.

D. Loop Accuracy: The accuracy of each instrumentation system or loop shall be determined as a probable maximum error; this shall be the square-root of the sum of the squares of certified "accuracies" of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of plus and minus 2 percent of full scale and a minimum repeatability of plus and minus 1 percent of full scale when installed in the field, unless otherwise indicated. Instruments that do not conform to or improve upon these criteria are not acceptable.

E. Instrument and Loop Power: Power requirements and input/output connections for all components shall be verified. Power for transmitted signals shall, in general, originate in and be supplied by the control panel devices. The use of "2-wire" transmitters is preferred, and use of "4-wire" transmitters shall be minimized. Individual loop or redundant power supplies shall be provided as required by the manufacturer's instrument load characteristics to ensure sufficient power to each loop component. Power supplies shall be mounted within control panels or in the field at the point of application.

F. Loop Isolators and Converters: Signal isolators shall be provided as required to ensure adjacent component impedance match where feedback paths may be generated, or to

maintain loop integrity during the removal of a loop component. Dropping precision wirewound resistors shall be installed at all field side terminations in the control panels to ensure loop integrity. Signal conditioners and converters shall be provided where required to resolve any signal level incompatibilities or provide required functions.

G. Environmental Suitability: Indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain all instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The contractor shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.

H. Signal Levels: Analog measurements and control signals shall be as indicated herein, and unless otherwise indicated, shall vary in direct linear proportion to the measured variable. Electrical signals outside control panels shall be 4 to 20 mA DC, except as indicated. Signals within enclosures may be 1-5 VDC. Electric signals shall be electrically or optically isolated from other signals.

I. Alternative Equipment and Methods: Equipment or methods requiring redesign of any project details are not acceptable without prior written approval of the engineer through the "or equal" process of Division 01 and the Bidding and Contract requirements of Division 00. Any proposal for approval of alternative equipment or methods shall include evidence of improved performance, operational advantage and maintenance enhancement over the equipment or method indicated, or shall include evidence that an indicated component is not available. To match existing equipment and future equipment being installed under other contracts, equipment substitutions for equipment specified as no equal will not be accepted.

J. Instrument Brackets and Mounting Hardware: All instrument brackets and mounting hardware shall be stainless steel.

K. All materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements, and submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

L. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent (0.001) of the total contract amount, or $2,500, whichever is greater. For the purposes of this paragraph, the cost is the value of the products as they are delivered to the Project including freight.

2.02 OPERATING CONDITIONS

A. The PCIS shall be designed and constructed for satisfactory operation and long term operation, and low maintenance service under the following conditions:

1.	Environment	-	Power plant facility
2.	Indoor Temperature Range	-	32 through 95 degrees F
3.	Relative Humidity	-	20-90% , non-condensing
4.	ASCE-07 Seismic Design Category	-	D
5.	ASCE-07 Importance Factor	-	Ip=1.0

2.03 SPARE PARTS AND SPECIAL TOOLS

A. The CONTRACTOR shall provide the following:

1. Spare parts as listed in equipment specifications in Section 23 09 35 PLC-Based Control System Hardware.

B. The contractor shall furnish a priced list of all special tools required to calibrate and maintain the instrumentation provided under the Contract Documents. After approval, the contractor shall furnish tools on that list.

C. Special tools and spare parts shall be submitted before startup commences, suitably wrapped and identified.

2.04 SEISMIC ZONE

A. Panels, instruments, conduits, and pipes shall be anchored to meet seismic restraint requirements of the American Society of Civil Engineers, Standard 07 Chapter 13. Refer to 23 05 00 Part 2.08.

PART 3 - EXECUTION

3.01 PRODUCT HANDLING

A. Tagging: Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel tag firmly attached and stamped with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package. Each HART device shall have the PID number programmed into smart HART protocol memory. The complete tag shall be the instrument drawing tag shown on the contract drawings.

B. Storage: Equipment shall not be stored outdoors. Equipment shall be stored in dry, permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the contractor. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the engineer. If such tests reveal defects, the equipment shall be replaced.

3.02 INSTALLATION

A. General

1. Instrumentation, including instrumentation furnished under other Divisions, shall be installed under Division 23 and the manufacturers' instructions.
2. Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the OWNER exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the CONTRACTOR shall make such changes without additional cost to the OWNER.

B. Conduit, Cables, and Field Wiring

1. Install conduit in conformance with Division 26 05 33.
2. Install process equipment control wiring, 4-20 mA signal circuits, signal wiring to field instruments, PLC input and output wiring and other field wiring and cables in conformance with Division 26 05 33.
3. Install PLC equipment cables, data communication networks in conformance with Division 26 05 19 & Division 27 10 00.

C. Instrumentation Tie-Downs: Instruments, control panels, and equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

D. Ancillary Devices: The Contract Documents show all necessary instruments required to make a complete instrumentation system. The contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such additions and such changes, including the proposed method of installation, shall be submitted to the engineer for approval prior to commencing the work. Such changes shall not be a basis of claims for extra work or delay.

E. Installation Criteria and Validation: Field-mounted components and assemblies shall be installed and connected according to the requirements below:

1. Installation personnel have been instructed on installation requirements of the Contract Documents.
2. Technical assistance is available to installation personnel at least by telephone.
3. Installation personnel have at least one copy of the approved Shop Drawings and data.
4. Flexible cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.
5. Power and signal wires shall be terminated with crimped type lugs.
6. Connectors shall be, as a minimum, watertight.

7. Wires shall be mounted clearly with an identification tag that is of a permanent and reusable nature.
8. Wires shall be numbered as shown on the shop drawings to reference termination point in PLC cabinet and connected field device.
9. Wire and cable shall be arranged in a neat manner and securely supported in cable groups and connected from terminal to terminal without splices, unless specifically approved by the engineer. Wiring shall be protected from sharp edges and corners.
10. Mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.
11. Verify the correctness of each installation, including polarity of electric power and signal connections, and make sure process connections are free of leaks. The contractor shall certify in writing that discrepancies have been corrected for each loop or system checked out.
12. The owner will not be responsible for any additional cost of rework attributable to actions of the contractor or the Instrumentation Supplier.

3.03 CALIBRATION

A. General: Devices shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.

B. Calibration Points: Each instrument shall be calibrated at 20, 60, and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Testing Standards.

C. Bench Calibration: Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the engineer.

D. Field Calibration: Instruments that were not bench-calibrated shall be calibrated in the field to insure proper operation in accordance with the instrument loop diagrams or specification data sheets.

E. Analyzer Calibration: Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.

F. Calibration Sheets: Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit:

1. Project name
2. Loop number
3. Tag number
4. Manufacturer
5. Model number
6. Serial number

7. Calibration range
8. Calibration data: Input, output, and error at 20 percent, 60 percent and 100 percent of span
9. Switch setting, contact action, and deadband for discrete elements
10. Space for comments
11. Space for sign-off by Instrumentation Supplier and date
12. Test equipment used and associated serial numbers

G. Calibration Tags: A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the engineer. The contractor shall have the Instrumentation Supplier sign the tag when calibration is complete. The engineer will sign the tag when the calibration and testing has been accepted.

3.04 LOOP TESTING

A. General: Individual instrument loop diagrams per ISA Standard S5.4 - Instrument Loop Diagrams, expanded format, shall be submitted to the engineer for review prior to the loop tests. The contractor shall notify the engineer of scheduled tests a minimum of 30 days prior to the estimated completion date of installation and wiring of the PCIS. After the engineer's review of the submitted loop diagrams for correctness and compliance with the Specifications, loop testing shall proceed. The loop check shall be witnessed by the engineer.

B. Instrument and Instrument Component Validation: Each instrument shall be field-tested, inspected, and adjusted to its indicated performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirement, or, in the absence of a Contract requirement, any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the engineer and at the contractor’s expense.

C. Loop Validation: Controllers and electronic function modules shall be field-tested and exercised to demonstrate correct operation of the hardware and wiring. Control loops shall be checked under simulated operating conditions by impressing input signals at the primary control elements and observing appropriate responses at register in the PLC processor. Actual signals shall be used wherever available. Following any necessary corrections, the loops shall be retested.

D. Loop Validation Sheets: The contractor shall prepare loop confirmation sheets for each loop covering each active instrumentation and control device including simple hand switches and lights. Loop confirmation sheets shall form the basis for operational tests and documentation. Each loop confirmation sheet shall cite the following information and shall provide spaces for sign-off on individual items and on the complete loop by the Instrumentation Supplier:

1. Project name
2. Loop number
3. Tag number, description, manufacturer and model number for each element
4. Installation bulletin number

5. Specification sheet number
6. Adjustment check
7. Space for comments
8. Space for loop sign-off by Instrumentation Supplier and date
9. Space for engineer witness signature and date

E. Loop Certifications: When installation tests have been successfully completed for all individual instruments and all separate analog control networks, a certified copy of each test form signed by the engineer or the engineer's representative as a witness, with test data entered, shall be submitted to the engineer together with a clear and unequivocal statement that the instrumentation has been successfully calibrated, inspected, and tested.

3.05 PERFORMANCE TEST

A. The entire PCIS hardware, field instruments, power supplies, and wiring shall operate for 30 days without failure.

B. The contractor shall furnish support staff as required to satisfy the repair or replacement requirements.

C. If any component, other than field instruments, fails during the performance test, it shall be repaired or replaced and the PCIS shall be restarted for another 30-day period.

3.06 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

A. In addition to Division 01 requirements, the following conditions shall be fulfilled before the work is considered substantially complete:

1. Submittals have been completed and approved.
2. The PCIS has been installed, calibrated, and loop tested.
3. Spare parts and expendable supplies and test equipment have been delivered to the engineer.
4. The performance test has been successfully completed.
5. Punch-list items have been corrected.
6. Record drawings in both hard copy and electronic format have been submitted.
7. Revisions to the Technical Manuals that may have resulted from the field tests have been made and reviewed.
8. Debris associated with installation of instrumentation has been removed.
9. Probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.
10. Training has been completed.

B. Training: The manufacturer shall provide factory trained instructor to give full instruction to designated personnel in the operation of the system installed. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. The manufacturer shall provide all students with a student binder containing product specific training modules for the system installed. Training may involve day, evening, and/or night sessions at Owner’s requirement.

C. Provide eight hours of training for Owner's designated operating personnel. Training shall include:

1. Explanation of drawings, technical manuals.
2. Walk-through of the job to locate control components.
3. HMI, Operator workstation and peripherals.
4. PLC controller operation/function.
5. Operator control functions including graphic generation and field panel programming.
6. Demonstration and explanation of adjustment, calibration and replacement procedures.

D. Since the Owner may require personnel to have more comprehensive understanding of the hardware and software, additional training must be available from the Manufacturer. If such training is required by the Owner, it will be contracted at a later date.

END OF SECTION

SECTION 23 09 35
PLC-BASED CONTROL SYSTEMS HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The contractor, through the use of the Instrumentation Supplier and qualified electrical installers, shall provide and install the PLC-based control system (PLCS) hardware complete and operable, in accordance with the Contract Documents.

B. Instrumentation Supplier: It is the intent of these Specifications to have the Instrumentation Supplier be singularly responsible for selecting, and verifying correct operation of compatible hardware to provide a functional PLCS and to provide future support of all PLCS hardware.

C. Minimum Instrumentation Supplier Scope: The exact contractual relationship and scope definition shall be established exclusively between the contractor and the Instrumentation Supplier. It is the intent of these Specifications that the Instrumentation Supplier, under the direction of the contractor, shall assume full responsibility for the following, as a minimum:

1. Procurement of all hardware required to conform to these Specifications.
2. Design and submit PLCS hardware, and spare parts submittals.
3. Perform all required PLCS hardware tests, adjustments, and calibrations.
4. Furnish all required PLCS tools, test equipment, spare parts, supplies, operations and maintenance manuals, and reproducible record drawings as specified herein.

1.02 RELATED SECTIONS

A. Section 01 11 13 – Summary of Work.

B. Section 01 31 14 – Work Coordination.

C. Section 01 72 00 – Utilities Coordination.

D. Section 23 05 00 – Common Work Results for Mechanical.

E. Section 23 09 34 – Control Panels.

F. Section 23 09 94 – Sequence of Operations for PLC Controls.

G. Section 26 05 00 – Common Work Results for Electrical.

H. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

1.03 REFERENCES

A. Equipment and materials selected by the contractor that do not achieve design requirements after installation shall be replaced or modified by the Instrumentation Supplier

to attain compliance. The cost for doing so shall be the contractor's responsibility. Following replacement or modification, the contractor shall retest the system and perform any additional procedures needed to place the complete PLCS in satisfactory operation and attain design compliance approval from the engineer.

B. The contractor warrants/guarantees the satisfactory performance of the equipment and materials under operating conditions for a period of 1 year after the date of final acceptance of the new PLCS hardware. In the event that tests and inspections disclose latent defects or failure to meet the specified requirements, the Instrumentation Supplier, upon notification by the owner, shall proceed at once to correct or repair any such defects or non-conformance or to furnish, at the delivery point named in the Contract Documents, such new equipment or parts as may be necessary for conformity to the requirements, and shall receive no additional compensation therefore. In case of any required repairs or other corrective or remedial work covered under warranty, the warranties on all such corrections, repairs, new equipment, or parts shall be extended for an additional 24 months from the date of final acceptance, or 12 months from the date of completion of any such corrections, repairs, new equipment, or parts, whichever date is later. If the owner performs repair, the contractor shall reimburse the owner for all costs incurred in the removal of the defective material and installation of the replacement.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 23 05 00.

B. Shop Drawings: PLCS hardware submittals shall be in accordance with the applicable requirements of Section 23 09 33 – Process Control and Instrumentation Systems.

C. Hardware Submittals: The PLCS hardware submittal shall be a single submittal which includes at least the following:

1. A complete index appearing in the front of each bound submittal volume. System groups shall be separated by labeled tags.
2. Data sheets shall be included for each PLCS component together with a technical product brochure or bulletin and instrument equipment summary form per 230933. These data sheets shall show the component name as used within the Contract Documents, the manufacturer's model number or other identifying product designation, the project tag number, the project system of which it is a part, the Site to which it applies, the input and output characteristics, the requirements for electric power, the ambient operating condition requirements, and details on materials of construction.
3. Complete and detailed bills of materials: A bill of material list, including quantity, description, manufacturer, and part number, shall be submitted for each component of the PLCS system. Bills of material shall include all items within an enclosure.

D. Owner's Manuals: General requirements for Owner's Manuals are as described in Section 23 09 33 – Process Control and Instrumentation Systems. The following items shall also be included in the PLCS manual:

1. Operation and maintenance manuals for new PLCS hardware.

1.05 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The CONTRACTOR/Instrumentation Supplier shall arrange for visits by, and services of, technical field representatives of the PLC manufacturer for installation certification, system testing, and start-up. These services shall be part of the work.

1.06 STORAGE AND HANDLING

A. All equipment and materials delivered to the Site shall be stored in a location that shall not interfere with the operations of the owner's personnel or interfere with construction. Storage and handling shall be performed in a manner that shall afford maximum protection to the equipment and materials. It is the contractor's responsibility to assure proper handling and on-site storage.

PART 2 - PRODUCTS

2.01 GENERAL

A. The requirements of Section 23 09 33 – Process Control and Instrumentation Systems apply to this Section.

B. All materials and all PLCS equipment furnished under this Contract shall be new, free from defects, of first quality, and produced by manufacturers regularly engaged in the manufacture of these products.

C. Hardware Commonality: Where there is more than one item of similar equipment being furnished all such similar equipment shall be the product of a singular manufacturer.

D. All materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements, and submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

2.02 ACCEPTABLE MANUFACTURERS

A. Allen Bradley as basis of design.

B. ProSoft.

C. Substitutions: Under provisions of Division 01, Bidding and Contract Requirements of Division 00.

2.03 BASIS OF DESIGN PLC RACK AUTHORIZED EQUIPMENT LIST

A. Allen Bradley 13-Slot Chassis #1746-A7 w/ Chassis Interconnect Cable

B. Allen Bradley Power Supply AB SLC500.

C. ProSoft Modbus Master/Slave Communication Module #174646-MCM

D. Allen Bradley Analog I/O Module.

E. Allen Bradley Binary I/O Module.

F. Allen Bradley Stratix either net switch.

2.04 HARDWARE FOR EXISTING PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. Interface and Network

1. The PLC system shall communicate via Modbus TCP protocol with the Generator Controllers and fuel level sensor.

B. PLC Input/Output (I/O) Modules

1. I/O Modules General: All I/O housings and modules shall be suitable for hostile industrial environments. All I/O modules shall be isolated and conform to IEEE Surge Withstand Standards and NEMA Noise Immunity Standards. The I/Os shall be 4-20 mA DC for all analog inputs and outputs and shall be 24 VDC for discrete inputs and dry relay contacts for safe discrete outputs. Each PLC I/O location shall contain the I/O module quantity and be shown on shop drawings.
2. Discrete Input Modules with Diagnostics: Defined as contact closure inputs from devices external to the programmable controller module. Individual inputs shall be optically isolated from low energy common mode transients to 1500 volts peak from users wiring or other I/O modules.

    a. DC input for devices that operate at 5 to 30 VDC.

3. Discrete Output Modules with Electronic Fuse: Defined as contact closure outputs for ON/OFF operation of devices external to the programmable controller module. The output modules shall be optically isolated from inductively-generated, normal mode and low energy, common mode transients to 1500 volts peak. Discrete output contacts shall be provided with interposing relays in the control panel.

    a. DC output for devices that operate at 10 to 30 VDC.

4. Analog Input Modules: Defined as 4 to 20 mA DC signals, where an analog to digital conversion is performed with 14-bit precision and the digital result is entered into the processor. The analog to digital conversion shall be updated with each scan of the processor. Input modules shall be source or sink to handle 2-wire or 4-wire transmitters, respectively.
5. Analog Output Modules: Defined as 4 to 20 mA DC output signals where each output circuit performs a digital to analog conversion minimum of 12-bit precision with each scan of the processor. Each analog output module shall have two isolated output points which shall be rated for loads of up to 1200 ohms. The contractor shall provide current loop isolators as required to break ground loops.

2.05 NETWORK HARDWARE

A. All unshielded twisted pair cabling shall be rated EIA/TIA 485 category 6 for plenum space.

B. All shielded twisted pair cabeling shall be rated for voltage of adjacent equipment and cabeling. Shielded twisted pair shall have overall foil shield layer, drain wire and woven metal shield.

2.06 FIELD DEVICES

A. Ultrasonic Liquid Level Transmitters.

1. Foxboro IGP10 series w/ display as basis of design.
2. Provide with drop tube as required by manufacturer's installation instructions.
3. Substitutions: Under provisions of Division 01, Bidding and Contract Requirements of Division 00.

2.07 SPARE PARTS

A. Provide the following spare parts:

1. One (1) Ultrasonic Liquid Level Transmitter.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The contractor shall utilize qualified personnel to accomplish, or supervise the physical installation of all elements, components, accessories, or assemblies that it provides. The contractor shall employ installers who are skilled and experienced in the installation and connection of all elements, components, accessories, and assemblies it provides.

B. The contractor shall have a complete, up-to-date set of wiring drawings and PLC register list for the test point, for review throughout the test.

3.02 CALIBRATION, TESTING, AND INSTALLATION

A. Calibration: All analog inputs and outputs of the PLC shall have their calibration checked at a minimum of two points to verify consistency with the balance of the analog loop. This calibration check shall be done in conjunction with the analog loop tests in Section 23 09 33 – Process Control and Instrumentation Systems. Operator Interfaces and PLC registers shall both be verified for correctness.

END OF SECTION

SECTION 23 09 94
SEQUENCE OF OPERATIONS FOR PLC CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Standby Generator Control and Monitoring.

B. Fuel Dispensing Tank Monitoring.

1.02 RELATED SECTIONS

A. Section 01 11 13 – Summary of Work.

B. Section 01 31 14 – Work Coordination.

C. Section 01 72 00 – Utilities Coordination.

D. Section 23 05 00 – Common Work Results for HVAC.

E. Section 23 09 33 - Process Control and Instrumentation Systems.

F. Section 23 09 35 - PLC Based Control Systems Hardware.

G. Section 26 32 13 – Packaged Engine Generator Systems.

1.03 REFERENCES

A. This Section defines the manner and method by which programmable logic controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01, Section 23 05 00, and Section 23 09 33.

B. Submit diagrams indicating mechanical system controlled and control system components. Label with settings, adjustable range of control and limits. Include written description of control sequence.

C. Include flow diagrams for each control system, graphically depicting control logic.

D. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 01, Section 23 09 33.

B. Accurately record actual setpoints and settings of controls, including changes to sequences made after submission of shop drawings.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.01 STANDBY DIESEL GENERATOR MONITORING AND CONTROL

A. Alarms (MODBUS TCP communication protocol):

1. Low Engine Oil Pressure.
2. High coolant temperature.
3. Loss of Coolant.
4. Overspeed.
5. Overcrank.
6. Emergency Stop.
7. Low coolant temperature.
8. Low battery voltage.
9. Low fuel level alarm (subbase tank generator only).
10. High oil filter differential pressure.
11. High fuel filter differential pressure.
12. High air filter differential pressure.
13. High battery voltage.
14. Control switch not in auto.
15. Battery charger failure alarm.
16. Generator over voltage.
17. Generator under voltage.
18. Generator over frequency.
19. Generator under frequency.
20. Generator reverse power (real and reactive)
21. Generator overcurrent.
22. Generator current balance.
23. Loss of excitation alarm/shutdown.
24. Instantaneous over excitation alarm/shutdown.
25. Time over excitation alarm/shutdown.
26. Rotating diode failure.
27. Loss of sensing.
28. Loss of PMG.

B. Electronic Control and Indication (digital/analog control):

1. Generator Start Control.

C. Electronic Control and Indication (MODBUS TCP communication protocol):

1. Generator on/off status indication.
2. Generator paralleling (sinc) auto/manual command.
3. Generator paralleling (sinc) mode indication.
4. Engine oil pressure indication.
5. Engine oil temperature indication.
6. Engine coolant temperature indication.
7. Fuel Level indication (subbase tank generator only).
8. Engine fuel temperature.
9. Engine fuel pressure.
10. Instantaneous fuel consumption.
11. Total fuel consumption.
12. Oil filter differential pressure indication.
13. Fuel filter differential pressure indication.
14. Air filter differential pressure indication.
15. Engine RPM indication.
16. Battery volts indication.
17. Engine hours indication.
18. Engine crank attempt counter indication.
19. Engine successful start counter indication.
20. Service maintenance interval indication.
21. Real time clock indication.
22. Engine exhaust stack temperature indication.
23. Generator AC volts (line to Line, Line to Neutral, and Average) indication.
24. Generator AC current (Avg and Per Phase) indication.
25. Generator AC Frequency indication.
26. Generator kW (Total and Per Phase) indication.
27. Generator kVA (Total and Per Phase) indication.
28. Power Factor (Avg and Per Phase) indication.
29. Total kW-hr indication.
30. Total kVAR-hr indication.
31. %kW indication.
32. %kVA indication.
33. %kVAR indication.
34. Excitation voltage indication.
35. Excitation current indication.

D. Automated Control:

1. Upon a generator start command in automatic paralleling (sinc) mode for no-load testing from the PLC the generators shall start and parallel. The automatic transfer switch shall remain on utility power. Upon a generator stop command the generators shall stop.
2. Upon a generator start command in manual paralleling (sinc) mode for no-load testing from the PLC the selected generator shall start. Upon a generator stop command the generator shall stop.

3. Packaged engine controller will automatically start, run & parallel the standby generators. Refer to Section 26 32 13.

3.02 DIESEL DISPENSING TANK MONITORING

A. Alarms:

1. High Level (95% total capacity).
2. Low Level (60% total capacity).
3. Critical Low Level (40% total capacity).

B. Electronic Control and Indication (digital/analog control):

1. Fuel oil level indication (Inches of fuel)
2. Fuel oil capacity indication (Gallons)

END OF SECTION

SECTION 23 11 18
FUEL PIPING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fuel oil pipe and pipe fittings.

B. Above grade fuel oil storage tanks.

C. Valves.

D. Fuel Systems Specialties

E. Fuel System Equipment.

1.02 RELATED SECTIONS

A. Section 01 11 13 – Summary of Work.

B. Section 01 31 14 – Work Coordination.

C. Section 01 72 00 – Utilities Coordination.

D. Section 09 96 00 – High-Performance Coatings.

E. Section 23 05 00 – Common Work Results for HVAC.

F. Section 23 09 33 – Process control and instrumentation systems.

G. Section 23 09 35 – PLC-based control systems hardware.

H. Section 23 09 94 – Sequences of operations for PLC control.

1.03 REFERENCES

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:

1. National Electrical Manufacturers' Association (NEMA).
2. Underwriters Laboratories (UL).
3. National Fire Protection Association (NFPA).

D. Ensure pumps operate at specified system fluid temperatures without vapor binding.

E. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 23 05 00.

B. Include data on: piping, valves, pumps, dispensers and specialties.

C. Provide manufacturer's installation requirements.

D. Include dimension drawings of pumps and dispenser indicating components and connections to other equipment and piping.

E. Indicate pump type, capacity, power requirements, and affected adjacent construction.

F. Submit tank shop drawings under provisions of Division 01.

G. Submit, as part of shop drawings for tanks, manufacturer's installation instructions.

1.05 REGULATORY REQUIREMENTS

A. Comply with applicable government regulations.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Deliver and store valves, specialties, and equipment in shipping containers with labeling in place.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

C. Include exploded view and replacement parts list.

1.08 WARRANTY

A. Provide manufacturer's warranty under provisions of Division 01.

B. Warranty: Include coverage of Dispenser and pumps.

1.09 EXTRA STOCK

A. Furnish to the Owner, two extra fuel dispenser filters.

B. Furnish to the Owner, one extra submersible turbine fuel oil pump assembly.

PART 2 - PRODUCTS

2.01 FUEL OIL PIPING

A. Steel Pipe: ASTM A333, Schedule 40 black. Fittings: ANSI/ASTM B16.3, malleable iron, or ASTM A668, steel welding type. Joints: ANSI/AWS D1.1, welded.

2.02 FUEL OIL PIPING UNIONS

A. 150 psig malleable iron unions for threaded ferrous piping.

2.03 FUEL OIL GATE VALVES AND GLOBE VALVES

A. Not permitted. Use ball valves.

2.04 FUEL OIL BALL VALVES

A. Bronze body, stainless steel ball, Teflon seats and stuffing box ring, lockable ever handle, solder or threaded ends. Seat material to be compatible with fluid handled.

2.05 FUEL OIL CHECK VALVES

A. Swing Check Valves: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, threaded ends.

B. Spring Loaded Check Valves: MSS SP 80, Class 150 bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, threaded ends.

2.06 FUEL OIL POPPET FOOT VALVES

A. Valve: All brass parts, precision machined poppets and seats, lapped in with seats, single flat seat and disc construction. 20 mesh stainless steel screen on inlet.

B. Morrison Brothers #334 as basis of design.

2.07 FUEL OIL EXPANSION RELIEF VALVES

A. Ductile iron construction, used for relief of excessive pressure, 40 psi relief. UL listed for fuel systems.

B. Morrison Brothers #78DI as basis of design.

2.08 FUEL OIL ANTI-SIPHON VALVES

A. Stainless steel internal components, integral 25 psi expansion relief, factory preset 10’-15’ setting.

B. Morrison Brothers #912 as basis of design.

2.09 FUEL OIL FIRE SAFETY VALVE

A. Valve shall be stainless steel and UL C842 listed. 50 psi max operating pressure.

B. Morrison Brothers #446 as basis of design.

2.10 FUEL OIL FLEXIBLE CONNECTORS

A. 2 inches and Smaller: Corrugated Type 304 stainless steel inner hose with single layer of Type 304 stainless steel exterior braiding. Maximum working pressure 200 psig.

2.11 ABOVE GRADE FUEL OIL STORAGE TANK

A. Manufacturers:

1. Anchorage Tank

2. Ace Tank

3. Greer Tank

4. Highland Tank

5. Substitutions: Under the provisions of the Division 01.

B. Tank: The contractor shall provide all materials, equipment, and labor to construct a horizontal, cylindrical, tow bar skid mounted fuel (Class II) UL-2085 listed storage tank complete with pumping, filtration, metering, and safety systems. Tank shall have the ability to withstand fire (UL-2075 Section 17), vehicle impact resistance (UL-2075 Section 20) and projectile resistance (UL-2075 Section 21) as well as all NFPA fire code requirements under NFPA 30, 37 and 110. The tank shall be constructed such that 100% integrated secondary containment of the tank primary volume is achieved. Fuel pumping, filtration, filling, and dispensing equipment shall be mounted on the tank to provide a complete storage/pumping system. Anchorage Tank & Welding, Inc. Model AGOFMH20, AGOF4COUP basis of design or approved equal.

C. Material for all steel construction shall conform to ASTM-36.

D. All pipe and fittings shall conform to Schedule 40; seamless iron pipe.

E. All pipe connections shall be screwed or welded except for final connection to the tank, which shall be an approved welded fitting.

F. Normal air vents shall be screened downward venting tee design, Morrison #155 as basis of design, or approved equal.

G. Emergency vents shall be sized in accordance with NFPA 30, Morrison #244 as basis of design, or approved equal.

H. Fuel thermal expansion relief valves, 40 psi relief, Morrison 78DI as basis of design, or approved equal.

I. The tank shall be protected from overfilling with a positive closing automatic shutoff set to 90% of tank capacity. Morrison #9095, as basis of design, or approved equal with dry-break coupling (for installation in a 4" MPT.)

J. Tank filling connection shall be in a weather proof spill containment vessel with a lockable latch mounted to the storage tank to allow for tank filling from the ground. The remote fill box shall have a 3” flanged top connection, bottom valved drain, and 2” dry disconnect adaptor with ball valve and dust cap for fill connection. Remote fill box shall be 14-gauge steel powder coated white. Morrison #715, as basis of design, or approved equal.

K. The fuel level gauge shall be float type, direct reading, inch tank level gauge, Morrison #818 basis of design, or approved equal. The direct reading gauge shall be located in a convenient location for personnel filling the tank. The gauge shall be completely assembled and fitted to the tank and then shall be disassembled for shipping (if required).

L. The pumping and metering equipment shall be completely assembled and tested.

M. The fuel transfer pump assembly shall be a submersible turbine type pump, electrically powered and capable of pumping 30 gallons per minute (GPM) at 20 feet total dynamic head (TDH), of No.1 fuel oil at 30 degrees F. All electrical components shall be required with head-discharge curve and demonstrated performance at low temperatures. Veeder-Root, Red Jacket as basis of design, or approved equal. The fuel transfer pump shall be complete with a dispensing nozzle, breakaway fitting, hose swivel, fuel hose and solenoid valve actuator.

N. Fuel metering shall be provided and installed to measure fuel quantity delivered from the fuel pump in flow rates up to 40 GPM. The meter shall have two registers, calibrated in gallons, with one resettable register and one total register. Fill-Rite series 900 basis of design, or approved equal.

O. Fire safety valve shall be installed on the fuel dispensing piping. Valve shall be stainless steel and UL C842 listed. Morrison #446 as basis of design, or approved equal.

P. Fuel filtering shall consist of a fuel strainer and canister type filter on the outlet side of the fuel transfer pump. The fuel strainer shall be bottom clean out type with 40 mesh screen or approved equal and the filter shall be 30 micron filter. Four (4) replacement elements to be shipped with each tank assembly. Central Illinois Centurion I filter as basis of design, or approved equal.

Q. The storage/pumping system shall be completely plumbed, pre-wired as an explosion-proof package, and delivered as a complete ready-to-use storage/delivery system which will require only an electrical supply to be fully operational.

R. All surfaces, with the exception of the inside of the tank and secondary containment, shall receive protective coatings.

S. All seams shall be seal welded.

T. A two coat system shall be applied according to the manufacturers' recommendations. The first coat shall be a minimum 2 mil dry film thickness primer coat. A second coat shall be applied to a given total of 6 mils minimum dry film thickness, color white. Label tank contents with 8" high lettering, stenciled on tank.

U. Steel construction, with closed top outer containment dike capable of carrying 150% of inner tank capacity, mounted on full length steel beam skids. Provide flexible pipe connector between inner tank and outer tank with capped drain on bottom end of inner tank. Provide tank openings as indicated and as required for UL explosion venting, all accessories including outer tank monitoring and draining. Provide 2 additional spare plugged 4" openings for spare use. Inner and outer tank gauge to be as recommended by Steel Tank Institute for size and service of tank. Internal framework to be of sufficient design to maintain integrity of tank during seismic disturbance with skids restrained.

V. Ladder: Provide steel welded ladder to top of tank for access to fill opening.

2.12 FUEL OIL TANK LIQUID LEVEL SENSOR

A. Ultrasonic liquid level sensor provided by PLC instrumentation supplier. Provide fittings and drop tube, install per the manufacturer's instructions.

2.13 NATURAL GAS PIPING

A. Piping: Steel Pipe ASTM A53, Schedule 40 black. Fittings: ASME B16.3, malleable iron.

B. Joints: Screwed or Viega MegaPressG Cold Press Mechanical Joint. Press fittings are acceptable to last tee for connection to the appliance. Utilize threaded piping at the last tee.

2.14 NATURAL GAS BALL VALVES

A. Two piece body, full port, forged brass, chrome plated ball, Teflon seats and stuffing box ring, lever handle, solder, threaded or press-fit ends.

PART 3 - EXECUTION

3.01 PREPARATION - PIPING

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION - PIPING

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of accessories and access to valves and fittings.

G. Install valves with stems upright or horizontal, not inverted.

H. Paint piping and fittings in accordance with specification 09 96 00.

3.03 APPLICATION - PIPING

A. Provide vertical poppet check valve on inlet of supply drop tubes.

3.04 PUMP INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide line sized poppet check valve on suction and line sized filter and emergency impact/fire valve on discharge.

C. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation.

3.05 INSTALLATION – TANK AND TANK ACCESSORIES

A. Install fuel tanka and tank accessories in accordance with manufacturer's recommendations.

B. Extend tank vents to a minimum 12 feet above finish grade.

C. Field cut drop tube to length as required to height above bottom of tank shown.

D. Fill all fuel tanks full with fuel prior to project completion.

3.06 FUEL OIL PIPING TESTING

A. After installation piping shall be tested for leaks. Piping shall be tested hydrostatically or pneumatically with air at not less than $1^1/_2$ times its maximum working pressure, but not less than 5 psig (gage pressure of 35 kPa) measured at the highest point of the system.

B. The test shall be made so as not to impose a pressure of more than 10 psig on any tank connected to the piping.

C. Pressure shall be maintained for at least 30 minutes or for sufficient time to complete visual inspection of all joints and connections.

3.07 NATURAL GAS PIPING TESTING

A. Test all piping in accordance with IFGC and UPC requirements. The test pressure used shall be no less than 10 times the proposed maximum working pressure, but not less than 10 psig for low pressure gas systems (7 inch WC) or 60 psig for medium pressures gas systems (2 psig or 5 psig).

3.08 UTILITY COORDINATION

A. Coordinate meter relocation with local utility, modify piping as required by utility for meter installation.

END OF SECTION

SECTION 26 01 26
MAINTENANCE TESTING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Feeder Mega ohm Testing.

B. Receptacle Branch Circuit Testing.

C. Ground Fault Circuit Interrupter Testing.

D. Electrical Service and Separately Derived System Ground Testing.

E. Ground Fault Protection Testing.

F. Transformer Testing.

G. Phase Rotation.

H. Additional Testing and Maintenance Requirements in Individual Equipment and System Sections.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 05 00 – Common Work Results for Electrical and Division 27.

B. Section 01 11 13 - Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 05 19 – Electrical Conductors and Cables.

F. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

G. Section 26 05 29 – Hangers and Supports for Electrical Systems.

H. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

I. Section 26 05 53 – Identification for Electrical Systems.

J. Section 26 22 00 - Low-Voltage Transformers

K. Section 26 24 13 – Switchboards.

L. Section 26 24 16 – Panelboards.

M. Section 26 27 16 – Enclosed Cabinets and Enclosures.

N. Section 26 28 16 – Enclosed Switches and Circuit Breakers.

O. Section 26 32 13 – Packaged Engine Generator Systems.

P. Section 26 36 00 – Transfer Switches

1.03 REFERENCES

A. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. ANSI/IEEE Std 81-1983 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

C. ANSI/TIA/EIA – 568-B.1 and Addendums, General Cabling System Requirements.

1.04 SUBMITTALS

A. Submit data under provisions of Division 01 and Section 26 05 00.

B. Product Data: Submit technical information for each test instrument to include manufacturer, model number, serial number, ratings, accuracy, and National Institute of Standards and Technology (NIST) Traceable calibration certification.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit Test Reports per Section 26 05 00.

1.06 COORDINATION

A. Provide written 72 hours advance notice of all tests to be performed to allow ENGINEER to witness testing.

1.07 REQUIRED TEST INSTRUMENTS

A. MEGOHMMETER.

1. Product Description: 1000 Volt DC, portable, insulation and resistance test Megohmmeter.
2. Equipment Accuracy:

    a. 2000 Megohm Range - 3% of full Scale.

B. BRANCH CIRCUIT ANALYZER

1. Product Description: Branch circuit analyzer capable of receptacle testing of voltage drop under load, hot-neutral-ground conductor resistances, common mode (N-G) Voltage, and G.F.C.I. trip point.
2. Manufacturer: Ideal SureTest. Model: 61-156 ST-1THD Wiring/Harmonic Distortion Analyzer or approved equal.
3. Equipment Accuracy:

    a. Accuracy 1% full scale ± 1 digit True RMS.

C. GROUND RESISTANCE CLAMP-ON METER

1. Product Description: Digital, direct reading clamp-on resistance ground tester.
2. Manufacturer: AEMC. Model: 3711 or approved equal.
3. Equipment Accuracy:

    a. 1.0 to 50.0 Ohms ± (1.5% + 0.1 Ohm).
    b. 50.0 to 100.0 Ohms ± (2.0% + 0.1 Ohm).
    c. 100 to 200 ± (1.5% + 0.1 Ohm).
    d. 200 to 400 Ohms ± (1.5% + 0.1 Ohm).
    e. 400 to 600 Ohms ± (1.5% + 0.1 Ohm).

D. MULTIMETER

1. Product Description: Digital True RMS Multimeter.
2. Equipment Accuracy:

    a. AC Voltage Range: 0.75% ± 3 last single digits at 60 Hz.
    b. AC Current Range: 0.90% ± 3 last single digits at 60 Hz.
    c. DC Voltage Range: 0.25% ± 1 last single digit.
    d. DC Current Range: 0.75% ± 1 last single digit.
    e. Resistance Ranges: 0.50% ± 1 last single digit.
    f. Frequency Range: 0.10% ± 1 last single digit @ 60 Hz.

1.08 TEST INSTRUMENT CALIBRATION

A. All test equipment shall be in good mechanical and electrical condition.

B. Provide calibration for each test instrument directly traceable to the National Institute of Standards and Technology (NIST) of higher accuracy than that of the instrument tested.

C. Provide calibration labels visible on all test equipment. Records, which show date and results of instruments calibrated or tested, shall be kept up-to-date.

D. Calibrate instruments in accordance with the following frequency schedule:

1. Field instruments: 12 months maximum.
2. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument with the equipment.

1.09 MINIMUM REPORT INFORMATION

A. Report Criteria: After each test, promptly submit one copy of report to the ENGINEER. Provide form with the minimum following information:

1. Date issued.
2. Project title and number.
3. Name and Model of Tester and witnesses.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Type of inspection or test.
7. Date of test.
8. Results of tests.
9. Indicate compliance or non-compliance with Contract Documents.
10. Final adjustment setting values where applicable.

B. Submit copy of all tests performed in the O&M manual.

1.10 GENERAL REQUIREMENTS

A. Submit test results within 3 working days of each test and included in the O&M manual.

B. Provide qualified personnel at site to perform all testing.

C. Perform specified testing of products in accordance with specified standards or as denoted in this specification whichever is more stringent.

D. Promptly notify ENGINEER of irregularities or non-conformance of Work or products.

E. Perform additional tests when test is performed incorrectly, deemed inaccurate, or incorrectly documented.

F. The Contractor shall provide all forms, instrumentation and test equipment, loads, and other consumables required to demonstrate the systems to the ENGINEER'S satisfaction.

G. Perform and submit all testing prior to substantial completion and system acceptance.

H. Retest all material, cables etc that are disturbed after testing.

I. Replace and retest all material installed which does not meet or exceed the minimum acceptable limits set forth in this specification in accordance with the contract original requirements at no additional charge to Contract Sum/Price.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.01 FEEDER CONDUCTOR TEST

A. Tests Criteria:

1. Use Megohm meter to test all conductors sized #6AWG and larger.
2. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential 1000 volts DC for 600 volt rated cable.
3. Perform test immediately after installation.
4. Clean exposed cable ends with clean cloth and alcohol.
5. Test duration shall be one minute.
6. Disconnect conductors from all equipment.
7. Record the resistance of the insulated conductor under test with all other conductors connected together and to ground (metallic raceway, grounding conductor, etc).
8. Perform continuity test to insure correct cable connection.

    a. Submit test results to ENGINEER.

B. Test Values:

1. Minimum insulation-resistance value: 50 megohms.
2. Investigate deviations between adjacent phases.

3.02 RECEPTACLE GROUND FAULT CIRCUIT INTERRUPTER TEST

A. Test Criteria:

1. Use Branch Circuit Analyzer to perform test of each GFCI protected receptacle.
2. Record trip level in mA for each outlet.
3. Submit test results to ENGINEER.

B. Test Values:

1. Trip Range: Between 6-9 mA.

3.03 ELECTRICAL SERVICE AND SEPARATELY DERIVED SYSTEM GROUND TEST

A. Test Criteria:

1. Use ground resistance clamp-on meter to measure the resistance of service ground with meter clamped between system neutral bond and each grounding electrode. Perform this test on new or existing/modified services, generator grounding and all new or modified separately derived systems.
2. Record resistance value in Ohms.
3. Submit test results to ENGINEER.

B. Test Values:

1. Maximum ground resistance: 10 Ohms.

3.04 GROUND FAULT PROTECTION SYSTEMS

A. Visual and Mechanical Inspection:

1. Compare equipment nameplate data with drawings and specifications.
2. Visually inspect the components for damage and errors in polarity or conductor routing.
3. Verify that ground connection is made ahead of neutral disconnect link and on the line side of any ground fault sensor.
4. Verify that neutral sensors are connected with correct polarity on both primary and secondary.
5. Verify that all phase conductors and the neutral pass through the sensor in the same direction for zero sequence systems.
6. Verify that grounding conductors do not pass through zero sequence sensors.
7. Verify that the grounded conductor is solidly grounded.
8. Verify correct operation of all functions of the self-test panel.
9. Set pickup and time-delay settings in accordance with the settings provided in a manufacturer's coordination study. Record appropriate operation and test sequences as required by NEC Article 230-95. Submit test results to the ENGINEER.

B. Electrical Tests:

1. Measure the system neutral-to-ground insulation resistance with the neutral disconnect link temporarily removed. Replace neutral disconnect link after testing.
2. Perform the following pickup tests using primary injection:

    a. Verify that the relay does not operate at 90 percent of the pickup setting.
    b. Verify pickup is less than 125 percent of setting or 1200 amperes, whichever is smaller.

3. For summation type systems utilizing phase and neutral current transformers, verify correct polarities by applying current to each phase-neutral current transformer pair. This test also applies to molded-case breakers utilizing an external neutral current transformer.

    a. The relay shall operate when current direction is the same relative to polarity marks in the two current transformers.
    b. The relay shall not operate when current direction is opposite relative to polarity marks in the two current transformers.

4. Measure time delay of the relay at 150 percent or greater of pickup.
5. Verify reduced control voltage tripping capability: 55 percent for ac systems and 80 percent for dc systems.
6. Submit test results to the ENGINEER.

C. Test Values:

1. Relay timing shall be in accordance with manufacturer's specifications but shall not exceed one second at 3000 amperes.

3.05 TRANSFORMER TEST

A. Electrical Test:

1. Use Multimeter to perform test.
2. Measure output voltage under load on secondary side.
3. Submit test results to the ENGINEER.

B. Test Values:

1. Voltage Output: Test voltage output per transformer nameplate value.
2. Adjust transformer taps to provide closet possible output to rated output voltage within plus or minus 5%.

3.06 PHASE ROTATION TEST

A. Test each three phase circuit and feeder for consistent phase rotation for the entire power system with a phase rotation meter.

B. Bump test each motor for proper rotation prior to use.

C. Correct conductor phase relationship to provide proper phase rotation.

D. Record the rotation sequence on each panelboard, MDP and Service circuit schedule.

E. Submit test results of each panelboard, MDP and Service to the ENGINEER.

3.07 PHASE LOAD BALANCE TEST

A. After energizing building loads conduct a phase load balance test for each new or remodeled panelboard with a clamp on ammeter.

B. Shift loads to provide current balance within 20% of the other phases. Revise circuit directory and all conductor labels to reflect any changes.

C. Notify ENGINEER at least 72 hours in advance before test.

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The electrical system equipment and installation shall comply with all provisions and requirements of this specification, as well as any and all applicable national, state and local codes and standards.

1.02 RELATED SECTIONS

A. Section 01 11 13 – Scope of Work.

B. Section 01 31 14 – Work Coordination.

C. Section 01 72 00 – Utilities Coordination.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code, latest adopted edition including all state and local amendments.

B. NECA - Standard of Installation.

C. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. Electrical Reference Symbols: The Electrical "Legend" on drawings is standardized version for this project. All symbols shown may not be used on drawings. Use legend as reference for symbols used on plans.

E. Electrical Drawings: Drawings are diagrammatic; complimentary to the Architectural drawings; not intended to show all features of work. Install material not dimensioned on drawings in a manner to provide a symmetrical appearance. Do not scale drawings for exact equipment locations. Review Architectural, Civil, Structural, and Mechanical Drawings and adjust work to conform to conditions shown thereon. Field verification of dimensions, locations and levels is directed.

1.04 SUBMITTALS

A. Submit inspection and permit certificates under provisions of Division 01.

B. Include certificate of final inspection and acceptance from authority having jurisdiction.

C. Submittal review is for general design and arrangement only and does not relieve the Contractor from any requirements of Contract Documents. Submittal not checked for quantity, dimension, fit or proper operation. Where deviations of substitute product or

system performance have not been specifically noted in the submittal by the Contractor, provisions of a complete and satisfactory working installation is the sole responsibility of the Contractor.

D. In addition to requirements referenced in Division 01, the following is required for work provided under this division of the specification.

1. Provide material and equipment submittals containing complete listings of material and equipment shown on Electrical Drawings and specified herein. Separate from work furnished under other divisions. Index and clearly identify all material and equipment by item, name or designation used on drawings and in specifications.
2. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring diagrams and controls; component parts; finishes; dimensions; and required clearances.
3. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.
4. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
5. Coordinate submittals with requirements of work and of Contract Documents.
6. Certify in writing that the submitted shop drawings and product data are in compliance with requirements of Contract Documents. Notify the ENGINEER in writing at time of submittal, of any deviations from requirements of Contract Documents.
7. Do not fabricate products or begin work which requires submittals until return of submittal with CONSULTANT acceptance.
8. Equipment scheduled by manufacturer's name and catalog designations, manufacturer's published data and/or specification for that item, in effect on bid date, are considered part of this specification. Approval of other manufacturer's item proposed is contingent upon compliance therewith.
9. Submittals for Division 26 shall be complete and submitted at one time. Unless given prior approval, partial submittals will be returned unreviewed. If partial submittal review is permitted, all submittals that affect the review of the submittal item shall be submitted for a comprehensive review.

1.05 COORDINATION

A. Coordinate the Work specified in this Division under provisions of Division 01.

B. Prepare drawings showing proposed rearrangement of Work to meet job conditions, including changes to Work specified under other Sections. Obtain permission of Architect prior to proceeding.

1.06 QUALITY ASSURANCE

A. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements, and submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 FUTURE WORK

A. Provide for future work under requirements of Division 01.

1.08 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70.

B. Conform to the latest adopted edition of the International Building Code and the International Fire Code including all state and local amendments thereto.

C. Conform to ANSI/IEEE C2.

D. Obtain electrical permits, plan review, and inspections from authority having jurisdiction.

1.09 SUBSTITUTIONS

A. See General Conditions in Division 00 and the General Requirements in Division 01 for substitution request procedures.

B. In accordance with the 00700 General Conditions, Section 00800 Supplementary Conditions, and the General Requirements in Division 01, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The Architect/Engineer shall be the final authority regarding acceptability of substitutes.

1.10 PROJECT RECORD DRAWINGS

A. Maintain project record drawings in accordance with Division 01.

B. In addition to the other requirements, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.

C. Record drawing field mark-ups shall be maintained on-site and shall be available for examination of the ENGINEER at all times.

1.11 OPERATION AND MAINTENANCE MANUALS

A. Provide operation and maintenance manuals for training of ENGINEER in operation and maintenance of systems and related equipment. In addition to requirements referenced in Division 01, the following is required for work provided under this section of the specifications.

B. Manuals shall be separate from work furnished under other divisions. Prepare a separate chapter for instruction of each class of equipment or system. Index and clearly identify each chapter and provide a table of contents.

C. Unless otherwise noted in Division 01, provide one copy of all material for approval.

D. The following is the suggested outline for operation and maintenance manuals and is presented to indicate the extent of items required in manuals.

1. List chapters of information comprising the text. The following is a typical Table of Contents:

    a. Switchboards
    b. Panelboards
    c. Transformers
    d. Disconnect Switches and Circuit Breakers
    e. ATS
    f. Standby Generator.
    g. Other chapters as necessary.

2. Provide the following items in sequence for each chapter shown in Table of Contents:

    a. Describe the procedures necessary for personnel to operate the system including start-up, operation, emergency operation and shutdown.

        1) Give complete instructions for energizing equipment and making initial settings and adjustments whenever applicable.
        2) Give step-by-step instructions for shutdown procedure if a particular sequence is required.
        3) Include test results of all tests required by this and other sections of the specifications.

    b. Maintenance Instructions:

        1) Provide instructions and a schedule of preventive maintenance, in tabular form, for all routine cleaning and inspection with recommended lubricants if required for the following:

            a) Switchboards
            b) Panelboards
            c) Transformers
            d) Disconnect Switches and Circuit Breakers
            e) ATS

f) Standby Generator.

2) Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments which may be performed without special tools or test equipment and which requires no special training or skills.
3) Provide manufacturers' descriptive literature including approved shop drawings covering devices used in system, together with illustrations, exploded views, etc. Also include special devices provided by the Contractor.
4) Provide any information of a maintenance nature covering warranty items, etc., which have not been discussed elsewhere.
5) Include list of all equipment furnished for project, where purchased, technical representative if applicable and a local parts source with a tabulation of descriptive data of all electrical-electronic spare parts and all mechanical spare parts proposed for each type of equipment or system. Properly identify each part by part number and manufacturer.

1.12 DEMONSTRATION OF ELECTRICAL SYSTEMS

A. During substantial completion inspection:

1. Conduct operating test for approval under provisions of Division 01.
2. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents.
3. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply.
4. Have instruments available for measuring light intensities, voltage and current values, and for demonstration of continuity, grounds, or open circuit conditions.
5. Provide personnel to assist in taking measurements and making tests.

1.13 CERTIFICATE OF COMPLETION

A. Submit, at time of request for final inspection, a completed letter in the following format:

B. I, ____NAME_____ , of ____FIRM____ , certify that the electrical work is complete in accordance with Contract Plans and Specifications, and authorized change orders (copies attached) and will be ready for final inspection as of __DATE___. I further certify that the following specification requirements have been fulfilled:

1. ____ megger readings performed, __ copies of logs attached.
2. ____ ground tests performed, __ copies of method used and results attached.
3. ____ operating manuals completed, DATE .
4. SIGNED.
5. ____ as-built drawings up-to-date and ready to deliver to DEPARTMENT
6. SIGNED.
7. Instruction of operating personnel completed on DATE for _____ by:

8. SIGNED. (Provide for training of each type of system)
9. Instruction of operating personnel completed on DATE by:
10. SIGNED.
11. ____ all other tests required by specifications have been performed.
12. ____ all systems are fully operational.
13. SIGNED.

1.14 WARRANTY

A. In addition to the requirements of Division 01, or as specified in other sections. Warrant all materials, installation and workmanship for one (1) year from date of acceptance unless noted otherwise in specific Division 26 section.

B. Copies of manufacturer product warranties for all equipment shall be included in the operation and installation manuals.

1.15 INSTRUCTION OF OPERATING PERSONNEL

A. In accordance with the requirements of Division 01 and this section provide services of qualified representative of supplier of each item or system listed below to instruct designated personnel of DEPARTMENT in operation and maintenance of item or system.

B. Make instruction when system is complete, of number of hours indicated, and performed at time mutually agreeable.

System or Equipment	Hours of Instruction
Standby power system	18 hours - (3) 6 hour days

C. Certify that an Anchorage-based authorized service organization regularly carries complete stock of repair parts for listed equipment or systems, that organization is available and will furnish service within 48 hours after request. Include name, address and telephone number of service organization.

D. Have approved operation and maintenance manuals and parts lists for all equipment on hand at time of instruction.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All Materials and Equipment shall be new.

B. All Materials and Equipment shall be listed by Underwriter's Laboratories or equivalent third party listing agency for the use intended.

C. Materials and Equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended when installed per listing and labeling instructions.

D. No materials or equipment containing asbestos in any form shall be used. Where materials or equipment provided by this Contractor are found to contain asbestos such items shall be removed and replaced with non-asbestos containing materials and equipment at no cost to the DEPARTMENT.

E. In describing the various items of equipment, in general, each item will be described singularly, even though there may be numerous similar items.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Install Work using procedures defined in NECA Standard of Installation and/or the manufacturer's installation instructions.

3.02 TESTS

A. Perform tests in accordance with Section 26 01 26 – Testing and Maintenance of Electrical Systems.

B. Notify the ENGINEER at least 72 hours prior to conducting any tests.

C. Following completion of installation, test system ground in accordance with the requirements of NETA ATS 7.13. and all feeders in accordance with NETA ATS 7.3. Submit logs of values obtained, and nameplate data of instruments used prior to final inspection. Include a copy of all data in the power distribution section of the Operation and Maintenance Manuals.

D. Perform additional tests required under other sections of these specifications.

E. Perform all tests in the presence of the ENGINEER.

F. The Contractor shall provide written notification to the ENGINEER and the State Electrical Inspector thirty days in advance of requests for rough-in and substantial completion inspections.

3.03 PENETRATIONS OF FIRE BARRIERS

A. Related information to this section appears in Division 07, Fire Stopping.

B. All holes or voids created to extend electrical systems through fire rated floors, walls or ceiling shall be sealed with an asbestos-free intumescent fire stopping material capable of expanding 8 to 10 times when exposed to temperatures 250º F or higher.

C. Materials shall be suitable for the fire stopping of penetrations made by steel, glass, plastic and shall be capable of maintaining an effective barrier against flame, smoke and gases in compliance with the requirements of ASTM E814 and UL 1479.

D. The rating of the fire stops shall be the same as the time-rated floor, wall or ceiling assembly.

E. Install fire stopping materials in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 26 05 03
EQUIPMENT WIRING CONNECTIONS

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Division 23 – Heating Ventilation and Air Conditioning

F. Section 26 01 26 – Maintenance Testing of Electrical Systems.

G. Section 26 05 19 - Electrical Power Conductors and Cables.

H. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

I. Section 26 05 29 – Hangers and Supports for Electrical Systems.

J. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

K. Section 26 05 53 – Identification for Electrical Systems.

1.02 REFERENCES

A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. National Electrical Manufacturers Association:

1. NEMA WD 1 - General Purpose Wiring Devices.
2. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.03 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data: Submit wiring device manufacturer’s catalog information showing dimensions, configurations, finish, and construction. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

1.04 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Indicate actual locations and mounting heights of all wiring devices on the project record drawings. Submit under Section 26 05 00.

1.05 QUALITY ASSURANCE

A. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.06 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer’s wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 - PRODUCTS

2.01 CORDS AND CAPS

A. Straight-blade Attachment Plug: NEMA WD 1.

B. Locking-blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermoset insulated Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.03 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make conduit connections to equipment that is subject to vibration or movement using flexible conduit. Use Liquidtight flexible conduit in damp or wet locations.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified by the equipment manufacturer's installation instructions, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where required.

F. Install disconnect switches, controllers, control stations, and control devices, and connect with conduit and wiring as indicated in the equipment manufacturer's installation instructions.

G. Where reconnecting existing equipment, extend connections using materials and methods compatible with existing electrical installations, or as specified.

3.04 ADJUSTING

A. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

END OF SECTION

SECTION 26 05 05
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

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

PART 3 - EXECUTION

3.01 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 Drawings are based on casual field observation and existing record documents. Report discrepancies to the ENGINEER before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Reference temporary service requirements within Division 01 prior to starting demolition.

B. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

C. Coordinate utility service outages with Utility Company.

D. 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.

E. 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 the DEPARMTENT at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Fire Alarm System: Maintain existing system in service while power is disconnected to facility. Disable system only to make switchovers and connections. Notify the DEPARTMENT and local fire service at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

G. Existing Telephone System: Maintain existing system in while power is disconnected to facility. Disable system only to make switchovers and connections. Notify the DEPARTMENT and Telephone Utility Company at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of Division 01, Division 02, and this Division.

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. Where abandoned conduit is installed below existing slab not scheduled for demolition, remove the conductors, cut conduit flush with floor, and patch surface.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Repair adjacent construction and finishes damaged during demolition and extension work. T-bar ceiling tiles damaged under normal construction conditions or having voids where junction boxes were removed shall be replaced by the Contractor.

J. Maintain access to existing electrical installations which remain active.

K. Extend existing installations using materials and methods as specified.

L. Where materials or equipment are to be turned over to the DEPARTMENT or reused and installed by the Contractor, it shall be the Contractor's responsibility to maintain condition of materials and equipment equal to the existing condition of the equipment before the work began. Repair or replace damaged materials or equipment at not additional cost to the DEPARTMENT.

M. Relocate existing lighting fixtures as necessary. Test fixture to see if it is in good working condition before installation at new location. If relocated light fixture is not operational after relocation, light fixture shall be relocated at no additional cost to the Owner.

3.04 EXISTING PANELBOARDS

A. Ring out circuits in existing panel affected by the Work. Where additional circuits are needed, reuse circuits available for reuse. Install new breakers.

B. Tag unused circuits as spare.

C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.

D. Remove existing wire no longer in use from panel to equipment.

E. Provide new updated directories where more than three circuits have been modified or rewired.

3.05 CLEANING AND REPAIR

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

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions.

3.06 INSTALLATION

A. Install relocated materials and equipment under the provisions of Division 01.

END OF SECTION

SECTION 26 05 19
ELECTRICAL CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Building Wire.

B. Cable.

C. Wiring Connections and Terminations.

D. Fiber Optic Cable and Accessories

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Division 23 - HVAC

F. Section 26 01 26 – Maintenance Testing of Electrical Systems.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 53 – Identification for Electrical Systems.

K. Section 26 22 00 - Low-Voltage Transformers

L. Section 26 24 13 – Switchboards.

M. Section 26 24 16 – Panelboards.

N. Section 26 27 16 – Enclosed Cabinets and Enclosures.

O. Section 26 28 16 – Enclosed Switches and Circuit Breakers.

P. Section 26 32 13 – Packaged Engine Generator Systems.

Q. Section 26 36 00 – Transfer Switches.

R. Division 31 – Trenching and Backfill.

1.03 REFERENCES

A. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual

B. Federal Specification FS-A-A59544 – Cable and Wire, Electrical (Power, Fixed Installation).

C. Federal Specification FS-J-C-30B – Cable Assembly, Power, Electrical.

D. ANSI/NEMA WC 70-2009 – Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

E. NETA ATS – Acceptance testing specifications for Electrical Power Distribution and Systems.

F. NFPA 70 – National Electrical Code.

G. NFPA 262 – Standard Method of test for flame travel and smoke of wires and cables for use in air-handling spaces.

H. UL 62 – Flexible Cords and Cables.

I. UL 83 – Thermoplastic Insulated Wire and Cable.

J. UL 1063 – Standard for Machine and Tool Wire and Cable.

K. UL 1424 – Standard for Cables for Power-Limited Fire Alarm.

L. UL 1479 – Standard for Fire Tests of Through Wall Penetration Fire Stops.

M. UL 1581 – Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data: Submit product data for all components provided which fall under this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

1.05 CLOSEOUT SUBMITTALS

A. O&M Manual: Submit data under provisions of Division 01 and Section 26 05 00.

1. Provide product data.
2. Provide operation and maintenance information per manufacturer.

1.06 QUALITY ASSURANCE

A. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

PART 2 - PRODUCTS

2.01 BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WC 5.

B. Feeders and Branch Circuits Larger than 6 AWG: Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN or XHHW-2 as indicated.

C. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THHN/THWN or XHHW-2. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid conductor.

D. Branch Circuit Wire Color Code:

1. Color code wires by line or phase as follows:

a. Black, red, blue and white for 120/208V systems.
b. Brown, orange, yellow and gray for 277/480V systems.

2. For conductors 6 AWG and smaller, insulation shall be colored. For conductors 4 AWG and larger, identify with colored phase tape at all terminals, splices, and boxes per Section 26 05 53 Identification for Electrical Systems.
3. Grounding conductors 6 AWG and smaller shall have green colored insulation. For 4 AWG and larger, use green tape at both ends and at all other visible points in between, including pull and junction boxes.

E. Control Circuits: Copper, stranded conductor 600 volt insulation, THHN/THNN or XHHW-2.

F. Wire and cables in cable trays shall be specifically approved for installation in cable trays.

2.02 VFD CABLE

A. Manufacturer:

1. Lutze Driveflex A220 cable or approved equal.

B. Description: Power cable designed for use with three-phase variable frequency drives (VFD) applications and rated up to 1000V at minimum. Cable may be used in wet, damp, or dry locations at temperatures not to exceed 90-degrees Celsius.

C. Ground: 3 symmetrically placed annealed, tinned copper conductors in direct contact with shield. Class B standing per ASTM B8. Total cross sectional area of the 3 ground conductors shall be no less than the value indicated on the drawings.

D. Dual Shield: Overall tinned copper braided shield in conjunction with an aluminum/polymer tape shield.

E. Insulation: Flame-retardant cross-linked polyethylene (XLPE) – 90 degrees Celsius.

F. Jacket: Lead free, flame-retardant, sunlight-resistant Polyvinyl Chloride (PVC).

2.03 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 90º C, individual conductors twisted together, shielded, and covered with an overall PVC jacket; UL listed.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a PVC jacket; UL listed.

C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

D. Armored Underground Signal Cable: Heavy duty direct burial railroad signal multiconductor cable consisting of 7#14 AWG solid uncoated copper conductors per ASTM B-3 and AREMA Manual Part 10.3.17, Type 1 EPR 600V 90 degrees C. insulation per ICEA S-95-658 and AREMA Manual Part 10.3.19, cushion tape layer, flat copper alloy C19400 armor tape per ASTM B-465, pull cord, and overall jacket per ICEA S-95-658 Part 4.1.5. Okonite, Draka, Prysmian or approved equal.

2.04 WIRING CONNECTIONS AND TERMINATIONS

A. For conductors 8 AWG and smaller:

1. Dry interior areas: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Where stranded conductors are terminated on screw type terminals, install crimp insulated fork or ring terminals. Thomas & Betts Sta-Kon or equal.

2. Motor connections: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Provide a minimum of 8 wraps of Scotch 33+ electrical tape around conductors and connector to eliminate connector back off.

3. Wet or exterior: Spring wire connectors, pre-insulated “twist-on”, resin filled rated for direct burial per UL 486D.

B. For conductors 6 AWG and larger:

1. Bus lugs and bolted connections: 600 V, 90 degrees C., two hole long barrel irreversible compression copper tin plated. Thomas & Betts or approved equal.
2. Motor connection: 600 V, 90 degrees C., copper tin plated compression motor pigtail connector, quick connect/disconnect, slip on insulator. Thomas & Betts or approved equal.
3. Two way connector for splices or taps: 600 V, 90 degrees C., compression long barrel, copper tin plated. Thomas & Betts or approved equal. Insulate with Scotch 23 rubber insulating base covering and Scotch 33+ outer wrap.

2.05 FIBER OPTIC CABLE AND ACCESSORIES

A. Fiber Optic Cable: ANSI/ICEA S-87-640 Outdoor fiber optic backbone cable, 24 strand, single-mode 1310 nm / 1383 nm / 1550 nn, gel-free with water-swellable tape, dual loose-tube, all-dielectric construction, medium-density polyethylene jacket and -40 degrees C. to 70 degrees C. operating temperature. Buffer tube colors shall be blue and orange. Fiber coloring shall be blue, orange, green, brown, slate, white, red black, yellow, violet, rose and aqua. Cable shall be free of hazardous substances according to RoHS 2002/95/EG. Corning, General Cable, Superior Essex or approved equal.

B. Fiber Optic Patch Panel: Closet connector housing panel for LC duplex adapters, single-mode cable, 12 fiber, 6 adapters per panel, blue adapter housing color, composite adapter housing material and ceramic insert material. Patch panel shall be free of hazardous substances according to RoHS 2002/95/EG. Patch panel shall be the same manufacturer as the fiber optic cable.

C. Fiber Optic Panel Housing: Wall-mountable enclosure for indoor use to fit a single fiber optic patch panel as described above and containing a 6-slot, .4 inch splice holder to accommodate up to 12 heat-shrink single splices. Enclosure shall be the same manufacturer as the fiber optic cable.

PART 3 - EXECUTION

3.01 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 18 AWG for control wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

C. Splice only in junction or outlet boxes.

D. Neatly train and lace wiring inside boxes, equipment, and panelboards.

E. Make Conductor lengths for parallel circuits equal.

F. Wiring in lighting fixture channels shall be rated for 90º C minimum.

G. Do not share neutral conductors. Provide a dedicated neutral conductor for each branch circuit that requires a neutral.

3.02 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Verify that raceway is complete and properly supported prior to pulling conductors. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Do not install XHHW-2 conductors when ambient temperatures are below –5 degrees C and THHN/THWN conductors when ambient temperatures are below 0 degrees C.

D. Conductors shall be carefully inspected for insulation defects and protected from damage as they are installed in the raceway. Where the insulation is defective or damaged, the cable section shall be repaired or replaced at the discretion of the ENGINEER and at no additional cost to the DEPARTMENT.

E. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

F. Route conductors from each system in independent raceway system and not intermix in the same raceway, enclosure, junction box, wireway, or gutter as another system unless otherwise shown on the plans.

G. No more than six current carrying conductors shall be installed in any homerun unless otherwise indicated on the drawings or without prior approval from the CONSULTANT.

H. Completely and thoroughly swab raceway system before installing conductors.

I. When two or more neutrals are installed in one conduit, identify each with the proper circuit number in accordance with Section 26 05 53.

J. All fiber optic cable shall be installed within conduit containing innerduct in accordance with Section 26 05 33.

3.03 CABLE INSTALLATION

A. Provide protection for exposed cables where subject to damage.

B. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or cable ties to support cables from structure. Do not support cables from ceiling suspension system. Include bridle rings or drive rings.

C. Use suitable cable fittings and connectors.

D. Trench and backfill for direct buried cables per Division 31. Install warning tape along entire length of direct burial cables and conduits.

E. Provide XHHW-2 conductors for all damp and exterior locations.

3.04 WIRING CONNECTIONS AND TERMINATIONS

A. Splice only in accessible junction boxes.

B. Thoroughly clean wires before installing lugs and connectors.

C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

D. Terminate spare conductors with twist on connectors or heat shrink insulation to proper voltage rating.

E. Control systems wiring in conjunction with mechanical, electrical or miscellaneous equipment to be identified in accordance with wiring diagrams furnished with equipment.

F. Code sound and signal systems wiring and any special equipment in accordance with manufacturer's diagrams or recommendations.

G. Do not exceed manufacturer's recommended pull tensions.

H. Terminate aluminum wire in accordance with manufacturer’s instructions.

I. Terminate aluminum conductors with tin-plated aluminum-bodied compression connectors only. Fill with anti-oxidant compound prior to installation of conductor.

J. Use suitable reducing connectors or mechanical connector adapters for connecting aluminum conductor to copper conductors.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01 and Section 26 01 26.

B. Inspect wire and cable for physical damage and proper connection.

C. Torque conductor connections and terminations to manufacturer's recommended values.

3.06 WIRE AND CABLE INSTALLATION SCHEDULE

A. All Locations: Building wire and/or remote control and signal cable in raceways.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Power System Grounding.

B. Electrical Equipment and Raceway Grounding and Bonding.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 05 00 – Common Work Results for Electrical and Division 27.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 01 26 – Maintenance Testing of Electrical Systems.

F. Section 26 05 19 – Electrical Conductors and Cables.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 53 – Identification for Electrical Systems.

K. Section 26 22 00 - Low-Voltage Transformers

L. Section 26 24 13 – Switchboards.

M. Section 26 24 16 – Panelboards.

N. Section 26 27 16 – Enclosed Cabinets and Enclosures.

O. Section 26 27 26 – Wiring Devices.

P. Section 26 28 16 – Enclosed Switches and Circuit Breakers.

Q. Section 26 32 13 – Packaged Engine Generator Systems.

R. Section 26 36 00 – Transfer Switches.

S. Section 27 10 00 – Structured Cabling.

1.03 REFERENCES

A. ANSI/NEMA GR-1, Ground Rod Electrodes and Ground Rod Electrode Couplings.

B. ANSI/NFPA 70 – National Electrical Code.

C. ASTM B 3 – Standard Specification for Soft or Annealed Copper Wire.

D. AWS A5.8/A5.8M – Specification for Filler Metals for Brazing and Braze Welding.

E. IEEE Std 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

F. IEEE Std 142 – Recommended Practice for Grounding of Industrial and Commercial Power System.

G. UL 467 – Standard for Grounding and Bonding Equipment.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data: Submit product data for all components provided, showing material type and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

C. Shop Drawings: Submit shop drawings indicating location of main grounding bus, system grounding electrode connections (ground rods, concrete encased electrode, etc.), routing of grounding electrode conductor, and size/type of bonding conductors and termination locations of all major bonding connections (water, piping, steel, fuel tanks, etc.).

1.05 SYSTEM DESCRIPTION

A. Provide a complete grounding system for services and equipment as required by State and Local Codes, NEC, applicable portions of other NFPA codes, and as indicated herein.

1.06 QUALITY ASSURANCE

A. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 CLOSEOUT SUBMITTALS

A. Project Record Drawings

1. Accurately indicate actual locations of main grounding bus, all grounding rods, concrete encased electrodes, etc.
2. Show the actual installed layout of ground ring, routing of grounding electrode conductor, and size/type of bonding conductors and termination locations of all major bonding connections (water, piping, steel, fuel tanks, etc.).

B. Test Reports

1. See Section 26 01 26 - Maintenance Testing of Electrical Systems for Grounding System Tests.
2. Each test report shall include:

   a. Date of test, soil moisture content, and soil temperature.
   b. Test operator.
   c. Instrument or other test equipment used.
   d. Electrode designation or location matching that shown on shop drawings.
   e. Ground impedance in ohms.
   f. Assumptions made - if required.

1.08 COORDINATIONS

A. Division 01 – Administrative Requirements: Requirements for Coordination.

B. Complete grounding and bonding of building reinforcing steel prior to concrete placement.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Solid Ground Rods: ANSI/NEMA GR-1, copper-encased steel, ¾ inch diameter, minimum length 10 feet. Ground rods shall be clean and smooth.

B. Bonding Conductors: Solid bare copper wire for sizes No. 8 AWG and smaller diameter. Stranded bare copper wire for sizes No. 6 AWG and larger diameter. Conductors may be insulated conductors if used provide green insulation.

C. Grounding Conductors: Copper conductor bare or green insulated.

D. Mechanical Grounding and Bonding Connectors: Non-reversible crimp type lugs only. Use factory made compression lug for all terminations.

E. Exothermic Grounding and Bonding Connectors: AWS A5.8/A5.8M Exothermic welded type. Welding procedure shall include the proper mold and powder charge and shall conform to the manufacturer’s recommendations.

F. In external locations, clamping shall be used only where a disconnect type of connection is required. Connection device may utilize spring-loaded jaws. Device shall be constructed such that positive contact pressure shall be maintained at all times. Machine bolts with tooth-type lock washers shall be used.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide a separate, insulated equipment-grounding conductor in all feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing. Multiple conductors on single lug not permitted. Each grounding conductor shall terminate on its own terminal lug.

B. Reconnect existing grounding electrode conductors to new service equipment in accordance with the Drawings.

C. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter and back flow preventors.

D. Supplementary Grounding Electrode: Use driven ground rod on exterior of building. Install ground rod in suitable recessed well; fill with gravel after connection is made. Use effectively grounded metal frame of the building where feasible. Use minimum of 20 feet No. 4 bare copper wire embedded in concrete foundation for all new concrete pads.

E. Provide grounding and bonding at Utility Company's metering equipment and pad-mounted transformer.

F. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing and fuel systems.

G. Grounding conductors for branch circuits shall be sized in accordance with NEC, except minimum size grounding conductor shall be No. 12 AWG.

H. Grounding conductor is in addition to neutral conductor and in no case shall neutral conductor serve as grounding means.

I. Ground rods shall be installed so that the top of the rod is not less than 12 inches below finished grade. Conceal after inspection.

3.02 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Perform system ground test as specified in Section 26 01 26 - Maintenance Testing of Electrical Systems.

C. Continuity Test: Continuity test shall be performed on all power receptacles to ensure that the ground terminals are properly grounded to the facility ground system.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Conduit Supports.

B. Formed Steel Channel.

C. Spring Steel Clips.

D. Sleeves.

E. Mechanical Sleeve Seals.

F. Firestopping Relating to Electrical Work.

G. Firestopping Accessories.

H. Equipment Bases and Supports.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 05 00 – Common Work Results for Electrical and Division 27.

B. Division 03 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.

C. Section 01 11 13 – Summary of Work.

D. Section 01 31 14 – Work Coordination.

E. Section 01 72 00 – Utilities Coordination.

F. Section 26 05 19 – Electrical Conductors and Cables.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 53 – Identification for Electrical Systems.

K. Section 26 22 00 - Low-Voltage Transformers

L. Section 26 24 13 – Switchboards.

M. Section 26 24 16 – Panelboards.

N. Section 26 27 16 – Enclosed Cabinets and Enclosures.

O. Section 26 28 16 – Enclosed Switches and Circuit Breakers.

P. Section 26 32 13 – Packaged Engine Generator Systems.

Q. Section 26 36 00 – Transfer Switches.

1.03 REFERENCES

A. International Building Code (IBC), Chapter 16 – Structural Design.

B. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

C. Underwriters Laboratories Inc.:

1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data:

1. Firestopping: Submit data on product characteristics, performance and limitation criteria.

C. Manufacturer's Installation Instructions:

1. Firestopping: Submit preparation and installation instructions.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Seismic Restraint Calculations:

1. Provide structurally engineered shop drawings for seismic restraint of all electrical equipment required by the International Building Code (IBC), Chapters 16, 17. Structural design shall be based on the Seismic Use Category and Seismic Design Category as designated in these chapters.
2. Shop drawings shall be stamped by a professional engineer registered in the State of Alaska.

1.05 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.06 SYSTEM DESCRIPTION

A. Firestopping Materials: ASTM E814 and UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.

1. Ratings may be 3-hours for firestopping in through-penetrations of 4-hour fire rated assemblies unless otherwise required by applicable codes.

1.07 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to UL for fire resistance ratings and surface burning characteristics.

B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.08 COORDINATION

A. Coordinate size, shape and location of concrete pads with Division 03.

1.09 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

B. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.

1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
2. Floor, Ceiling and Wall Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
3. Floor Penetrations Within Wall Cavities: T-Rating is not required.

C. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Division 01: Environmental conditions affecting products on site.

B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.

C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

PART 2 - PRODUCTS

2.01 CONDUIT SUPPORTS

A. Manufacturers:

1. Allied Tube & Conduit Corp.
2. Minerallac Fastening Systems.
3. O-Z Gedney Co.

B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits. **Exception – Exterior conduits supported on the back side of the Portal buildings shall utilize two-hole malleable iron clamps for additional support.**

F. Cable Ties: High strength nylon temperature rated to 185 degrees F. self-locking.

2.02 FORMED STEEL CHANNEL

A. Manufacturers:

1. B-Line Systems.
2. Allied Tube & Conduit Corp.
3. Unistrut Corp.

B. Product Description: Galvanized 12 gage) thick steel. With holes 1-1/2 inches on center.

2.03 SLEEVES

A. Sleeves Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

B. Sleeves Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

C. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.04 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.05 FIRE STOPPING

A. Manufacturers:

1. Dow Corning Corp.
2. 3M Fire Protection Products.
3. Fire Trak Corp.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

2.06 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

C. General:

1. Furnish UL listed products or products tested by independent testing laboratory.
2. Select products with rating not less than rating of wall or floor being penetrated.

D. Non-Rated Surfaces:

1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Division 01: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

C. Verify openings are ready to receive firestopping.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install damming materials to arrest liquid material leakage.

D. Obtain permission from ENGINEER before using powder-actuated anchors.

E. Obtain permission from ENGINEER before drilling or cutting structural members.

3.03 INSTALLATION - GENERAL

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, beam clamps, or spring steel clips.

B. Use toggle bolts or hollow wall fasteners in hollow masonry partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not support raceways, low voltage pathways, cables, telecommunication pathways or boxes from ceiling suspension wires or suspended ceiling systems. Provide support from building structure independently to allow ceiling removal and replacement without removal of electrical system. If dedicated support wires are used, wires and wire clips must be painted or color-coded.

D. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or ceiling suspension system.

E. Do not penetrate by drilling or screwing into metal roof decking. All penetrations into metal roof decking must be approved by the Project Manager in writing.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

G. In wet locations install free-standing electrical equipment on concrete pads. Pad top shall be a minimum of 3 ½" above the surrounding grade and shall be reinforced in accordance with Division 3 of these specifications.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

J. Securely fasten fixtures and equipment to building structure in accordance with manufacturer's recommendations and to provide necessary earthquake anchorage.

K. Provide wall attached fixtures and equipment weighing less than 50 pounds with backing plates of at least 1/8" x 10" sheet steel or 2" x 10" fire retardant treated wood securely built into the structural walls. Submit attachment details of heavier equipment for approval.

L. Earthquake Anchorages:

1. Equipment weighing more than 50 pounds shall be adequately anchored to the building structure to resist lateral earthquake forces.
2. Total lateral (earthquake) forces shall be 1.5 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.

M. Provide two minimum color-coded dedicated seismic support wires for each ceiling mounted light fixture weighing less than 50 pounds. Attach support wires to building structure independent from ceiling system and on opposing corners of the light fixtures to not allow fixture to drop more than 6 inches upon ceiling failure. Secure each end with three tight wraps within 1 inch at each end of the wire.

N. Attach the supporting cables for all pendant fixtures to both the building structure and to the ceiling grid which they pass through.

O. Replace or repair any fireproofing damaged by the installation of supporting equipment or devices.

P. Power-driven fasteners are prohibited for tension load applications (such as supporting luminaries or conduit racks from ceiling above). Use drilled-in expansion anchors, or drilled and screw-in anchors such as Kwik-Con II or Tapcon.

3.04 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating to uniform density and texture.

D. Place intumescent coating in sufficient coats to achieve rating required.

E. Remove dam material after firestopping material has cured.

F. Fire Rated Surface:

1. Seal opening at floor, wall and ceilings as follows:

    a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    c. Pack void with backing material.
    d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.

G. Where conduit penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.

H. Non-Rated Surfaces:

1. Seal opening through non-fire rated wall, floor and ceilings as follows:

    a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    c. Install type of firestopping material recommended by manufacturer.

I. Install escutcheons, floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.

J. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.

3.05 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

G. Install stainless steel escutcheons at finished surfaces.

3.06 FIELD QUALITY CONTROL

A. Division 01: Field inspecting, testing, adjusting, and balancing.

B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.07 CLEANING

A. Division 01: Requirements for cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.08 PROTECTION OF FINISHED WORK

A. Division 01: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal Conduit.

B. PVC Coated Metal Conduit.

C. Flexible Metal Conduit.

D. Liquidtight Metal Conduit.

E. Electrical Metallic Tubing.

F. Nonmetallic Conduit.

G. Auxiliary Gutter.

H. Fittings and Conduit Bodies.

I. Wall and Ceiling Outlet Boxes.

J. Pull and Junction Boxes.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 05 00 – Common Work Results for Electrical and Division 27.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Division 07 - Thermal and Moisture Protection.

F. Section 26 05 19 – Electrical Conductors and Cables.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 53 – Identification for Electrical Systems.

K. Section 26 22 00 - Low-Voltage Transformers

L. Section 26 24 13 – Switchboards.

M. Section 26 24 16 – Panelboards.

N. Section 26 27 16 – Enclosed Cabinets and Enclosures.

O. Section 26 28 16 – Enclosed Switches and Circuit Breakers.

P. Section 26 32 13 – Packaged Engine Generator Systems.

Q. Section 26 36 00 – Transfer Switches.

R. Section 27 10 00 – Structured Cabling.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 123 – Specification for Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.

C. National Electrical Manufacturers Association (NEMA):

1. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
2. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
3. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
4. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
5. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
6. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
7. NEMA TC 7 - Smooth-Wall Coilable Polyethylene Electrical Plastic Conduit.
8. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.

E. Telecommunications Industry Association (TIA) and Electronics Industries Association (EIA):

1. ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard.

F. Building Industry Consulting Service International (BICSI):

1. BICSI Telecommunication Design Methods Manual.

G. International Building Code (IBC):

1. IBC chapters 16 and 17 seismic requirements.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data: Submit data for products to be provided.

1.05 RACEWAY AND BOX INSTALLATION SCHEDULE

A. Raceway Minimum Size:

1. Below Grade: Provide 1 inch minimum, unless otherwise noted.
2. Above Grade or Slab on Grade: Provide 3/4 inch minimum. Raceway may be reduced to ½ inch for final connection of raceway up to 6 feet for connection to fixture or device where maximum conduit entry size is ½ inch.

B. Underground more than 5 feet from foundation wall:

1. Raceway: Provide rigid steel conduit, intermediate metal conduit or Schedule 40 plastic conduit.

a. Provide detectable warning tape over all underground raceways per section 26 05 53.
b. Provide 3-inch minimum spacing between raceways.
c. Provide 3/4 inch minus granular material 6 inches above and below conduit. Backfill remaining trench free of debris or rocks greater than 1 inch in diameter.

2. Boxes and Enclosures: Provide polymer concrete junction boxes.

C. Under or in concrete slab, or underground within 5 feet of foundation wall:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit. All conduit in contact with concrete or block shall be rigid steel conduit half lapped wrapped with pipe wrap or be plastic-coated conduit. Provide transition to rigid steel conduit 12 inches prior to exit penetration through foundations, concrete walls, or block walls. Provide transition to rigid steel conduit elbow and riser for penetration through slab. Arrange raceway so the curved portion of bend is not visible above finished slab.
2. Boxes and Enclosures: Provide concrete tight cast and sheet metal steel metal boxes.

D. In or through CMU walls:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit. EMT conduit may penetrate through CMU walls where the EMT is installed in a sleeve and does not come in direct contact with the CMU. All conduit in contact with concrete or block

shall be rigid steel conduit half lapped wrapped with pipe wrap or be plastic-coated conduit.

2. Boxes and Enclosures: Provide concrete tight cast and sheet metal steel metal boxes.

E. Outdoor Above Grade:

1. Raceway: Provide PVC Coated Rigid Steel Conduit.
2. Boxes and Enclosures: Provide weatherproof NEMA 4X stainless steel junction boxes for branch circuit junction and outlet boxes. Provide weatherproof NEMA 4X stainless steel enclosures.
3. Fittings: Provide PVC Coated Rigid Steel fittings with gaskets suitable for use with coated conduit. Provide Myers threaded hubs for all conduit entries into top and side of enclosures.

F. Interior Damp or Wet Locations:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit.
2. Boxes and Enclosures: Provide weatherproof malleable iron for branch circuit junction and outlet boxes. Provide weatherproof NEMA 3R sheet metal enclosures for safety and disconnect switches and NEMA 4 sheet metal enclosures with gaskets for motor controllers and control panels.
3. Fittings: Provide galvanized malleable iron with gaskets. Provide Myers threaded hubs for all conduit entries into top and side of sheet metal enclosures.

G. Concealed Dry Locations:

1. Raceway: Provide rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.
2. Boxes and Enclosures: Provide sheet-metal boxes. Provide vapor barrier boxes in exterior walls and the ceiling.
3. Fittings: Provide galvanized malleable iron and steel.

H. Exposed Dry Locations:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit. EMT conduit may be used where exposed conduit is allowed where it is not subject to physical damage or where installed on the ceiling or a minimum of ten feet above the floor.
2. Boxes and Enclosures: Provide sheet-metal boxes with raised steel covers.
3. Fittings: Provide galvanized malleable iron and steel.
4. Surface Raceway and Boxes. Where specifically noted on the Drawings, provide surface raceway and boxes.

I. Interior Branch Circuits 60 Amperes or Larger and Feeders:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit.
2. Boxes and Enclosures: Provide sheet-metal boxes.
3. Fittings: Provide galvanized malleable iron and steel.

J. Hazardous Locations (Classified Wiring):

1. Raceway: Provide rigid steel conduit.
2. Boxes and Enclosures: Provide galvanized malleable iron rated Class 1 Division 1, NEMA FB1.

K. Equipment Connections: Provide short extensions (three feet maximum) of flexible metal conduit for connections to light fixtures, motors, transformers, vibrating equipment or equipment that requires removal for maintenance or replacement. Use Liquidtight flexible conduit and fittings for motors and equipment in damp or wet locations or subject to spilling of liquids as at pumps, kitchen equipment, in mechanical rooms, boiler rooms, pump rooms, etc.

L. Liquidtight flexible nonmetallic conduit and electrical nonmetallic tubing are not approved raceway systems for this project.

1.06 DESIGN REQUIREMENTS

A. Raceway Minimum Size:

1. Line Voltage Circuits: Raceway is sized on the drawings for copper conductors with 600-Volt type XHHW insulation, unless otherwise noted. Where a raceway size is not shown on the drawings, it shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9 using the conduit dimensions of the NEC Table 4, Chapter 9 and conductor properties of the NEC Table 5, Chapter 9.
2. Fire Alarm, Telecom, Intercom and other Low-Voltage Circuits: Where installed in raceways, the raceway size shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9, using the conduit dimensions of the NEC Table 4, Chapter 9, and cable diameter provided by the manufacturer.

B. Box Minimum Size: Provide all boxes sized and configured per NEC Article 370 and as specified in this section.

C. Seismic Support: Provide support in accordance with section 26 05 29.

D. Telecommunication Pathways Layout and Configuration: BICSI Telecommunication Design Methods Manual and ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard. Provide non-metallic HDPE raceway (innerduct) for all conduit containing fiber optic cable.

1.07 QUALITY ASSURANCE

A. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one

tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC conduit from sunlight.

PART 2 - PRODUCTS

2.01 RIGID METAL CONDUIT (RMC)

A. Rigid Steel Conduit: ANSI C80.1, UL 6.

B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; Galvanized malleable iron with threaded hubs for all conduit entries. Provide threaded connections and couplings only. Set Screw and running thread fittings are not permitted. Provide copper free aluminum fittings and conduit bodies with Aluminum Conduit.

C. Provide insulated throat bushings at all conduit terminations.

2.02 PVC COATED RIGID METAL CONDUIT

A. Product Description: NEMA RN 1; rigid steel conduit with external 40-mil PVC coating and internal galvanized surface.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with insulated throat bushings and external PVC coating to match conduit.

2.03 INTERMEDIATE METAL CONDUIT (IMC)

A. Product Description: ANSI C80.6, UL 1242; Galvanized Steel Conduit.

B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; use fittings and conduit bodies specified above for rigid steel conduit.

C. Provide insulated throat bushings at all conduit terminations.

2.04 FLEXIBLE METAL CONDUIT (FMC)

A. Product Description: UL 1, FS WW-C-566; galvanized or zinc-coated flexible steel, full-wall thickness. Reduced-wall flexible metal conduit is not acceptable.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron with insulated throat bushings. Die cast zinc or threaded inside throat fittings are not acceptable.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Product Description: UL 360, flexible metal conduit with interlocked steel construction and PVC jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; liquid tight steel or malleable iron with insulated throat bushings. Die cast fittings are not acceptable.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3, UL 797; galvanized steel tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, compression type with insulated throat bushings. Zinc die cast, set screw or indentor fittings are not acceptable.

C. Maximum size shall be 2". Provide factory elbows on sizes 1-½" and larger.

2.07 RIGID NONMETALLIC CONDUIT (RNC)

A. Product Description: NEMA TC 2; Schedule 40 or 80 PVC, rated for 90º C cable.

B. Fittings and Conduit Bodies: NEMA TC 3.

C. Provide PVC-coated rigid steel factory elbows for bends in all plastic conduit runs, regardless of length.

2.08 HIGH DENSITY POLYETHYLENE CONDUIT (HDPE)

A. Not approved for use on this project.

2.09 ELECTRICAL NONMETALLIC TUBING (ENT)

A. Not approved for use on this project.

2.10 FLEXIBLE NONMETALLIC CONDUIT (INNERDUCT)

A. Product Description: UL Listed, nonmetallic, corrugated flexible conduit for use in riser and general purpose applications. Provide with pre-installed pull tape and orange outer color.

B. Provide 1-1/4” size throughout entire length of conduit runs containing fiber optic cables.

2.11 AUXILIARY GUTTERS

A. Manufacturers:

1. Square D.
2. Circle AW.
3. Hoffmann.

B. Auxiliary Gutters: General purpose, Raintight, and/or oil tight, as applicable, type wireway without knockouts. Provide stainless steel for exterior locations on the Whittier side of the Tunnel.

C. Size and length as indicated on Drawings.

D. Cover: Hinged cover with full gasketing.

E. Connector: Slip-in construction; hinged cover.

F. Fittings: Lay-in type with removable top, captive screws. Provide drip shield in wet locations.

G. Finish: Rust inhibiting primer coat with gray enamel finish.

2.12 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, UL514A galvanized steel, with plaster ring where applicable.

1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.
2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required. Minimum Size: 4 inches square or octagonal, 2-1/8 inches deep.
3. Concrete and Masonry: Concrete type with field installed tape cover to prevent concrete entry to raceway system. Minimum Size: 4 inches square, 2-1/8 inches deep.
4. Telecommunications Outlets: Minimum size 4-11/16 inches square, 2-1/8 inches deep.
5. Cut-In Boxes: Minimum size 2” x 3” x 2-1/2” deep. Provide cut-in outlet boxes where required for installation in existing walls.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2, thermoset, phenolic with 150°C fire rating. Provide plaster ring where applicable.

1. Wall Outlets: Minimum size 3-1/2” x 2-1/4” x 2-7/8” deep.
2. Ceiling Outlets: Minimum size 4” diameter 2-9/16” deep.

C. Vapor Barrier Boxes: Airtight box with vapor barrier flange and integral wire entry seal. Lessco, Nutek, Enviroseal, or approved equal.

D. Cast Boxes: NEMA FB 1, Type FD, galvanized malleable iron. Furnish gasketed cover by box manufacturer. Furnish threaded hubs. “Bell” boxes are not acceptable.

E. Wall Plates: As specified in Section 26 27 26.

2.13 PULL AND JUNCTION BOXES

A. Sheet Metal Pull and Junction Boxes: ANSI/NEMA OS 1, UL514A galvanized steel.

1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.

B. Sheet Metal Boxes Larger Than 12 Inches in Any Dimension: in accordance with Section 26 27 16.

C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250, Type 4; flat-flanged, surface mounted junction box, UL listed as raintight:

1. Material: Galvanized cast iron or copper-free cast aluminum.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover and screws.

D. Cast Metal Boxes for Underground Installations: NEMA 250, Type 4; flat-flanged, flush-mounted junction box, UL listed as raintight:

1. Material: Galvanized cast iron or copper-free cast aluminum.
2. Cover: Furnish with outside flange, neoprene gasket, and recessed stainless steel cover and screws.

E. Polymer Concrete Junction Boxes for Underground Installations: Polymer concrete consisting of sand and aggregate bound together with a polymer resin. Internal reinforcement shall be provided by means of steel, fiberglass or a combination of the two. The installed enclosure shall be rated for a minimum test load of 7500 pounds distributed over a 10 inch by 10 inch area and used in occasional, non-deliberate vehicular traffic or pedestrian traffic application. All hardware shall be stainless steel. Cover shall read “ELECTRIC” or “COMMUNICATIONS” as applicable. Size boxes in accordance with the NEC.

2.14 EXPANSION FITTINGS

A. Galvanized malleable iron, galvanized with grounding bond jumper.

2.15 BUSHINGS

A. Non-grounding: Threaded impact resistant plastic.

B. Grounding: Insulated galvanized malleable iron/steel with hardened screw bond to raceway and conductor lug.

2.16 LOCKNUTS

A. Threaded Electro Zinc Plated Steel designed to cut through protective coatings for ground continuity.

2.17 WIREWAY

A. Product Description: General purpose type wireway. Size per NEC minimum fill capacity required.

B. Knockouts: Field-installed, no factory knockouts acceptable.

C. Cover: Screw cover.

D. Fittings and Accessories: Include factory couplings, offsets, elbows, adapters and support straps required for a complete system. Provide internal ground bonding jumper bonded to each section.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 05 26.

B. Provide seismic support and fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.

C. Identify raceway and boxes with origin and destination in accordance with Section 26 05 53.

D. Unless otherwise noted, do not inter-mix conductors from separate panelboards or any other system in the same raceway system or junction boxes.

3.02 INSTALLATION - GENERAL RACEWAY

A. Install raceway for all systems, unless otherwise noted.

B. Install an equipment grounding conductor inside of all raceways containing line voltage conductors.

C. Provide raceways concealed in construction unless specifically noted otherwise, or where installed at surface cabinets, motor and equipment connections and in Mechanical and Electrical Equipment rooms. Do not route conduits on roofs, outside of exterior walls, or along the surface of interior finished walls unless specifically noted on the plans.

D. Raceway routing and boxes are shown in approximate locations unless dimensioned. Where raceway routing is not denoted, field-coordinate to provide complete wiring system.

E. Do not route raceways on floor. Arrange raceway and boxes to maintain a minimum of 6 feet 6 inches of headroom and present a neat appearance. Install raceways level and square to a tolerance of 1/8” per 10 feet. Route exposed raceways and raceways above accessible ceilings parallel and perpendicular to walls, ceiling, and adjacent piping.

F. Maintain minimum 6-inch clearance between raceway and mechanical and piping and ductwork. Maintain 12-inch clearance between raceway and heat sources such as flues, steam pipes, heating pipes, heating appliances, and other surfaces with temperatures exceeding 104 degrees F.

G. Do not install raceway embedded in spray applied fire proofing. Seal raceway penetrations of fire-rated walls, ceilings, floors in accordance with the requirements of Section 26 05 00 and Division 07.

H. Route raceway through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket. Coordinate all requirements with Division 07 of these specifications.

I. Where raceway penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating, seal opening around conduit with UL listed firestop sealant or intumescent firestop, preserving the fire time rating of the construction. Install in accordance with Section 07 84 00 Firestopping.

J. Raceways and boxes penetrating vapor barriers or penetrating areas from cold to warm shall be taped and sealed with a non-hardening duct sealing compound to prevent the accumulation of moisture, and shall include a vapor barrier on the outside.

K. Conduit embedded in concrete or solid masonry shall not be larger than 1/3 the thickness of the wall or slab and shall be spaced not less than three diameters apart. No cutting of reinforcing bars shall be permitted unless specifically approved. Should structural members prevent the installation of conduit or equipment, notify the Contracting Officer before proceeding.

L. Route conduits in slabs to have 1 inch minimum cover. Conduits in slab shall not compromise the structural integrity of the slab.

M. Field coordinate the installation of all conduit installed in or through concrete slabs containing radiant heating piping to avoid conflict with the piping prior to the concrete being poured. Core drilling of slabs with radiant heat piping installed is not allowed.

N. Arrange raceway supports to prevent misalignment during wiring installation. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

O. Do not attach raceway to ceiling support wires or other piping systems and do not fasten raceway with wire or perforated pipe straps. Remove all wire used for temporary raceway support during construction, before conductors are pulled. Raceway shall be installed to permit ready removal of equipment, piping, ductwork, or ceiling tiles.

P. Group raceway in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps, as specified in Section 26 05 29.

Q. Cut conduit square; de-burr cut ends. Bring conduit to the shoulder of fittings and couplings and fasten securely. Where locknuts are used, install with one inside box and one outside with dished part against box.

R. Use threaded raintight conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Sealing locknuts are not acceptable.

S. Install no more than the equivalent of three 90-degree bends between boxes.

T. Install conduit bodies to make sharp changes in direction, such as around beams. “Goosenecks” in conduits are not acceptable.

U. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.

V. Provide protective plastic bushings or insulated throat bushings at each raceway termination not installed to an enclosure. Bushings shall be threaded to the raceway end or connector.

W. Avoid moisture traps; install junction box with drain fitting at low points in raceway system.

X. Install fittings and flexible metal conduit to accommodate 3-axis movements where raceway crosses seismic joints.

Y. Install fittings designed and listed to accommodate expansion and contraction where raceway crosses control and expansion joints.

Z. Stub a minimum of 2 inches above floor all raceways terminated beneath free standing service equipment, pad mounted equipment, etc.

AA. Provide weatherhead on all raceway stub ups which are outdoors and do not terminate into equipment.

BB. Use cable sealing fittings forming a watertight non-slip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor outside diameter. Use Appleton CG series or equal cable sealing fittings.

CC. Use suitable caps to protect installed raceway against entrance of dirt and moisture.

DD. Provide nylon "jet-line" or approved equal pull string in empty raceway, except sleeves and nipples.

EE. Paint all exposed conduit to match surface to which it is attached or crosses. Clean greasy or dirty conduit prior to painting in accordance with paint manufacturer's instructions. Where raceway penetrates non-rated ceilings, floors or walls, provide patching, paint and trim to retain architectural aesthetics similar to surroundings.

FF. Coat non-ferrous metallic conduit threads prior to joining with ferrous conduit with conductive metallic grease antioxidant.

GG. 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 that will be inserted into fitting. Let joint cure for 20 minutes minimum.

HH. Outdoor, above-grade work within the portal and tunnel footprint shall be GRSC. Outdoor above-grade work that is outside of the portal and tunnel footprint shall be PVC-coated RSC.

3.03 INSTALLATION – GENERAL BOXES

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance. All electrical box locations shown on Drawings are approximate unless dimensioned.

B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

C. Coordinate layout and installation of boxes to provide adequate headroom and working clearance. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

D. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems and where normal and emergency power circuits occur in the same box.

F. Verify location of floor boxes in offices and work areas prior to rough-in. Set boxes level and flush with finish flooring material.

G. Adjust box location up to 6 feet prior to rough-in to accommodate intended purpose.

H. Locate and install boxes to maintain headroom and to present a neat appearance.

I. Locate flush-mounted box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

J. Provide knockout closures for unused openings.

K. Install boxes in walls without damaging wall insulation or reducing its effectiveness.

L. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. For outlet boxes in walls with combustible finished surfaces such as wood paneling or fabric wall coverings, position box to be flush with finished surface per NEC requirements.

M. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes. Accurately position bridges to allow for surface finish thickness.

N. Install with minimum 24 inches separation in fire rated walls. Limit penetrations in fire rated walls to 16 square inches each and a maximum total combined penetration area of 100 square inches in any given 100 square feet of wall. Where penetrations are in excess of these requirements provided UL listed fire stop wrap acceptable to Authority having Jurisdiction.

O. Do not fasten boxes to ceiling support wires or other piping systems.

P. Support boxes independently of conduit.

Q. Clean interior of boxes to remove dust, debris, and other material and clean exposed surfaces and restore finish.

R. Provide blank covers or plates for all boxes that do not contain devices.

3.04 INSTALLATION – AUXILIARY GUTTER

A. Bolt auxiliary gutter to steel channels fastened to the wall or ceiling or in self-supporting structure. Install level.

B. Gasket each joint in oil-tight gutter.

C. Mount raintight gutter in horizontal position only.

3.05 INSTALLATION – BURIED CONDUITS

A. Excavation and backfilling shall be in accordance with these specifications and the applicable portions of Division 31:

1. Excavate and backfill as necessary for proper installation or work.
2. Provide bracing and shoring as necessary or required.
3. Compact backfill under footings, floor slabs and paving using materials and methods specified under Division 31, Earthwork.
4. All conduits outside the building perimeter shall be buried a minimum of 24 inches below grade. Bottom of trench shall be smoothed and all rocks and cobbles 3 inches and larger shall be removed. Conduits shall be bedded and covered in a minimum of 2 inches of 3/4” minus material. Trench shall be backfilled with non-frost susceptible material and compacted.
5. Conduits below slab on grade shall be installed in the top 6 inches of classified material.
6. Damage to existing underground utilities shall be repaired immediately by the Contractor at no cost to the DEPARTMENT.

3.06 INSTALLATION – TELECOMMUNICATION RACEWAYS AND SLEEVES

A. Provide continuous pathway system for all telecommunication cables.

B. Install the telecommunication pathways in accordance with requirements for Installation of General Conduit and General Boxes above unless superceded by more stringent requirements of this section or ANSI/EIA/TIA568-B and the latest published edition of the BICSI Telecommunication Distribution Methods Manual guidelines and recommendations.

C. Provide pathways for all telecommunication cables with Conduit and chases for the entire length of each cable. Provide pathway capacity throughout entire system for each telecommunication outlet served sized to accommodate a minimum of four 4-pair 100-Ohm UTP cables from each outlet location to telecommunication room denoted on the plans.

D. Conduit Pathways:

1. Install pull boxes in continuous straight runs of conduit longer than 100 feet.
2. Maximum allowable continuous conduit section length of 100 feet between pull boxes.
3. Contain no more than two 90-degree bends or de-rate conduit capacity 15% for up to one additional 90-degree bend. Conduits less than 33 feet long, oversized one trade size or with one of the 90-degree bends within 12 inches of a pull box may have up to three 90 degree bends without de-rating.
4. Rate each offset as a 90-degree bend.
5. Bond each conduit to telecommunication ground system.
6. Condulets (LB fittings) shall not be installed in any telecommunications raceway.
7. Do not use flexible metal conduit unless specifically noted on the plans or approved by the CONSULTANT where it is the only practical alternative. Increase raceway one trade size above required size where flexible metal conduit is used.
8. Provide bend radius of 6 times of the internal conduit diameter of conduits up to 2 inches; 10 times of the internal conduit diameter of conduits above 2 inches.
9. Provide conduit pathways through walls with insulated bushings on each end for all wall penetrations of cables.
10. Provide minimum conduit size of ¾ inch. Size all other conduits, sleeves and chases according to the following table:

Conduit Trade size	Conduit Maximum Cable Capacity Based on two 90 degree bends and < 100 ft (Inches OD of Cable)									
	(0.13”)	(0.18”)	(0.22”)	(0.24”)	(0.29”)	(0.31”)	(0.37”)	(0.53”)	(0.62”)	(0.70”)
0.75”	6	5	4	3	2	2	1	0	0	0
1”	8	8	7	6	3	3	2	1	0	0
1.25”	16	14	12	10	6	4	3	1	1	1
1.5”	20	18	16	15	7	6	4	2	1	1
2”	30	26	22	20	14	12	7	4	3	2
2.5”	45	40	36	30	17	14	12	6	3	3
3”	70	60	50	40	20	20	17	7	6	6
3.5”							22	12	7	6
4”							30	14	12	7

E. Provide innerduct the entire length in conduits denoted to contain innerducts. Size innerducts to use entire available capacity of the outer conduit.

F. Do not install innerduct and other cables in the same raceway.

3.07 INSTALLATION – TELECOMMUNICATION BOXES

A. Boxes:

1. All boxes shall be readily accessible.

2. Do not use boxes for angle pulls or change pathway direction. Locate pull boxes in straight through sections of horizontal conduit pathways.
3. Provide pull boxes for 3/4-inch and 1-inch through pull for horizontal UTP cabling. Provide all other boxes sized per the following table:

Maximum Trade Size Conduit	Minimum Size of Pull Box in Inches			For each additional conduit increase width in inches
	Width	Length (direction of conduit)	Depth	
0.75”	4	12	3	2
1”	4	16	3	2
1.25”	6	20	3	3
1.5”	8	27	4	4
2”	8	36	4	5
2.5”	10	42	5	6
3”	12	48	5	6
3.5”	12	54	6	6
4”	15	60	8	8

END OF SECTION

SECTION 26 05 48
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide seismic anchorage and restraint of electrical systems including, equipment, raceways, etc.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 05 00 – Common Work Results for Electrical and Division 27.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 05 19 – Electrical Conductors and Cables.

F. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

G. Section 26 05 29 – Hangers and Supports for Electrical Systems.

H. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

I. Section 26 05 53 – Identification for Electrical Systems.

J. Section 26 22 00 - Low-Voltage Transformers

K. Section 26 24 13 – Switchboards.

L. Section 26 24 16 – Panelboards.

M. Section 26 27 16 – Enclosed Cabinets and Enclosures.

N. Section 26 28 16 – Enclosed Switches and Circuit Breakers.

O. Section 26 32 13 – Packaged Engine Generator Systems.

P. Section 26 36 00 – Transfer Switches.

1.03 REFERENCES

A. Seismic anchorage and restraints shall be designed and installed in accordance with codes and standards as enforced by authorities having jurisdiction in Anchorage, Alaska. Authorities shall include Owner's insurance company.

B. Where applicable, building standards supersede those of other evaluation or listing agencies referenced in specification.

C. International Building Code (IBC), Chapter 16,17 – Structural Design.

D. ASCE 7-10 Chapter 13.

E. NFPA 70 National Electrical Code.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Provide structurally engineered shop drawings for seismic restraint of all electrical equipment required by the International Building Code (IBC), Chapters 16, 17. Structural design shall be based on the Seismic Use Category and Seismic Design Category as designated in these chapters.

C. Provide complete calculations, drawings and details.

D. Shop drawings shall be stamped by a professional engineer registered in the State of Alaska.

E. Submittals shall be coordinated with building CONSULTANT.

F. Submit for approval, seismic restraint calculations, drawings and details to authorities having jurisdiction as required by those authorities.

1.05 QUALITY ASSURANCE

A. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements, and submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.06 DESCRIPTION

A. Seismic Category C:

1. Only electrical items that are of Importance Factor (Ip) = 1.5 are required to be seismically braced. This applies to the following:

    a. The component is required to function for life safety purposes after an earthquake, including fire protection systems, fire alarm systems, emergency lighting, etc.
    b. The component contains hazardous materials.
    c. The component is in or attached to an Occupancy Category IV structure (Hospitals, fire station, police station, emergency shelters, etc. per ASCE 7-05, Table 1-1) and it is needed for continued operation of the facility or its failure could impair the continued operation of the facility.

2. All other electrical components shall be assigned a component importance factor Ip = 1.0 and are not required to be seismically braced.

B. Seismic Category D, E and F:

1. All electrical items that are of Importance Factor (Ip) = 1.5 are required to be seismically braced. This applies to the following:

    a. The component is required to function for life safety purposes after an earthquake, including fire protection systems, fire alarm systems, emergency lighting, etc.
    b. The component contains hazardous materials.
    c. The component is in or attached to an Occupancy Category IV structure (Hospitals, fire station, police station, emergency shelters, etc. per ASCE 7-05, Table 1-1) and it is needed for continued operation of the facility or its failure could impair the continued operation of the facility.

C. All other electrical equipment shall be assigned a component importance factor (Ip) = 1.0 and are required to be seismically braced unless one of the following conditions is satisfied:

a. Component is MOUNTED (connection to structure) at less than 4' above the floor (to the center of gravity of the component), and weighs less than 400 lbs.
b. Component is mounted higher than 4' (to the center of gravity of the component), but weighs less than 50 lbs (if it is concealed).
c. Component is mounted higher than 4' (to the center of gravity of the component), but weighs less than 100 lbs (if it is exposed).
d. Flexible connections between the components and associated conduit are provided.
e. All runs or groupings of conduits on or off of trapezes shall be seismically braced, unless the distribution system (including conduit, wiring and fittings) weighs less than 5 pounds per linear foot.
f. Lighting fixtures, lighted signs and ceiling fans that are not rigidly connected to ducts or piping, that are supported by chains or otherwise suspended from structure, are not required to be seismically braced, as long as:

    1) The attachment points can carry at least 140% of the weight of the fixture, and
    2) The swinging light will not create a falling debris problem by bumping into ceiling of other finishes, and

3) Connections to structure allow for movement of the fixture without damaging the connections.

D. In accordance with ASCE 7-05 13.6.4, all electrical components with Ip = 1.5 shall also satisfy the following requirements:

1. Provisions shall be made to eliminate seismic impact between components.
2. Loads imposed on the components by attached utility or service lines that are attached to separate structures shall be evaluated.
3. Batteries on racks shall have wrap-around restraints to ensure that the batteries will not fall from the rack. Spacers shall be used between restraints and cells to prevent damage to cases. Racks shall be evaluated for sufficient lateral load capacity.
4. Internal coils of dry type transformers shall be positively attached to their supporting substructure within the transformer enclosure.
5. Electrical control panels, computer equipment, and other items with slide-out components shall have a latching mechanism to hold the components in place.
6. Electrical cabinet design shall comply with the applicable National Electrical Manufacturers Association (NEMA) standards. Cutouts in the lower shear panel that have not been made by the manufacturer and reduce significantly the strength of the cabinet shall be specifically evaluated.
7. The attachments of additional external items weighing more than 100 lbs shall be specifically evaluated if not provided by the manufacturer.
8. Where conduit, cable trays, or similar electrical distribution components are attached to structures that could displace relative to one another and for isolated structures where such components cross the isolation interface, the components shall be designed to accommodate the seismic relative displacements defined in ASCE 7-05 Section 13.3.2.

E. Unless otherwise exempted above, electrical component supports and the means by which they are attached to the component shall be designed for the Seismic Category they are installed in accordance with ASCE 7-05 Section 13.6.5.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and devices shall be in accordance with applicable codes and standards and shall be appropriate for intended use.

B. Anchors and attachments to building structure shall be as approved by building CONSULTANT.

C. Seismic restraints used in conjunction with vibration isolators may consist of loose cables, telescoping pipes or box sections, angles or sections, flat plates used as limit stops or snubbers, or other types of housing used either integral with or separate from vibration isolators to accomplish necessary seismic restraint.

2.02 EQUIPMENT

A. Equipment available with seismic rating shall be provided with rating applicable to seismic zone of project location.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Secure stationary equipment, raceways and equipment supports to structure, concrete bases, or special supports to provide protection against earthquakes and to restrain lateral or vertical movement. Where vibration isolators are used, seismic restraints shall be designed to limit lateral or vertical movement during earthquake without short-circuiting vibration isolation system.

B. Coordinate seismic restraints with building Structural engineer and incorporate building Structural engineer's requirements.

C. Seismic restraint methods and materials shall be supplementary to support devices specified in other sections of this specification and together shall serve as equipment support criteria.

D. Installation of devices shall be in accordance with seismic Structural engineer's drawings and details and in accordance with seismic guidelines.

E. Coordinate installation of devices with other trades and incorporate their requirements.

F. Modify raceway and equipment locations as required for seismic restraint system.

G. Seismic restraint systems shall not interfere with installation of other building systems or access.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates and Tape Labels.

B. Wire and Cable Markers.

C. Wire Markers.

D. Conduit Markers.

E. Underground Warning Tape.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 05 00 – Common Work Results for Electrical and Division 27.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

F. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

G. Section 26 22 00 - Low-Voltage Transformers

H. Section 26 24 13 – Switchboards.

I. Section 26 24 16 – Panelboards.

J. Section 26 27 16 – Enclosed Cabinets and Enclosures.

K. Section 26 27 26 – Wiring Devices.

L. Section 26 28 16 – Enclosed Switches and Circuit Breakers.

M. Section 26 32 13 – Packaged Engine Generator Systems.

N. Section 26 36 00 – Transfer Switches.

O. Section 27 10 00 – Structured Cabling.

1.03 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color-coding, tag number, location, and function.

C. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

D. Prior to Substantial Completion, submit copies of all panel schedules for review by the ENGINEER. The ENGINEER will note any changes to the room numbers/names and the Contractor shall provide revised typed panel schedules to reflect all changes, at no additional cost to the DEPARTMENT.

1.04 QUALITY ASSURANCE

A. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements, and submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.01 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black background. Nameplate for service disconnect shall be engraved white letters on red background.

B. Letter Size:

1. 1/4-inch high letters for identifying individual panel or equipment.
2. 1/8-inch high letters for remaining lines with 1/8 inch spacing between lines.

C. Minimum nameplate size: 1/8 inch thick with a consistent length and height for each type of nameplate wherever installed on the project.

2.02 TAPE LABELS

A. Product Description: Adhesive tape labels, with 3/16 inch Bold Black letters on clear background made using Dymo RhinoPro 5000 label printer or approved equal.

B. Embossed adhesive tape will not be permitted for any application.

2.03 WIRE MARKERS

A. Power and Lighting Description: Machine printed heat-shrink tubing, cloth or wrap-on type, for all neutrals and Phase conductors.

B. Low Voltage System Description: Self-adhesive machine printed label with unique wire number that is shown on shop drawing for system.

C. Telecommunications Cable Markers: Self-laminating vinyl with translucent band and minimum 1”W x .5”H printable area with matte white finish. Brady #B-427 series or approved equal.

2.04 UNDERGROUND WARNING TAPE

A. Product Description: Red, 6-inch wide, detectable.

B. Wording to read “Caution – Buried Electric Line Below”.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Degrease and clean surfaces to receive nameplates and tape labels.

B. Install nameplates and tape labels parallel to equipment lines.

C. Underground Warning Tape Installation: Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

3.02 NAMEPLATE INSTALLATION

A. Secure nameplates to equipment fronts using machine screws tapped and threaded into panelboard, or using rivets. The use of adhesives is not acceptable. Machine screws to not protrude more than 1/16 inch on back side.

B. Service Disconnect Nameplate: Provide nameplate on exterior service disconnect that reads “SERVICE DISCONNECT”.

C. Switchboard Nameplates:

1. Provide overall equipment identification.

a. Line 1: Switchboard name.

b. Line 2: Bus Amps Rating, Voltage, Phase and Wire configuration.
c. Line 3: AIC rating of the panel.

2. Provide circuit breaker identification for each feeder breaker.

a. Line 1: Name of panelboard or equipment served.
b. Line 2: Location of served panelboard.

D. Branch Panelboard Nameplates:

1. Provide nameplate for each panelboard with the following information:

a. Line 1: Panelboard name.
d. Line 2: Bus Amps Rating, Voltage, Phase and Wire configuration.
b. Line 3: AIC rating of the panelboard.

E. Transformers:

1. Provide nameplate for each transformer with the following information:

a. Line 1: Transformer name.
b. Line 2: Source from which the transformer is fed.
c. Line 3: Primary and secondary voltage, phase and wire configuration (i.e. 480-120/208V,3PH,4W)
d. Line 4: Secondary load and location.

F. Disconnects, Starters, or Contactors:

1. Provide nameplate for each device with the following information:

a. Line 1: Load served.
b. Line 2: Panelboard and circuit number from which the device is fed.
c. Line 3: Switch/Disconnect/Contactor Rating
d. Line 4: Fuse Size or Circuit Breaker Trip (if different from frame size) and poles.

G. Control or Low Voltage System Panels:

1. Provide nameplate for each control panel with the following information:

a. Line 1: Unique panel name as shown on the shop drawings.
b. Line 2: System description such as Fire Alarm, Intercom, BAS, Security, etc.
c. Line 3: Panelboard and circuit number from which the panel is fed if applicable.

3.03 LABEL INSTALLATION

A. Conduit Feeder Labels - Provide conduit labels on all feeder raceways as follows:

1. Switchboards – “PANEL xxxx IN ROOM #xxx”.

2. Panelboards – “PANEL xxxx FED FROM MDP xxx”.

B. Spare Raceways: Provide raceway label on each individual raceway denoting the source and termination point at each end.

C. Low-Voltage System Device Labels: Provide label on each device, denoting device ID or address where applicable. Affix label to device faceplate for ceiling-mounted devices or wall-mounted devices above 8’-0” AFF. Affix label inside backbox for exterior devices.

3.04 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identification shall be as follows:

1. Markers shall be located within one inch of each cable end, except at panelboards, where markers for branch circuit conductors shall be visible without removing panel deadfront.
2. Each wire and cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations.
3. Color code phases, neutral, and ground per NEC requirements and Section 26 05 19.
4. Color-code all low-voltage system wires and cables in accordance with the individual sections in which they are specified.
5. For power and lighting circuits, identify with branch circuit or feeder number.
6. Control Circuits: Control wire number as indicated on schematic and shop drawings.

B. Provide pull string markers at each end of all pull strings. Marker shall identify the location of the opposite end of the pull string.

3.05 JUNCTION BOX IDENTIFICATION

A. Paint all junction boxes designated for future expansion with blue spray paint.

B. Label each lighting and power junction box with the panelboard name and circuit number.

C. For junction boxes above ceilings, mark the box cover with the circuit or system designation using permanent black marker. For junction boxes in finished areas, mark the inside of the cover with the circuit or system designation using permanent black marker.

3.06 DEVICE PLATE IDENTIFICATION

A. Label each receptacle device plate or point of connection denoting the panelboard name and circuit number.

B. Install adhesive label on the top of each plate.

3.07 PANELBOARD IDENTIFICATION

A. Provide panelboard circuit directories in accordance with Section 26 24 16.

3.08 LOW-VOLTAGE SYSTEM IDENTIFICATION

A. Install all labeling in accordance with the requirements of this section and of each section where the individual systems are specified.

END OF SECTION

SECTION 26 21 00
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Arrangement with Utility Company for permanent electric service including payment of Utility Company charges for service.

B. Underground service entrance.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements and Section 26 05 00 – Common Work Results for Electrical.

B. Section 26 05 26 – Grounding and Bonding for Electrical System.

C. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

D. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

E. Section 26 05 53 – Identifications for Electrical Systems.

F. Section 31 23 16.13 – Trenching.

1.03 REFERENCE STANDARDS

A. NEMA 250 – 2003 Enclosures for Electrical Equipment (1000 Volts Maximum).

B. UL 50 – 1995 Enclosures for Electrical Equipment.

C. UL 414 – 1999 Standard for Meter Sockets.

1.04 SYSTEM DESCRIPTION

A. System Voltage: 480 volts, three phase, four-wire, 60 Hertz.

B. Service Entrance: Underground.

1.05 SUBMITTALS

A. Product Data: Submit product data for all components provided, showing electrical characteristics, material, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

B. Shop Drawings: Submit shop drawings and manufacturer's literature for transformer rated meter base, current transformer cabinet, and shunt trip safety switch operator.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manuals: Submit manufacturer's instructions for shunt trip safety switch operator maintenance.

1.07 QUALITY ASSURANCE

A. Utility Company: Chugach Electric Association (CEA)

B. Install service entrance in accordance with Utility Company's rules and regulations.

PART 2 - PRODUCTS

2.01 METERING EQUIPMENT

A. Meter: Furnished and installed by the Utility Company.

B. Transformer Rated Meter Base: NEMA 3R, 316 stainless steel, 13-terminal, transformer rated 20 amperes, 600 volts with mounting provisions to accommodate a covered test switch with test switch cover sealing provisions. The test switch mounting provisions shall accept a 10 pole covered test switch with a base dimension of 9.5 inches in width and a depth (the dimension from the rear edge of the test switch base to the top of the cover sealing stud) of no less than 3.375 inches. The lower cover of the meter socket shall seat fully with a covered test switch in place. Meet requirements of NEMA standards for watthour meter sockets-NEMA EI17-1978 (similar to EUSERC Drawing No. 339). The utility company will furnish and install the test switch and CT wiring.

C. Current Transformer Cabinet: NEMA 4X, 316 stainless steel, UL 414 listed, minimum size as shown on the drawings. All current transformer cabinets and compartments shall have hinged front cover access to the current transformers. The hinged front cover shall be lockable and shall accept a padlock with a shackle diameter of not less than 5/16 inch. Current transformer cabinets for services from 201 Amperes to 800 Amperes shall have ¼ x 20 mounting studs on the enclosure body spaced to accept a current transformer mounting base. Current transformer cabinets for services from 801 Amperes to 2,500 Amperes shall have side gutters sized as shown on the drawings and removable bus links.

D. Shunt Trip Safety Switch: The shunt trip switch shall be a heavy duty non-fused safety switch in NEMA 4x stainless steel enclosure and shall be lockable in either “On” or “Off” position with. Interlock contacts may be used to provide correct handle location. The “Off” position must disconnect the power. The shunt trip switch enclosure shall be labeled with white engraved letters: “SERVICE SHUNT TRIP – UTILITY”.

E. All removable covers for compartments containing un-metered conductors shall be sealable or lockable with sealable latches, stud and wing-nuts, sealing screws, or slot and tab devices. All top cover panels, side cover panels and rear cover panels providing access to un-metered conductors shall be secured in place with devices that cannot be loosened from the outside, screws or bolts requiring special tools for installation or removal are not acceptable alternates. No removable panel or cover requiring sealing or locking shall be located behind other panels, covers or doors except for rain-tight enclosures. Hinged cover panels shall be lockable on the side opposite the hinges. Hinged panel covers shall accept a padlock with a shackle diameter of not less than 5/16 inch. Stud and wing-nut sealing assemblies shall consist of a ¼ inch x 20 (minimum) stud and associated wing-nut, each drilled 0.0635 inch (minimum) for sealing purposes. The stud shall be securely attached so as to not loosen or back out when being fastened. Sealing screws shall be drilled 0.0635 inch (minimum) for sealing purposes. All securing screws for removable panel covers shall be captive.

F. Current Transformer: Provided by Utility.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Underground: Install service entrance conduits from property line to building service entrance equipment. Utility Company will connect service lateral conductors to service entrance conductors.

C. Install red engraved plastic nameplate on shunt trip disconnect on outside of box. Install signage inside cover indicating location of main disconnect inside building.

D. Meter sockets shall be installed with the centerline of the socket opening no more than 72 inches and no less than 60 inches above finished grade. The meter socket shall be installed with a minimum 10 inches of side clearance to each side of the socket. On current transformer rated meter sockets, the conduit connecting the meter socket and the current transformer cabinet shall be rigid steel or IMC and have a minimum diameter of 1 inch, shall not be longer than 25 feet, shall have no access points (junction boxes, condulets, etc.), and shall connect to the meter socket at a factory supplied knockout located below the test switch mounting provisions.

E. Wall mounted current transformer enclosures shall be mounted with the top of the cabinet no more than 96 inches above grade and the bottom of the cabinet no less than 16 inches above grade.

F. Current transformer cabinets shall not be used as a junction point to service other metered services or as a splicing chamber.

G. All service entrance equipment shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

END OF SECTION

SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Dry Type Two Winding Transformers.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Division 03 - Concrete Work.

F. Section 26 01 26 – Maintenance Testing of Electrical Systems.

G. Section 26 05 19 – Electrical Conductors and Cables.

H. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

I. Section 26 05 29 – Hangers and Supports for Electrical Systems.

J. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

K. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

L. Section 26 05 53 – Identification for Electrical Systems.

1.03 REFERENCES

A. ANSI/NEMA - ST 1 - Specialty Transformers.

B. ANSI/NEMA ST 20 - Dry Type Transformers for General Applications.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Submit data under provisions of Division 01 & Section 26 05 00.

B. O&M Manual: Submit data under provisions of Division 01 and Section 26 05 00.

1. Provide product data and shop drawing information including replacement parts list.
2. Provide installation, operation and maintenance information per manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years of experience.

B. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Upon arrival at the site inspect equipment and report on any damage.

C. Store and protect products under provisions of Division 01.

D. Handle carefully on site to avoid any damage to internal components, enclosures and finishes.

E. Store in a warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.

F. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow if handled in inclement weather.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DRY TYPE TWO WINDING TRANSFORMERS

A. Square D.

B. General Electric.

C. EATON.

D. Substitutions: Under provisions of Division 01.

2.02 DRY TYPE TWO WINDING TRANSFORMERS

A. Dry Type Transformers: ANSI/NEMA ST 20; factory-assembled, air cooled dry type transformers; ratings as shown on the Drawings.

B. Insulation system and average winding temperature rise for rated KVA as follows:

Rating	Class	Rise (º C)
1-15	185	115
16-500	220	115

C. Case temperature shall not exceed 35ºC rise above ambient at its warmest point.

D. Winding Taps, Transformers Less than 15 KVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

E. Winding Taps, Transformers 15 KVA and Larger: ANSI/NEMA ST 20.

F. Sound Levels: per ANSI/NEMA ST 20 as follows:

KVA Rating	Sound Level
1-9	40 dB
10-50	45 dB
51-150	50 dB
151-300	55 dB
301-500	60 dB
501-700	62 dB

G. Basic Impulse Level: 10 KV

H. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

I. Mounting: Transformers 75 KVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 75 KVA shall be suitable for floor or trapeze mounting.

J. Coil Conductors: Continuous copper windings with terminations brazed or welded.

K. Enclosure: ANSI/NEMA ST 20; Type 3R. Provide lifting eyes or brackets.

L. Isolate core and coil from enclosure using vibration- absorbing mounts.

M. Nameplate: Include transformer connection data.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set transformer plumb and level.

B. Use flexible conduit, 2 ft. minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

C. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the pad.

D. Provide seismic restraints.

E. All dry type transformers shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.

B. Measure primary and secondary voltages under normal building and make appropriate tap adjustments.

END OF SECTION

SECTION 26 24 13
SWITCHBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section includes main and distribution switchboards.

1.02 RELATED SECTIONS

A. Section 01 11 13 – Summary of Work.

B. Section 01 31 14 – Work Coordination.

C. Section 01 72 00 – Utilities Coordination.

D. Section 03 30 00 - Cast-In-Place Concrete for concrete pads.

E. Section 26 01 26 – Maintenance Testing of Electrical Systems.

F. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

G. Section 26 05 53 - Identification for Electrical Systems.

H. Section 33 71 73 - Electrical Utility Services: Utility metering equipment.

1.03 REFERENCES

A. American National Standards Institute:

1. ANSI C12.1 - Code for Electricity Metering.
2. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.

B. Institute of Electrical and Electronics Engineers:

1. IEEE C57.13 - Standard Requirements for Instrument Transformers.
2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

C. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
3. NEMA PB 2 - Deadfront Distribution Switchboards.
4. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.

D. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

E. Underwriters Laboratories Inc.:

1. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
2. UL 891 - Dead-Front Switchboards.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, neutral, and ground; and switchboard instrument details.

C. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.

D. Test Reports: Indicate results of factory production and field tests.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.

C. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Basis of Design: Square D.

C. The Service/Main Breaker Switchboard Basis of Design is Square D. Contractor shall coordinate dimension of selected gear to ensure that the gear will fit in the designated space and will accept existing conduit stub ups from below in the location required. Selection of another manufacturer that requires additional work shall be completed at no additional cost to the Owner.

D. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron

products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.

C. Accept switchboards on site. Inspect for damage.

D. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.

E. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 SEQUENCING

A. Section 01 10 00 - Summary: Work sequence.

B. Sequence Work to avoid interferences with building finishes and installation of other products.

1.11 MAINTENANCE MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish two of each key.

1.12 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish three of each size and type of fuse installed.

PART 2 - PRODUCTS

2.01 DISTRIBUTION SWITCHBOARDS

A. Manufacturers:

1. Square D Type QED-2 as basis of design.
2. Cutler-Hammer.
3. General Electric.
4. Siemens.

B. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.

C. Service Conditions:

1. Temperature: 70 degrees F.
2. Altitude: 300 feet.

D. Service/Main Breaker Switchboards:

1. Utility Section: Provide 42” wide section for Utility Metering Compartment. Furnish metering transformer compartment with space for mounting Utility Company current transformers in accordance with Utility Company Requirements.
2. Main Breaker Section: Provide 36” wide section to house main breaker and customer metering equipment.
3. Distribution Switchboards:

    a. Auxiliary Section: Provide 24” wide auxiliary pull section.
    b. Distribution Section: Provide 36” wide section for distribution/branch circuit breakers.

E. Bus:

1. Material: Copper with silver plating, standard size.
2. Connections: Bolted, accessible from front for maintenance.

F. Ground Bus: Extend length of switchboard.

G. Minimum Short Circuit Rating: 42,000 symmetrical amperes rms, fully rated.

H. Line and Load Terminations: Accessible from front of switchboard, suitable for conductor materials and sizes as indicated on Drawings. 90 degrees C temperature rating on all busbar/lug cable terminations.

I. Future Provisions: Fully equip Distribution Switchboard circuit breaker spaces for future devices with bussing and bus connections, insulated and braced for short circuit currents.

J. Enclosure: Type 1 - General Purpose.

K. Align sections at front and rear.

L. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. Manufacturers:

1. Square D as basis of design.
2. Cutler-Hammer.
3. General Electric.
4. Siemens.

B. Product Description: UL 489, molded-case circuit breaker.

C. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 400 amperes and larger shall have mechanism for adjusting long time and short time current settings for automatic operation.

D. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 400 amperes and larger shall have changeable trip units.

E. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with integral ground fault sensing adjustable from 200-1200 amperes; instantaneous trip; and adjustable short time trip.

F. Accessories: Conform to UL 489.

1. Shunt Trip Device: 120 volts, AC.
2. Electrical Operator: 120 volts, AC.

2.03 AMMETERS, VOLTMETERS AND POWER METERS

A. Manufacturers:

1. Square D Model PM820 as basis of design.

B. Provide meters where shown on the Drawings.

C. Ammeters: ANSI C39.1; direct-reading, full range, indicating ammeter, 5 ampere, 60 Hertz movement, 1 percent accuracy.

D. Voltmeters: ANSI C39.1; direct-reading, full range, indicating voltmeter, 120 volt, 60 Hertz movement, 1 percent accuracy.

E. Watt-hour Meters and Wattmeters: ANSI C12.1; three phase induction type with two stators, each with current and potential coil, rated 5 amperes and 120 volts at 60 Hertz. Meter suitable for connection to 3- and 4-wire circuits. Furnish potential indicating lamps; adjustments for light and full load, phase balance, and power factor; four-dial clock register; integral demand indicator; ratchets to prevent reverse rotation; removable meter with draw-out test plug; semi-flush mounted case with matching cover.

F. Furnish meters with appropriate multiplier tags.

2.04 METERING TRANSFORMERS

A. Current Transformers: IEEE C57.13; 5 ampere secondary, wound type, with single secondary winding and secondary shorting device, primary/secondary ratio as indicated on Drawings, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

B. Potential Transformers: IEEE C57.13; 120 volt single secondary, disconnecting type with integral fuse mountings, primary/secondary ratio as indicated on Drawings, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

2.05 SOURCE QUALITY CONTROL

A. Furnish shop inspection and testing in accordance with NEMA PB 2.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify surface is suitable for switchboard installation.

3.02 EXISTING WORK

A. Disconnect and remove abandoned switchboards.

B. Maintain access to existing switchboards and other installations remaining active.

3.03 PREPARATION

A. Concrete Pad: Comply with requirements of Section 03 30 00.

3.04 INSTALLATION

A. Install in accordance with NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. Install engraved plastic nameplates in accordance with Section 26 05 53.

D. Install breaker circuit directory for Distribution Switchboards.

E. Ground and bond switchboards in accordance with Section 26 05 26.

3.05 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.1.

3.06 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust operating mechanisms for free mechanical movement.

C. Tighten bolted bus connections.

3.07 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Distribution Panelboards.

B. Branch Circuit Panelboards.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 01 26 – Maintenance Testing of Electrical Systems.

F. Section 26 05 19 – Electrical Conductors and Cables.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

K. Section 26 05 53 – Identification for Electrical Systems.

1.03 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers.

B. NEMA KS 1 - Enclosed Switches.

C. NEMA PB 1 - Panelboards.

D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

E. NEMA PB 2.2 - Application Guide for Ground-fault Protective Devices for Equipment.

F. UL 50 – Enclosures for Electrical Equipment.

G. UL 67 – Panelboards.

H. UL 98 - Enclosed and Dead-front Switches.

I. UL 489 – Molded Case Circuit Breakers and Circuit Breaker Enclosures.

J. Federal Specification W-C-375B/Gen – Circuit Breakers, Molded Case, Branch Circuit and Service.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data: Submit product data for all components provided which fall under this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

C. Shop drawings: Submit shop drawings for each panelboard indicating features and device arrangement and size. Include outline and support point dimensions, voltage, main bus ampacity, and integrated short circuit ampere rating.

D. Submit final panel schedules in Microsoft Excel format with the O&M manuals.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Submit data under provisions of Division 01 & Section 26 05 00.

B. O&M Manual: Submit data under provisions of Division 01 and Section 26 05 00.

1. Provide product data and shop drawing information including replacement parts list.
2. Provide installation, operation and maintenance information per manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years of experience.

B. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Upon arrival at the site inspect equipment and report on any damage.

C. Store and protect products under provisions of Division 01.

D. Handle carefully on site to avoid any damage to internal components, enclosures and finishes.

E. Store in a clean, dry environment. Maintain factory packaging and provide an additional heavy canvas or plastic cover to protect enclosures from dirt, water, construction debris and traffic.

1.08 EXTRA STOCK

A. Keys: Furnish 2 each to the DEPARTMENT.

PART 2 - PRODUCTS

2.01 MANUFACTURERS – PANELBOARDS

A. Square D.

B. Cutler Hammer.

C. General Electric.

D. Siemens.

2.02 DISTRIBUTION CIRCUIT BREAKER PANELBOARDS

A. Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 4X or as indicated on the drawings. Cabinet size: 6 inches deep; 24 inches wide minimum.

C. Provide cabinet front with door-in-door cover.

D. Interior trim shall be dead-front construction to shield user from all energized parts.

E. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.

F. Panelboard bussing shall be fully rated with sequential phase distribution. Bussing shall be plated copper and the plating shall run the entire length of the busbar.

G. Provide UL Listed short circuit current ratings as indicated on the drawings. Minimum short circuit rating shall be 10,000 amperes RMS symmetrical for 250 volt panelboards; 14,000 amperes RMS symmetrical for 600 volt panelboards.

H. A solidly bonded copper equipment ground bar shall be provided.

I. Solid neutral bus bars shall be provided. Neutral bus shall be of same material as the phase busses. Solid neutral bars shall be equipped with a full capacity bonding strap for service entrance applications. Gutter mounted neutrals will not be accepted.

J. Panelboards shall have nameplates containing the following information:

1. Catalog number.
2. Factory order number.
3. UL Listed Label.
4. Short Circuit Current Rating.
5. Main Circuit Breaker or Main Lug Rating.
6. System Voltage.

K. Thermal Magnetic Molded Case Circuit Breakers: NEMA AB 1; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Breaker ampacity and AIC rating shall be visible on breaker without removing panel deadfront or cover.

2.03 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 4X or as indicated on Drawings. Boxes shall be galvanized or stainless steel constructed in accordance with UL50 requirements. Interiors shall be field convertible for top or bottom incoming feed. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.

C. Cabinet Size: 6 inches deep; 20 inches wide minimum.

D. Provide front or surface cabinet front as indicated on the Drawings with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide one continuous bus bar per phase each. Panelboards shall have sequentially phased branch circuit connectors suitable for bolt-on branch circuit breakers. Bussing shall be fully rated.

F. Integrated Short Circuit Rating: Provide panelboards with short circuit ratings as shown on the Drawings. Minimum ratings shall be 10,000 amperes RMS symmetrical for 250 volt panelboards; 14,000 amperes RMS symmetrical for 600 volt panelboards.

G. Main/Sub Feed Circuit Breakers: NEMA AB 1; Provide vertical mount main and/or sub feed circuit breaker in panelboards as shown on the drawings.

1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.

2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90°C rated wire, sized according to the 75 °C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.

H. Branch Circuit Breakers: NEMA AB 1; Provide panelboards with bolt-on type thermal magnetic trip circuit breakers.

1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free with common trip handle for all poles.
2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90°C rated wire, sized according to the 75 °C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.
3. Provide circuit breakers UL listed as Type SWD for lighting circuits.
4. Provide circuit breakers UL listed as type HACR for use with heating, air conditioning and refrigeration equipment.
5. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.

B. Height: 6 feet, 6 inches to top of panelboard.

C. Provide filler plates for unused spaces in panelboards.

D. Panel Schedules: Revise schedules to reflect circuiting changes required to balance phase loads.

E. Panelboard Identification:

1. Provide identification per Section 26 05 53 Identification for Electrical Systems.
2. For each new panelboard and each existing panelboard where circuits are added or modified, provide typed schedule denoting each circuit load by the load type and final name and room number actually in use in the facility. Schedule shall not be typed with names shown on the Contract Drawings unless names are acceptable to the ENGINEER.
3. Where more than one nominal voltage system is present on the premises, the conductor color-coding legend shall be permanently posted at each branch circuit and distribution panelboard per NEC requirements.
4. All panelboards shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

C. Confirm panelboard directory is typed and installed.

END OF SECTION

SECTION 26 27 16
ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.01 SECTION INCLUDED

A. Hinged Cover Enclosures.

B. Cabinets.

C. Terminal Blocks and Accessories.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 01 26 – Maintenance Testing of Electrical Systems.

F. Section 26 05 19 – Electrical Conductors and Cables.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

K. Section 26 05 53 – Identification for Electrical Systems.

1.03 REFERENCES

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. ANSI/NEMA ICS 1 - Industrial Control and Systems.

C. ANSI/NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.

D. ANSI/NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in ANSI/NEMA ICS 1.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Submit data under provisions of Division 01 & Section 26 05 00.

B. O&M Manual: Submit data under provisions of Division 01 and Section 26 05 00.

1. Provide product data and shop drawing information including replacement parts list.
2. Provide installation, operation and maintenance information per manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years of experience.

B. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 EXTRA STOCK

A. Keys: Furnish 2 each to the DEPARTMENT.

PART 2 - PRODUCTS

2.01 MANUFACTURERS – PANELBOARDS

A. Hoffman.

B. Substitutions: Under provisions of Division 01.

2.02 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 1, steel.

B. Finish: Manufacturer's standard enamel finish.

C. Covers: Continuous hinge, held closed by flush latch operable by key.

D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gauge steel, white enamel finish.

2.03 CABINETS

A. Cabinet Boxes: Galvanized steel with removable endwalls, 24 inches wide, 6 inches deep.

B. Cabinet Fronts: Steel, surface type with concealed trim clamps, concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.04 TERMINAL BLOCKS AND ACCESSORIES

A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.

B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.05 FABRICATION

A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.

B. Provide knockouts on enclosures.

C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

B. Provide accessory feet for free-standing equipment enclosures.

C. Install trim plumb.

D. Height: 6 feet, 6 inches to top of enclosure.

E. Provide identification per Section 26 05 53 Identification for Electrical Systems.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Receptacles.

B. Device Plates and Box Covers.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 01 26 – Maintenance Testing of Electrical Systems.

F. Section 26 05 19 - Electrical Power Conductors and Cables.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 53 – Identification for Electrical Systems.

1.03 REFERENCES

A. FS W-C-596 – Federal Specification for Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. FS W-S-896 – Federal Specification for Switches, Toggle (Toggle and Lock), Flush Mounted.

C. NEMA WD 1 - General Color Requirements for Wiring Devices.

D. ANSI/NEMA WD 6 – Wiring Devices – Dimensional Requirement.

E. UL 20 – General-Use Snap Switches.

F. UL 498 - Attachment Plugs and Receptacles.

G. UL 943 – Ground-Fault-Circuit-Interrupters.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data: Submit product data for all components provided that are specified in this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Indicate actual locations and mounting heights of all wiring devices on the project record drawings. Submit under Section 26 05 00.

B. O&M Manual: Submit data under provisions of Division 01 and Section 26 05 00.

1. Provide product data including replacement parts list.
2. Provide installation, operation and maintenance information per manufacturer.

1.06 QUALITY ASSURANCE

A. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - RECEPTACLES

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Substitutions: Under provisions of Division 01.

2.02 RECEPTACLES

A. Convenience and Straight-blade Receptacles: UL 498, NEMA WD 1 and Federal Specification FS W-C-596 industrial grade receptacle.

B. Locking-Blade Receptacles: NEMA WD 5.

C. Convenience Receptacle Configuration: NEMA WD 1; Type 5-20R, white [ivory] nylon face.

D. Specific-use Receptacle Configuration: NEMA WD 1 or WD 5; type as indicated on Drawings, black phenolic face.

E. GFCI Receptacles: 20A, duplex convenience receptacle with integral class 'A' ground fault current interrupter, LED indicator lamp and integral lockout.

F. Weather-Resistant Receptacles: Listed to the weather-resistant supplement of UL498 and complying with the requirements of NEC 406.9.

2.03 DEVICE PLATES

A. Weatherproof Cover Plate: UL listed, cast aluminum, hinged outlet cover/enclosure, with gasket between the enclosure and the mounting surface, suitable for wet locations while in use and identified as "Extra Duty" per NEC 406.9 (B)(1).

B. Exposed Work Cover Plate: ½ inch raised, square, pressed, galvanized or cadmium plated steel cover plate supporting devices independent of the outlet box.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install convenience receptacles 18 inches above floor, 4 inches above counters or backsplash, grounding pole on bottom.

B. Install specific-use receptacles at heights shown on Contract Drawings.

C. Unless otherwise noted, mounting heights are for finished floor to center line of outlet.

D. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.

E. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

F. Install devices and wall plates flush and level.

G. Ground receptacles to boxes with a grounding wire. Grounding through the yoke or screw contact is not an acceptable alternate to the ground wire.

H. Install circuit label on each receptacle and light switch in accordance with Section 26 05 53.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Disconnect Switches.

B. Fuses.

C. Enclosed Circuit Breakers.

D. Enclosures.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements and Section 26 0500 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 01 26 – Maintenance Testing of Electrical Systems.

F. Section 26 05 19 – Electrical Conductors and Cables.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

K. Section 26 05 53 – Identification for Electrical Systems.

1.03 REFERENCES

A. ANSI/UL 198C - High-Intensity Capacity Fuses; Current Limiting Types.

B. ANSI/UL 198E - Class R Fuses.

C. ANSI/UL 98 - Enclosed and Dead Front Switches.

D. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

E. NEMA FU 1 – Low Voltage Cartridge Fuses.

F. UL 489 – Molded Case Circuit Breakers and Circuit Breaker Enclosures.

G. NEMA AB-1 – Molded Case Circuit Breakers and Molded Case Switches.

H. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

I. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data: Submit product data for all components provided, showing electrical characteristics, material, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

C. Shop Drawings: Submit shop drawings include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit current interrupting rating.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Submit data under provisions of Division 01 & Section 26 05 00.

B. O&M Manual: Submit data under provisions of Division 01 and Section 26 05 00.

1. Provide product data and shop drawing information including replacement parts list.
2. Provide installation, operation and maintenance information per manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years of experience.

B. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Upon arrival at the site inspect equipment and report on any damage.

C. Handle carefully on site to avoid any damage to internal components, enclosures and finishes.

D. Store in a clean, dry environment. Maintain factory packaging and provide an additional heavy canvas or plastic cover to protect enclosures from dirt, water, construction debris and traffic.

1.08 EXTRA STOCK

A. Provide extra stock under provisions of Division 01.

B. Fuses: Provide one set of 2 fuses of each size and type of fuse installed.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - ENCLOSED SWITCHES

A. Square D.

B. EATON.

C. Siemens.

2.02 ENCLOSED SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; Heavy Duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses and reject all other classes of fuse.

B. Nonfusible Switch Assemblies: NEMA KS 1; Heavy Duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1; Type 1, 3R or 4 as indicated on Drawings.

2.03 ACCEPTABLE MANUFACTURERS - FUSES

A. Cooper-Bussmann.

B. Ferraz-Shawmut.

2.04 FUSES

A. Fuses 600 Amperes and Less: ANSI/UL 198E, Class RK1; RK5; dual element, current limiting, time delay, one-time fuse, 250 volt.

B. Interrupting Rating: 200,000 rms amperes.

2.05 MOLDED CASE CIRCUIT BREAKERS

A. Molded case circuit breakers shall provide circuit overcurrent protection with inverse time and instantaneous tripping characteristics.

B. All circuit breakers shall have a quick-make, quick break over center toggle type mechanism and the handle mechanism shall be trip free to prevent holding contacts closed against a short circuit or sustained overload. All circuit breaker handles shall assume a position between "ON" and "OFF" when tripped automatically. Multiple pole circuit breakers shall be common trip such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Arc extinction is to be accomplished by magnetic arc chutes. All ratings are to be clearly visible.

C. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings. The interrupting rating of the circuit breakers shall be at least equal to the available short circuit current at the line terminals of the circuit breaker. Where indicated or allowed, circuit breakers shall be UL listed for series application.

D. Where indicated, circuit breakers shall be current limiting. Current limiting circuit breakers shall limit the let-through I^2t to a value less than the I^2t of one-half cycle wave of the symmetrical prospective current without any fusible elements when operating within its current range.

E. Where combination motor control is indicated on the drawings, instantaneous only circuit breakers shall be furnished as the means to provide short circuit protection. The magnetic trip settings for each phase shall be individually adjustable from the front of each circuit breaker.

F. Unless otherwise noted on the drawings, all circuit breakers 250A ampere frame and below shall have thermal-magnetic trip units, with inverse time-current characteristics.

1. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Instantaneous pick-up settings for each phase shall be individually adjustable on all frames 250A and above.
2. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40º C, the circuit breaker automatically derates itself to better protect its associated conductor.
3. Circuit breakers from 250 to 2000A frames shall have thermal magnetic interchangeable trip units. When reverse feed is indicated on the drawings, in accordance with UL, circuit breakers with sealed trip units shall be supplied.

G. Circuit breaker enclosure assembly shall be listed as service entrance rated.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install enclosed switches where indicated on Drawings, and where required for NEC required disconnect of equipment specified under other divisions, but installed under Division 26.

B. Install fuses in fusible disconnect switches.

C. All enclosed switches shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Field inspecting, testing, adjusting and balancing.

B. Inspect and test in accordance with NETA ATS, exception Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION

SECTION 26 32 13
PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system.

B. Exhaust silencer and fittings.

C. Fuel fittings and day tank.

D. Battery and charger.

E. Weatherproof enclosure.

F. Generator Controls

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 01 26 – Maintenance Testing of Electrical Systems.

F. Section 26 05 19 – Electrical Conductors and Cables.

G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 – Hangers and Supports for Electrical Systems.

I. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

J. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

K. Section 26 05 53 – Identification for Electrical Systems.

L. Section 26 24 16 – Panelboards.

M. Section 26 24 13 - Switchboards

N. Section 26 27 16 – Electrical Cabinets and Enclosures.

O. Section 26 28 19 – Enclosed Switches.

P. Section 26 36 00 – Transfer Switches

1.03 REFERENCES

A. ANSI/NEMA MG 1 - Motors and Generators.

B. ANSI/NFPA 70 - National Electrical Code.

C. ANSI/NFPA 110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.

D. ANSI/NEMA AB 1 - Molded Case Circuit Breakers.

E. UL 2200 - Standard for Stationary Engine Generator Assemblies: The genset shall be listed to UL 2200 or submitted to an independent third party certification process to verify compliance as installed.

F. IEEE 446 - Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

G. International Building Code (IBC), Chapter 16 – Structural Design.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Submit product data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, power panel, luminaire(s), battery, battery rack, battery charger, exhaust silencer, vibration isolators, skid-mounted tank, load sharing/synchronization controller, remote radiator.

C. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams (power and control), and electrical panel schedule for generator ancillary loads.

D. Complete drawings, details, and specifications covering the equipment furnished shall be submitted for review. Within 7 days after Notice to Proceed, the Contractor shall furnish the following:

1. Complete and accurate drawings of the equipment, including outline drawings and dimensional data which fully describe the height, width, and depth of the equipment; skid construction; schematics; wiring diagrams; and other relevant details.
2. Mechanical and electrical performance data including intake and exhaust air flow; charge air cooling requirements; heat rejection; engine coolant pump curve at rated speed; fuel flow rate; fuel consumption at 100%, 75%, 50%, and 25% of rated standby power; and other relevant data.
3. EPA, IBC Seismic, & ISO 9001 Certificates of Conformity shall be included.

E. Submittal Preparation Requirements

1. Engineering data covering all equipment and fabricated materials, which will become permanent part of the Work under this contract, shall be submitted to the CONSULTANT for review. This data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorage, and

supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

2. Each submittal shall indicate the intended use of the item of Work. When catalog pages are submitted, applicable items shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.
3. Contractor shall accept full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and shall review and coordinate each submittal with the requirements of the Work and the Contract Documents.
4. Each submittal shall include a statement prepared by the originator of the drawings and data certifying compliance with the Contract Documents.
5. Contractor shall accept full responsibility for the completeness of each submission, and, in the case of a resubmission, shall verify that all exceptions previously noted by the CONSULTANT have been taken into account. This shall apply in the event that more than one resubmission is required because of failure of the Contractor to account for exceptions previously noted.
6. Resubmittals shall be made within 14 days of the date of receipt of the CONSULTANT's comments unless within 7 days the Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

F. Submit manufacturer's installation instructions under provisions of Division 01.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Submit data under provisions of Division 01 & Section 26 05 00.

B. O&M Manual: Submit data under provisions of Division 01 and Section 26 05 00.

1. Provide one (1) complete bound set of operation and maintenance (O&M) manuals for the engine generator unit. Identification symbols for all replaceable parts and assemblies shall be included. Provide manuals for the following equipment:

   a. Engine
   b. Generator
   c. Skid-Mounted Tank
   d. Generator Control Panel and Load share/Synchronization Controller
   e. Voltage Regulator
   f. All Accessories

2. For the engine provide all available factory service publications including parts manuals, service manuals, component technical manuals, etc.

3. For all other components of each engine generator unit provide:

   a. Equipment function, normal operating characteristics, and limiting conditions.
   b. Assembly, installation, alignment, adjustment, and checking instructions.
   c. Operating instructions for start-up, routine and normal operation, regulation and control, shutdown, and emergency conditions.
   d. Lubrication and maintenance instructions.
   e. Guide to "troubleshooting."
   f. Parts list.
   g. Outline, cross section, elevation, and assembly drawings.
   h. Engineering data including all mechanical and electrical performance characteristics.

i. Complete AC connection and three-line diagrams.
j. Complete DC schematics including voltage regulator, fuel injector pump, sensors, switches, fuses, and all other devices.

4. The operation and maintenance manuals shall be in addition to any instructions or parts list packed with or attached to the equipment when delivered, or any information submitted for review.
5. Each copy of the final O&M manual shall be provided with original copies of the manufacturer's instruction books. Copies of manufacturer's instruction books shall not be inserted in any of the final O&M manuals.
6. Bind materials in locking three ring "D" style binders. Binder capacities shall not exceed 3 inches, nor shall material included exceed the designed binder capacity. If material to be bound exceeds capacity rating, multiple volumes shall be furnished. Binder capacity shall not be less than approximately ½ inch greater than the thickness of the material within the binder. Permanently label with project information on the front cover and edge.
7. Where reduction is not practical, larger drawings shall be folded separately and placed in envelopes, which are bound into the manuals. Each envelope shall bear suitable identification on the outside.
8. All information in the O&M manuals shall be new and original publications.
9. A CD shall be provided on the inside cover of each O&M volume. The CD shall contain the final O&M Manual in PDF format meeting the same requirements stipulated for the submittal. The CD shall also include the final approved submittal package in Adobe PDF format as well as all as-built drawings in AutoCAD 2014 format.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in packaged engine generator system with minimum 25 years of documented experience and who maintains an Alaska based service organization available twenty-four hours a day throughout the year.

B. The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.

C. The equipment shall be produced by manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.

D. The completed engine generator set shall be supplied by the manufacturer's authorized Alaskan distributor only. There will be one source responsibility for warranty, parts, and service through an Alaska based organization with factory-trained servicemen. The engine generator supplier shall maintain 24-hour parts and service capability within 100 miles of the project site. The distributor shall stock parts as needed to support the generator set package for this specific project. The supplier must carry sufficient inventory to cover no less than 80% parts service within 24 hours and 95% within 48 hours.

E. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one

tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Accept packaged engine generator set and accessories on site in crates and verify damage.

D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.08 WARRANTY

A. Provide four (4) year, 2000 hour warranty under provisions of Division 01. The complete electrical power system (generator set, controls, automatic transfer switch and associated switches and accessories) shall be warranted by the manufacturer against defects in materials and workmanship for a period of four years or 2000 hours, whichever occurs first from the date of beneficial occupancy. Warranty shall include parts, labor, reasonable travel expenses and labor necessary for repairs at the job site. Running hours shall be limited to 500 hours annually for the system warranty by both the manufacturer and servicing distributor. There shall be no deductibles applied to the warranty. Submittals received without written warranties as specified will be rejected in their entirety.

1.09 MAINTENANCE SERVICE

A. Furnish service and maintenance of packaged engine generator system for two (2) years from Date of Substantial Completion. The maintenance service shall include two semi-annual inspections and test run the engine to perform manufacturers recommended preventative maintenance service on the equipment furnished, annually.

1.10 EXTRA STOCK

A. Submit maintenance materials under provisions of Division 01.

B. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized tool box.

C. Provide two additional sets of each: engine oil and air filter element required for the engine generator system. Provide genuine filters for the generator manufacturer selected. Do not purchase off-brand filters.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Engine generator system to provide source of standby power.

B. Each generator set shall be Standby Duty rated at 400ekW, 500 kVA, 1800 RPM, 0.8 power factor, 277/480V, 3-Phase, 60 Hz, including radiator fan and all ancillary loads. Generator set shall be sized to operate at the specified load at a maximum ambient of 77degF and altitude of 500 feet, and shall be able to operate in parallel. Operation: In accordance with ANSI/NFPA 110.

2.02 BASIS OF DESIGN

A. Basis of Design: CATERPILLAR C13 Engine.

B. Provide a diesel-generator set of the latest commercial type and design. In a standby power capacity, it shall be capable of continuous duty at rated output. The engine and generator shall be the product of one company. It shall be a new, factory assembled and tested, and field-tested set. The engine and generator set shall have undergone comprehensive prototype testing to ensure acceptable performance at rated load and power factor.

C. The part numbers referenced in this drawing are based upon a Caterpillar system, however, shall be considered “or approved equal”. Alternative systems manufactured by Cummins, Kohler, or other will be considered providing that sufficient documentation is provided to satisfy the CONTRACTING AGENCY that the equipment meets the requirements of the specifications, and that all impacts of substituting an alternate to the Basis of Design have been addressed (performance requirements, space, size, connection requirements, power and control requirements, etc.). Should any alternatives be used, the CONTRACTOR shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

2.03 ENGINE

A. The engine shall be diesel fueled, four (4) cycle, water-cooled, while operating with nominal speed not exceeding 1800 RPM. The engine will utilize in-cylinder combustion technology, as required, to meet applicable EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 – D2 Emissions Cycle at specified ekW / bHP rating. Utilization of the “Transition Program for Equipment Manufacturers” (also known as “Flex Credits”) to achieve EPA certification is not acceptable. The in-cylinder engine technology must not permit unfiltered exhaust gas to be introduced into the combustion cylinder. Emissions requirements / certifications of this package: EPA ESE (EPA Tier 2 Emissions Levels).

B. Type: Water-cooled inline, four stroke cycle, compression ignition Diesel internal combustion engine.

C. Fuel System: The fuel system shall be integral with the engine. In addition to the standard fuel filters provided by the engine manufacturer, there shall also be installed a primary fuel filter/water separator installed in the fuel inlet line to the engine. All fuel piping shall be black iron or flexible fuel hose rated for this service. No galvanized piping will be permitted. Flexible fuel lines shall be minimally rated for 300F and 100PSI.

D. Cooling System: The generator set shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 110F ambient air entering the enclosure. The generator set supplier is responsible for providing a properly sized cooling system based on the enclosure static pressure restriction.

E. Engine Speed: 1800 rpm.

F. Governor: The engine governor shall be an ADEM A4 electronic Engine Control Module (ECM). The ECM is housed in an environmentally sealed, die-cast aluminum housing which isolates and protects electronic components from moisture and dirt contamination.

1. All wiring connections to the ECM are made using two sealed connectors: a single seventy-pin connector and a single one hundred twenty-pin connector.
2. Desired engine speed is calculated by the ECM and held within +/-0.2 HZ for isochronous and droop mode. The ECM accounts for droop that is requested. The proper amount of fuel is sent to the injectors due to these calculations. The ECM also employs cool down/shutdown strategies, acceleration delays on startup, acceleration ramp times and speed reference.
3. Warm and cold fuel-air ratio control limits are controlled by the ECM. Electronic monitoring system derates, torque limit, and cranking limit, programmable torque scaling, and cold cylinder cutout modes are standard features.
4. Master timing for injection is controlled by the ECM control. Temperature dependencies are accounted for in the fuel injection calculations.
5. Electronic monitoring of vital engine parameters can be programmed. Warning, derate, and shutdown event conditions may be customized by the end user.
6. The ECM stores information to assist with electronic troubleshooting. Active and logged diagnostic codes, active events, logged events, fuel consumption, engine hours, and instantaneous totals shall be available to aid service technicians when diagnosing electronic faults.
7. Auto/Manual sensor calibrations shall be provided to ensure engine performance is optimized through injection timing.
8. System tests shall be available to assist in electronic troubleshooting. At a minimum these tests include: injector activation, injector cutout, and override of control outputs.
9. A dedicated communication network shall be provided for communication with the generator set controller.
10. The following electronic sensing shall be available on the ECM: oil pressure, fuel pressure, fuel temperature, atmospheric pressure, air inlet temperature, turbo outlet pressure, engine coolant temperature, engine speed, throttle position, exhaust temperature, oil filter pressure differential, fuel filter pressure differential, air filter pressure differential and crankcase pressure.
11. The ECM shall be impervious to the following: salt spray, fuel, oil and oil additives, coolant, spray cleaners, chlorinated solvents, hydrogen sulfide and methane gas, and dust.
12. All inputs and outputs to the ECM shall be protected against short circuits to +battery and –battery.
13. The ECM shall be engine mounted. The ECM shall withstand shock of 20g and vibration of 8.0g @ 24 to 2 kHz.

G. Safety Devices: Engine shutdown on high water temperature, high lube oil temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.

H. Engine Starting: Electric DC starting system capable of three complete cranking cycles without overheating. Starters shall have positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.

I. Engine Jacket Heater: UL499 listed and labeled thermal circulation type water heater with integral thermostatic control. Factory installed system including a remote engine mounted thermostat for optimized power cycle efficiency with factory set to 100F. Tank heater shall be located on the genset base to provide isolation from vibration. Complete with durable silicone hoses and heater control relay wired to a common connection point in the control panel. The heater and thermostat shall be located to optimize the maximum coolant flow and heating power efficiency. When the engine is running the heater shall be automatically disconnected via a dedicated heater control relay located in the control panel. The heater shall be rated 3000 watts, 208V, 1-phase.

J. Radiator: Closed loop, liquid cooled engine mounted radiator using 50/50 glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110º F and freeze protection to -50 ºF. Radiator Air Flow Restriction: 0.5 inches of water, maximum. Rotating parts shall be guarded against accidental contact.

1. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
2. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock
3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

K. Engine Accessories:

1. Oil Pump: Positive displacement, mechanical, full pressure, lubrication oil pump.
2. Fuel Pump: An engine driven, mechanical, positive displacement fuel pump. Include fuel priming pump.
3. Fuel filter with a replaceable spin-on canister element. Provide Caterpillar part 1R-0749 or approved equal pre-filter.
4. Replaceable dry element air cleaner with restriction indicator.
5. Water pump.
6. Lube oil cooler
7. Lube Oil Drain: Extend the lube oil drain to the outside of the generator skid. Install a shut off valve on the hose at an accessible location of the unit and cap the end of the hose with a ¾" NPT cap.

L. Mounting: Provide unit with suitable rubber vibration isolators and mount on structural steel base. Spring-type vibration isolators will not be accepted.

2.04 GENERATOR

A. The synchronous generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG1 and directly connected to the engine flywheel housing with a flex coupling. The generator shall meet performance class G2 of ISO 8528. The excitation system shall be Alternative Regulation Excitation Poly-phase.

B. Generator shall be frame LC7024J, random wound, 4 pole, 12 lead, 0.6667 pitch.

C. Rating: 400 kW, 500 kVA, at 0.8 power factor, 480Y/277 volts, 60Hz at 1800 rpm.

D. Insulation: ANSI/NEMA MG 1, Class H.

E. Temperature Rise: 105º C at 40º C ambient.

F. Voltage Regulation: The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain generator output voltage within +/-0.25% for any constant load between no load and full load. The regulator shall be capable of sensing true RMS in three phases of alternator output voltage, or operating in single phase sensing mode. The voltage regulator shall include a VAR/PF control feature as standard. The regulator shall provide an adjustable dual slope regulation characteristic in order to optimize voltage and frequency response for site conditions. The voltage regulator shall include standard the capability to provide generator paralleling with reactive droop compensation and reactive differential compensation.

G. The voltage regulator shall communicate with the Generator Control Panel via a J1939 communication network with generator voltage adjustments made via the controller keypad. Additionally, the controller shall allow system parameter setup and monitoring, and provide fault alarm and shutdown information through the controller. A PC-based user interface shall be available to allow viewing and modifying operating parameters in a windows compatible environment.

H. The diesel engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.

I. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic.

J. Generator Leads: The generator leads shall be brought out and terminated on a unit-mounted generator circuit breaker. The generator leads shall have sufficient length to allow for any connection configuration.

K. Motor Starting: Provide locked rotor motor starting capability of 1,428.6 kVA at 30% instantaneous voltage dip as defined per NEMA MG1. Sustained voltage dip data is not acceptable.

2.05 ACCESSORIES

A. Sub-Base Tank: Double-wall, all-welded construction, base-mounted fuel tank with a minimum capacity to provide 24 hours of generator operation at full load which is suitable for use in project seismic zone. The tank outside dimensions shall not exceed the dimensions of the generator framework. The tank shall have the structural integrity to support the engine-generator set, shall be supplied by the engine-generator set manufacturer, and shall be installed before shipment. The tank shall be UL 142 listed for both primary and secondary containment and shall meet all of the requirements of NFPA for the intended use. The tank shall have the following features; vent connections, emergency vents, tank-mounted fuel gauge, flexible fuel line connections, check valve, high and low fuel level alarm contacts and indicating lights, complete fuel tank gravity drainage capabilities, manual overfill protection, lockable fill cap, fuel level gauge and 4” port for manual fuel level verification. All appurtenances shall meet all state and local codes.

B. Fuel Pumps (Bear Valley side only): Complete fuel tank pump package for automatic self-refilling of the sub-base day tank. The fuel pump package shall include manual fuel pump, automatic duplex supply pumps and a return pump, inlet solenoid valve, fuel oil strainer, thermal expansion relief valve and automatic operating controls. The controls shall consist of a UL Listed, integrated design, digital level controller which provides differential level control for activation of pumps, duplex pump alternator, tank level indication, system alarms and manual operating controls. Level controller shall be self-contained as a unit within a NEMA4 enclosure. The controller shall include auxiliary contacts for high and low alarm monitoring of the tank by the PLC system. The supply pumps shall be sized at GPM 150% greater than the generator peak fuel consumption. The return pump shall be sized at GPM 150% greater than the supply pumps. The pumps shall be sized to transfer fuel from the fuel storage tank to the sub-base tank through piping as indicated on the plans. All appurtenances shall meet all state and local codes.

C. Batteries: 4D Premium High Output Batteries shall be provided. Battery provides 1300 Cold Cranking Amps, 400 Reserve Capacity Minutes, and 190 Amp Hr. Capacity at 20 hours. Battery construction shall be low maintenance, hybrid construction. Alternate

batteries can be provided but must demonstrate they exceed the following performance test requirements:

1. 100 Hour Vibration Testing. Battery must be able to withstand vibration forces without suffering mechanical damage, loss of capacity, loss of electrolyte or without developing internal/external leaks. Battery must pass a high rate discharge test after the vibration testing.
2. Five 72-hour Deep Discharge/Recharge Test Cycles. Battery must recover to 25 charging amps within 20 minutes and meet Industry Electrical Performance Standards.
3. 30 Day Complete Discharge Test. Battery must recover to 25 charging amps within 60 minutes and meet Industry Electrical Performance Standards after recharging.
4. SAE J2185 Life Cycle Test. Battery subject to deeper discharge and charge cycles at extreme temperatures not normally encountered.
5. Cold Soak Test. Battery cold soaked at sub-freezing temperatures and then tested by starting an equally cold engine.

D. Battery Tray: Non-metallic battery boxes with covers and hold-downs, treated for electrolyte resistance and constructed to contain spillage of electrolyte. Provide with seismic restraints to secure batteries during earthquakes. The battery housing shall be mounted inside the engine/generator skid base.

E. Battery Charger: A UL Listed/CSA certified 10 amp voltage regulated battery charger shall be provided for each engine-generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float and equalize charge settings, with provisions to automatically switch between the two modes. It shall maintain its rated output voltage within +/-0.2% with AC input variation of +/-10%. Operational monitors shall provide with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of battery charger malfunction, low battery voltage, and high battery voltage. Charger shall include an Analog DC voltmeter and ammeter and fused AC input and DC output, and shall be wall mount type in a NEMA 1 enclosure. Battery charger shall be factory mounted inside the generator enclosure.

F. Line Circuit Breaker: Provide a generator mounted 100% rated circuit breaker, insulated case, electrically operated, 800A trip, 3 pole, NEMA 1 / IP22. Breaker shall utilize a solid state trip unit. The breaker shall be UL/CSA Listed and connected to engine/generator safety shutdowns. Breaker shall be housed in an extension terminal box which is isolated from vibrations induced by the generator set. Mechanical type lugs, sized for the circuit breaker feeders shown on drawing, shall be supplied on the load side of breaker.

G. Engine-Generator Control Panel: Basis of Design Caterpillar EMCP 4.4. Provide a fully solid-state, microprocessor based, generator set control. The control shall provide all operating, monitoring, and control functions for the generator set. The control panel shall provide real time digital communications to all engine and regulator controls via SAE J1939.

1. Environmental: The generator set control shall be tested and certified to the following environmental conditions:

   a. -40ºC to +70ºC Operating Range
   b. 100% condensing humidity, 30ºC to 60ºC
   c. IP22 protection for rear of controller; IP55 when installed in control panel
   d. 5% salt spray, 48 hours, +38ºC, 36.8V system voltage
   e. Sinusoidal vibration 6 G's RMS, 24-1000Hz
   f. Electromagnetic Capability (89/336/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC, BS EN 50081-2, 50082-2)

g. Shock withstand 15G

2. Functional Requirements: The following functionality shall be integral to the control panel.

   a. The control shall include a minimum 5.5 inch, 480 x 320 pixel, white backlit graphical display with text based alarm / event descriptions.
   b. The control shall include a minimum of 6-line data display
   c. Generator set overview screen displaying critical generator set mechanical and electrical data on a single screen.
   d. Audible horn for alarm and shutdown with horn silence switch.
   e. Standard ISO labeling
   f. Multiple language capability
   g. Remote start/stop control
   h. Local run/off/auto control integral to system microprocessor
   i. Cooldown timer
   j. Speed adjust
   k. Lamp test
   l. Emergency stop push button
   m. Voltage adjust
   n. Voltage regulator V/Hz slope – adjustable
   o. Password protected system programming

3. Digital Monitoring Capability: The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units.

   a. Engine oil pressure
   b. Engine oil temperature
   c. Engine coolant temperature
   d. Engine RPM
   e. Battery volts
   f. Engine hours
   g. Engine crank attempt counter
   h. Engine successful start counter
   i. Service maintenance interval
   j. Real time clock
   k. Engine exhaust stack temperature
   l. Generator AC volts (Line to Line, Line to Neutral and Average)
   m. Generator AC current (Avg and Per Phase)
   n. Generator AC Frequency
   o. Generator kW (Total and Per Phase)
   p. Generator kVA (Total and Per Phase)
   q. Generator kVAR (Total and Per Phase)
   r. Power Factor (Avg and Per Phase)
   s. Total kW-hr
   t. Total kVAR-hr
   u. %kW
   v. %kVA
   w. %kVAR
   x. Excitation voltage
   y. Excitation current
   z. Instantaneous Fuel Consumption
   aa. Oil Filter Differential Pressure
   bb. Fuel Filter Differential Pressure

cc. Air Filter Differential Pressure

4. Alarms and Shutdowns: The control shall monitor and provide alarm indication and subsequent shutdown for the following conditions. All alarms and shutdowns are accompanied by a time, date, and engine hour stamp that are stored by the control panel for first and last occurrence:

   a. Engine Alarm/Shutdown
   b. Low oil pressure alarm/shutdown
   c. High coolant temperature alarm/shutdown
   d. Loss of coolant shutdown
   e. Overspeed shutdown
   f. Overcrank shutdown
   g. Emergency stop shutdown
   h. Low coolant temperature alarm
   i. Low battery voltage alarm
   j. High battery voltage alarm
   k. Control switch not in auto position alarm
   l. Battery charger failure alarm
   m. Generator Alarm/Shutdown
   n. Generator over voltage
   o. Generator under voltage
   p. Generator over frequency
   q. Generator under frequency
   r. Generator reverse power (real and reactive)
   s. Generator overcurrent
   t. Generator current balance
   u. Voltage Regulator Alarm/Shutdown
   v. Loss of excitation alarm/shutdown
   w. Instantaneous over excitation alarm/shutdown
   x. Time over excitation alarm/shutdown
   y. Rotating diode failure
   z. Loss of sensing
   aa. Loss of PMG

5. Programmable Digital Inputs: The controller shall include the ability to accept programmable digital input signals. The signals may be programmed for either high or low activation using programmable Normally Open or Normally Closed contacts.
6. Programmable Discrete Outputs: The controller shall include the ability to operate sixteen (16) discrete outputs, integral to the controller, which are capable of sourcing up to 300mA.
7. Paralleling: The controller shall be capable of automatically synchronizing and paralleling 2 generator sets to a common bus. Paralleling shall be accomplished without the need for a system master controller. Paralleling functions shall include:

   a. Modes of Operation
   b. Automatic paralleling
   c. Manual paralleling
   d. Semi-Automatic paralleling
   e. Paralleling Features
   f. Dead bus arbitration
   g. Automatic synchronization
   h. Real and reactive load sharing
   i. Load sense/load demand
   j. Load shed

k. Load add

8. All engine, voltage regulator, control panel and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set control.

   a. Engine running hours display
   b. Service maintenance interval (running hours or calendar days)
   c. Engine crank attempt counter
   d. Engine successful starts counter
   e. 40 events are stored in control panel memory
   f. Chronological status event log capable of displaying a sequence of event leading up to a generator set shutdown
   g. Programmable cycle timer that starts and runs the generator for a predetermined time. The timer shall use 7 user-programmable sequences that are repeated in a 7-day cycle. Each sequence shall have the following programmable set points: Day of week, Time of day to start, and Duration of cycle.

9. Remote Communications: The control shall include Modbus TCP communications via Ethernet 10BASE-T and Modbus RTU communications via RS-485 half duplex with configurable baud rates from 2.4k to 57.6k.
10. Remote Monitoring Software: The control shall provide Monitoring Software with the following functionality:

    a. Monitor up to eight (8) generator sets, plus ATS.
    b. Provide access to all date and events on generator set communications network
    c. Provide remote control capability for the generator sets
    d. Ability to communicate via Modbus TCP, Modbus RTU or remote modem

11. Sequence of Operations:

    a. Upon loss of utility, the standby generator automatic transfer switch (ATS) shall send a group start signal to the generator set system. Each generator set in the system shall automatically start and accelerate to rated speed and voltage. The first generator set to reach rated speed and voltage shall automatically close its circuit breaker, energizing the generator bus. At this point, the first priority load add signal shall be enabled, allowing emergency loads to be energized. Each additional generator set in the system shall automatically drive the output voltage, frequency, and phase to match the bus, and close the generator circuit breaker once the conditions have been met. As each subsequent generator is brought on-line, an additional load add signal shall be enabled, allowing additional loads to be added to the bus.
    b. Once all generator sets are on-line, the paralleling controller shall actively monitor real (kW) and reactive (kVA) load requirements of the system, and adjust the generator set output to maintain balanced loading.
    c. The controller shall also include logic to automatically sequence the generator sets based on the total load requirement of the system. If the load exceeds a minimum reserve kW threshold, additional generator sets will automatically start, synchronize, and close the generator circuit breaker. If the site load falls below a reserve kW threshold, a generator set will automatically unload, open the generator circuit breaker, and shutdown.
    d. Once utility power has been restored, the ATS shall remove the group start signal. The generator set will open the generator circuit breaker, and the

generator set will enter cool down mode. At the expiration of the cool down timer, the generator set shall automatically shutdown.

12. Local Annunciator (NFPA 99/110, CSA 282): Provide a local, generator control mounted, annunciator to meet the requirements of NFPA 110, Level 1.

    a. Annunciator shall be networked directly to the generator set control.
    b. Annunciator shall include a lamp test pushbutton, alarm horn and alarm acknowledge pushbutton
    c. Provide the following individual light indications for protection and diagnostics:

        1) Overcrank
        2) Low coolant temperature
        3) High coolant temperature warning
        4) High coolant temperature shutdown
        5) Low oil pressure warning
        6) Low oil pressure shutdown
        7) Overspeed
        8) Low coolant level
        9) EPS supplying load
        10) Control switch not in auto
        11) High battery voltage
        12) Low battery voltage
        13) Battery charger AC failure
        14) Emergency stop
        15) Spare
        16) Spare

H. Heaters: Provide manufacturer's recommended heaters with thermostatic controls to keep engine oil pan, engine block, generator controls, and generator windings within manufacturer's recommended temperature.

I. Mounting: The complete engine/generator package shall be mounted on a common, self-supporting, low profile, structural steel skid base with rubber in shear vibration isolators between the engine and base. The base shall extend from the rear end of the generator to the most forward point of the engine and shall be predrilled to accept a 4/0 AWG copper grounding conductor.

2.06 WEATHER-PROTECTIVE ENCLOSURE

A. The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in the ambient conditions previously specified. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 75 dBA at any location 7 meters from the generator set in a free field environment. Housing configuration and materials used may be of any suitable design which meets application needs, except that acoustical materials used shall be oil and water resistant.

B. The enclosure shall include robust and highly corrosion resistant construction. Enclosure panels will be 14 gauge steel with an environmentally friendly, polyester powder baked paint.

C. The enclosure shall include vertically hinged doors to allow 180° opening rotation and retention with door stays on both sides of the engine and alternator, the control equipment and the local enclosure panel. Key-locking door latches shall be provided for all doors

along with rain lips over all doors. Door hinges shall be stainless steel. Compression door latches required to provide a solid door seal.

D. Fuel fill, oil fill, and battery shall be internal to the enclosure.

E. The enclosure shall be provided with a critical grade exhaust silencer, which is mounted inside of the enclosure, and allows the generator set package to meet specified sound level requirements. Silencer and exhaust shall exit the enclosure sidewall with horizontal 45 deg chamfer termination. Exhaust termination direction per mechanical plans.

F. The enclosure footprint shall not exceed 244 inches in length, 82 inches width, and 128 inches height.

G. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.

H. The enclosure shall be furnished with a load center 100A, 120/208V, single-phase, copper bussing with bolt on thermal magnetic circuit breakers for each enclosure load. All enclosure loads shall be wired by the factory to the load center. This includes, but is not limited to, Generator Anti-Condensation Heater, Jacket Water Heater, Battery Charger, Battery Heater, Lube Oil Heater, and Fuel Polishing unit (Whittier Side Only). The NEMA 3R load center shall be mounted within the enclosure in a space that is accessible via the enclosure doors and providing working space in accordance with the NEC.

I. The enclosure shall be fitted with fixed horizontal inlet and exhaust louvers and motorized inlet and exhaust dampers. Total pressure drop of the intake and exhaust at full load rating of the engine generators rated sized not to exceed 0.35” of water column.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and field dimensions are as shown on Drawings.

B. Verify that required utilities are available in proper location and ready for use.

C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Ground and bond generator and other electrical system components in accordance with NEC requirements.

3.03 FIELD QUALITY CONTROL

A. Provide 80% Installation Inspection at the jobsite for all generator sets. Visually inspect installation progress and provide detailed report noting any deficiencies to the installing contractor.

B. Start-Up & Testing: Coordinate all start-up and testing activities with the ENGINEER and the DEPARTMENT. After installation is complete and normal power is available, the manufacturer’s local dealer shall perform the following:

1. NFPA 110 Load Test
2. Verify that the equipment is installed properly.
3. Check all auxiliary devices for proper operation, including battery charger, jacket water heater(s), generator space heater, remote annunciator, etc.
4. Test all alarms and safety shutdown devices for proper operation and annunciation.
5. Check all fluid levels.
6. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
7. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
8. Connect the generator to building load and verify that the generator will start and run all designated loads.

C. Provide two (2) hour load test utilizing a portable resistive load bank. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal. Demonstrate all automatic features as directed by the ENGINEER and for each startup scenario listed in drawings. Load bank testing shall be done as follows:

1. 30 minutes at 50% rated load.
2. 30 minutes at 75% rated load.
3. 60 minutes at 100% rated load.

D. During test, record the following at 20 minute intervals:

1. Kilowatts.
2. AC Amperes – all phases.
3. AC Voltage.
4. Coolant temperature.
5. Ambient temperature.
6. Frequency.
7. Oil pressure.
8. Battery charge rate.

E. Test alarm and shutdown circuits by simulating conditions.

F. Upon completion of the load bank test, provide a test under full available site load for 2 hours for witness by the Authority Having Jurisdiction and the ENGINEER. Simulate power failures from ATS with load transfer and normal cool-down cycle. Record voltage, current, and frequency during building load test. Note any required adjustments. Furnish record of tests to the DEPARTMENT.

3.04 DEMONSTRATION

A. Provide system training and demonstration for the facility operating personnel covering operation and maintenance of the equipment provided by Factory Representative per Division 01 and Section 26 05 00. Demonstrations shall be performed for each startup scenario noted on plans. Training dates shall be coordinated with and acceptable to the Contracting Agency.

END OF SECTION

SECTION 26 36 00
TRANSFER SWITCHES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Complete factory assembled automatic transfer switch (ATS).

1.02 RELATED SECTIONS

A. Section 01 11 13 – Summary of Work.

B. Section 01 31 14 – Work Coordination.

C. Section 01 72 00 – Utilities Coordination.

D. Section 26 01 26 – Maintenance Testing of Electrical Systems.

E. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables

F. Section 26 05 26 – Grounding and Bonding for Electrical Systems

G. Section 26 05 33 – Raceway and Boxes for Electrical Systems

H. Section 26 05 53 - Identification for Electrical Systems

I. Section 26 32 13 – Packaged Engine Generator Systems.

1.03 REFERENCES

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements and Section 26 05 00 – Common Work Results for Electrical.

B. UL 1008 – Transfer Switches

C. UL 991 – Tests for Safety-Related Controls Employing Solid-State Devices

D. NFPA 70 - National Electrical Code.

E. NFPA 110 – Emergency and Standby Power Systems.

F. NEMA ICS 1 - General Standards for Industrial Control and Systems.

G. NEMA ICS 10 - Industrial Control and Systems: AC Transfer Switch Equipment.

H. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching devices, operating logic, short circuit ratings, dimensions, enclosure details and all option provided.

C. Factory Test Report: Provide copy of factory operational test on the transfer switch prior to shipping from the factory. A certified test report shall be included in the packing list with the transfer switch. The test process shall include calibration of voltage sensors.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Indicate actual locations, correct dimensional information, and mounting heights of transfer switches on the project record drawings.

B. O&M Manuals:

1. Provide project adjusted shop drawings indicating the final wiring and terminations with the O&M manuals.
2. Provide printout or spreadsheet indicating final settings and adjusted values of the transfer switch.
3. Include instructions for operating equipment. Include instructions for operating equipment under normal power outage conditions when engine generator is running.
4. Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience. Manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation and service in accordance with ISO 9001. Manufacturer must maintain an Alaska based service organization available twenty-four hours a day throughout the year.

B. The ATS shall be supplied by the manufacturer's authorized Alaskan distributor only. There will be one source responsibility for warranty, parts, and service through an Alaska based organization with factory-trained servicemen. Support staff shall have an office located in Anchorage, Alaska or Whittier, Alaska.

C. Materials shall meet Buy America Provisions and shall comply with 23 CFR 635.410, Buy America Requirements and Division 01. Submit a completed Material of Origin Certificate Form 25D-60 before award of the Contract.

1. Steel and iron products, which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent of the total contract amount, or $2,500, whichever is greater. The cost is value of the products as they are delivered to the Project including freight.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Conform to requirements of NFPA 110 for a Level 1 system.

C. Provide a certificate of compliance with UL 1008 for the transfer switches furnished under this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by manufacturer.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of transfer switch for one year from Date of Substantial Completion.

1.11 WARRANTY

A. Provide four-year manufacturer warranty of all components, parts, and assemblies against defects in materials and workmanship, with no deductible for all components.

PART 2 - PRODUCTS

2.01 BASIS OF DESIGN

A. The ATS shall be new, factory assembled and tested as manufactured by CATERPILLAR (Model ATC) which is the Basis of Design shown on the Drawings. The ATS shall have undergone comprehensive prototype testing to ensure acceptable performance.

B. Alternative systems manufactured by Kohler or MTU will be considered providing that sufficient documentation is provided to satisfy the CONTRACTING AGENCY that the equipment meets the requirements of the specification, and that all impacts of substituting an alternate to the Basis of Design have been addressed (performance requirements, space, size, connection requirements, etc.). Should any alternatives be used, the CONTRACTOR shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

2.02 CONSTRUCTION

A. Power Switching Device

1. Switching devices for transfer switches shall be Contactor type mechanisms. All Contactors shall be UL listed for application in their intended enclosures for 100% of their continuous ampere rating.
2. Each transfer switch shall be positively interlocked both mechanically and electrically to prevent simultaneous closing of both sources under either automatic or manual operation. Main contacts shall be mechanically held in position in both normal and emergency positions.

B. Transfer switches shall be open transition and provided with in-phase monitor, which will permit a transfer or re-transfer between two live sources that have a phase angle difference of +/-8 degrees or less.

C. The automatic transfer switch shall be of double throw construction operated by a reliable electrical mechanism momentarily energized. There shall be a direct mechanical coupling to facilitate transfer in 6 cycles or less.

D. Contactors or components thereof not specifically designed, as an automatic transfer switch will not be acceptable.

E. The switching panel shall consist of a separate control or transformer panel. Control power for all transfer operations shall be derived from the line side of the source to which the load is being transferred. The transformer shall be multi-tap for ease of voltage adjustment in the field.

F. Transfer switches will be supplied with a manual-operating handle. Manual operation shall only be performed with the switch de-energized.

2.03 BYPASS ISOLATION TRANSFER SWITCH

A. The ATS shall be provided with a bypass isolation switch to permit isolation of the ATS from source and load conductors. The bypass isolation transfer switch assembly shall be configured of two automatic contactor switching devices factory interconnected with silver plated copper bus. The bypass contactor switch shall be constructed to carry full load with the same withstand and close-on ratings as the ATS.

B. The ATC-300 controller (or approved equal per same manufacturer as generator) shall be active in both the ATS and bypass mode of operation. In the event of a power failure while operating on bypass, the controller shall initiate an automatic transfer to the alternate source.

C. The primary contactor switching device and the bypass contactor switching device shall both be draw-out configuration and supplied in a front access structure. Bus links shall be provided to allow for field configurable connections of top or bottom entry or a combination of both. Standard shall be with source one and load connections on top and source two connections on the bottom.

D. All control wiring shall be contained in a low-voltage compartment separated from the line voltage. All control wiring shall be harnessed with keyed disconnect plugs for ease of maintenance. Customer connections shall be wired out to a single terminal block mounted inside the low voltage compartment.

E. The primary and the bypass switch shall be contained in separate compartments located behind separate doors with handles that can be padlocked.

F. The transfer to bypass shall be accomplished by operation of a single selector switch. The selector switch shall have an “Auto” and “Bypass” position. Transfer to bypass shall not interrupt power to the load.

G. The bypass isolation transfer switch shall be electrically interlocked to prevent cross connection of sources when operated either automatically via controller or manually via control switch.

H. The bypass isolation transfer switch shall have three positions: “Connected”, “Isolated”, and “Removed”. In the “Connected” position, ATS is racked-in and is being actively controlled by the controller. In the “Isolated” position, the ATS is connected to control power only and may be electrically operated for test purposes. In the “Removed” position the ATS has been disconnected from the main bus and control power and the transfer switch may be safely removed for inspection or replacement.

I. The ATS shall be capable of being racked-out with the enclosure door closed. An indicating light shall be mounted on the door to indicate when the ATS is isolated from the power and when the ATS is in the removed position. A key interlock shall be provided to prevent the ATS from being racked out while the transfer switch is still powering the load.

J. The Bypass Isolation transfer switch shall be interlocked to prevent connecting or disconnecting the contactor from the main bus with the contacts closed.

K. The bypass isolation transfer switch shall have a Test/Manual selector switch. The “Test” position shall be used to test the electrical operation of the primary contactor switching device while in the isolated position. The “Manual” position shall be used to disable automatic control while operating in bypass mode and to perform a non-automatic transfer.

L. A detached handle shall be provided for manual operation of the switches in racked-out and in the removed position.

M. Bypass isolation Transfer Switch shall be painted ANSI 61 grey with white interior

2.04 MICROPROCESSOR LOGIC

A. The transfer switch shall be a microprocessor-based controller. The controller shall be hardened against potential problems from transients and surges. Operation of the transfer switch and monitoring of both sources shall be managed by the controller.

B. Basis of Design: CATERPILLAR ATC type

C. The automatic transfer switch controllers shall meet or exceed the following standards in addition to the basic switch standards:

1. IEC 61000-4-2 - EMC Testing and Measurement Techniques - Electrostatic Discharge Immunity Test
2. IEC 61000-4-3 - EMC Testing and Measurement Techniques - Radio-frequency, Electromagnetic Field Immunity Test
3. IEC 61000-4-4 - EMC Testing and Measurement Techniques - Electrical Fast Transient/Burst Immunity Test
4. IEC 61000-4-5 - EMC Testing and Measurement Techniques - Surge Immunity Test
5. IEC 61000-4-6 - EMC Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radio-frequency Fields
6. IEC 61000-4-11 - EMC Testing and Measurement Techniques - Voltage Dips, Short Interrupts and Voltage Variations Immunity Tests
7. CISPR11, Class B - Industrial, Scientific and Medical Radio-frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement
8. FCC Part 15, Subpart B, Class B

2.05 ENCLOSURE

A. Each transfer switch shall be provided in a NEMA 1 enclosure suitable for use in environments indicated in the drawings.

B. NEMA 1 enclosures shall be painted with the manufacturer's standard light gray ANSI 61 paint. Enclosure dimensions shall not exceed 40 inches width, 40 inches depth, and shall be front accessible only.

2.06 CONTROLLER DISPLAY AND KEYPAD

A. The microprocessor-based controller display shall be UV resistant and include a 2-line, 16 character, backlit LCD display. The controller shall be capable of displaying transfer switch status, parameters, and diagnostic data. All set point parameters shall be password protected and programmable using the controller keypad or remotely using serial port access.

B. The microprocessor-based controller shall include a mimic bus display consisting of four (4) individual LED's (3mm) for indicating the following:

1. Availability status of NORMAL source
2. Availability status of EMERGENCY source
3. Connection status of NORMAL source
4. Connection status of EMERGENCY source

2.07 VOLTAGE AND FREQUENCY SENSING

A. The controller shall have a voltage range of 0-790 volts (50/60 Hz) and an accuracy of +/- 1% of nominal input voltage and a frequency range of 40-70 Hz and an accuracy of +/- .3 Hz.

B. Voltage and frequency dropout and pickup parameters are set as a percentage of the nominal voltage as indicated in the table below.

Setpoint	Sources	Dropout	Pickup
Undervoltage	Source1 and 2	78 – 97%	(DO + 2%) - 99%
Overvoltage	Source 1 and 2	105 – 110%	103% - (DO – 2%)
Underfrequency	Source 1 and 2	90 – 97%	(DO + 1Hz) – 99%
Overfrequency	Source 1 and 2	103 – 105%	101% - (DO – 1Hz)
Voltage Unbal-ance	Source 1 and 2	5 – 20%	(UNBAL DO% - 2) – 3%

C. The normal and emergency sources shall include phase reversal protection. The preferred rotation is programmable as ABC or CBA.

2.08 TIME DELAYS

A. A time delay shall be provided on transfer to EMERGENCY source, adjustable from 0 to 1800 seconds.

B. A time delay shall be provided to override a momentary power outage or voltage fluctuation, adjustable from 0 to 120 seconds.

C. A time delay shall be provided on retransfer from EMERGENCY source to NORMAL source, adjustable from 0 to 1800 seconds.

D. A time delay shall be provided after retransfer that allows the generator to run unloaded prior to shutdown, adjustable form 0 to 1800 seconds.

E. A time delay shall be provided for engine failure to start, fixed setting of 6 seconds.

F. A pre-transfer time delay output adjustable from 0-120 seconds. The contact shall be a form-c contact rated for 10-Amp at 600-Vac and 10-Amp at 30-Vdc.

G. All delays shall be field adjustable from the microprocessor-based controller without the use of special tools.

2.09 ADDITIONAL FEATURES

A. One Form A contact for closure of the Generator start circuit. The contacts shall be of silver alloy with gold flashing. The contacts shall be rated for 5-Amp at 600-Vac and 5-Amp at 30-Vdc.

B. Programmable Engine Exerciser, selectable as disabled, 7, 14, or 28 day interval, adjustable 0-600 minutes, load or no load with Failsafe

C. The controller shall include a keypad pushbutton to initiate a system test.

D. The controller shall include a keypad pushbutton to bypass the time delay on transfer to emergency and the time delay on retransfer to normal.

E. The controller shall include a terminal input to accept a remote contact which closes to initiate a transfer to source 2. This feature shall be failsafe and an automatic retransfer shall occur in the event that source 2 power is lost.

F. The controller shall include a terminal input to accept a remote contact which opens to inhibit transfer to source 2.

G. One Form C auxiliary contact to indicate Source 1 position and one Form C contact to indicate source 2 position. The contacts shall be rated for 10-Amp, 1/3-Horsepower at 600-Vac and 10-Amp at 30-Vdc.

H. One Form C contact for NORMAL Source Available. The contacts shall be rated for 10-Amp, 1/3-Horsepower at 600-Vac and 10-Amp at 30-Vdc.

I. One Form C contact for EMERGENCY Source Available. The contacts shall be rated for 10-Amp, 1/3-Horsepower at 600-Vac and 10-Amp at 30-Vdc.

J. Historical Data Storage to include:

1. Engine Run Time
2. NORMAL source Available time
3. EMERGENCY source Available time
4. NORMAL source Connected time
5. EMERGENCY source Connected time
6. LOAD Energized Time
7. Number of Transfers
8. Date, Time and Reason for Last Sixteen (16) transfers
9. Monitor Mode Event
10. Fail Safe Event
11. Aborted Test

2.10 ACCESSORIES

A. Non-Automatic Control: Provide a 2-Position Selector Switch, maintained contact, marked: “Automatic” and “Non-Automatic”. The transfer switch shall be transferred by actuating a two position maintained selector switch labeled “Source 1”and “Source 2”. A 30mm pilot light shall be provided labeled “Not in Automatic”.

B. Manual Retransfer Control: The ATS shall remain connected to the emergency source after the normal source becomes available until a momentary pushbutton contact closure signal is received to initiate the retransfer. Should a failure of the emergency source occur while waiting for the manual return, the re-transfer will proceed automatically.

C. Communications Interface to be Ethernet TCP/IP.

2.11 WITHSTAND AND CLOSING RATINGS

A. The transfer switch shall have a specific breaker withstand and closing rating of 65 KA at 480V.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surface is suitable for transfer switch installation.

3.02 FACTORY TESTING

A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.

1. Insulation check to ensure the integrity of insulation and continuity of the entire system
2. Visual inspection to ensure that the switch matches the specification requirements and to verify that the fit and finish meet quality standards
3. Mechanical tests to verify that the switch's power sections are free of mechanical hindrances
4. Electrical tests to verify the complete electrical operation of the switch and to set up time delays and voltage sensing settings of the logic

B. The manufacturer shall provide a certified copy of factory test reports.

C. Transfer switch shall include a label indicating order number, catalog number and date

3.03 INSTALLATION

A. Install transfer switches in accordance with manufacturer's instructions.

B. Provide engraved plastic nameplates under the provisions of Section 26 05 53.

C. Provide start-up control signal wiring between transfer switch and standby diesel generator system to start generator upon local loss of power.

D. All transfer switches shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.04 ON-SITE ACCEPTANCE TEST

A. Coordinate testing with standby generator sets to ensure proper operation of transfer device under actual operating conditions. Simulate power failure at each automatic transfer switch with load transfer. Demonstrate all automatic features as directed by the Contracting Agency.

B. Provide commissioning report certifying that the automatic transfer switch has been installed, adjusted, and tested in accordance with the manufacturer's recommendations

3.05 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be a minimum of (4) hours in duration for up to 5 individuals. To be coordinated with the generator training.

B. Contractor shall provide a minimum of one week written notification to the DEPARTMENT of the training schedule. Training dates shall be coordinated with and acceptable to the Contracting Agency.

END OF SECTION

SECTION 27 10 00
STRUCTURED CABLING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for the design and installation of a complete and functional telecommunications cabling system including communications cable, raceways, and other equipment or components as required to achieve the specified function.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements.

B. Section 01 11 13 – Summary of Work.

C. Section 01 31 14 – Work Coordination.

D. Section 01 72 00 – Utilities Coordination.

E. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

F. Section 26 05 29 – Hangers and Supports for Electrical Systems.

G. Section 26 05 53 – Identification for Electrical Systems.

H. Section 26 32 13 – Packaged Engine Generator Systems.

I. Section 26 36 00 – Transfer Switches.

J. Division 31 – Trenching and Backfill.

1.03 REFERENCES

A. The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only. The reference codes and standards are minimum requirements:

1. ANSI/NFPA 70 National Electrical Code, latest adopted version.
2. BICSI Telecommunications Distributions Methods Manual, current version.
3. TIA/EIA 568-C Commercial Building Telecommunications Cable Standard, current version.
4. TIA/EIA 569-C Commercial Building Standard for Telecommunications Pathways and Spaces, current version.
5. TIA/EIA 606-A Administration Standards for the Telecommunications Infrastructure of Commercial Buildings, current version.
6. J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications, current version.

1.04 SUBMITTALS

A. Submit data under provisions of Division 00, Division 01 and Section 26 05 00.

B. Provide factory test results for cables and connectors. Provide product data for the following products:

1. UTP and Fiber Telecommunications Cable.
2. Fiber Connectors
3. Fiber Connector Housing
4. UTP Cable Signal Extender
5. Armored Multi-Conductor Signal Cable
6. UTP and Fiber Telecommunications Cable Tester.

C. Submit qualifications and certifications to install the specified cabling system.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings:

1. Submit documents under the provisions of Division 01.
2. Accurately record location of pull boxes, routing of all telecommunications raceways and cables, numbering scheme and identification number of all cables..
3. Submit test results for all cables prior to Substantial Completion.

B. O&M Manual: Submit data under provisions of Division 01.

1. Provide product data.
2. Provide operation and maintenance information per manufacturer.

1.06 QUALITY ASSURANCE

A. Install all work in accordance with the above reference standards and codes. The ENGINEER reserves the right to reject all or a portion of the work performed either on technical or aesthetic grounds.

B. All workmen employed for installation of equipment and cabling specified under this section shall be specifically trained and certified in the installation of the specified Category 6 UTP cabling systems, and shall have at least three years experience installing, terminating, and testing Category 6 UTP on this size and complexity of project.

C. The intended function of the telecommunications cable system is to transmit communication signals between the generator controllers and the ATS. Upon completion of the work, the UTP cable system shall be capable of transmitting a data signal that meets and exceeds the following requirements:

1. Category 6: Supports data rates up to and including 1 Gb/s.

1.07 WARRANTY

A. Proof of pre-project warranty registration with manufacturer shall be provided. The Contractor shall also provide proof of manufacturer's acceptance of warranty after completion of project.

1.08 LISTINGS AND STANDARDS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. and suitable for purpose specified and indicated.

B. Where a UL Standard is in effect equipment shall meet that standard and shall bear the UL label.

1.09 LABELING SYSTEM

A. Labeling shall conform to ANSI/TIA/EIA-606 standards, Section 26 05 53 Identification for Electrical Systems, and this Section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – STRUCTURED CABLING SYSTEM

A. Throughout this specification, specific manufacturers and manufacturer's catalog numbers are cited. These citations are for the purpose of establishing quality and performance criteria and are not intended to be proprietary. All products in the structured cabling system shall be provided from one of the approved manufacturing partnerships listed below, or an alternate system shall be substituted under the provisions of Division 01. All decisions regarding approval of non-specified manufacturers and products will be at the discretion of the DEPARTMENT.

1. Belden.
2. Ortronics/Superior Essex.
3. CommScope Uniprise.
4. Corning Cable Systems (fiber products).
5. Hubbell/Mohawk.
6. Leviton/Berk-Tek.
7. TE Connectivity (formerly ADC/Krone/Amp).
8. Substitutions: Under provisions of Division 01.

B. Structured Category 6 cabling systems shall include, but not be limited to, UTP and fiber telecommunications cable, , and fiber connector panels.

2.02 UTP TELECOMMUNICATIONS CABLE

A. All UTP telecommunications cables that exit the building envelope or are run in underslab raceway shall be UL listed, outside plant rated, Category 6, 4 pair, 23-24 AWG, solid copper conductor cable, injected with water-resistant flooding compound and jacketed with UV-resistant polyethylene jacket.

1. Superior Essex "OSP Cat 6" or approved equal.

2.03 FIBER TELECOMMUNICATION CABLE

A. All singlemode fiber optic cables shall be UL listed, loose tube, OS2, FDDI indoor/outdoor fiber optic cable meeting National Electrical Code riser (OFNR) standards. Cables shall utilize dry water-blocking technology, have a flame-resistant PVC outer jacket, and operate in a range from -20°C to 70°C. (xx in part numbers = fiber count, as shown on Drawings).

1. Riser Cable: Corning “FREEDM” #0xx4ESF-T4101D20.

2.04 FIBER CONNECTORS

A. All fibers shall be terminated with LC type connectors with ceramic ferrule. The termination method shall be a mechanical crimp.

1. Corning “Unicam” #XX.

2.05 FIBER CONNECTOR HOUSINGS

A. All fiber connector panels shall have six duplex LC fiber adapters with ceramic sleeve and fiber designation strip. Connector panel shall be installed in a compatible fiber wall box.

1. Closet Connector Housing: Corning CCH-CP12-A9 or approved equal.
2. Single Panel Housing: Corning SHP-01P or approved equal.

2.06 UTP CABLE SIGNAL EXTENDER

A. Single CAT6 UTP Cable Signal Strength extender for non POE connections. Extender shall be connected at end of cables, not mid-span.

1. Extender: Veracity Longspan Lite VLS-1N-L equal
2. Extender Power Supply: Veracity VPSU-12V-U or approved equal

2.07 ARMORED MULTI-CONDUCTOR SIGNAL CABLE

A. Solid, uncoated #14awg copper conductors per ASTM B-3. AREMA Type 1 EPR Insulated, 600V cable.

1. Okonite Armored Underground Signal Cable Catalog No. 206-11-6887.

2.08 SPARE PARTS

A. Provide 2 CAT6 UTP Extenders.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 GENERAL INSTALLATION

A. Follow cable manufacturer's specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations. Where manufacturer does not provide bending radius information, minimum bending radius shall be 10 times the diameter of the cable. Use a tension-monitoring device to ensure that the maximum pulling tension that may be applied to the cable to be pulled into a conduit section is not exceeded. Provide replacement cable if cable manufacturer's maximum pulling tension is exceeded at any time during a pull.

B. Cable shall be carefully inspected for sheath defects or other irregularities as it is paid out from the reel. When defects are detected, pulling shall stop immediately and the cable section shall be repaired or replaced at the discretion of the Contracting Agency. A system of communications shall be maintained between pulling and feed locations so that pulling can be stopped instantly, when required.

C. Adequate care shall be exercised when handling and storing reels of cable to prevent damage to the cable. Cable with dents, flat spots, or other sheath distortions shall not be installed.

D. Store a maximum of one foot of slack UTP cable for each connection at end of line (both ends)

E. All cabling shall be run continuous with no splices from end to end. Telecommunications cables shall be terminated at each end on their respective jack. Where cable run exceeds 90 meters (295 feet) in length from end to end, provide a CAT6 signal extender at each end of line to allow a longer length of cable. Mid-span installed signal extenders not permitted.

F. All cable shall be routed in such a way as to minimize EMI and RFI interference. Cables shall be routed to maintain the following minimum distances from noise producing devices:

1. Open or Nonmetallic Communications Pathways:

    a. 12 inches from electrical equipment and power lines of 3 kVA or less.
    b. 18 inches from fluorescent and HID ballasts.
    c. 36 from electrical equipment and power lines greater than 5 kVA.
    d. 48 inches from transformers and motors.

2. Grounded Metal Conduit Communications Pathways:

    a. 3 inches from electrical equipment and power lines of 2 kVA or less.
    b. 6 inches from electrical equipment and power lines of 2 kVA to 5 kVA.
    c. 12 inches from 5 kVA or greater power lines.

3.03 TERMINATIONS

A. All strands of all fiber cables shall be terminated at each end on their respective connectors.

B. The jacket of UTP cables shall be maintained to a point within one inch of the telecommunications connection point. The twists on the individual pairs shall be maintained as close as possible to the contacts of the termination points but shall in no case exceed 1/2 inch.

C. Pairs from each cable shall be terminated sequentially from left to right, top to bottom starting with the lowest assigned number at the upper left-hand corner of the panel.

D. Fibers shall be terminated sequentially from left to right in connector housing, based on standard color code sequence of individual fiber coatings.

3.04 PATHWAYS AND RACEWAYS

A. Unless otherwise noted, all cables shall be installed in conduit.

B. Cables to be installed in raceway for the entire length of each cable. Provide raceway through areas that will not be accessible for future cable replacement or additions.

C. Telecommunication cables shall not be installed in the same raceway or pathway as power cables.

D. Install polyethylene pulling string in each empty conduit containing a bend or over 10 feet in length.

E. Support raceways, outlet boxes, junction boxes and equipment racks under the provisions of Section 26 05 29.

3.05 LABELING

A. Label equipment racks as noted here-in and under the provisions of Section 26 05 53.

B. Furnish and install labels and documentation to identify all cables in accordance with TIA/EIA standards, as shown on the Drawings, and under the provisions of Section 26 05 53.

3.07 CABLE ACCEPTANCE TESTING

A. Each UTP cable shall be tested for compliance with TIA/EIA 568C Category 6 standards after installation using a Fluke #DTX or approved equal tester that has been calibrated within the last 30 days. At a minimum, the Contractor shall perform the following tests with the maximum frequency of the tester set at 350MHz:

1. Signal Attenuation / Insertion Loss.
2. Near End Cross Talk (NEXT).
3. Power Sum Near End Cross Talk (PS-NEXT).
4. Equal Level Far End Cross Talk (ELFEXT).
5. Power Sum Equal Level Far End Cross Talk (PS-ELFEXT).
6. Attenuation to Crosstalk Ratio (ACR).
7. Power Sum Attenuation to Crosstalk Ratio – Near End (PSACR-N).
8. Power Sum Attenuation to Crosstalk Ratio – Far End (PSACR-F).
9. Propagation Delay.

10. Delay Skew.
11. Return Loss.
12. Wiremap.
13. Overall Cable Length.

B. Test, analyze, and record compliance for the following network protocols:

1. 10 Base-T.
2. 100 Base-T.
3. 1000 Base-T (1 Gb/s).
4. 10 Gb/s (Fiber).

C. The Contractor shall provide 100% testing for each “permanent link” (i.e. between generator controllers). Provide test results for all tests noted above in the form of printouts from the test equipment and provide an electronic copy of the test data for each cable on CD. If proprietary software is used, the submitted CD shall include any necessary software required to view test results. If the results are delivered in a standard format such as Excel or Access, the viewing software need not be provided. At the front of the test report, the Contractor shall provide an index showing the pass/fail results of each cable, along with the cable length and a corresponding cable label.

D. Field test instruments for singlemode fiber cabling shall meet the requirements of TIA/EIA-526-7. Measured results shall be plus/minus 1dB of submitted loss budget calculations. If loss figures are outside this range, test cable with an Optical Time Domain Reflectometer (OTDR) in accordance with TIA/EIA 455-61 to determine the cause of variation. Improper terminations shall be re-done and damaged cable shall be replaced at no additional cost to the Owner.

E. Where any portion of the system does not meet the Specifications, the Contractor shall correct the deviation and repeat any applicable testing at no additional cost to the DEPARTMENT.

F. Provide three working days advance notice of tests. The ENGINEER shall reserve the right to be present during the testing of any or all cables in the system. Submit a copy of the test report for each cable prior to substantial completion of the project.

G. Acceptance of the telecommunications system shall be based on the results of the above tests, functionality, and the receipt of documentation.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 01 57 10 "Erosion, Sediment and Pollution Controls" for temporary erosion- and sedimentation-control measures.

1.03 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.05 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain DEPARTMENT's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.06 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.07 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct adjacent occupied or used facilities without permission from DEPARTMENT and authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on DEPARTMENT's premises where indicated.

C. Utility Locator Service: Notify “Call Before You Dig”, Alaska Railroad Corporation, and Alaska Department of Transportation & Public Facilities for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to DEPARTMENT.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.03 EXISTING UTILITIES

A. DEPARTMENT will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.
2. DEPARTMENT will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by DEPARTMENT or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify DEPARTMENT not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without DEPARTMENT's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.04 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.05 STOCKPILING ROCK

A. Remove from construction area naturally formed rocks that measure more than 1 foot across in least dimension. Do not include excavated or crushed rock.

B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.

1. Limit height of rock stockpiles to 36 inches
2. Stockpile surplus rock to allow later use by the DEPARTMENT.

3.06 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.07 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off DEPARTMENT's property.

END OF SECTION

SECTION 31 20 00
EARTH MOVING

PART 1- GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, pavements, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Classified material for concrete walks and pavements.
6. Classified material and leveling course for sidewalks and future asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 01 32 00 “Work Schedules”.
2. Section 03 30 00 “Cast-in-Place Concrete” for granular course if placed over vapor retarder and beneath the slab-on-grade.
3. Section 31 10 00 “Site Clearing” for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
4. Section 32 92 00 “Turf and Grasses” for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.03 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Surface Course: Aggregate layer placed over the classified material that is used as a wear surface in place of asphalt.

C. Leveling Course: Aggregate layer placed between the select material and hot-mix asphalt paving.

D. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

F. Classified Material: Aggregate layer placed between the subgrade and leveling course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

G. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

H. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by ENGINEER.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by ENGINEER. Unauthorized excavation, as well as remedial work directed by ENGINEER, shall be without additional compensation.

I. Fill: Soil materials used to raise existing grades.

J. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. Yd. for bulk excavation or 3/4 cu. Yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

K. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below select material, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches.
2. Warning Tape: 12 inches long; of each color.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.06 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct adjacent occupied or used facilities without permission from DEPARTMENT and authorities having jurisdiction.

B. Utility Locator Service: Notify “Call Before You Dig”, Alaska Railroad Corporation, and Alaska Department of Transportation and Public Facilities for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 01 50 00 “Temporary Facilities and Controls” and Section 31 10 00 “Site Clearing” are in place.

PART 2- PRODUCTS

2.01 SOIL MATERIALS

D. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

E. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: less than 35.
2. Plasticity Index: less than 10.

F. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

G. Surface Course: The surface course shall consist of both fine and coarse fragments of crushed stone or crushed gravel mixed or blended with sand, screenings, or other approved materials. The material shall consist of hard, durable particles or fragments of

stone and shall be free from excess soft or disintegrated pieces, dirt, or other objectionable matter.

1. Surface Course shall meet the following gradation:
   a. Percent passing 1” sieve = 100.
   b. Percent passing 3/4” sieve = 70-100.
   c. Percent passing 3/8” sieve = 50-85.
   d. Percent passing No. 4 sieve = 35-55.
   e. Percent passing No. 8 sieve = 20-50.
   f. Percent passing No. 50 sieve = 15-30.
   g. Percent passing No. 200 sieve = 8-15.

H. Leveling Course: The leveling course shall consist of crushed stone or crushed gravel, consisting of sound, tough, durable pebbles or rock fragments of uniform quality. The material shall be free from clay balls, vegetable matter or other deleterious matters.

1. Leveling course shall meet the following requirements:
   a. Percent of Wear (LAR)-ASTMC131 = 50 max.
   b. Degradation Value – ATMT13 = 20 min.
   c. Percent Fracture (Single Face) – ATM T4 = 70 min.
   d. Plasticity Index – ASTMD4318 = 6 max.

2. Leveling course shall meet the following gradation:
   a. Percent passing 1” sieve = 100.
   b. Percent passing 3/4” sieve = 70-100.
   c. Percent passing 3/8” sieve = 50-80.
   d. Percent passing No. 4 sieve = 35-55.
   e. Percent passing No. 8 sieve = 20-50.
   f. Percent passing No. 40 sieve = 8-30.
   g. Percent passing No. 200 sieve = 0-6.

I. Classified Material and Backfill:

1. Classified Material, Type A, shall contain no muck, frozen material, roots, sod or other deleterious matter. It shall have a plasticity index not greater than 6 as determined in accordance with ASTM D4318. It shall have 20 to 55% by weight of particles passing the No. 4 sieve and not more than 6% by weight of particles that pass the No. 200 sieve as determined in accordance with ASTM D422. The percent passing the No. 200 sieve will be based on the minus 3-inch fraction of material.

J. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

K. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

L. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and zero to 5 percent passing a No. 8 sieve.

M. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

N. Sand: ASTM C 33/C 33M; fine aggregate.

O. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

P. Stabilization Stone – Use stones that are angular, sound and durable, are no larger than 8 inches in greatest dimension, and not more than 50% by weight passing a 3-inch sieveas determined by ATM 304.

2.02 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
   a. Grab Tensile Strength: 157 lbf; ASTM D 4632.
   b. Sewn Seam Strength: 142 lbf; ASTM D 4632.
   c. Tear Strength: 56 lbf; ASTM D 4533.
   d. Puncture Strength: 56 lbf; ASTM D 4833.
3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.5 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
   a. Grab Tensile Strength: 247 lbf; ASTM D 4632.
   b. Sewn Seam Strength: 222 lbf ASTM D 4632.
   c. Tear Strength: 90 lbf; ASTM D 4533.
   d. Puncture Strength: 90 lbf; ASTM D 4833.
3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.02 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.03 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3- EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by ENGINEER. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
    a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
   a. 24 inches outside of concrete forms other than at footings.
   b. 12 inches outside of concrete forms at footings.
   c. 6 inches outside of minimum required dimensions of concrete cast against grade.
   d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   e. 6 inches beneath bottom of concrete slabs-on-grade.
   f. 6 inches > beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.04 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

3.05 EXCAVATION FOR PAVEMENTS

A. Excavate surfaces under pavements to indicated lines, cross sections, elevations, and subgrades.

3.06 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

   1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.07 SUBGRADE INSPECTION

A. Notify ENGINEER when excavations have reached required subgrade.

B. If ENGINEER determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the slab and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by ENGINEER, and replace with compacted backfill or fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by DEPARTMENT, without additional compensation.

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.09 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing Select Material, Type A. Concrete is specified in Section 03 30 00 "Cast-in-Place Concrete."

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of Select Material Type A, free of particles larger than 1 inch **i**n any dimension, to a height of 12 inches over the pipe or conduit.
   a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under pavements, use engineered fill.
3. Under steps and ramps, use engineered fill.
4. Under slabs, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry density according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
3. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch
2. Pavements: Plus or minus 1/2 inch.

3.15 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.16 CLASSIFIED MATERIAL AND LEVELING COURSE UNDER PAVEMENTS AND WALKS

A. Place classified material and leveling course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place classified material and leveling course under pavements and walks as follows:

1. Place leveling course material over classified material under hot-mix asphalt pavement.
2. Shape classified material and leveling course to required cross-slope grades.
3. Place classified material and leveling course 6 inches or less in compacted thickness in a single layer.
4. Place classified material and leveling course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact classified material and leveling course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

C. Pavement Shoulders: Place shoulders along edges of classified material and leveling course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each classified material and leveling course layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.17 SURFACE COURSE OVER LEVELING COURSE

A. On prepared subgrade, place surface course over classified fill or leveling course as follows:
   1. Place surface course material over leveling course when pavement is not to be used as the wear surface.
   2. Material shall be placed in uniform, equal-depth layers, each not exceeding 6 inches of compacted depth.
   3. Spread and shape the material to the required grade and section.
   4. Material shall not be placed within 4 feet from the face of any embankment, within 150 feet from any surface water body, in embankment areas where culvert placement is required, or in contact with any geosynthetic material.
   5. Compact surface course to required grade and section. Water or aerate as necessary to provide the approximate optimum moisture content for compaction as determined by ATM 212.
   6. Surface finishing of the surface course is by blading or equipment specifically designed for this purpose.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

   1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place drainage course 6 inches or less in compacted thickness in a single layer.
   3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry density according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Special Inspections: DEPARTMENT will engage a qualified special inspector to perform the following special inspections:

   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material classification and maximum lift thickness comply with requirements.
   3. Determine, during placement and compaction that in-place density of compacted fill complies with requirements.

B. Testing Agency: CONTRACTOR will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by ENGINEER; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off DEPARTMENT's property.

B. Transport surplus satisfactory soil to designated storage areas on DEPARTMENT's property. Stockpile or spread soil as directed by ENGINEER.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off DEPARTMENT's property.

3.22 INSTALLATION OF ROCK STABILIZATION

1. Excavate as required to install rock stabilization to maintain original grade. The additional excavation required to install stabilization stone in lieu of topsoil and seeding is subsidiary. Place rock stabilization materials so that the finished face is reasonably uniform and conforms to the original grade.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Hot-mix asphalt patching.
2. Hot-mix asphalt paving.

B. Related Requirements:

1. Section 31 20 00 "Earthwork" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Job Mix Design

C. Paving Plan describing the Contractor's anticipated means, methods, supervisory personnel, and quality control.

1.03 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each paving material.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. Coarse Aggregate: (retained on the No. 4 Sieve). Crushed stone or crushed gravel consisting of sound, tough, durable rock of uniform quality. Free from clay balls, vegetative matter, or other deleterious matters. Not coated with dirt or other finely divided mineral matter. Meet the following requirements:

L.A. Wear, %	AASHTO T 96	45, max.
Degradation Value	ATM 313	30, min.
Sodium Sulfate Loss, %	AASHTO T 104	9, max. (5 cycles)
Fracture, %	WAQTC FOP for AASHTO TP 61	80, min. (single face)
Flat – Elongated Pieces, %	ATM 306	8, max.
Absorption, %	ATM 308	2.0, max.

B. Fine Aggregate: (passing the No. 4 sieve) The plasticity index of material passing the number 40 sieve shall have a maximum of 4.0. Maximum weighted loss shall be no higher than 15% when determining soundness with sodium sulfate.

C. The aggregates shall meet requirements of type II broad band gradation as described in Section 703-2.04 of the Alaska Department of Transportation and Public Facilities Standard Specification for Highway Construction, 2015 Edition.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: PG 52-28.

B. Antistrip Addidtives: use antistrip agents in the proportions determined by ATM T 14 and included in the approved Job Mix Design. At least 70% of the aggregate shall remain coated when tested according to ATM T 14.

C. Tack Coat: Alaska DOT STE-1 or CSS-1 thinned with an equal amount of fresh water.

D. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

E. Asphalt materials shall meet requirements of class B asphalt materials as described in Section 702 of the Alaska Department of Transportation and Public Facilities Standard Specification for Highway Construction, 2015 Edition .

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

C. Tack Coat: Apply uniformly to surfaces of existing pavement as well as abutting curb and gutter at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.02 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Spread mix at a minimum temperature of 250 deg F.

2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

D. Do not place the asphalt concrete mixture on a wet surface, on an unstable/yielding roadbed, when the base material is frozen, or when weather conditions prevent proper handling or finishing of the mix. Do not place asphalt concrete mixture for a leveling course unless the roadway surface temperature is 40 degrees Fahrenheit or warmer.

E. Do not pave against new concrete curbing until it has cured for at least 72 hours.

3.03 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.04 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 93 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 91 percent or greater than 97 percent.
2. Compact all joints to at least 91% of the maximum specified density. Change the method of joining construction, if necessary, to meet density requirements.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.05 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Lift Thickness: Place each lift of pavement, within allowable tolerance, at a minimum thickness of 1.5 inches and maximum thickness of 3.0 inches.

C. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch
2. Surface Course: 1/8 inch
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.06 FIELD QUALITY CONTROL

A. CONTRACTOR shall perform necessary field quality control testing during construction using qualified and experienced personnel.

B. CONTRACTOR shall perform the following tests at a minimum:

C. Asphalt Binder Content – HMA samples shall be taken randomly by the Contractor in the presence of the Engineer from behind the paver screed before initial compaction, or will be taken randomly by the Engineer from the windrow, according to ATM 402 or ATM 403, at the discretion of the engineer.

Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if requested. Asphalt binder content will be determined according to ATM 405 or ATM 406, at the discretion of the Engineer.

D. Aggregate Gradation – Samples will be taken from dry batched aggregates according to ATM 301 or from the same location as samples for determination of asphalt binder content, at the discretion f the Engineer. Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if requested. The aggregate gradation for dry batch samples will be determined according to ATM 304. For HMA Samples, the gradation will be determined according to ATM 408 from the aggregate remaining after ignition oven (ATM 406) has burned off the asphalt binder.

E. Density – The Engineer will determine and mark the locations where the Contractor takes each core sample.

Mat Cores: The location(s) for taking core samples is determined using a set of random numbers (independent of asphalt binder and aggregate sampling set of random numbers) and the Engineer's judgement. Take no mat cores within 1 foot of a joint edge. Core samples are not taken on bridge decks.

Take core samples according to ATM 413 in the presence of the Engineer. Cut full depth core samples, centered on the marks and as noted above, from the finished HMA within 24 hours after final rolling. Neatly core drill one six inch diameter sample at each marked location.

END OF SECTION

SECTION 32 32 23
SEGMENTAL RETAINING WALLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete landscape block retaining walls.

1.02 RELATED REQUIREMENTS

A. Section 31 20 00 – Earth Moving

1.03 REFERENCE STANDARDS

A. AASHTO M288 – Standard Specification for Geotextile Specification for Highway Applications

B. ASTM D 422 – Standard Test Method for Particle-Size Analysis of Soils

C. ASTM D 698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12400 ft-lbf/ft3).

D. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

E. ASTM D 3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

F. ASTM D 4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in Xenon Arc Type Apparatus

G. ASTM D 4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

H. ASTM D 4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles

I. ASTM D 4632 – Standard Test Method for Brab Breaking Load and Elongation of Geotextiles.

J. ASTM D 4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.

K. ASTM D 5199 – Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.

L. ASTM D 5261 – Standard Test Method for Measuring Mass per Unit of Area of Geotextiles.

M. ASTM D 5262 – Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics.

N. ASTM D 6241 – Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

O. ASTM D 6637 – Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.

1.04 PREINSTALLATION MEETINGS

A. Convene preinstallation meeting 2 weeks before start of installation of concrete landscape block retaining walls.

B. Retain attendance of parties directly affecting work of this section, including Contractor, ENGINEER, and DEPARTMENT.

C. Review the following:

1. Materials.
2. Excavation.
3. Installation.
4. Tolerances.
5. Field quality control.
6. Protection.
7. Coordination with other work.

1.05 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer’s product data for the following:

C. Concrete landscape blocks.

D. Concrete landscape block forms.

E. Geogrid soil reinforcement.

F. Drainage collection pipe.

G. Geotextile filter fabric.

H. Reinforced Backfill: Submit reinforced backfill sample and laboratory test results to ENGINEER for approval before use of proposed reinforced backfill material.

I. Installer's Project References: Submit installer's list of successfully completed retaining wall projects, including project name and location, names of architect and engineer, and type and size of retaining walls installed.

1.06 QUALITY ASSURANCE

A. Installer's Qualifications:

1. Installer regularly engaged, for past 5 years, in installation of retaining walls of similar type and size to that specified.

2. Employ persons trained for installation of retaining walls.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver material to site in manufacture's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:

1. Store and handle materials in accordance with manufacturer's instructions.

2. Keep materials in manufacturer's original, unopened containers and packaging until installation.

3. Protect materials during storage, handling, and installation to prevent damage.

PART 2 - PRODUCTS

2.01 DESIGN CRITERIA

A. Assumed Soil Properties

1. Backfill Soil – In accordance with Section 31 30 00 – Earth Moving

2. Base Soil:

a. Soil Type: Gravel well drained and compacted.

b. Soil Unit Weight: 135 pcf.

c. Internal Soil Friction Angle: 35 degrees.

B. Concrete Landscape Blocks:

1. Concrete Unit Weight: 150 pcf.

2. Concrete-Soil Friction Factor: 0.67.

C. Static Factor of Safety Assumption's:

1. Retaining Wall Sliding: 1.5.

2. Retaining Wall Overturning: 2.0.

3. Soil Bearing Capacity: 3.0.

2.02 CONCRETE LANDSCAPE BLOCKS

A. Concrete Landscape Blocks

1. Interlocking, concrete landscape blocks in shapes and sizes as indicated on the Drawings to create complete concrete landscape block retaining walls.

2. Exposed stone face.

B. Concrete Landscape Block Forms:

1. Form Material: Steel.

2. Nominal Dimensions of Basic Full Block: As indicated in drawings.

3. Complete selection of concrete landscape block from categories include:

a. Basic block forms.

b. Corner block forms.

c. Recess blockout forms

d. Cap forms.

e. Step forms.

f. Key block forms.

g. Base block forms.

h. Form Liners: Creates exposed stone face.

C. Concrete for Landscape Blocks:

1. Minimum Compressive Strength: 4,000 psi at 28 days.

2. Maximum Water-Cementitious Materials Ratio: 0.45

3. Slump Limit: 4 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

4. Air Content: 5.5% plus or minus 1.5%

2.03 SOIL

A. Base Leveling Pad Material: Compacted crushed stone base or nonreinforced concrete as indicated on the Drawings.

B. Drainage Fill:

1. Clean, 1-inch-minus crushed stone or crushed gravel.

2. Gradation, ASTM D 422:

a. 1-inch Sieve Size: 100 percent passing

b. 3/4-inch Sieve Size: 75 to 100 percent passing

c. No. 4 Sieve Size: 0 to 10 percent passing

d. No. 50 Sieve Size: 0 to 5 percent passing.

3. Use minimum of 1 cubic foot of drainage fill for each square foot of retaining wall face.

4. Place drainage fill between and behind concrete landscape blocks.

C. Reinforced Backfill:

1. Clean.

2. Gradation, ASTM D 422:

a. 2-inch Sieve Size: 75 to 100 percent passing.

b. 3/4 –inch Sieve Size: 75 to 100 percent passing.

c. No. 40 Sieve Size: 0 to 60 percent passing.

d. No. 200 Sieve Size: 0 to 10 percent passing.

e. Maximum Aggregate Size: ¾ inch, unless field test performed to evaluate potential strength reductions to geogrid soil reinforcement design due to damage during construction.

f. Site Excavated Soils: Acceptable when specified requirements can be met.

g. Do not use unsuitable soils, including high-plastic clays or organic soils, for backfill or in reinforced soil mass.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas to receive concrete landscape block retaining walls.

B. Notify ENGINEER of conditions that would adversely affect excavation or installation.

C. Do not begin excavation or installation until unacceptable conditions are corrected.

3.02 GENERAL

A. Construct concrete landscape block retaining walls to lines, grades, dimensions, design, and pattern indicated on the Drawings.

3.03 EXCAVATION

A. Excavate to lines and grades indicated on the Drawings.

B. DEPARTMENT's representative will inspect excavation and approve before placement of leveling material or backfill.

C. Proof roll foundation areas as directed to determine if remedial work is required.

D. Following excavation for leveling pad and reinforced soil zone, soil will be examined by ENGINEER to assure actual foundation soil strength meets or exceeds assumed design bearing strength.

E. Remove and replace soils not meeting required strength with soil meeting design criteria, as directed by ENGINEER.

3.04 BASE LEVELING PAD

A. Place Leveling Pad Material to:

1. Lines and grades indicated on the Drawings.
2. Minimum thickness of 6 inches.
3. Extent laterally a minimum of 6 inches in front and behind concrete landscape blocks.

B. Compact soil leveling pad material to a minimum of 95 percent of maximum Standard Proctor density in accordance with ASTM D 698.

C. Prepare leveling pad to ensure full contact with base surface of concrete landscape blocks.

3.05 CONCRETE LANDSCAPE BLOCK INSTALLATION

A. Install concrete landscape blocks in accordance with concrete landscape block manufacturer's instructions.

B. Place first course of concrete landscape blocks on leveling pad at proper line and grade.

C. Check alignment and level in all directions.

D. Ensure concrete landscape blocks are in full contact with base and properly seated.

E. Place front of concrete landscape blocks side-by-side.

F. Do not leave gaps between adjacent blocks.

G. Layout corners and curves in accordance with concrete landscape block manufacturer's instructions.

H. Place and compact drainage fill within and behind concrete landscape blocks.

I. Place and compact backfill soil behind drainage fill.

J. Follow retaining wall erection and drainage fill closely with structure backfill.

K. Do not exceed 1 course of stacked vertical height of concrete landscape blocks, before drainage fill and backfill placement and compaction.

3.06 REINFORCED BACKFILL PLACEMENT

A. Place and compact reinforced backfill in maximum 6-inch lifts where hand compaction is used or maximum 8 to 10-inch lifts where heavy compaction equipment is used.

B. Decrease lift thickness to achieve required density, if necessary.

C. Compact reinforced backfill to 95 percent of maximum density in accordance 2with ASTM D 698.

D. Ensure moister content of reinforced backfill before and during compaction is uniformly disturbed throughout each layer and is dry of optimum, plus 0 percent, minus 3 percent.

E. Construction Equipment:

1. Allow only lightweight hand-operated equipment within 3 feet from soil side of concrete landscape blocks.
2. Keep tracked vehicle turning to a minimum to prevent tracks from displacing backfill.
3. Avoid sudden braking and sharp turning with rubber-tired equipment.

F. Slope last lift of backfill away from concrete landscape blocks to direct runoff away from retaining wall face, at end of each day's operation.

G. Do not allow surface runoff from adjacent areas to enter retaining wall construction site.

3.07 TOLERANCES

A. Retaining Wall Vertical Alignment: Plus or minus 1.5 inches over any 10-foot distance.

1. Retaining Wall Batter: Plus or minus 2 degrees of design batter.

B. Retaining Wall Horizontal Alignment: Plus or minus 1.5 inches over any 10-foot distance.

1. Corners, Bends, and Curves: Plus or minus 1 foot to theoretical location.

C. Maximum Horizontal Gap Between Concrete Landscape Blocks: 1/2 inch.

3.08 FIELD QUALITY CONTROL

A. CONTRACTOR shall perform necessary field quality control testing during construction using qualified and experienced personnel.

B. CONTRACTOR shall perform soil and backfill compaction testing per ASTM D1556, ASTM D2167, ASTM D2937, or ASTM D6938. Perform tests for each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.

3.09 PROTECTION

A. Protect installed concrete landscape block retaining walls to ensure that, except for normal weathering, retaining walls will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 32 92 00
TURF AND GRASSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Seeding.
   2. Hydroseeding.
   3. Turf renovation.
   4. Erosion-control material(s).

1.03 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

C. Topsoil: A natural friable surface soil without admixtures of undesirable subsoil, refuse, or foreign materials meeting the following:
   1. Reasonably free from roots, clods, hard clay, noxious weeds, tall grass, brush,s ticks, stubble or other litter, and be free-draining and non-toxic.
   2. Contain between 3% and 20% organic matter as determined by loss-on-ignition of oven dried samples according to ATM 203.
   3. Grading requirements:

Sieve	Percent Passing
2 in.	100
No. 4	75-100
No. 10	60-100
No. 200	10-70

D. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
   1. Experience: Three years' experience in turf installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

1.07 FIELD CONDITIONS

A. Planting Restrictions: Plant between May 15th and August 15th. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality: State-certified seed of grass species as listed below for solar exposure.
2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
3. Grass-Seed Mix: Proprietary seed mix as follows:
   a. 50 percent 'NORCOAST' Bering hairgrass
   b. 40 percent 'ARCTARED' red fescue
   c. 10 percent 'NORTRAN' tufted hairgrass
4. Contractor may submit alternate seed mixes that adhere to the recommendations from "Revegetation Manual for Alaska" published by the Alaska Department of Natural Resources.

2.02 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 20 percent phosphorous, and 10 percent potassium, by weight.

2.03 MULCHES

B. Fiber Mulch: Bonded fiber matrix mulch.

1. With the following properties:
   a. Mass per unit area : 12 oz/sq yd min. (ASTM D-6566)
   b. % Ground cover: 97% min. (ASTM D-6567)
   c. Water holding capacity: 1500% min. (ASTM D-7367)
   d. Cover Factor: 0.001 min. (ASTM D-6459)
   e. Germination: 700% min. (ASTM D-7322)
   f. Material Color: Green
   g. Functional Longevity: 18 months min.

2.04 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

C. Erosion-Control Mats: Cellular, nonbiodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by DEPARTMENT and replace with new planting soil.

3.02 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 TURF AREA PREPARATION

A. General: Prepare planting area for topsoil placement.

B. Placing Topsoil: Spread topsoil evenly on the designated areas to the depth (after settlement) shown on Plans. Do not place when the ground or topsoil is frozen, excessively wet, or in a condition detrimental to the work. Keep the roadway surfaces clean of topsoil during hauling and spreading operations.

3.04 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

3.05 HYDROSEEDING

A. Hydroseeding: Mix specified seed, slow-release fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 0.7-lb per 1,000 square feet dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 70 lb per 1,000 square feet.

3.06 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by DEPARTMENT:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.07 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off DEPARTMENT's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION