

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

SPECIFICATIONS AND CONTRACT DOCUMENTS

January 22, 2024

Prepared for:

**CITY OF WHITTIER
P.O. Box 608
Whittier, Alaska 99693**

Prepared by:

**CRW Engineering Group, Inc.
3940 Arctic Boulevard, Suite 300
Anchorage, Alaska 99503**

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE



These documents were prepared under the supervision of a registered Professional Engineer.



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#AECL882-AK

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

MASTER INDEX

I. BIDDING REQUIREMENTS

- Invitation For Bids
- Required Documents
- Bid Proposal
- Bid Schedule
- Bid Bond
- Certification by Bidder of Compliance with the Use of American Iron and Steel Law
- Certification Regarding Debarment, Suspension, and Other Responsibility Matters (EPA Form 5700-49)

II. CONTRACT FORMS

- Contract
- Performance & Payment Bond
- City of Whittier Business License Application

III. SPECIAL PROVISIONS

IV. TECHNICAL SPECIFICATIONS

V. CONSTRUCTION FORMS

- Deviation Request (DR)
- Substitution Request (SR)
- Design Clarification/Verification Request (DC/VR)
- Submittal Transmittal
- Sample Step Manufacturer Certification

VI. OTHER UTILITY REQUIREMENTS

- CEA Facility Requirements
- ENSTAR Safety Requirements

VII. MINIMUM RATES OF PAY

- A. State of Alaska Wage Rate
- B. Federal Wage Determination with Attachments

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

VIII. EEO CONTRACT COMPLIANCE SPECIFICATIONS

- Disadvantage Business Enterprises Overview
- Equal Employment Opportunity Statement of Acknowledgement
- Disadvantage Business Enterprises (Minority and Women-Owned Business Enterprises) Compliance Statement

IX. RECORD DRAWINGS

X. SOIL BORING LOGS

XI. PERMITS

- State of Alaska DEC Conditional Construction Approval
- State of Alaska DPS State Fire Marshal Plan Approval

XII. DRAWINGS (UNDER SEPARATE COVER)

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION I
BIDDING REQUIREMENTS

CITY OF WHITTIER, ALASKA
PURCHASING DIVISION
Invitation For Bids
No. 2024-01

The City of Whittier desires to receive bids from Contractors to construct the Whittier Well Field Upgrade project. The scope of work includes furnishing and installing a masonry block building with lighting, electrical, mechanical, interior and exterior water piping, interior and exterior valves, controls, and all related appurtenances; building site work and building pad; coordination and installation of electric and gas services; connection to the existing water main; furnishing and installing well pumps, discharge piping, connection to water piping, controls, and electrical for two wells. Work also includes demolition of two existing well house structures and abandoning two wells and other miscellaneous items of work.

Bidding documents are available electronically at: <https://www.whittieralaska.gov/rfps/>

Requests from Bidders for interpretation or clarification of the bidding documents shall be made to the City Clerk by email at cityclerk@whittieralaska.gov and must arrive at least seven (7) working days prior to the date for opening bids.

A pre-bid conference will be held at 11:00 a.m. on February 6, 2024 using Microsoft Teams. Bidders may contact the City Clerk to receive an invitation by email or use the following information to join the conference:

Microsoft Teams meeting

Join on your computer, mobile app or room device

[Click here to join the meeting](#)

Meeting ID: 226 761 621 989

Passcode: pBHJLq

[Download Teams](#) | [Join on the web](#)

All bidders are encouraged to attend the pre-bid teleconference.

Sealed bids must be submitted to the City Clerk as specified in the bid documents. All bids and any bid amendments or withdrawals must be received prior to the bid opening. Bids shall be submitted on the forms furnished and must be in a sealed envelope marked as follows:

BID FOR:

WHITTIER WELL FIELD UPGRADE

CITY CLERK
P.O. BOX 608
660 WHITTIER STREET
PUBLIC SAFETY BUILDING 2ND FLOOR
WHITTIER, ALASKA 99693

Bids will be opened publicly at 2:00 p.m. local time, in the Whittier City Council Chambers, 660 Whittier Street, Public Safety Building 3rd Floor, Whittier, Alaska on February 26, 2024.

The selection of the qualified bidder will be at the sole discretion of the City of Whittier, and the City reserves the right to reject any and all bids or to not award a contract if deemed in the best interest of the City. This solicitation does not commit the City of Whittier to pay any cost incurred in the preparation of the bid or to award any contract.

Bids shall not discriminate on the basis of race, color, national origin, or sex in the solicitation of sub-bids, award of subcontracts, or performance of the work.

The contract shall be let by the Whittier City Council to the lowest qualified responsive and responsible bidder.

Provisions of both Alaska Title 36, Public Contracts, Laborers' and Mechanics' Minimum Rates of Pay, AS 36.05.010 and AS 36.05.030, and a Federal Wage Determination are applicable to this contract.

By: Scott Korbe, Director of Public Works

Dated: January 24, 2024

**CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE
REQUIRED DOCUMENTS**

I. DOCUMENTS REQUIRED WITH BID

A. In order to be considered a responsive and acceptable bid, the bidder must submit the following documents in accordance with MASS Section 10.02 Bidding Requirements and Conditions and Section 10.03 Award and Execution of Contract:

1. Bid Proposal
2. Bid Schedule
3. Bid Bond
4. Certification by Bidder of Compliance with the Use of American Iron and Steel Law
5. Certification Regarding Debarment, Suspension, and Other Responsibility Matters (EPA Form 5700-49)
6. Equal Employment Opportunity Statement of Acknowledgement
7. Disadvantage Business Enterprises (Minority and Women-Owned Business Enterprises) Compliance Statement

II. DOCUMENTS REQUIRED FOR AWARD

A. In order to be awarded the contract, the successful bid must be completely filled out and the following documents submitted as specified in MASS Section 10.03 Award and Execution of Contract.

1. Contract
2. Performance & Payment Bond
3. Certificate of Insurance

B. In addition to the above, the Contractor must have a current Alaska Contractor's license, a current Alaska Business License, a current City of Whittier Business License and, if a corporation or limited liability company, must be registered in Alaska.

BID PROPOSAL

TO: CITY OF WHITTIER _____, 2024
P.O. Box 608
660 Whittier Street
Public Safety Building 2nd Floor
Whittier, Alaska 99693

SUBJECT: Invitation For Bid No. 2024-01
Project Title: Whittier Well Field Upgrade

Pursuant to and in compliance with subject Invitation For Bids, and other bid documents relating thereto, the Bidder hereby proposes to furnish all labor, materials, and equipment required to complete all work for the construction of the above referenced project in strict accordance with the bid documents at the prices established in the Bid Schedule submitted herewith.

The Bidder agrees, if awarded the contract, to commence and complete the work within the time specified in the bid documents.

The Bidder acknowledges receipt of the following addenda:

Addenda No. _____ Date of Addenda _____
Addenda No. _____ Date of Addenda _____
Addenda No. _____ Date of Addenda _____

Enclosed is a Bid Bond in the amount of _____
(Dollar Amount or Percentage of Bid)

Type of Business Organization

The Bidder, by checking the applicable box, represents that it operates as
 a corporation incorporated under the laws of the State of _____,
 an individual,
 a partnership,
 a non-profit organization, or
 a joint venture.

If a partnership or joint venture, identify all parties on a separate page.

(Bidder/Company Name) Alaska Contractor's License
Number: _____

(Address of Bidder) Employer's Tax Identification
Number: _____

(Signature)

Phone: _____

CITY OF WHITTIER, ALASKA
WELL FIELD UPGRADE
BID SCHEDULE

ITEM NO.	MASS NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
1	10.07.5	Utility Work Allowance (Building Services) per CS	1	\$17,500.00	\$17,500.00
2	60.09	Construct Well Field Upgrade per LS	1		
3	60.10	Furnish and Install Well Pump A per LS	1		
4	60.10	Furnish and Install Well Pump B per LS	1		
5	60.10	Furnish Spare Well Pump per Each	1		
6	60.11	Decommission Municipal Water Well No. 2 per LS	1		
7	60.11	Decommission Municipal Water Well No. 3 per LS	1		

TOTAL BID \$ _____

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we, _____
_____ of _____
as Principal, and _____
a corporation organized under the laws of the _____
_____ and authorized to transact surety
business in the State of Alaska, of _____,
as Surety, are held and firmly bound unto the CITY OF WHITTIER, as Obligee, in the full and
just sum of _____
(\$_____) Dollars, lawful money of the UNITED STATES, for the payment of
which sum, well and truly to be made, we bind ourselves, our heirs, administrators, executors,
successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal is herewith submitting its proposal for:

WHITTIER WELL FIELD UPGRADE

The condition of this obligation is such that if the aforesaid Principal will, within the time
required enter into a formal Contract and give a good and sufficient bond to secure the
performance of the terms and conditions of the Contract, then this Obligation to be void;
otherwise the Principal and Surety will pay unto the Obligee the amount stated above.

Signed, sealed, and delivered _____, 2024.

WITNESS AS TO PRINCIPAL:

(Contractor Name)

(Contractor Signature)

(Name/Title)

(AFFIX CORPORATE SEAL)

(Corporate Surety)

(Surety Business Address)

By: _____

(Attorney-in-Fact)

(AFFIX SURETY SEAL)

EPA Project Control Number

United States Environmental Protection Agency
Washington, DC 20460

**Certification Regarding
Debarment, Suspension, and Other Responsibility Matters**

The prospective participant certifies to the best of its knowledge and belief that it and the principals:

- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- (b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction: violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (c) Are not presently indicted for otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification; and
- (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated or cause or default.

I understand that a false statement on this certification may be ground for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to \$10,000 or imprisonment for up to 5 years, or both.

Typed Name & Title of Authorized Representative

Signature of Authorized Representative Date

I am unable to certify to the above statements. My explanation is attached.

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION II
CONTRACT FORMS

CONTRACT

Invitation For Bids No. _____

Contract No. _____

NAME AND ADDRESS OF CONTRACTOR:

Check appropriate box:

- Individual
 Partnership
 Incorporated in the State of _____

CITY OF WHITTIER (hereinafter the Owner)

Contract for (describe Work to be performed):

WHITTIER WELL FIELD UPGRADE

Bid Schedules	Items	Plan Sheet File Numbers	Amount _____
---------------	-------	----------------------------	--------------

Total Amount: _____

TOTAL AMOUNT OF CONTRACT IN WORDS: _____

THIS CONTRACT, entered into by the Owner named above, and the individual, partnership, or corporation named above, hereinafter called the Contractor, WITNESSETH that the parties hereto do mutually agree as follows:

Statement of Work: The Contractor shall furnish all labor, equipment, and materials and perform the Work above described, for the amount stated, in strict accordance with the Contract Documents.

CONTRACT DOCUMENTS

I. One of the following:

_____ Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction, 2020

_____ Municipality of Anchorage Standard Specifications, 2015 (MASS)

(Place "X" or "N/A" where applicable)

II. Specifications consisting of the following:

_____ Special Provisions consisting of _____ pages numbered _____ through _____.

_____ Technical Specifications consisting of Chapters _____ through _____.

(Place "X" or "N/A" where applicable)

III. This Contract consisting of three (3) pages.

IV. The Contract Performance and Payment Bond consisting of two (2) pages dated _____.

V. The Bid Proposal including unit price schedule(s) consisting of _____ pages numbered _____ through _____.

VI. The Contractor's Certificate of Insurance dated _____.

VII. The Laborers' and Mechanics' Minimum Rates of Pay dated _____.

VIII. The Drawings consisting of _____ sheets.

IX. Addenda No. _____ through _____.

X. Other

Time being of the essence, all Work shall be completed _____.

Contract No. _____

APPROVED AS TO FORM:

(City Attorney)

IN WITNESS WHEREOF, the parties hereto have executed this Contract as of the Contract Date entered below.

CITY OF WHITTIER, ALASKA

CONTRACTOR: _____
(Name)

By: _____
(Signature)

By: _____
(Signature)

(Name/Title)

(Name/Title)

Date of Signature: _____

Date of Signature: _____

Attest: _____
(Municipal Clerk)

Contract Date: _____
(Same as Date of Signature by City)

STATE OF ALASKA)
) ss.
THIRD JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this _____ day of _____, 2024 before me, the undersigned, a Notary Public in and for the State of Alaska, duly commissioned and sworn as such, personally appeared _____, to me known to be a/the _____ (individual, partner, president, etc.) of _____ named in the foregoing instrument, and s/he acknowledged to me that s/he had in his/her official capacity aforesaid executed the foregoing instrument as the free act and deed of the said _____, (individual, partnership, corporation, etc.) for the uses and purposes therein stated. Witness my hand and official seal on the day and year first above written.

Notary Public in and for Alaska

My Commission Expires: _____

CONTRACT PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, That we, _____
_____ of _____
as Principal, and _____
a corporation organized under the laws of the _____
_____ and authorized to transact surety
business in the State of Alaska, of _____,
as Surety, are held and firmly bound unto the CITY OF WHITTIER, as Obligee, in the full and
just sum of _____
(\$ _____) Dollars, lawful money of the UNITED STATES, for the payment of
which sum, well and truly to be made, we bind ourselves, our heirs, administrators, executors,
successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION IS SUCH, that whereas the Principal has entered
into a certain contract dated the _____ day of _____, 2024, with the Obligee
for the construction of:

WHITTIER WELL FIELD UPGRADE

which contract is hereby referred to and made a part hereof as fully and to the same extent as
if copied at length herein.

NOW THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings,
covenants, terms, conditions, and agreements of said Contract, and shall promptly make
payments to all persons supplying labor and materials in the prosecution of the Work provided
for in said Contract, during the original term of said Contract and any extensions or
modifications thereof that may be granted by the City of Whittier, with or without notice to the
Surety, then this obligation to be void; otherwise to remain in full force and effect.

This obligation is made for the use of said Obligee and also for the use and benefit of all
persons who may perform any work or labor or furnish any materials in the execution of said
Contract and may be sued on thereby in the name of said Obligee.

The said Surety, for the value received, hereby stipulates and agrees that no change,
extension of time, alteration or addition to the terms of the Contract or to the Work to be
performed thereunder or the Specifications accompanying the same, shall in anywise affect its
obligations on this Bond, and it does hereby waive notice of any such change, extension of
time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

IN TESTIMONY WHEREOF, the parties hereunto have caused the execution hereof in _____
_____ original counterparts as of the ____ day of _____, 2024.

WITNESS AS TO PRINCIPAL:

(Contractor Name)

(Contractor Signature)

(Name/Title)

(AFFIX CORPORATE SEAL)

(Corporate Surety)

(Surety Business Address)

(AFFIX SURETY SEAL)

By: _____
(Attorney-in-Fact)



**City of Whittier
Business License
Application YR 2024-25**

DEPARTMENT USE ONLY

License #: _____

NEW RENEWAL
 PTBT SALES TAX NON-FILER

Licenses issued for the period of two calendar years (January 1 – December 31).

THE NON-REFUNDABLE BUSINESS LICENSE APPLICATION FEE IS \$50.00.

Please make checks payable to the **City of Whittier** or call (907) 472-2327 Ext. 201 for credit card payment.

Note: You must have a valid Alaska state business license before a City of Whittier business license can be issued. (Please include a copy).

ATTN: PLEASE USE DROP-DOWN ARROWS FOR REPORTING YEAR. *RECEIVED FORM WILL NOT BE CORRECTED IF REPORTED INCORRECTLY.*

Business Name: _____ DBA: _____

AK Business License Number: _____ Expiration Date: _____

Phone: _____ Secondary Phone: _____ Fax: _____

Email: _____ Website: _____

Physical Address: _____

Mailing Address: _____

Nature and description of business: _____

Will this business be selling liquor? YES NO Hotel/Motel/B&B? YES NO

Corporation or Limited Liability Company (LLC)

Corporation Name: _____ EIN: _____

Sole Proprietorship
Proprietor's Name: _____ SSN: _____

Partnership, Limited Liability or Limited Partnership
*Please provide the social security number of the primary partner and the names of the first two partners.
If there are more than two partners, please attach a complete list of partner names.*

Partner #1: _____ SSN: _____

Partner #2: _____ SSN: _____

**Have you been issued a City of Whittier Business License under a different name? Yes No*

If yes, please provide name of Business: _____ Account Number: _____

Description of Business Tax Reporting: Sales Tax Passenger Transportation Business Tax

This application must be completed in its entirety. This application must be signed and dated by the person completing this application on behalf of the business and must state the person's title or position in the business.

I declare, under penalty of perjury, that this application is true and complete.

Printed Name

Title

Signature

Date Signed

Send application to: City of Whittier
P.O. Box 608
Whittier, Alaska 99693

receptionist@whittieralaska.gov
Phone: (907) 472-2327
Fax: (907) 472-2404

City of Whittier Received Date: _____

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION III
SPECIAL PROVISIONS

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

INDEX TO THE SPECIAL PROVISIONS

Section 95.01	General Statement and Extent of Work	1
Section 95.02	Reference to Municipality of Anchorage Standard Specifications	1
Section 95.03	Time of Completion	2
Section 95.04	Modifications and/or Additions to Municipality of Anchorage Standard Specifications	2
A. Division 10	Standard General Provisions.....	2
Section 10.01	Definitions	2
Section 10.03	Award and Execution of Contract.....	2
Section 10.04	Scope of Work.....	3
Section 10.05	Control of Work	5
Section 10.06	Legal Relations and Responsibilities.....	7
Section 10.07	Measurement and Payment	11
Section 10.08	Forms	14
B. Division 20	Earthwork	15
Section 20.01	General	15
Section 20.12	Dewatering	15
Section 20.13	Trench Excavation and Backfill	15
Section 20.16	Furnish Bedding Material	15
Section 20.27	Disposal of Unusable or Surplus Material	16
Section 20.30	Shoring, Sheet piling and Bracing/Sheet piling and Sheet piling Left in the Trench and Portable.....	16
C. Division 60	Water Systems	17
Section 60.01	General	17
Section 60.02	Furnish and Install Pipe.....	17
New Section 60.09	Construct Well Field Upgrade.....	17
New Section 60.10	Well Pump	23
New Section 60.11	Decommission Municipal Water Well.....	28

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

SPECIAL PROVISIONS

SECTION 95.01 GENERAL STATEMENT AND EXTENT OF WORK

All proposed Work is located within the City of Whittier, herein defined as the Owner, and is more particularly located as shown on the Drawings. The Work included in this Contract consists of furnishing all labor, materials, tools, equipment, supervision, transportation, and other facilities necessary to successfully complete the Work set forth in the Drawings and Specifications. It is the responsibility of the bidder to prepare the bid so that all materials and working arrangements harmoniously conform to the intent of the Contract Drawings, Specifications, and Special Provisions.

The Work that is presented in the Bid Proposal for this Contract consists of furnishing and installing a masonry block building with lighting, electrical, mechanical, interior and exterior water piping, interior and exterior valves, controls, and all related appurtenances; building site work and building pad; coordination and installation of electric and gas services; furnishing and installing dry well and associated piping; connection to the existing water main; furnishing and installing well pumps, discharge piping, connection to water piping, controls, and electrical for two wells. Work also includes demolition of two existing well house structures and abandoning two wells.

The Contractor awarded the Contract for this project and all subcontractors shall be required to obtain a City of Whittier business license.

This project is funded under an EPA Assistance Agreement and is subject to regulations governing federal procurements. This includes the use of disadvantage owned businesses enterprises (DBE) as summarized in the State of Alaska Department of Environmental Conservation Alaska Clean Water Fund & Alaska Drinking Water Fund overview included in Section VIII EEO Contract Compliance Specifications.

American Iron and Steel (AIS) compliance is required for this project.

SECTION 95.02 REFERENCE TO MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS

This Contract is subject to and hereby incorporates by reference the Municipality of Anchorage Standard Specifications, dated 2015, hereinafter referred to as MASS. All references to the Municipality of Anchorage contained in MASS shall be changed to read the City of Whittier. All references to the Anchorage Water & Wastewater Utility, hereinafter referred to as AWWU, shall be changed to read the City of Whittier. All MASS references to work which will be performed by AWWU shall be disregarded; the Contractor is responsible for all work required to complete the Project.

MASS is available for download on the Municipality of Anchorage website at the following link:

http://www.muni.org/departments/project_management/pages/mass.aspx

All Work under this Contract shall comply with the latest edition and addenda to all applicable codes, ordinances, and standards including the AWWU Design and Construction Practices Manual (hereinafter referred to as DCPM).

The DCPM is available for download at the following link:

<https://www.awwu.biz/about-us/reliable-infrastructure/design-and-construction-practices-manual>

SECTION 95.03 TIME OF COMPLETION

This Project shall be substantially complete by February 21, 2025. Final completion for the Project shall be March 25, 2025.

SECTION 95.04 MODIFICATIONS AND/OR ADDITIONS TO MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS

The following listed provisions of MASS are amended as hereinafter stated:

A. DIVISION 10 STANDARD GENERAL PROVISIONS

Add the following Section:

SECTION 10.00 ALL APPLICABLE MASS ARTICLES

Delete any and all references to and requirements for compliance with Anchorage Municipal Code Chapter 7.60 the Disadvantaged/Women Owned Business (DBE/WBE) program and specifications.

SECTION 10.01 DEFINITIONS

Add the following item to the list of definitions:

Record Drawings – Detailed drawings that accurately depict all changes in location (both horizontal and vertical), material, equipment, and other elements of Work accomplished by the Contractor. The drawings shall also depict the horizontal and vertical locations of all other utilities and obstructions encountered during construction. Final elevations and locations shall be clearly marked with actual dimensions.

SECTION 10.03 AWARD AND EXECUTION OF CONTRACT

Article 3.7 Contractor's Warranty

Delete the first sentence of the first paragraph and replace with the following:

The Contractor shall warranty all materials and workmanship for two (2) years from the Final Acceptance Date. In accordance with the requirements of 40 90 00 - Process Control and Instrumentation Systems, the control system warranty shall extend to four (4) years from the Final Acceptance Date.

SECTION 10.04 SCOPE OF WORK

Article 4.8 Work Incidental to the Contract

Delete the numbered item thirteen and replace with the following:

13. Adjustment of water valve boxes to finish grade.
14. All Work required to shore, remove, and/or reset light poles and luminaires, including coordinating with Chugach Electric Association.
15. All Work required to shore, remove, and/or reset gas utility amenities including coordinating with Enstar Natural Gas Company.
16. All Work required to shore and protect in place Yukon Telephone and GCI utility amenities including coordinating with the utility.
17. Trench shoring, including the use of a portable trench box.
18. Preserving, protecting, and replacing all monuments and lot corners.
19. Removal and disposal of all water utility amenities to be removed.
20. Connections to existing items specified in the Contract Documents. This includes but is not limited to items specified in the Contract Documents as furnish and install pipe connecting to existing water mains.
21. Other items indicated on the Drawings or in these Specifications, but not specifically listed as a bid item in these Contract Documents.

Article 4.17 Utilities

Add the following after the sixth paragraph:

Allowances for work performed by Utility Companies are shown as an item on the Bid Proposal. Any invoices for the Work shall be paid by the Contractor and reimbursed through the utility allowances. Contractor shall provide copies of invoices to the Engineer, and no markup shall be allowed. Contractor is responsible for coordination with the Utility Companies. All costs for coordination and management are incidental to the Work.

Add the following sentence to the end of the seventh paragraph:

Utility locates are the responsibility of the Contractor to request, coordinate with the Work, maintain, and protect.

Add the following new Articles:

Article 4.22 Responsibility of Contractor to Act in Emergency

In case of an emergency that threatens loss and/or injury of property and/or safety of life, the Contractor shall act, without previous instructions from the Engineer, as the situation may warrant. The Contractor shall notify the Engineer thereof immediately thereafter. Any claim for compensation by the Contractor, together with substantiating documents in regard to expense, shall be submitted to the Owner through the Engineer. The amount of compensation shall be determined by agreement.

The Contractor shall supply the Engineer, prior to commencement of Work, with an emergency telephone number through which a responsible Contractor's representative can be contacted on a twenty-four (24) hour a day basis.

Article 4.23 Daily Progress Reports

The Contractor shall submit daily progress reports to the Engineer. The reports for the current workweek shall be submitted no later than the following Monday by 12:00 p.m. The development, preparation, and presentation of all daily progress reports are incidental to the Contract and no separate payment shall be made. Each daily report shall include:

1. Names and hours worked for all personnel on site, including personnel for all subcontractors.
2. Construction equipment on hand, including utility vehicles such as pickup trucks, maintenance vehicles, etc.
3. Documentation of weather conditions and any resulting impacts to the Work.
4. General progress of the Work, including a list of activities started and completed, mobilization and demobilization of subcontractors, and major milestones achieved.
5. Contractor's plan for management of site (e.g., lay down and staging areas, construction traffic, etc.), utilization of construction equipment, buildup of trade labor, and identification of potential Contract changes.
6. Identification of new activities and sequences as a result of executed Contract changes (if any).
7. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
8. Changes to activity logic.
9. Changes to the critical path.
10. Identification of, and accompanying reason for, any activities added or deleted since the last report.
11. Steps taken to recover the schedule from Contractor caused delays.

Article 4.24 Coordination with Other Projects

It shall be the responsibility of the Contractor to coordinate with and minimize impact to other projects.

The Contractor is responsible for affirmatively coordinating with other projects so as to not unreasonably interfere with the performance of the other projects.

If the Work of the Contractor is delayed or disrupted because of the construction or transportation activities of other projects, the Contractor is not entitled to additional compensation from the Owner but may be entitled to an extension of time in accordance with Article 5.23 – Delays and Extension of Time.

Except with regard to a possible entitlement to an extension of time, the Contractor must hold harmless, defend, and indemnify the Owner from and against any and all claims by the Contractor arising directly or otherwise out of the other projects.

Work required to coordinate with and minimize impact to other work in the Project area will be considered incidental to the Project.

SECTION 10.05 CONTROL OF WORK

Article 5.3 Construction Progress Schedule and Schedule of Values

Replace the last sentence of the first paragraph:

The Construction Progress Schedule shall be revised and resubmitted to the Engineer at weekly project status meetings. The Contractor shall be required to attend the weekly meetings. Meeting participation and attendance is incidental to the contract and no separate payment shall be made.

Add the following paragraphs after the second paragraph:

A. Schedule of values format and content:

1. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related specification section or division.
 - b. Description of Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change orders (numbers) that affect value.
 - g. Dollar value (percentage of contract sum to nearest percent, adjusted to total 100 percent).
2. Provide a breakdown of the contract sum in sufficient detail to facilitate continued evaluation of applications for payment and progress reports. Coordinate with the project manual table of contents. Break principal subcontract amounts down into several line items.
3. Round amounts to nearest whole dollar. The total shall equal the contract sum.
4. Provide a separate line item in the schedule of values for each part of the Work where applications for payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
5. Provide separate line items on the schedule of values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Margins of cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in applications for payment. Each item in the schedule of values and applications for payment shall be complete.

Include the total cost and proportionate share of general overhead and profit margin for each item.

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be either shown as separate line items in the schedule of values or distributed as general overhead expense, at the Contractor's option.
7. Schedule updating: Update and resubmit the schedule of values prior to the next applications for payment when Change Orders or construction change directives result in a change in the contract sum.

Article 5.4 Non-Working Hours, Holidays, Saturdays, and Sundays

Replace the first sentence of the first paragraph:

The Contractor shall give the Engineer seventy-two (72) hours advance notice of his intention to work overtime, Saturdays, nights, Sundays or holidays, or any time outside the usual working hours.

Add the following sentence to the end of the last paragraph:

A standard workday is a ten (10) hour workday (excluding meal times) within the timeframe of no earlier than 7:00 a.m. and no later than 7:00 p.m.

Article 5.10 Subcontracting

Add the following item to the list:

5. The Contractor, at any time after award of contract, proposes to remove or make substitutions for MBE and/or WBE subcontractors or joint-venture partners under the contract, a written notice of such removal or substitution shall be submitted to the Engineer prior to commencement of performance of the affected work, with the names, addresses and phone numbers of the subcontractors or joint venture partners to be removed or substituted for and an explanation of the reasons for the removal and substitution. The Contractor shall make good faith efforts to utilize another MBE or WBE subcontractor as the replacement. These efforts shall be documented and the circumstances fully explained in writing, and approval obtained from the Engineer prior to such replacement. The Engineer will, within seven (7) days of receipt of such notice, approve said notice or removal and substitution where it is shown that the requested action is for good cause and not for discriminatory purposes.

Article 5.27 Liquidated Damages

Delete the first two sentences of the first paragraph and replace with the following:

The Owner may deduct out of any progress payment the sum of Five Hundred Dollars (\$500.00) per day as Liquidated Damages for each and every calendar day that the Substantial Completion Date is delayed beyond the Substantial Completion Date specified in Article 5.22, Time for Completion of Work. The Owner may deduct out of any progress payment the sum of Two Hundred Fifty Dollars (\$250.00) per day as Liquidated Damages for each and every calendar day that the Final Acceptance Date is delayed beyond the Contract Completion Date.

Add the following Article:

Article 5.34 Project Meetings

The Engineer will schedule once-per-week project meetings at a time and location determined by the Engineer. The Contractor's Project Manager, its Field Superintendent, and Subcontractors, as requested, shall attend the meetings with the Owner, its Representative, Engineer, and Inspector.

SECTION 10.06 LEGAL RELATIONS AND RESPONSIBILITIES

Article 6.1 Laws to be Observed

Add the following paragraph:

Owner is not aware of any contaminated material within the project limits. If such material is encountered, Contractor shall notify the Engineer immediately for direction. This will be treated as a changed condition unless the contamination was caused by Contractor's operation.

Article 6.14 Preference to Local Labor

Add the following paragraph to the end of the Article:

Notwithstanding page ix of the Wage & Hour Administration Pamphlet No. 600 contained in Section VII of this Invitation to Bid and in accordance with Alaska Statute 36.10.040, this clause does not apply to this Invitation to Bid.

Article 6.15 State of Alaska Prevailing Wage Scale

Add the following paragraph to the end of the Article:

The Contractor, and all Subcontractors, is responsible to identify, pay, and report the higher of the prevailing wage rates on the proper forms. Those wages for which the Federal wage rate is higher, the Contractor, and all Subcontractors, shall report those wages on the Federal forms provided included as part of the Federal wage determination contained elsewhere herein. The Contractor, and all Subcontractors, shall submit the Federal payroll forms directly to the Engineer weekly.

Article 6.16 Nondiscrimination

Add the following paragraph to the end of the Article:

The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 40 CFR, Part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or other legally available remedies.

Add the following new Article:

Article 6.19 Federal Contract Provisions – Retention of Records

Contractors shall retain all records of this Contract in accordance with 40 CFR 31.36(i)(10) that allows access by the grantee, the subgrantee, the Federal grantor agency, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the Contractor which are directly pertinent to that specific contract for the purpose of making an audit, examination, excerpts, and transactions.

Additionally, Contractors shall, in accordance with 40CFR 31.36(i)(11) retain all required records for a period of three (3) years after grantees or subgrantees make final payment and all other pending matters.

Add the following new Article:

Article 6.20 Federal Clauses Added by Reference

The Contractor shall comply with all provisions of the following federal clauses hereby incorporated by reference:

- Copeland Anti-Kickback Act.
- Section 306 of the Clean Air Act.
- Section 508 of the Clean Water Act.
- Energy Policy and Conservation Act (P.L. 94-163, 89 Stat.871).

Add the following new Article:

Article 6.21 Federal Certifications

The Contractor shall submit with its bid the following certification:

- Certification Regarding Debarment, Suspension, and Other Responsibility Matters (EPA Form 5700-49).

Add the following new Article:

Article 6.22 Settlement of Procurement Issues and Bid Protests

The following applies to this Invitation to Bid:

SETTLEMENT OF PROCUREMENT ISSUES. Grantees and subgrantees alone will be responsible for the settlement of all contracts and administrative issues arising out of procurement. Grantees and subgrantees will have procedures to handle and resolve procurement issues and shall disclose information regarding such issues to EPA. Such issues include, but are not limited to, source evaluation, bid protests, disputes, and claims.

EPA is not a party to any of the grantee's or subgrantee's subagreements for the construction of the proposed project. EPA's funding of this project does not relieve the grantee or subgrantee of any contractual responsibilities under its contracts. Reviews and approvals by EPA are: for administrative purposes only; used to determine compliance with Federal laws and regulations; and used to determine the level of Federal participation.

EPA will not substitute its judgment for that of the grantee or subgrantee unless the matter is primarily a Federal concern. Violations of law will be referred to the local, state, or Federal authority having jurisdiction. Reviews by EPA will be limited to the violations specified below. All other issues received by EPA will be referred to the grantee or subgrantee.

- Violations of Federal law or regulations and the standards. Violations of State or local law will be under the jurisdiction of state or local authorities; and
- Violations of the grantee's or subgrantee's protest procedures for failure to review a complaint or protest.

BID PROTESTS. Grantees and subgrantees will have procedures to resolve bid protest appeals and shall disclose information regarding the protest to EPA and the state. A protestor must exhaust all administrative remedies at the grantee's and subgrantee's level before pursuing a protest with EPA.

Only parties with a financial interest that are adversely affected by the grantee's or subgrantee's decision on the initial bid protest may file a bid protest appeal with EPA. EPA will not substitute its judgment for the grantee or subgrantee unless the matter is primarily a Federal concern. Reviews by EPA will be limited to the violations described under the preceding section entitled "Settlement of Procurement Issues". Violations of law will be referred to the appropriate local or state authority.

Bid protest appeals must be filed with the Office of Regional Counsel, EPA Region 10, ORC-158, EPA, Region 10, 1200 Sixth Avenue, Seattle, WA 98101. A protest appeal must:

- Be a written complaint regarding the grantee's or subgrantee's determination of a bid protest appeal;
- Include a copy of the grantee's or subgrantee's determination of the protest; and
- State the basis for the appeal.

The party filing the bid protest appeal must concurrently transmit a copy of all protest documents and any attachments to all other financially interested parties that may be adversely affected by the determination of the protest appeal.

EPA will only consider written protest appeals received by the Office of Regional Counsel (ORC) within seven (7) calendar days; the adversely affected party can meet the seven day notice requirements by telegraphing or faxing to ORC within the seven calendar day period its intent to file a protest appeal, provided the adversely affected party submits a complete protest appeal within seven (7) calendar days of the date it sent the telegram or fax. If the

seventh day falls on a Saturday, Sunday, or holiday, the next working day shall be the last day to submit a protest appeal.

For any protest appeal based upon alleged improprieties in the solicitation that were clearly apparent before receipt of initial proposals, EPA may dismiss as untimely any such appeals if the grantee or subgrantee does not receive the initial protest before bid opening or the closing date for receipt of proposals.

Add the following new Article:

Article 6.23 American Iron and Steel Provisions

All iron and steel products used in the project shall be produced in the United States. The Contractor by signing the Contract acknowledges to and for the benefit of the City of Whittier, and the State of Alaska (the "State") that it understands the goods and services under this Contract are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel" (AIS) that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contractor pursuant to this Contract. For the purposes of this Article, the definition of "iron and steel products" mean products made primarily of iron or steel; lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials that are permanently incorporated into the public water or sanitary sewer system.

The Contractor by signing the Contract represents and warrants to and for the benefit of the City of Whittier and the State that:

- (a) the Contractor has reviewed and understands the AIS Requirement,
- (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the AIS Requirement, unless a waiver of the requirement is approved, and
- (c) the Contractor will provide any further verified information, certification or assurance of compliance with this Article, or information necessary to support a waiver of the AIS Requirement, as may be requested by the City of Whittier or the State.

Notwithstanding any other provision of this Contract, any failure to comply with this Article by the Contractor shall permit the City of Whittier or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the City of Whittier or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the City of Whittier). While the Contractor has no direct contractual privity with the State, as a lender to the City of Whittier for the funding of its project, the City of Whittier and the Contractor agree that the State is a third-party beneficiary and neither this Article (nor any other provision of this Contract necessary to give this Article force or effect) shall be amended or waived without the prior written consent of the State.

Bidders are encouraged to read the guidance and training materials maintained by EPA at:

<https://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement>

The successful Bidder will be required to comply with all record keeping and reporting requirements requiring information from the Contractor under the Clean Water Act/Safe Drinking Water Act, including certification letters for AIS compliance.

Sample certification forms are provided in the Contract Documents for use in ensuring compliance with the AIS requirement. The Contractor must provide a completed form documenting compliance with the AIS Requirements to the City of Whittier for all AIS products as a submittal prior to material shipment to the jobsite.

SECTION 10.07 MEASUREMENT AND PAYMENT

Article 7.5 Progress Payments

Delete the fourth sentence of the first paragraph and replace with the following:

The Owner shall process Partial Payment Estimates and make payment to the Contractor within fifteen (15) days of execution of all signatures required on the Partial Payment Estimate.

Add the following paragraphs after the second paragraph:

A. Applications for payment

1. Each application for payment shall be consistent with previous applications and payments as certified by the Owner's representative and paid for by the Owner.
 - a. The initial application for payment, the application for payment at time of Substantial Completion, and the final application for payment involve additional requirements.
2. Application preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor.
 - a. Entries shall match data on the schedule of values and the Contractor's construction schedule. Use updated schedules if revisions were made.
 - b. Include amounts of Change Orders and construction change directives issued prior to the last day of the construction period covered by the application.
3. Transmittal: Submit one (1) signed and notarized original copy of each application for payment to the Owner's representative by a method ensuring receipt within twenty-four (24) hours. One copy shall be complete, including OEO reports and similar attachments, when required.
 - a. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Engineer.

4. Initial application for payment: Administrative actions and submittals, that must precede or coincide with submittal of the first application for payment, include the following:
 - a. List of subcontractors.
 - b. List of principal suppliers and fabricators.
 - c. Schedule of values.
 - d. Contractor's construction schedule (preliminary if not final).
 - e. Schedule of principal products.
 - f. Schedule of unit prices.
 - g. Submittal schedule (preliminary if not final).
 - h. List of Contractor's staff assignments.
 - i. List of Contractor's principal consultants.
 - j. Copies of permits.
 - k. Initial progress report.
5. Application for payment during construction:
 - a. Progress Redlines shall be submitted with each application for payment.
6. Application for payment at substantial completion: Submit an application for payment following issuance of substantial completion.
 - a. This application shall reflect certificates of partial substantial completion issued previously for Owner occupancy of designated portions of the Work.
 - b. Administrative actions and submittals that shall precede or coincide with this application include:
 - i. Occupancy permits and similar approvals.
 - ii. Warranties (guarantees) and maintenance agreements.
 - iii. Maintenance instructions.
 - iv. Changeover information related to Owner's occupancy, use, operation, and maintenance.
 - v. Final cleaning.
 - vi. List of incomplete Work, recognized as exceptions to Engineer's issuance of substantial completion.

Contractor shall submit, with the first application for payment, a copy of the Notice of Work executed by the State Department of Labor, Wage & Hour Administration. Failure to submit a copy of this form with the first application for payment will result in the withholding of \$5,000 from the progress payment. Additionally, a filing may be issued to the Wage & Hour Administration for failure to provide such notice.

Add the following to the list of Withholdings in the fourth paragraph, and renumber the previous six (6) through eight (8) as nine (9) through eleven (11):

6. Failure to submit the detailed Schedule of Values consisting of several elements as required. (The Engineer cannot pay on any of the items specified to be broken down until the breakdown is received and accepted).
7. A maximum of \$5,000 for failure to provide a Notice of Work and/or a Notice of Completion as required by Alaska Statute 36.05.045. For final payments, the difference between \$5,000 and the actual amount paid for the Notice of Work filing shall be withheld until such time as the Contractor provides a copy of the Notice of Completion executed by the Wage & Hour Administration to the Engineer.
8. The value of items missing by the contract documents. Examples include, but are not limited to, record drawings; operations and maintenance manuals; Department of Labor Notice of Work and/or Notice of Completion, ADEC Notice of Completion form, or other items as listed in the schedule of values or elsewhere required in the contract documents.

Add the following sentence to the end of the list of withholdings:

Monies withheld under Article 7.5 - Progress Payments, shall be paid to the Contractor by subsequent pay estimates that follow the date on which the Contractor satisfactorily corrects the deficiencies causing the withholding.

Delete the fifth paragraph and replace with the following:

The amount of any withholding for items one (1) through eight (8) above shall be the reasonable value of the Work or remedy to be accomplished as estimated by the Engineer, without regard to bid amount or cost to the Contractor. The amount of withholding for items nine (9) through eleven (11) shall be in accordance with the claimed amount or the applicable Contract provisions.

Add the following paragraph to the end of the Article:

The monthly pay estimate shall be computed on the basis of Work completed. All quantities shall be subject to review by the Engineer prior to approval for payment. Monthly price allocation for payment of lump sum items shall be based on the approved construction progress schedule and schedule of values.

The provisions of Alaska Statute 36, Section 36.90, and Article 3 entitled "Public Construction Contract Payment" apply to this project.

Article 7.7 Final Payment

Add the following paragraphs after the first paragraph:

Additional administrative actions and submittals that must precede or coincide with submittal of the final application for payment include the following:

1. Evidence of completion of project closeout requirements.
2. Completion of items specified for completion after substantial completion and all applicable punchlist(s) from the Engineer.
3. Proof that incomplete Work has been completed and accepted by the Owner.

4. Transmittal of required project construction records to the Owner's representative.
5. Removal of temporary facilities and services, surplus materials, rubbish, and similar elements.
6. Change of door and gate locks to Owner.
7. Approved redlines for record drawings.

Article 7.8 Correction of Work after Final Acceptance Date

Delete the first sentence of the first paragraph and replace with the following:

Placement of the Project on warranty shall not relieve the Contractor of his responsibility for paying all costs resulting from defects in materials or workmanship supplied under the terms of the Contract, and for correction of those defects, for a period of two (2) years following the Final Acceptance Date.

SECTION 10.08 FORMS

Delete this Section. All forms required for this Project are provided in Section V of the Contract Documents.

B. DIVISION 20 EARTHWORK

SECTION 20.01 GENERAL

Article 1.6 Subsurface Investigation

Add the following paragraph to the end of the Article:

Bore logs are included in Section X of the Contract Documents.

SECTION 20.12 DEWATERING

Article 12.3 Construction

Add the following paragraph to the end of the Article:

Trench dewatering shall be required to protect adjacent utilities and property and to install the new utility lines successfully. The Contractor shall provide copies of any and all dewatering permits and approvals to the Engineer.

Article 12.4 Measurement

Delete this Article and replace with the following:

No measurement will be made for Work in this Section.

Article 12.5 Basis of Payment

Delete this Article and replace with the following:

No separate payment will be made for Work in this Section. All Work associated with Dewatering will be considered incidental to the Contract.

SECTION 20.13 TRENCH EXCAVATION AND BACKFILL

Article 13.3 Construction

E. Locator Tape

Delete the fourth sentence and replace with the following:

The Contractor shall install the locator tape at least 24 inches but no more than 36 inches above the crown of the pipe.

SECTION 20.16 FURNISH BEDDING MATERIAL

Article 16.2 Materials

D. Class "E" Bedding

Add the following paragraph to the end of the subarticle:

In addition to the grading limits above, the fraction of materials passing the #200 sieve shall not be greater than 20 percent of that fraction passing the #4 sieve. The material shall not include mechanically fractured materials.

SECTION 20.27 DISPOSAL OF UNUSABLE OR SURPLUS MATERIAL

Article 27.2 Construction

Add the following paragraph to the end of the Article:

If asbestos-cement pipe is encountered and has to be removed from the trench and disposed of, the Contractor is hereby notified that Federal regulations governing the removal and disposal of asbestos are NESHAP 40 CFR, Part 61, Subpart M, and OSHA 29 CFR 1910. The Alaska Department of Environmental Conservation requirements include, but are not limited to 18 AAC 50, Air Quality Control Regulations, and 18 AAC 60, Solid Waste Management Regulations. The Alaska Department of Labor governing regulations include but are not limited to Occupational Safety and Health Standard, Subchapter 04.0103: Asbestos; 8 AAC 61.600.790 Article 8; and Alaska Workers Right to Know, AS 18.60. Asbestos-cement pipe removed from the trench must be handled and disposed in accordance with the applicable Federal and State regulations. Asbestos-cement pipe must be disposed of and declared at the Hiland Road Municipal Landfill.

Article 27.4 Measurement

Add the following paragraph to the end of the Article:

No measurement will be made for the removal, handling, and disposal of asbestos-cement pipe.

Article 27.5 Basis of Payment

Add the following paragraph to the end of the Article:

No separate payment will be made for the removal, handling, and disposal of asbestos-cement pipe. All Work associated with the removal, handling, and disposal of asbestos-cement pipe will be considered incidental to the Contract.

SECTION 20.30 SHORING, SHEETING AND BRACING/SHORING AND SHEETING LEFT IN THE TRENCH AND PORTABLE

Article 30.1 General

Add the following at the end of the Article:

The Work under this Section also includes all operations necessary to shore, brace and protect from harm existing utilities located within the project area. Utilities include underground facilities as well as overhead facilities, utility poles, supporting structures and street lights.

C. DIVISION 60 WATER SYSTEMS

SECTION 60.01 GENERAL

Article 1.2 Applicable Standards

Add the following items to the list of standards:

ANSI/AWWA C550-05 Standard for Protective Epoxy Interior Coatings for Valves and Hydrants

AWWA M23 PVC Pipe - Design and Installation

ASTM D1784-07 Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds

ASTM D2837-04 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

SECTION 60.02 FURNISH AND INSTALL PIPE

Article 2.3 Materials

I. Fittings and Gaskets

Delete the first two sentences of the fifth paragraph and add the following:

Only stainless steel bolts shall be used.

Add the following to the end of the fifth paragraph:

Only lubricants with NSF 61 certification shall be used as approved by the Engineer.

NEW SECTION 60.09 CONSTRUCT WELL FIELD UPGRADE

Article 9.1 General

The Work under this Section consists of providing all labor, equipment, and materials to construct the Whittier Well Field Upgrade as shown on the Drawings and described herein.

Technical specifications for the Work utilize a combination of MASS and CSI format specifications.

Refer to Part III Technical Specifications for additional CSI format specifications. If a specific work item is not listed in the Technical Specifications, reference MASS for the applicable section.

The Standby Generator to be installed at the Manifold Building is Owner-furnished. The generator is currently mounted to a mobile trailer located at the Whittier Public Works garage. Contractor shall be responsible for transporting and installing the generator in the Manifold Building, including anchoring it to the concrete floor slab.

A Contractor Staging Area is provided as shown on the Drawings. The staging area is a parcel with an abandoned concrete slab that functions as a storage area for the City of

Whittier. Contractor shall remove and dispose of existing debris in the storage area as detailed on the Drawings. The concrete slab will remain in place.

This work does not include construction of the following items:

1. Well Pumps, Discharge Piping, and Appurtenances
2. Decommission Municipal Water Wells

Article 9.2 Quality Assurance

A. Codes: Perform all work in strict accordance with all applicable national, state, and local codes including, but not limited to, the latest legally enacted editions of the following codes, including local adopted local amendments and provisions:

1. International Building Code - IBC
2. International Fire Code - IFC
3. International Mechanical Code - IMC
4. National Electric Code

B. Standards: Reference to the following standards infers that installation, equipment, and materials shall be within the limits for which it was designed, tested, and approved, in conformance with the current publications and standards of the following organizations:

1. American Concrete Institute - ACI
2. American Institute of Steel Construction - AISC;
3. American National Standards Institute - ANSI;
4. American Society of Civil Engineers - ASCE;
5. American Society for Testing and Materials - ASTM;
6. American Society of Heating, Refrigerating and Air Conditioning Engineers - ASHRAE (Standard 90-75)
7. Factory Mutual - FM;
8. Institute of Electrical and Electronics Engineers - IEEE;
9. National Electrical Contractors Association - NECA;
10. National Electrical Manufacturers' Association - NEMA;
11. National Fire Protection Association - NFPA; and
12. Underwriters Laboratory - UL

Article 9.3 Shop Drawings, Product Data, and Manufacturer's Instructions

A. Shop Drawings

1. Basic requirements for Shop Drawings are identified in Section 10.05 Control of Work, Article 5.5 Shop Drawings.

2. Minimum sheet size shall be 8-1/2 inches x 11 inches. Identify each element of the Shop Drawings by reference to drawing numbers or specification section.
- B. Product Data
1. Basic requirements for Product Data are identified in Section 10.05 Control of Work, Article 5.6 Product Data.
- C. Manufacturer's Instructions
1. Provide manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, balancing and finishing of material and equipment.

Article 9.4 Operation and Maintenance Data

Provide Operation and Maintenance Data as detailed below and as specified in the Technical Specifications.

- A. O&M Manuals shall be in accordance with MASS Article 10.4.20 Operating and Maintenance Manuals.
- B. Contractor shall compile an individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components and subunits.
1. Describe maintenance requirements, including routine procedures, a guide to troubleshooting, disassembly, repair, re-assembly, adjusting, balancing and checking instructions. In addition, provide the following information:
 - a. Manufacturer's printed operation and maintenance instructions.
 - b. Sequence of operation by controls manufacturer.
 - c. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required to perform maintenance.
 - d. Detailed lubrication instruction and diagrams showing points to be greased or oiled; recommended type, grade, and temperature range of lubricants and frequency of lubrication for each piece of equipment on the summary forms.
 2. Recommended Spare Parts:
 - a. Data shall be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals.
 - b. "Unit" is the unit of measure for ordering the part
 - c. "Quantity" is the number of units recommended.
 - d. "Unit Cost" is the current purchase price.
 3. Content for each Electric or Electronic Item or System shall include a description of the Unit and Component Parts including:
 - a. Function, normal operation characteristics, and limiting conditions.
 - b. Performance curve, engineering data, nameplate data, and test results.
 - c. Complete nomenclature and commercial number of replaceable parts.

- d. For panel board circuit directories, provide electrical service characteristics, controls and communications. Include as-installed color-coded wiring diagrams.
 - e. Describe operating procedures, including start-up, break-in, and routine operating requirements and sequences. Include regulation, control, stopping, shut-down and emergency instructions.
- C. Materials and Finishes:
- 1. Include product data, with catalog number, size, composition and color and texture designations, as well as information for re-ordering custom manufactured products.
 - 2. Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

Article 9.5 Project Record Drawings

Maintain Record Drawings as specified in Section 10.04 Scope of Work, Article 4.19 Record Documents.

Article 9.6 Spare Parts

Provide quantities of products, spare parts, maintenance tools, and maintenance materials specified in each specification section. In general, some individual equipment specifications call for the submittal of a manufacturer's recommended spare parts list and list of spare parts sources.

Article 9.7 Materials

Materials shall be new and conform to the details shown on the Drawings and as specified herein.

- A. General: All materials incorporated into the project shall be new and of recent manufacture. Materials manufactured more than 18 months prior to date of issuance of NTP shall not be used.
- B. Water Pipe, Fittings, Bolts, Nuts, and Gaskets: Piping, fittings, bolts, nuts, and gaskets shall conform to the requirements of Section 60.02 Furnish and Install Pipe.
- C. Gate Valves: Gate valves shall conform to the requirements of Section 60.03 Furnish and Install Valves. Gate valves installed inside the building shall be hand-wheel operated and open counterclockwise. Gate valves installed outside the building shall have a 2-inch square operating nut and open counterclockwise.
- D. Sewer Pipe: Building drain pipe (floor drain/waste piping) to drywell shall conform to the requirements of Section 50.02 Furnish and Install Pipe.
- E. Masonry Block Manifold Building: Masonry block building and building systems shall conform to Part III Technical Specifications.
- F. Conduits and Fittings: Conduit and fitting materials shall conform to the requirements of Part III Technical Specifications.

- G. Wire and Cable: Wire and cable materials shall conform to the requirements of Part III Technical Specifications.
- H. Controls and Electrical Components: Controls and Electrical Components shall conform to the requirements of Part III Technical Specifications.

Article 9.8 Construction

- A. Prepare, implement, and maintain a SWPPP in accordance with Section 20.02 Storm Water Pollution Prevention Plan.
- B. Coordinate with utility companies in accordance with Section 10.04 Scope of Work, Article 4.17 Utilities for electric and gas services.
- C. Clear all vegetation and trees within the limits shown on the Drawings and process the materials through an industrial woodchipper. Resulting wood chips and organic debris may remain onsite. Grade the entire site smooth, including piles of accumulated wood chips. Grubbing is not required.
- D. Provide all necessary trench excavation, backfill, and compaction in accordance with Section 20.13 Trench Excavation and Backfill. Provide all necessary dewatering in accordance with Section 20.12 Dewatering.
- E. Furnish and install water main piping, fittings, and appurtenances in accordance with Section 60.02 Furnish and Install Pipe, including the requirements for flushing, hydrostatic testing, and disinfection.
- F. Fittings and valves installed outside the Manifold Building shall have Restrained Mechanical Joints. Fitting and valves installed inside the Manifold Building shall have Flanged Joints. Thrust blocks shall be installed at all fittings outside the Manifold Building.
- G. Valves: Before installation, carefully clean valves of all foreign material, adjust stuffing boxes, and inspect valves in OPEN and CLOSED positions. Install valves in accordance with the applicable portions of these Specifications. Unless otherwise indicated, install valves with the stem vertical. Installation practices shall conform to manufacturer's recommendations.
- H. Furnish and install sewer piping in accordance with Section 50.02 Furnish and Install Pipe.
- I. Construct the masonry block building and building systems in accordance with Part III Technical Specifications.
- J. Construct the dry well as shown on the Drawings.
- K. Prior to joining flanged valves, the flange faces shall be thoroughly cleaned. After cleaning, insert the gasket and tighten the nuts progressively and uniformly. If flanges leak under pressure, loosen the nuts, reseal or replace the gasket, retighten the nuts, and retest the joint. Joints shall be watertight at test pressures before acceptance.
- L. Paint all new valves, piping, and appurtenances inside the Manifold Building in accordance with Part III Technical Specifications.

- M. Install Owner-provided standby generator as shown on the Drawings and in accordance with Part III Technical Specifications.
- N. Furnish and install controls and electrical improvements in accordance with Part III Technical Specifications.
- O. Furnish and install classified material in accordance with Section 20.21 Classified Fill and Backfill.
- P. Furnish and install water reservoir transducer as shown on the Drawings. Coordinate access to the reservoir with the City of Whittier. After installation of the transducer, clean and disinfect the reservoir in accordance with AWWA Standard C652 Disinfection of Water-Storage Facilities, most current edition.
- Q. Furnish and install two 6-inch high x 12-inch wide signs (red text, white background, red border) in building Manifold Room and Generator Room with this wording: NO CHEMICAL STORAGE ALLOWED IN THIS FACILITY

Article 9.9 Measurement

Measurement for Construct Well Field Upgrade shall be by lump sum.

Article 9.10 Basis of Payment

Payment for this Work shall be in accordance with Division 10 Standard General Provisions, Section 10.07, Measurement and Payment, and shall include full payment for all Work described in this Section.

The Work to Construct Well Field Upgrade shall consist of providing all labor, materials, and equipment necessary to construct the facility as shown on the Drawings and described herein. The unit price shall include, but not be limited to, the following incidental items: preparation, implementation, and maintenance of the SWPPP; coordination with utility companies; construction survey measurement; removal and disposal of existing debris at the project-provided Contractor Staging Area; clearing, chipping, and grading smooth the area within the limits shown on the Drawings; site grading for the Manifold Building; furnishing and installing classified fill and backfill and bedding material; trench excavation, backfill, and compaction; excavation dewatering; trench support system; connection to existing water main; connection to well piping; furnishing and installing water main piping, fittings, appurtenances, valves, thrust blocks, and board insulation; disposal of unusable or surplus material; and cleanup. In addition, the Work shall include construction of the masonry block building with lighting, electrical, and mechanical systems; furnishing and installing the building piping, fittings, valves, and appurtenances; furnishing and installing all controls; installation of Owner-furnished standby generator; furnishing and installing dry well and associated sewer piping; furnishing and installing well pumps electrical and controls; furnishing and installing water reservoir transducer; and cleanup.

Payment shall be made under the following unit:

ITEM	UNIT
Construct Well Field Upgrade	Lump Sum

NEW SECTION 60.10 WELL PUMP

Article 10.1 Description

This Work shall consist of providing all labor, materials, and equipment required to furnish and install a submersible type vertical turbine pump as shown on the Drawings and described herein, including pitless unit system and discharge piping.

The 12-inch steel well casings and well screens were installed and Well A and Well B were developed and test pumped in December 2020. Well A has a production rate of 750 gpm, with a short term (6 hour) pumping rate of 850 gpm. Well B has a production rate of 500 gpm, with a short term (6 hour) pumping rate of 700 gpm.

The Work includes providing a spare submersible type vertical turbine pump.

Furnishing and installing the well pumps electrical and controls is included under Section 60.09 Construct Well Field Upgrade.

Article 10.2 Submittals

Submittals shall include well pump, check valve, discharge piping, pitless unit system, and decorative planter.

Article 10.3 Materials

A. Well Pump

1. The motor and pump shall be designed for continuous operating service in submerged conditions and constructed as follows to meet the intended service. Pumps shall be driven by a motor attached below the pump section. The pumping unit shall be designed and furnished in accordance with the latest Hydraulic Institute and AWWA Standard for submersible pumps.
2. Pump shall be suitable for operation in a 12-inch nominal diameter well casing.
3. Well pump and appurtenances shall be NSF 61 certified.
4. Design operating conditions shall be as follows:
 - a. Design Capacity at Duty Point 750 GPM
 - b. Design Total Dynamic Head at Duty Point..... 290 Feet
 - c. Maximum Capacity 850 GPM
 - d. Maximum Total Dynamic Head..... 315 Feet
 - e. Maximum Allowable Speed..... 3460 RPM
 - f. Minimum Efficiency at Design Point..... 83%
 - g. Discharge Size..... 6.0-inch
 - h. Pumpage Temp 33 to 35 Degrees F
5. Pump shall be Goulds VIS-BATM Submersible Turbine, Model 9RCLC 3-Stage, or approved equal.
6. Lift Chain/Cable

- a. Well pump shall include a lift chain/cable capable of lifting well pump in case discharge piping is separated from the pump.
 - b. Lift chain/cable shall be routed to the well cap and secured.
 - c. Lift chain/cable shall be NSF 61 certified.
7. Pump Design
- a. A check valve shall be integrally designed into the pump discharge housing.
 - b. Pumping downthrust shall be absorbed by the motor thrust bearing.
 - c. A filter screen shall be included as part of the suction inlet assembly.
8. Pump Construction
- a. Bowl assembly: The bowls shall be flanged type constructed of close grained cast iron conforming to ASTM A48, Class 30. They shall be free from sand holes, blowholes, or other faults and must be accurately machined and fitted to close tolerances. They shall be capable of withstanding a hydrostatic pressure equal to twice the pressure at rated flow or 1.5 times shut-off head, whichever is greater. The intermediate bowls shall have enamel or epoxy lined waterways for maximum efficiency and wear protection. All intermediate bowls shall be of identical design for interchangeability. All the bowls shall be fitted with sleeve type bearings of ASTM B584 bismuth bronze. A discharge bowl shall be used to connect bowl assembly to the discharge pipe. An extra-long bronze bearing packed with non-soluble grease shall be provided in the top bowl and extended into the discharge bowl. The bearing shall have a threaded cast iron cap or plug at the top to protect the bearing from abrasives. The hub of the discharge bowl should be such that the bearing can be easily removed through the top of the hub. A thrust ring shall be above the top impeller to prevent excessive vertical upthrust.
 - b. Impellers: The impellers shall be constructed from ASTM A744M type 316 stainless steel and shall be the enclosed type. They shall be free from defects and must be accurately cast, machined, balanced, and filed for optimum performance and minimum vibration. Impellers shall be balanced to grade G6.3 of ISO 1940 as minimum. They shall be securely fastened to the bowl shaft with taper locks of C1018.
 - c. Motor Adapter: The inlet motor adapter shall be of ASTM A536 Gr. 65-45-12 ductile iron and shall contain an extra-long bronze bearing. The inlet area shall have a net open area of at least four times the eye of the impeller and shall be protected with a 304 stainless steel screen. The openings on the screen shall not be more than 75% of the minimum opening of the water passage through the bowl or the impeller.
 - d. Shaft: The pump shaft shall be of ASTM A582 type 416 stainless steel. It shall be precision ground and polished with surface finish better than 40 RMS.

- e. Coupling: The shaft coupling shall be of stainless steel and be capable of transmitting the total torque and total thrust of the bowl assembly in either direction of rotation.

9. Submersible Cable

Pump cable shall be sized to limit the voltage drop to no more than 5%. The cable shall have three separate conductors and a ground and shall be included in a single continuous jacketed assembly. The insulation shall be water and oil resistant, and suitable for continuous immersion. The cable should be the length of the discharge pipe plus the length necessary to extend to the junction box. The cable should be adequately secured to the discharge pipe by plastic ties, or other non-metallic means, at 10-foot intervals.

10. Motor Design

The motor shall be a heavy duty canned (or wet wound) type of NEMA design 3600 RPM, with outside diameter suitable for operation in a 12-inch nominal diameter well casing. The motor shall be capable of continuous operation under water at the specified conditions outlined above. A suitable thrust bearing shall be incorporated in the lower end of the motor adequate to receive the entire hydraulic thrust load of the pump unit plus the weight of the rotating parts regardless of the direction of rotation. The motor shall be 100 horsepower, rated for 460 volts, 3 phase, 60 hertz, and inverter duty rated.

The motor leads shall be of sufficient length so that they may be spliced above the bowl assembly and the leads shall be protected by a type 304 stainless steel cable guard held in place with stainless steel banding. As the motor lead exit the top of the cable guard it shall be properly protected to prevent damaging or cutting the lead by the cable guard material.

11. Operation: Well pumps shall be activated as indicated in the controls narrative shown in the Drawings.

12. Warranty: Pumps shall be warranted for a period of two full years after date of shipment.

B. Controls

1. See Section 60.09 Construct Well Field Upgrade for all controls and electrical components required to provide a complete working system.

2. Thermal Shutdown:

- a. Thermal sensors and alarms are required for all pumps and shall not take the place of panel overload protection.
- b. The heat sensor shall be low resistance, bi-metallic disc that is temperature sensitive.
- c. The heat sensor shall be mounted directly on the stator windings and sized to open at 120 degrees C and automatically reset at 30-35 degree C differential.

- d. Thermal sensor warning lights will be mounted on the control panel. Thermal sensor shutdown in the motor shall be indicated by a panel mounted indicating lamp.
 - e. Thermal shutdown shall activate the lighted alarm indications. Light shall remain on until manually reset.
- C. Discharge Piping
- 1. Schedule 40 galvanized steel pipe in accordance with ANSI/AWWA E101.
 - 2. Connected by threaded sleeve type galvanized coupling.
 - 3. 6-inch nominal diameter.
- D. Pitless Unit System
- 1. Pitless unit system shall be manufactured specifically for completing a Class A municipal water well, and include well cap, upper casing extension to accommodate bury depth, discharge body, spool, discharge and drop connection, lift-out bail, and hold-down assembly.
 - 2. Pitless unit system shall be NSF 61 certified, Baker Water Systems/Monitor Standard Pitless Unit or approved equal.

Article 10.4 Construction

- A. Factory Pump Testing
- 1. Pump shall be fully tested on water at the pump factory before shipment. Certified test data will include head, capacity, motor output HP, RPM, pump efficiency and be charted and graphed.
 - 2. Pump shall be vibration tested when operating at prime design point at the pump factory before shipment. Test shall be conducted as directed by the Hydraulic Institute Standards according to Level "B" and under the direction of a registered Engineer.
 - 3. Pump shall be hydrostatically tested for casing integrity at 1.25 times the shut-off pressure of actual trim at operating speed at the pump factory before shipment. Tests shall be conducted as directed by a registered Engineer and data certified.
 - 4. Pump shall be tested for its NPSHR, when operating and in conjunction with the H/Q performance test conducted at the pump factory before shipment. The test shall include five points on the test performance curve using water at ambient temperature.
- B. Pitless Unit System
- 1. Provide all necessary trench excavation, backfill, and compaction in accordance with Section 20.13 Trench Excavation and Backfill. Provide all necessary dewatering in accordance with Section 20.12 Dewatering.

2. Excavate to the depth as shown on the Drawings and cut existing well casing for installation of pitless unit system. Install pitless unit system in accordance with manufacturer's instructions and as shown on the Drawings
 3. Surfaces to be welded shall be free from loose scale, rust, grease, paint, and other foreign materials, except for mill scale that withstands vigorous wire brushing. Joint surfaces shall be free from fins and tears.
 4. The technique of welding employed, the appearance and quality of the welds made, and the methods of correcting defective work shall be in accordance with current standards of the American Welding Society and shall conform to normally accepted standards of workmanship.
 5. At ambient temperatures below 32 degrees F, surfaces within 3 inches of the weld area shall be preheated to 150 degrees F immediately before welding is started. Welded sections shall be true to line and free from twists, bends, offsets, and open joints. All welded joints shall be complete penetration type and shall be watertight.
 6. Prior to backfilling the pitless unit system, install sanitary seal in accordance with ADEC requirements. Provide continuous grouting from existing sanitary seal at bottom of excavation to surface.
- C. Pump Installation
1. Install well pump, check valve, discharge piping, and centralizers in accordance with manufacturer's instructions and as shown on the Drawings.
 2. Contractor shall be responsible for determining and documenting pump intake elevation and providing copy of elevation data to Engineer.
- D. Well Pad, Decorative Planter, and Bollards
1. Construct well pad as shown on the Drawings. Grade pad to drain away from well in all directions. Furnish and install Type IIA Classified Fill as required.
 2. Furnish and install concrete decorative planter over the pitless unit system as shown on the Drawings.
 3. Furnish and install bollards in accordance with Section 70.13 Bollards and as shown on the Drawings.
- F. Start-up: Provide a factory-authorized representative to approve installation and provide a minimum of 2 hours of start-up and maintenance instruction to the Owner's personnel.
- G. Field Quality Control: Pump shall deliver the rated volume measured in gallons per minute (GPM) at the conditions indicated, without either vibration or cavitation. If deficiencies are revealed during testing, such deficiencies shall be corrected and the testing shall be repeated.
- H. Provide disinfection and bacteriological testing for well, well pump, and appurtenant piping and valves in accordance with AWWA Standard C654-21 Disinfection of Wells.

Article 10.5 Measurement

Measurement for Furnish and Install Well Pump shall be by lump sum for each well pump complete and accepted.

Measurement for Furnish Spare Well Pump shall be by each.

Article 10.6 Basis of Payment

Payment for this Work shall be in accordance with Division 10 Standard General Provisions, Section 10.07, Measurement and Payment, and shall include full payment for all Work described in this Section.

The Work to Furnish and Install Well Pump shall consist of providing all labor, materials, and equipment necessary to construct the well pump as shown on the Drawings and described herein. The unit price shall include, but not be limited to, the following incidental items: clearing; furnishing and installing classified fill and backfill, trench excavation, backfill, and compaction; excavation dewatering; trench support system; furnishing and installing pitless unit system and sanitary seal; furnishing and installing well pump, check valve, discharge piping, fittings and associated appurtenances; testing and training; furnishing and installing well pad, concrete decorative planter, and bollards; disinfection and bacteriological testing; and cleanup.

The Work to Furnish Spare Well Pump shall include providing complete spare pump and motor assembly to Owner in original shipping packaging/container. Well pump shall meet all requirements of this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish and Install Well Pump (number)	Lump Sum
Furnish Spare Well Pump	Each

NEW SECTION 60.11 DECOMMISSION MUNICIPAL WATER WELL

Article 11.1 General

The Work under this Section consists of providing all labor, equipment, materials, supplies, transportation, handling, and disposal required to decommission an existing municipal water well and demolish its well house as shown on the Drawings and described herein.

The City of Whittier shall have first rights to salvage components of the existing well and well house. All components designated for salvage by City of Whittier shall be placed in a secure on-site location to await removal by City personnel. All other materials shall be disposed of in accordance with Section 20.13, Disposal of Unusable or Surplus Material.

Decommissioning the water well and demolishing the well house shall not commence until the new Manifold Building, Well A, and Well B are each commissioned and fully operational.

Existing Well No. 1 is 75 feet deep and was constructed with a 10-inch casing, circa 1950. The well pump is 50 HP and rated for 530 gpm. Well No. 1 has a water meter installed in the well house.

Existing Well No. 2 is 76 feet deep and was constructed with an 8-inch casing, circa 1950. The well pump is 20 HP and rated for 220 gpm. Well No. 2 has a water meter and pressure reducing valve (PRV) installed in the well house.

Existing Well No. 3 is 80 feet deep and was constructed with an 8-inch casing, circa 1950. The well pump is 25 HP and rated for 250 gpm. Well No. 3 has a water meter and PRV installed in the well house.

Article 11.2 Construction

- A. Coordinate with utility providers to remove existing electric and gas services.
- B. Demolish the existing well house as shown on the Drawings. Remove and dispose of building, floor slab, foundation, piping, valves, electrical, lighting, HVAC equipment, and appurtenances in accordance with Section 20.27 Disposal of Unusable or Surplus Material.
- C. Provide all necessary trench excavation, backfill, and compaction in accordance with Section 20.13 Trench Excavation and Backfill.
- D. Backfill the excavation with classified material in accordance with Section 20.21 Classified Fill and Backfill. Grade to match existing ground at well house site.
- E. Decommission the existing municipal water well in accordance with ADEC Drinking Water Regulations for a Public Water Supply Well. Provide notification to ADEC that well has been permanently abandoned.

Article 11.3 Measurement

Measurement for Decommission Municipal Water Well shall be by lump sum for each well decommissioned, complete, and accepted.

Article 11.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10 Standard General Provisions, Section 10.07, Measurement and Payment, and shall include full payment for all Work described in this Section.

The Work to Decommission Municipal Water Well shall consist of providing all labor, materials, and equipment necessary to demolish the well house and decommission the existing well as shown on the Drawings and described herein. The unit price shall include, but not be limited to, the following incidental items: coordination with utility providers; trench excavation, backfill, and compaction; removal and disposal of well house, foundation, piping, and components; decommissioning the well; disposal of unusable or surplus material; furnishing and installation of classified fill and backfill; final site grading; and cleanup.

Furnishing and installing line stop shall be paid under the appropriate bid items.

Payment shall be made under the following unit:

ITEM					UNIT
Decommission (number)	Municipal	Water	Well	No.	Lump Sum

END OF SPECIAL PROVISIONS

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION IV
TECHNICAL SPECIFICATIONS

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

INDEX TO TECHNICAL SPECIFICATIONS

SPECIFICATIONS GROUP

GENERAL REQUIREMENTS SUBGROUP

Division 01 – General Requirements (Not Used)

FACILITY CONSTRUCTION SUBGROUP

Division 02 – Existing Conditions (Not Used)

Division 03 – Concrete

Section 03 30 00 Cast-In-Place Concrete15 pages

Division 04 – Masonry

Section 04 22 00 Concrete Unit Masonry.....10 pages

Division 05 – Metals

Section 05 50 00 Metal Fabrications6 pages

Division 06 – Wood, Plastics, and Composites

Section 06 10 00 Rough Carpentry4 pages

Section 06 16 00 Sheathing2 pages

Section 06 17 53 Shop-Fabricated Wood Trusses.....4 pages

Section 06 83 16 Fiber Reinforced Plastic Paneling4 pages

Division 07 – Thermal and Moisture Protection

Section 07 21 10 Building Insulation5 pages

Section 07 26 00 Vapor Retarders4 pages

Section 07 41 14 Metal Standing Seam Roof System.....12 pages

Section 07 42 13 Metal Wall Panels.....4 pages

Section 07 62 10 Flashing and Trim.....6 pages

Division 08 – Openings

Section 08 16 10 Fiberglass Doors and Frames5 pages

Section 08 36 13 Sectional Doors3 pages

Section 08 71 00 Door Hardware6 pages

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

Division 09 – Finishes

Section 09 21 16	Gypsum Board Assemblies	6 pages
Section 09 22 16	Non-Structural Metal Framing	3 pages
Section 09 90 00	Painting and Coating	12 pages
Section 09 91 00	Building Painting.....	10 pages

Division 10 – Specialties (Not Used)

Division 11 – Equipment (Not Used)

Division 12 – Furnishings (Not Used)

Division 13 – Special Construction (Not Used)

Division 14 – Conveying Equipment (Not Used)

FACILITY SERVICES SUBGROUP

Division 21 – Fire Suppression (Not Used)

Division 22 – Plumbing

Section 22 11 19	Piping and Tubing Systems.....	2 pages
------------------	--------------------------------	---------

Division 23 – Heating, Ventilating, and Air-Conditioning (HVAC)

Section 23 11 23	Facility Natural Gas Piping	8 pages
Section 23 31 00	HVAC Ducts	6 pages
Section 23 33 00	HVAC Accessories	6 pages
Section 23 34 00	HVAC Fans	5 pages
Section 23 55 00	Fuel-Fired Heaters	5 pages
Section 23 82 39	Electric Heaters	3 pages
Section 23 84 00	Humidity Control Equipment.....	3 pages

Division 26 – Electrical

Section 26 01 26	Electrical Tests	2 pages
Section 26 05 00	Electrical Work, General.....	11 pages
Section 26 05 05	Electric Motors.....	3 pages
Section 26 05 19	Wire and Cables	6 pages
Section 26 05 26	Grounding.....	4 pages
Section 26 05 33	Raceway and Boxes for Electrical Systems	11 pages
Section 26 05 43	Underground Raceway Systems	3 pages
Section 26 22 00 05	Dry Type Transformers.....	3 pages
Section 26 24 16 05	Panelboards	2 pages
Section 26 27 26	Wiring Devices	3 pages
Section 26 29 23	Variable Frequency Drive Units.....	11 pages
Section 26 36 05	Heavy-Duty Safety Switches	2 pages
Section 26 36 23	Automatic Transfer Switch.....	5 pages

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

Section 26 50 00	Lighting.....	4 pages
Section 26 99 90	Electrical Heat Trace	6 pages

Division 27 – Communications (Not Used)

Division 28 – Electronic Safety and Security (Not Used)

SITE AND INFRASTRUCTURE SUBGROUP

Division 31 – Earthwork (Not Used)

Division 32 – Exterior Improvements (Not Used)

Division 33 – Utilities (Not Used)

Division 34 – Transportation (Not Used)

Division 35 – Waterway and Marine Construction (Not Used)

PROCESS EQUIPMENT SUBGROUP

Division 40 – Process Integration

Section 40 90 00	Process Control and Instrumentation Systems.....	10 pages
Section 40 91 19 29	Pressure Measuring Systems.....	2 pages
Section 40 91 23 33	In-Line Liquid Flow Measuring Systems.....	2 pages
Section 40 91 23 36	Level Measuring Systems	2 pages
Section 40 95 13	Control Panels.....	11 pages

Division 41 – Material Processing and Handling Equipment (Not Used)

Division 42 – Process Heating, Cooling, and Drying Equipment (Not Used)

Division 43 – Process Gas and Liquid Handling, Purification, and Storage Equipment (Not Used)

Division 44 – Pollution Control Equipment (Not Used)

Division 45 – Industry-Specific Manufacturing Equipment (Not Used)

Division 48 – Electrical Power Generator (Not Used)

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 03 - CONCRETE

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Qualification Data: For testing agency.
- E. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Curing compounds.
 - 6. Bonding agents.

7. Repair materials.

F. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. 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."

C. 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. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.7 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. 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

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301
 2. ACI 117

2.2 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.
 1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
- C. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: Per Structural Drawings.

2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Normal-Weight Aggregates: ASTM C 33 coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 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. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94 and potable.

2.6 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.
- D. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Products
 - a. Dayton Superior: Cure & Seal 1315 J22WB.
 - b. L&M Construction Chemical, Inc.; Lumiseal WB Plus.
 - c. W.R. Meadows, Inc. Vocomp-30.

2.7 RELATED MATERIALS

- A. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.8 REPAIR MATERIALS

- A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 1. Basis of Design; PLANITOPX or ARDEX

2.9 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
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- C. 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 and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. 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.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Grade Beam, Pile Cap & Floors: Normal-weight concrete.
 1. Minimum Compressive Strength: Per Structural Drawings.

2. Maximum W/C Ratio: Per Structural Drawings.
3. Slump Limit: Per Structural Drawings.
4. Air Content: Per Structural Drawings..

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 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. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for smooth-formed finished surfaces.

- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Do not chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 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.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install link-seal or prep surface for link-seal around pipe penetrations.

3.3 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Locate horizontal joints at the top of footings or floor slabs.
 - 3. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. 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. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.6 FINISHING FORMED SURFACES

- A. 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.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

3.8 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 4 inches high unless otherwise indicated and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: Match slab strength.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.9 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. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. 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.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. 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 with the following materials:
 - a. Water.

- b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
- 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.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
- 3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than 28 days old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.11 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Contractor will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Special Inspections:
1. Steel reinforcement placement.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

- a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure one sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by engineer but will not be used as sole basis for approval or rejection of concrete.

12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by engineer.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.14 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 04 - MASONRY

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Miscellaneous masonry accessories.
- B. Related Requirements:
 - 1. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, finishes, colors, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
- C. Qualification Data: For testing agency.
- D. Material Certificates: For each type and size of the following:
 - 1. Masonry units.

- a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
2. Cementitious materials. Include name of manufacturer, brand name, and type.
 3. Mortar admixtures.
 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 5. Grout mixes. Include description of type and proportions of ingredients.
 6. Reinforcing bars.
 7. Anchors, ties, and metal accessories.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- F. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of (Per Structural Drawings).
 - 2. Density Classification: Normal weight.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
 - 4. Finish: Exterior face of CMUs shall be smooth face
 - 5. Color: Per owner or owner's representative. Contractor shall submit manufacturer's color options for review and selection.
 - a. Color 1: 70% of exterior walls.
 - b. Color 2: 30% of exterior walls.
 - 6. Weather Sealant: For exterior CMU surfaces. Sure Klean Weather Seal Siloxane WB Concentrate. Apply per manufacturer's recommendations.

2.5 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide color cement as required to produce mortar color that matches CMU color.
 - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Mortar Cement: ASTM C 1329/C 1329M.
- F. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- I. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: Per Structural Drawings.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from

0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. For reinforced masonry, use portland cement-lime masonry cement or mortar cement mortar.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For reinforced masonry, use Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.7 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor shall allow inspectors access to scaffolding and work areas as needed to perform tests and inspections.
- B. Testing Agency: Contractor will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- C. Special Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
- D. Testing Prior to Construction: One set of tests.
- E. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.8 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.9 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 05 - METALS

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included:
 - 1. Metal Fabrications.
- B. Products furnished, but not installed, under this Section:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related work:
 - 1. Section 03 30 00 – Cast-in-Place Concrete for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.

1.2 SUBMITTALS

- A. Dimensional prints: shall be submitted for approval prior to fabrication.

1.3 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Deliver materials to the jobsite in good condition and properly protected against damage to finished surfaces.
- B. Store material in a location and manner to avoid damage. Do not stack components. Lay out components on firm foundation material such that bending cannot occur.
- C. Store metal components in a clean dry location, away from uncured concrete, cement, or masonry products, acids, oxidizers, rain water, or any other chemical or substance that might damage the material or finish.
- D. Plan work and storage locations to keep on-site handling to a minimum.
- E. Exercise particular care to avoid damage to material finishes or unprotected surfaces when handling.

1.4 JOB CONDITIONS

- A. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- B. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
- C. Observe all appropriate OSHA safety guidelines for this work.

1.5 WARRANTY/GUARANTEEE

- A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (25) twenty five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.
- B. Manufacturer's Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

1.6 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.8 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 1. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Per Structural Drawings.
- C. Steel Bolts and Nuts: Per Structural Drawings.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers.
- E. Anchor Bolts: Per Structural Drawings.
 1. Hot-dip galvanized or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Eyebolts: ASTM A 489.
- G. Machine Screws: ASME B18.6.3.
- H. Lag Screws: ASME B18.2.1.
- I. Wood Screws: Flat head, ASME B18.6.1.
- J. Plain Washers: Round, ASME B18.22.1.
- K. Lock Washers: Helical, spring type, ASME B18.21.1.

- L. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- M. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

2.3 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.4 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.5 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.6 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 1. Shop prime with universal shop primer unless indicated.

PART 3 - EXECUTION

3.1 PREPARATIONS

- A. Coordination: Coordinate start and installation of metal fabrications with performance and construction requirements, and in accordance with approved shop drawings or dimensional prints. Fabricate and shop-assemble to greatest extent possible.
- B. Verification: Verify that dimensions and angles are correct and that substrate is in proper condition for metal fabrications installation. Do not proceed with installation until all necessary corrections have been made.

3.2 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

3.5 CLEAN-UP

- A. Leave work areas clean and free of debris.

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Wood blocking and nailers.
 - 3. Wood furring.
- B. Related Requirements:
 - 1. Section 06 16 00 - Sheathing
 - 2. Section 06 17 53 – Shop-Fabricated Wood Trusses

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- B. Exposed Framing: Framing not concealed by other construction.
- C. OSB: Oriented strand board.

1.4 INFORMATIONAL SUBMITTALS

- A. None.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 DIMENSION LUMBER FRAMING

- A. Joists, Rafters, and Other Framing: Per Structural Drawings.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- B. Dimension Lumber Items: Per Structural Drawings.
- C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Simpson Strong-Tie Co., Inc.
 2. USP Structural Connectors.
- B. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated of basis-of-design products of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
1. Use for interior locations unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.

2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
- J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 1. Comply with approved fastener patterns where applicable.
 2. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather.

END OF SECTION

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof sheathing.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- B. Factory mark panels to indicate compliance with applicable standard.

2.2 ROOF AND WALL SHEATHING

- A. Plywood or Oriented-Strand-Board Sheathing (DOC PS 2): Exterior sheathing.
 - 1. Span Rating: Per Structural Drawings.
 - 2. Nominal Thickness: Per Structural Drawings.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 2. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION

SECTION 06 17 53 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes shop fabricated wood trusses for roof framing; bridging, and bracing.
- B. Related Sections:
 - 1. Section 06 10 00 - Rough Carpentry.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A208.1 - Mat-Formed Wood Particleboard.
- B. ASTM International:
 - 1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 3. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 4. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
 - 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 6. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 7. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- C. Truss Plate Institute:
 - 1. TPI 1 - National Design Standard for Metal Plate Connected Wood Truss Construction.

- D. U.S. Department of Commerce National Institute of Standards and Technology:
 - 1. DOC PS 1 - Construction and Industrial Plywood.
 - 2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
 - 3. DOC PS 20 - American Softwood Lumber Standard.
- E. Western Wood Products Association:
 - 1. WWPA G-5 - Western Lumber Grading Rules.

1.3 SYSTEM DESCRIPTION

1.4 SUBMITTALS

- A. Shop Drawings: Indicate sizes and spacing of trusses and associated components, web and chord sizes, plate sizes, loads and truss cambers, and framed openings. Shop drawing shall be sealed by a Professional Engineer.
- B. Design Calculations: Submit design calculations. Design calculations shall be sealed by a Professional Engineer.
- C. Product Data: Submit truss configurations, bearing and anchor details, and bridging and bracing.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Lumber Grading Agency: Certified by DOC PS 20.
 - 2. Lumber: DOC PS 20.
- B. Truss Design, Fabrication, and Installation: In accordance with TPI 1.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Design trusses under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Alaska.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store truss depth in vertical position resting on intermittent bearing pads.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lumber Grading Rules: NFPA.

2.2 ACCESSORIES

- A. Wood framing: Per Structural Drawings.
- B. Fasteners and Anchors:
 - 1. Fasteners: Per Structural Drawings.
 - 2. Nails and Staples: Per Structural Drawings.
 - 3. Anchors: Per Structural Drawings.
- C. Bearing Plates: Hot dip galvanized steel.

2.3 FABRICATION

- A. Fabricate trusses to achieve structural requirements specified.
- B. Fabricate top chord extensions as indicated on Drawings.

2.4 SOURCE QUALITY CONTROL

- A. Inspect Work performed at fabricator's facility to verify conformance to Contract Documents.
- B. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop inspections are not required for Work performed by approved fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify supports and openings are ready to receive trusses.

3.2 PREPARATION

- A. Coordinate placement of support items.

3.3 ERECTION

- A. Set members level and plumb, in correct position.
- B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in alignment until completion of erection and installation of permanent bracing.
- C. Do not field cut or alter structural members without approval of Architect/Engineer.
- D. Place headers and supports to frame openings.
- E. Frame openings between trusses with lumber in accordance with Section 06 10 00.
- F. Coordinate placement of sheathing with work of this Section.

3.4 ERECTION TOLERANCES

- A. Framing Members: 1/2 inch maximum, from indicated position.

END OF SECTION

SECTION 06 83 16 - FIBER REINFORCED PLASTIC PANELING

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict only the most stringent shall apply.
1. ASTM C920 – Specification for Elastomeric Joint Sealants.
 2. ASTM D256 - Test Method for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
 3. ASTM D543 - Test Method for Resistance of Plastics to Chemical Reagents.
 4. ASTM D968 – Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
 5. ASTM D570 - Test Method for Water Absorption of Plastics.
 6. ASTM D2583 - Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor.
 7. ASTM D3841 - Specification for Glass Fiber-Reinforced Polyester Plastic Panels.
 8. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
 9. ANSI/ASTM E119 – Test Methods for Fire Tests of Building Construction and Materials.
 10. Underwriters Laboratories (UL) Listing and Fire Resistance Directory.
 11. International Building Code (IBC).

1.2 SUBMITTALS

- A. Submit product data, colors, installation, maintenance for panels, fasteners, adhesives, edge trim, and dividers for approval.
- B. Sample of panels and trims.

1.3 REGULATORY REQUIREMENTS

- A. Conform to IBC 803 for fire retardant characteristics.

1.4 STORAGE AND HANDLING

- A. Maintain panels and trim flat above ground protected from weather and moisture.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Maintain work area, substrate and materials 65 to 85 degrees F. 70 percent maximum relative humidity for 48 hours prior to, during and 48 hours minimum after installation.
- B. Provide adequate ventilation.

PART 2 - PRODUCTS

2.1 FIBER REINFORCED PLASTIC COATED PANELS (FRP)

- A. Fiberglass reinforced plastic resin wall liner - facer panels per ASTM D3841.
- B. Approved manufacturers subject to meeting specified criteria:
 - 1. Crane "Composites" : www.cranecomposites.com
 - 2. Marlite "FRP." : www.marlite.com
 - 3. Nudo Products, Inc.: www.nudo.com
- C. 0.090 inch thick by four feet by full length or minimum 10 feet.
- D. Fire retardant characteristics:
 - 1. U. L. class A, IBC class A maximum flame spread 25; maximum smoke developed 450 per ASTM E84.
- E. Hardness: 35 to 55 per ASTM D2583.
- F. Abrasion Resistance: 0.01 percent maximum after 25 cycle Tabor Test, or after 50 liters falling sand per ASTM 968.
- G. Water Absorption: 0.70 percent maximum in 24 hours per ASTM D570.

- H. Color-Surface: Highly resistant to mild acids and alkalis per ASTM D543.
 - a. Manufacturer's standard white, with pebbled surface textures as approved.
 - b. Backside roughened for adhesive bond.

2.2 PANEL EDGE TRIM

- A. Edges and Joints Trim: Shaped plastic inside corner, divider and edge "J" cap.
- B. Outside corners: 18 gage x 2 x 2-inch stainless steel or clear anodized aluminum.
- C. Stainless steel or aluminum screw trim fasteners.

2.3 PANEL FASTENERS AND ADHESIVES

- A. Plastic or stainless steel blind rivets, or round head stainless steel screws. Moisture resistant adhesives as recommended in writing by the panel manufacturer for moist conditions of use.

2.4 PANEL SEALANT

- A. Single component silicone in accordance with ASTM D920.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the DRAWING details and verify field conditions for defects that will adversely affect the work, and for deviations beyond allowable tolerances.
- B. Start of installation shall mean acceptance of the existing conditions as capable of producing an acceptable job.

3.2 FIBER REINFORCED PLASTIC PANEL INSTALLATION

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

submittals for conditions of use, using uniform full bed of adhesive. Evenly space panels plumb and level in space available.

- B. Set panel edges around penetrations into trim moldings with continuous bed of sealant. Allow thermal movement space between panels in accord with manufacturer's written instructions.
- C. Evenly space and predrill fastener holes oversize 1/8 to 1/4 inch.
- D. Secure moldings with approved screws evenly spaced at 12 inches maximum and 1 inch from ends maximum.
- E. Secure panel field with straight, level evenly spaced rivets or screws as recommended by panel manufacturer not more than at 18 inches and with adhesive.

3.3 TOLERANCES (NON-CUMULATIVE)

- A. Space around Mechanical, Electrical, and Other Penetrations: 1/4 to 1/2 inch before sealing.
- B. Plumb and level: 1/8-inch in 10 feet.
- C. Bowing or warping From Proper Plane: plus or minus 1/8 inch in ten feet.
- D. Gaps between Perimeter Edge Trim Molding and Abutting Surfaces: 1/8 inch maximum with no abrupt changes.

3.4 CLEANING

- A. Remove any excess visible adhesive or sealant using methods recommended by panel manufacturer.
- B. After panel trim installations wipe Panel and trim surfaces with a damp rag to remove dust and dirt.
- C. Leave Panels and adjacent surfaces in clean condition undamaged.

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

**DIVISION 07 - THERMAL AND MOISTURE
PROTECTION**

SECTION 07 21 10 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 07 26 00 - Vapor Retarders
- B. Section 07 92 00 - Joint Sealants
- C. Section 09 21 16 – Gypsum Board Assemblies
- D. Division 23 – HVAC Insulation

1.2 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this Specification. The publications may be referenced in the text by basic designation only. In case of conflict the most stringent shall govern:
 - 1. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) "Handbook of Fundamentals".
 - 2. Underwriter's Laboratories (UL) "Building Materials Directory".
 - 3. ASTM C165 – Test Method for Measuring Compressive Properties of Thermal Insulations.
 - 4. ASTM C177 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties By Means of the Guarded- Hot Plate Apparatus.
 - 5. ASTM C553 - Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications.
 - 6. ASTM C578 - Specification for Rigid Cellular Polystyrene Thermal Insulation.
 - 7. ASTM C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 8. ASTM C665 - Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 9. ASTM C1104 – Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
 - 10. ASTM C1338- Test Method for Deforming Fungi Resistance of Insulation Materials and Facings.

11. ASTM E84 - Tests for Surface Burning Characteristics of Building Materials.
12. ASTM E96 – Test Methods for Water Vapor Transmission of Materials.
13. ASTM E119 - Fire Tests of Building Construction and Materials.
14. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
15. ASTM 1621 – Test Method for Compressive Properties of Rigid Cellular Plastics.
16. National Fire Protection Association (NFPA) 285 – Standard Method of Test for Evaluation of Flammability Characteristics of Exterior Non-load – Bearing wall Assemblies Containing Combustible Components.

1.3 SUBMITTALS

- A. Manufacturer’s literature including material, composition, fire hazard ratings, and application instructions.

1.4 PRODUCT LABELING

- A. Insulation, or factory sealed packages of the insulation shall be marked by the insulation manufacturers as having the thermal resistance, fire hazard characteristics, water absorption, and compressive strength specified.

1.5 PROTECTION

- A. Store and protect insulation from moisture until permanently enclosed.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not heat building until vapor retarders are completely installed.
- B. Do not apply insulation to surfaces, which are frosty, damp or dirty.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Thermal Resistance Values R:

1. Fill spaces as shown on DRAWINGS and provide minimum "R" indicated.
 2. Indicated "R" shall be for the insulation material by itself per ASHRAE.
- B. Fire Hazard Classification: Insulation materials, including integral facing covers and vapor retarders, shall meet the following ratings when tested in accordance with ASTM E-84 (tunnel test). Not required for rigid insulation installed under concrete or earth.
- a. Fuel contributed: 50
 - b. Maximum installed flame spread: 25
 - c. Maximum smoke developed: 450 (50 for insulation left exposed).
 - d. Self-extinguishing.
- C. No added asbestos.
- D. No added formaldehyde.
- E. Blanket fibrous glass insulation: Green Guard Certified.

2.2 RIGID WALL INSULATION

- A. Expanded polystyrene foam insulation (EPS) per ASTM C578, conforming to the following requirements:
1. Rigid Board Size and thickness per DRAWINGS and as scheduled.
 2. Minimum thermal resistance "R" for 1 inch: 4.5 at 25 degrees F. per ASTM C518.
 3. Density 1.35 to 1.5 pounds per cubic foot.
 4. Minimum compressive resistance: less than 10 percent deformation under 15 psi uniform loading, per ASTM D1621.
 5. Maximum moisture absorption 3 percent by volume after 24 hour immersion per ASTM C272.
 6. Minimum vapor permeance: 2 perms per ASTM E96.

2.3 BLANKET (BATT) INSULATION

- A. Unfaced fibrous blanket of mineral wool or fibrous glass per ASTM C553 or C665 suitable for friction fit between framing or furring members.

2.4 ACCESSORIES

- A. As necessary to permanently secure insulation in place: Galvanized wire, screws, plastic washers, adhesive adhered stick-impaling pins, with press-on clips, tapes, adhesives and sealants recommended by insulation manufacturers for specified use.
 - 1. Tape:
 - a. 2 3/8 inch wide acrylic based pressure sensitive adhesive tape with polypropylene film, recommended by manufacturer for construction sealing against air and moisture: 3 mil minimum thick.
 - b. Owens Corning "Bild-R-Tape" or equal.

PART 3 - EXECUTION

2.5 EXAMINATION

- A. Examine DRAWINGS and verify field conditions to receive insulation for defects that will adversely affect the completed installation, and for deviation beyond allowable tolerances.
- B. Installation shall be done only after other trade work in the area is sufficiently complete to prevent subsequent disturbance of insulation.
- C. Beginning of installation shall mean acceptance of the interfacing surfaces as capable of producing an acceptable job.

2.6 PREPARATION

- A. Verify substrates are clean and dry. Remove loose or foreign matter.

2.7 INSTALLATION

- A. Install in accordance with approved submittals and manufacturers written instructions using necessary primers and accessories.
- B. Install continuously where indicated without voids. Fill spaces completely. Trim and fit closely around structure, door rough openings and frames, conduit, piping, obstructions and penetrations in accord with manufacturer's written instructions
- C. Coordinate to ensure separate vapor retarders are installed immediately after

insulation to avoid moisture build-up.

- D. Attach with sufficient tape, adhesives, or mechanical fasteners to permanently anchor insulation. Space stick pins where used at 16 inch maximum. Secure batt insulation between unfaced studs or joists with cross-wires at 12 inch.
- E. Where pipe or conduit is located in space to be insulated, place portion of insulation batt between pipe or conduit and building exterior. Compress insulation only slightly to keep in place.

END OF SECTION

SECTION 07 26 00 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 07 21 10 - Building Insulation
- B. Section 07 92 00 - Joint Sealants
- C. Section 09 21 16 - Gypsum Board Assemblies

1.2 APPLICABLE PUBLICATIONS

- A. The publications listed form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.
 - 1. ASTM C1136 - Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 - 2. ASTM D412 – Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - 3. ASTM D751 - Test Methods for Coated Fabrics.
 - 4. ASTM D882 -Test Methods for Tensile Properties of Thin Plastic Sheeting.
 - 5. ASTM D903 – Test Method for Peel or Stripping Strength of Adhesive Bonds.
 - 6. ASTM D 1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - 7. ASTM D1709 Test Methods for Impact Resistance of Plastic Film by Free-Falling Dart Method.
 - 8. ASTM D1790 - Test Method for Brittleness Temperature of Plastic Sheeting by Impact.
 - 9. ASTM D1876 -Test Method for Peel Resistance of Adhesives (T-Peel Test.)
 - 10. ASTM D2103 - Specification for Polyethylene Film and Sheeting.
 - 11. ASTM D2582 - Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
 - 12. ASTM D4533 – Test Method for Trapezoid Tearing of Geotextiles.

13. ASTM D7004 - Test Method for Grab Tensile Properties of reinforced Geo membranes
14. ASTM E84 -Test Method for Surface Burning Characteristics of Building Materials.
15. ASTM E96 -Test Methods for Water Vapor Transmission of Materials.
16. ASTM F1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.3 SUBMITTALS

- A. Manufacturer's literature including material, composition, fire hazard ratings, and application instructions. Provide proposed penetration, lap, and edge sealing methods.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Do not heat building with permanent insulation installed until vapor retarders are completely installed.

PART 2 - PRODUCTS

2.1 WALL AND CEILING SHEET VAPOR RETARDER:

- A. Tear resistant glass fiber or plastic cross thread reinforced sheet polyethylene plastic, or foil laminate per ASTM D2103 and D4397 minimum thickness 6 mils.
- B. Water Vapor Transmittance: 0.05 perm maximum per ASTM E96 method.
- C. Minimum tensile strength: 30 pound per inch width per ASTM C1136 or ASTM D882.
- D. Width: 8-foot minimum by continuous roll length.

2.2 ACCESSORIES

- A. Primers, adhesives, sealants, solvents, battens, staples, clips, stick pins, reglets, trim, and other accessories recommended by vapor retarder manufacturer and necessary for a complete installation.

2.3 TAPE

- A. Width: 2-inch minimum.

- B. Polyethylene or polypropylene tape, with water resistant self adhesive recommended by the vapor retarder membrane manufacturer for cold temperature application to polyethylene sheet and steel; minimum adhesive strength 25 ounces per inch width.
- C. Use tape specifically recommended by vapor retarder manufacturer:
 - 1. Owens Corning "Bild-R-Tape".

2.4 ADHESIVE

- A. Spray-on 3M Inc. "High tack adhesive 76" or equivalent recommended for adhesion to polyethylene.

2.5 SEALANT

- A. Single component Polyurethane or non-hardening synthetic rubber type per Section 07 92 00 - Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Drawing Details and field conditions to receive work for defects that will adversely affect the completed installation and for deviations beyond allowable tolerances.
- B. Substrate surfaces shall be free of sharp projections or holes over which the vapor retarder sheet can easily be applied without tearing or puncturing.
 - 1. Insulation shall be complete per Section 07 21 10 – Building Insulation and be dry, free of frost or ice.
- C. Verify that substrate work by other trades is complete and ready for vapor retarder.
- D. Beginning of installation shall mean acceptance of the existing conditions as capable of producing an acceptable job.

3.2 INSTALLATION

- A. Completed installation shall be continuous, without gaps, holes or tears and in accord with vapor retarder manufacturer's recommendations on warmest side of insulation to minimize vapor flow into insulation from the interior.
 - 1. Coordinate with framing installer to install separate sheets of vapor retarder through and around framing members for subsequent lap and seal.
- B. Joints:

1. Lap wall vapor retarder 4 inches minimum, staple or tape to supports or roll seams and staple together. Seal over seams continuously with tape.
- C. Edges: Seal edges with tape or adhesive onto firm continuous bearing: as at structure.
 - D. Layout vapor retarders to provide a single continuous sheet where possible with a minimum number of joints. Allow enough slack or pleats so that finish material installation does not tear vapor retarder.
 - E. Penetrations: Seal vapor retarder continuously around all structural, mechanical, electrical and other penetrations with tape and sealant in accord with vapor retarder recommendations. Wrap tape two times around penetration. Run separate sheet of wall vapor retarder behind electrical boxes or seal edges around electrical boxes with polyurethane sealant.
 - F. Attachment: Tape and adhesives or fasteners. Seal holes caused by fasteners with tape.
 - G. Extend wall vapor retarder into openings and similar, for trimming after finishes are applied. Seal with sealant to opening frames.
 - H. Lap wall and ceiling vapor retarders and tape.

END OF SECTION

SECTION 07 41 14 - METAL STANDING SEAM ROOF SYSTEM

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 07 42 13 - Metal Wall Panels
- B. Section 07 62 10 - Flashing and Trim
- C. Section 07 92 00 - Joint Sealants

1.2 APPLICABLE PUBLICATIONS

- A. The publications listed form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.
 - 1. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A792 - Specification for Steel Sheet, 55 percent Aluminum-Zinc Alloy-Coated by Hot-Dip Process.
 - 3. ASTM A924 – Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 4. ASTM B117 - Practice for Operating Salt Spray (Fog) Apparatus.
 - 5. ASTM C518 – Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 6. ASTM C578 – Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 7. ASTM D412 - Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
 - 8. ASTM D523 – Test Method for Specular Gloss.
 - 9. ASTM D714 - Test Method for Evaluating Degree of Blistering of Paints.
 - 10. ASTM D737 – Test Method for Air Permeability of Textile Fabrics.
 - 11. ASTM D822 – Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - 12. ASTM D882 – Test Methods for Tensile Properties of Thin Plastic Sheeting.

13. ASTM D903 – Test Method for Peel or Stripping Strength of Adhesive Bonds.
14. ASTM D968 - Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
15. ASTM D1621 – Test Method for Compressive Properties of Rigid Cellular Plastics.
16. ASTM D1970 - Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used As Steep Roofing Underlayment for Ice Dam Protection.
17. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
18. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
19. ASTM D3363 - Test Method for Film Hardness by Pencil Test.
20. ASTM D4145 – Test Method for Coating Flexibility of Prepainted Sheet.
21. ASTM D4214 - Test Method for Evaluating Degree of Chalking of Exterior Paint Films.
22. ASTM D5034 – Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
23. ASTM E96- Test Methods for Water Vapor Transition of Materials.
24. ASTM E331 – Test Method for Water Penetrations of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
25. ASTM E1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
26. ASTM E1646 – Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
27. ASTM E1677 – Specification for an Air Retarder (AR) Material or System for Low Rise Building Walls.
28. International Building Code (IBC), Chapter 16.
29. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
30. American Architectural Manufacturing Association (AAMA) 621 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized and Zinc-Aluminum Coated Steel Substrates.

1.3 PERFORMANCE REQUIREMENTS

- A. Wind Loads:
 - 1. Wind resistance in accord with ASTM E1592 from roof panel through attachment into structure. Use factor of safety of 3 for screws into steel, and 6 for screws into wood.
 - 2. Wind Load: in accord with Structural Drawings
 - 3. Snow Load: In accordance with Structural DRAWINGS.

- B. Thermal Movement: Provide for expansion and contraction from fix location with surface temperatures between minus 30 degrees F. and plus 180 degrees F. without causing permanent buckling, cracking of finish, opening of joints, or failure of fasteners.

- C. Water Penetration of Panel Joints: No leak at 12 psf when tested in accordance with ASTM E1646 or E331.

1.4 SUBMITTALS

- A. Shop Drawings, Calculations and Product Data to Illustrate:
 - 1. Conformance with Performance Requirements:
 - a. Provision for expansion, contraction, at edges, and panel attachment clips.
 - 2. Installation Layout and Details:
 - a. Panel profile with dimensions.
 - b. Air-Water barrier Data.
 - c. Attachment clip spacing, locations number and size of screws.
 - d. Details of edge flashing.
 - e. Indicate fixed screw attach point for panels from which thermal movement occurs.
 - f. Location of closure strips and sealant.
 - g. Location and flashing details at penetrations.
 - 3. Screw Fasteners:
 - a. Type, corrosion resistance, size and spacing to be used for substrate condition with manufacturer's pullout and shear rating to resist loads.

- b. Spacing and anchorage at eaves, ridges, rake, and central areas.
 - c. Attachment of exposed perimeter flashing.
 - 4. Joints:
 - a. Inter-relationship of components and flashing.
 - b. Sealant and Sealant tape specifications.
 - 5. Coating Specifications.
- B. Samples:
 - 1. Submit 12-inch long, full width sample of roof panel, illustrating seam system.
 - 2. 3 -inch square paint samples
- C. Certificates:
 - 1. Manufacturer's certification of conformance to Performance Requirements.
 - 2. Installer qualifications and approval by manufacturer.
- D. Warranties.

1.5 QUALITY ASSURANCE

- A. Roofing Manufacturer Qualifications:
 - 1. At least 25 successful jobs manufacturing concealed fastener standing seam metal roofing similar to that proposed.
 - 2. Roofing manufacturer shall have recommended installation details including attachment, ridge, eave, edges and penetration flashing.
 - 3. Roofing Manufacturer shall have installation training.
- B. Installer Qualifications:
 - 1. Minimum, 5 successful installations in Alaska with sheet metal roofing similar to that proposed.
 - 2. Approved in writing by the roofing manufacturer.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Installation of Expansion Joints, Sealants, and Underlayment:

1. Temperature between 40 and 65 degrees F.
2. Surfaces free of rain, snow, or frost.

1.7 WARRANTIES

- A. Manufacturer's 10-year warranty that panels, and panel manufacturer provided flashing, that will not rupture, fail structurally, or perforate due to corrosion.
- B. Paint Finish: Manufacturer's 10-year warranty covering color fade, chalking, peeling, cracking, or blistering.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to meeting specified criteria:
 1. Metal Sales – www.metalsales.us.com.
 2. AEP Span – www.aaepspan.com
 3. Peterson Aluminum Company – www.pac-clad.com

2.2 METAL ROOFING

- A. Roofing Panels: Steel, standing seam concealed fastener installation, continuously factory roll formed conforming to Performance Requirements: similar to Metal Sales "Clip-Loc" equivalent.
 1. Minimum Thickness: 24 gage before coating (0.023 inch).
 2. Width: 16 inches, maximum.
 3. Length: Full length of roof, no end joints permitted.
 4. Standing Ribs: Maximum 16 inches on center and 1-1/2 inches minimum height with intermediate small ribs.
 5. Sheet Steel: 40,000-psi minimum yield strength and tension leveled with base metal protective coating ASTM A792: Zincalume or galvalume 45 percent zinc, 55 percent aluminum alloy 1.6 mil minimum thickness or ASTM A653 galvanized G90 per ASTM A653.
 6. Attachment Clips: Galvanized or stainless steel with allowance for thermal movement.

- B. Factory applied color coating:
1. Prime both sides; complete finish exposed exterior side via coil coat method.
 2. Polyvinylidene fluoride (PVDF) coating system, with minimum 70 percent resin complying with AAMA 621.
 3. Coating Thickness: 3-coat system with minimum 1.5 mil thickness.
 4. Gloss: low less than 19 at 60 degrees in accord with ASTM D523.
 5. Weathering - no checking, blistering or adhesion loss when tested for 5,000 hours in accordance with ASTM D822.
 6. Chalking - no chalk greater than No. 8 rating when tested for 2,000 hours in accordance with ASTM D4214.
 7. Fading - color change shall not exceed 5 units when tested for 2,000 hours in accordance with ASTM D2244.
 8. Salt Spray - no more than 1/16-inch creep or tape off from scribe and less than 5 percent No. 8 blisters when tested for 750 hours in 5 percent salt fog at 95 degrees F. in accordance with ASTM B117.
 9. Flexibility - no rupture of coating when bent 180 degrees in accordance with ASTM D4145.
 10. Hardness: HB - pencil hardness: no film failure when tested in accordance with ASTM D3363.
 11. Abrasion Resistance: withstand 50 liters falling sand before appearance of base metal in accord with ASTM D968.
 12. One of manufacturer's standard colors will be selected: Match for flashing and trim.

2.3 FLASHING, TRIM, AND ACCESSORIES:

- A. Provide for perimeter edges and penetrations and as recommended by the roof manufacturer for complete weathertight installation per the Performance Requirements.
- B. 24 gage galvanized sheet steel accurately formed and in accordance metal roofing manufacturers and SMACNA recommended practices and approved submittals.
- C. Rectangular Penetrations and Pipes over 6-inch diameter: Single piece welded watertight penetration flashing with ice deflector cricket, formed to fit roof profile.
- D. Round Penetrations up to 6-inch diameter (Pipe Flashing): EPDM rubber "Dektite" "Sealtite" or "Master Flash" Type recommended by flashing manufacturer for metal

roof pipe penetration flashing, centered in roofing panel with stainless steel clamp band.

1. Over 6 inches diameter use flashing specified for rectangular panel.
- E. 10 feet minimum flashing lengths.
- F. Match finish and color of roofing.
- G. Flashing Attachment Cleat-Clips: 20-gage minimum, galvanized or Stainless steel.
- H. Fabricate in accordance with Contract Documents and approved shop drawings.

2.4 FASTENERS

- A. Screws recommended by the roof manufacturer but not smaller than Number 14 diameter stainless steel or carbon steel corrosion resistant coated to resist 1000 hours of salt spray per ASTM B117 with no more than 5 percent red rust appearing on head or shank. Screws shall completely penetrate materials to be joined.
- B. Exposed Fasteners: for flashing trim and fixed point only: Number 14 diameter screws preassembled with a 3/4 inch diameter 18 gage tapered lip stainless steel washer bonded to an EPDM sealing washer. Factory paint heads and washers to match roofing finish.
- C. Minimum pullout value 400 pounds when tested in predrilled pilot holes through 16 gage thick, ASTM A653 steel or 3/4 inch plywood.
- D. Rivets or nails not permitted.

2.5 ZEE FURRING

- A. Sixteen gage (0.054 inch) ASTM A653 hot-dip galvanized steel "Z"-Shaped web depth equal to insulation depth with 2-inch flanges by 8 feet long.

2.6 CLOSURE STRIPS

- A. Closed cell laminated polyethylene resilient foam shaped to tightly fit panel profile.
- B. 1-1/2 inch minimum width.

2.7 ROOF UNDERLAYMENT

- A. Pre-Manufactured, self-adhering, self-sealing sheet membrane waterproofing composed of cross laminated polyethylene bonded to polymer rubber modified bitumen recommended by manufacturer for application as metal roof underlayment meeting the following requirements.
1. Total thickness: 30-mil minimum.
 2. Water Vapor Transmission: 0.05 perms maximum per ASTM E96.
 3. Elongation per 250 percent minimum per ASTM D412.
 4. Low Temperature Flexibility: no cracking at minus 20 degree F per ASTM D1970.
 5. Overall adhesion between Plywood and to adjacent membrane at 40 degrees F: 3.0 pound per inch width minimum per ASTM D903.
 6. Sealability around nails and screws: pass per ASTM D1970.
 7. Removable treated release paper, no special cleaning to self adhere entire sheet.
 8. Primer: as required by underlayment manufacturer for conditions of use.
- B. Acceptable Manufacturer: Subject to Specified Criteria:
1. Grace "Ice and Water Shield", www.graceconstruction.com
 2. Henry "Blueskin RF200LT", www.henry.com
 3. Polyglass USA, Inc; Polystick MTS Self-Adhered High Temperature Roof Underlayment:, <https://polyglass.us>
- C. Substitutions in accordance with Section 01 60 00-Product Requirements.

2.8 ROOF AIR-WATER BARRIER

- A. Breathable water-resistive spun polypropylene coated sheet recommended by manufacturers for metal roofing underlayment.
1. Nominal thickness .0024 inches (.06mm) minimum with surface texture.
 2. Tensile Strength: 25 pounds minimum break per ASTM D 882 or ASTM D 5034.
 3. Water Vapor Transmission: 87 perms minimum per ASTM E96.
 4. Liquid Water Penetration Resistance: per ATTCC-127 or ASTM E1677: non-absorbent and no liquid pass.

5. Surface Burning Characteristics: Flame Spread A, smoke developed A, per ASTM E 84.
 6. Underlayment Sealing and Attach Tape: 20 to 30 mil, as recommended by underlayment manufacturer.
- B. ACCEPTABLE MANUFACTURER: Subject to specified criteria:
1. Vapro Shield USA "Slopeshield": www.vaproshield.com
 2. Henry Co: "Blueskin VP160": [www: henry.com](http://www.henry.com)
 3. Dupont: Tyvek Stuccowrap"www.tyvekconstruction.com "
 4. Substitutions in accord with Section 01 60 00- Product Requirements.

2.9 SEALANT

- A. Single component urethane or silicone, meeting the requirements of ASTM C 920.
- B. Color: Standard color nearest match to roofing.

2.10 TAPE SEALANT

- A. Self adhesive in roll form with closed cell resilient foam core as recommended by roof manufacturer.
- B. 3/8 inch minimum wide.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate, DRAWING Details, and conditions under which roof will be installed.
- B. Verify field measurements. Modify work as required for accurate fit.
- C. Beginning installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 VAPOR RETARDER INSTALLATION

- A. Prime substrate as recommended by underlayment manufacturer.
- B. Install continuous fully adhered over entire roof wrinkle free and with joints overlapping 6 inches minimum to shed water in accord with underlayment manufacturer's instructions. Extend up all adjoining walls, beneath flashing, 8 inches minimum.
- C. Extend up 6 inches minimum and seal around projecting items watertight with urethane sealant.
- D. Do not leave exposed to weather more than 15 days after beginning of installation.

3.3 ZEE FURRING INSTALLATION

- A. Install over vapor retarder.
 - 1. Fasten through plywood sheathing into solid structural frame 1/4 inch diameter by 2-1/2 inch fully threaded screws at 6 inch maximum spacing.
 - 2. Space as indicated on DRAWINGS and to meet Performance Requirements.
- B. Install rigid insulation with tight joints between furring.
- C. Fasten wood cross furring to steel zee with two 1/4 inch screws.

3.4 AIR-WATER BARRIER INSTALLATION

- A. Install continuously under entire roof metal wrinkle free with joints lapping 6 inches minimum to shed water and in accord with manufacturer's instructions.
 - 1. Start from bottom.
 - 2. Tape joints and edges.
- B. Extend up 6 inches minimum and tape around penetrations, and tape any joints.
- C. Replace torn or damaged sheet by: covering with a piece extending 12 inches horizontal beyond damage and extended 12 inches up and under the sheet above.

3.5 METAL ROOFING INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturer's written instructions to meet Performance Requirements. Walk on roof panels only with clean soft-soled shoes.
- B. Locate panel end clips 6 inches maximum from panel ends. Provide panel fixity with screws to resist snow down drag requirements.
- C. Align panels and intermediate clips for ease of thermal movement. Maintain seams parallel to slope. Provide shims and spacers as necessary for panel to clip thermal movement without abrasion.
- D. Provide additional Zee furring and panel clips at eaves and ridges, as required for wind resistance.
- E. Install sidelap tape sealant at panel side lap. Install extra sealant over and under clips.
- F. Secure panels without warp or deflection.
- G. Turn up panel trays at top of slope.
- H. Install closures at top and bottom of panels, and as indicated on the DRAWINGS set in continuous bead of sealant or sealant tape and with additional sealant between closure and roofing.
- I. Center pipe penetrations in panel tray. Provide elongated hole to accommodate thermal movement.

3.6 FLASHINGS AND ACCESSORIES INSTALLATION

- A. Conform to roof manufacturer recommendations SMACNA recommended practices and approved shop drawings for weathertight assembly with allowance for thermal movement. Extend in single piece 10 inches minimum above roof surface.
- B. Flashing Intersecting Panel Ribs: Install resilient closure and sealant as needed for weathertight closure: one piece or welded watertight 6 inches above rib top.
- C. Provide inside backed butt joints with thermal expansion space or lap flashing

joints 4-inches in sealant tape or continuous sealant or lap flashing joints 4 inches in sealant tape or continuous sealant.

- D. Fastener spacing at each roofing main rib, or 12-inches maximum and 2-inches maximum from edges and ends.
- E. Provide thermal movement space around penetration spaces.
- F. Seal round penetrations with rubber pipe flashing set in sealant and using sealing washers and screws.
- G. Seal fixed flashing joints in lapped sealant bed or 1/4 inch round sealant bead in slot.
- H. Seal moving flashing joints with sealant tape.
- I. Seal under edges of perimeter flashing.

3.7 TOLERANCES

- A. Alignment: 1/4 inch in 10 feet, maximum variation.

3.8 ADJUSTING AND CLEANING

- A. Remove cuttings and metal shavings from finished surfaces at the end of each day. Remove stains immediately.

END OF SECTION

SECTION 07 42 13 - METAL WALL PANELS

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 06 16 00 - Sheathing: Wall Sheathing

1.2 APPLICABLE PUBLICATIONS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2019.

1.3 SUBMITTALS

- A. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.
- C. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.
- D. Manufacturer's Qualification Statement.
- E. Installer's Qualification Statement.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

1.6 WARRANTY

- A. Correct defective work within a five year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
- B. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design:
 - 1. Metal Wall Panels - Exposed Fasteners: 7/8" Corrugated manufactured by Metal Sales.
 - 2. Metal Soffit Panels: Soffit Panel manufactured by Metal Sales.
- B. Other Acceptable Manufacturers - Metal Wall Panels - Exposed Fasteners:
 - 1. Petersen Aluminum Corporation; 7/8 inch Corrugated Panel: www.pac-clad.com/#sle.
 - 2. AEP Span; Nu-Wave: aepspan.com
- C. Other Acceptable Manufacturers - Metal Soffit Panels:
 - 1. Petersen Aluminum Corporation; Flush Solid: www.pac-clad.com/#sle.
 - 2. AEP Span; Flush Panel: aepspan.com

2.2 MANUFACTURED METAL PANELS

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
 - 1. Provide exterior wall panels and soffit panels.
 - 2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
 - 3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
 - 4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter

components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
 7. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.
- B. Exterior Wall Panels:
1. Profile: Vertical; style as indicated.
 2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
 3. Panel Width: ___ inches.
- C. Soffit Panels:
1. Profile: Style as indicated, with venting provided.
- D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- E. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- F. Anchors: Galvanized steel.

2.3 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, for coastal applications having a minimum total dry film thickness of 1.7 mil; color and gloss as selected by Architect from manufacturer's standard line.
1. Manufacturers:
 - a. PPG Coil Coatings; Duranar XL Plus: www.ppgideascales.com
 - b. Valspar; Flurothan Coastal: www.valsparcoilextrusion.com

2.4 ACCESSORIES

- A. Cladding Support Clips: Thermally-broken, galvanized steel clips for support of cladding z-girts, angles, channels and other framing.
1. Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 galvanized coating.
- B. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
- C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

- D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
- E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that building framing members are ready to receive panels.

3.2 INSTALLATION

- A. Install panels on walls and soffits in accordance with manufacturer's instructions.
- B. Lap panel ends minimum 2 inches.
- C. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.3 TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.4 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Remove protective material from wall panel surfaces.

END OF SECTION

SECTION 07 62 10 - FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 07 41 14 – Metal Standing Seam Roof Systems
- B. Section 07 42 13 – Metal Wall Panels
- C. Section 07 92 00 - Joint Sealants
- D. Section 08 16 10 – Fiberglass Doors and Frames

1.2 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this Specification. Publications may be referenced in the text by basic reference only. In case of conflict, the most stringent shall govern.
 - 1. American Society for Testing Materials (ASTM) specific references as noted.
 - 2. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM B117 – Practice for Operating Salt Spray (Fog) Apparatus.
 - 4. ASTM C920 - Specification for Elastomeric Joint Sealant.
 - 5. Sheet Metal and Air Condition Contractor's National Association (SMACNA) "Architectural Sheet Metal Manual".
 - 6. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.
 - 7. American Welding Society (AWS) "Code For Welding in Building Construction".
 - 8. Society for Protective Coatings (SSPC) Systems and Specifications.
 - 9. International Building Code (IBC).
 - 10. American Architectural Manufacturers Association (AAMA) 621 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized and Zinc-Aluminum Coated Steel Substrates.

1.3 SUBMITTALS

- A. Shop Drawings and Manufacturer's Literature: Including dimensions, materials, joints, fasteners, anchorage, installation recommendations, details and location in complete work if work proposed differs from Contract DRAWINGS.

PART 2 - PRODUCTS

2.1 GALVANNEALED STEEL SHEET

- A. American Society for Testing and Materials ASTM A653 cold rolled steel sheet, lock-forming quality. Hot-dip Galvannealed zinc coating both sides of at least 0.90 ounce per square foot total. (G90).
- B. Minimum thickness 24 gage except unbacked spans over 12 inches 20 gage unless indicated otherwise. Special thickness per DRAWING details. Anchor clips and hook strips 20-gage.
- C. Substitutions in accordance with Section 01 60 00 - Product Requirements

2.2 FASTENERS

- A. Number 14 (1/4 inch) stainless steel or corrosion and abrasion resistant coated carbon steel resistant to 1000 hours salt spray per ASTM B117 or 15 cycles per ASTM G87 – Kesternich Cabinet Testing;testing with 15 percent maximum red rust, and no coating blistering or cracking on head or shank.
- B. Exposed fasteners: Number 14 (1/4 inch) diameter screws preassembled with a 3/4 inch diameter 18-gage tapered lip stainless steel washer bonded to an EPDM sealing gasket washer. Factory paint heads to match adjacent metal color.
- C. Use button or pan head Phillips screws for concealed work.
- D. Nails and pop rivets not permitted.
- E. Screws shall penetrate metal substrate 1/2 inch or penetrate wood substrate 1-1/2 inches.

2.3 ACCESSORIES-ATTACHMENTS

- A. Primers, clips, hook strips, angles, cover plates, inserts and other accessories, as necessary for secure attachment shall be the same material as flashing and in accordance with SMACNA and NRCA recommendations. Fabricate anchor clips and hook strips one gage thicker than attached flashing.
- B. PVC Reglet built into masonry joint, 5/8-inch internal depth to fit into 3/8-inch mortar joint, face piece keeps mortar out and tears off prior to installation. Hohman & Barnard-Sandell: www.h-b.com or equal.

2.4 ANCHORS INTO CONCRETE AND MASONRY

- A. Standard commercial drilled expansion or epoxy anchors recommended for intended use by their manufacturer may be used if approved by the ARCHITECT. Submit manufacturer's literature indicating lateral (shear) and pullout (tension) data for approval. Explosive driven anchors not allowed.
- B. Minimum Diameter: 1/4 inch.
- C. Each anchor shall be capable of developing at least 200-pound lateral and 400-pound pullout load.

2.5 SEALANTS

- A. Single component silicone or urethane per ASTM C920.
 - 1. Tape sealant may be used for straight lap joints: 50 percent butyl, 1/4 to 1/2 inch width and thickness.
- B. Color: Standard color nearest match to flashing finish color for exposed sealants.

2.6 PAINT

- A. Shop prime and shop finish paint exposed surfaces.
 - 1. One coat zinc-base topcoat compatible primer.
 - 2. Two coats urethane enamel, semigloss.
- B. Coil factory coated Polyvinylidene fluoride, (PVDF) coating system with minimum 70 percent resin complying with AAMA 621 finish is acceptable in lieu of shop paint if steel thickness is equal to that specified.

2.7 METAL FABRICATION

- A. Fabricate per approved submittals and the best commercial practice of SMACNA and NRC. Form sections square, true and accurate to size, free from distortion and to fit substrate.
- B. Fabricate sheets or panels in longest lengths practical, true to details, free of dents, scratches and tool marks. Make allowances for thermal expansion-contraction at joints.
- C. Cross break as necessary to prevent "oil canning". Form lines and edges straight and neat. Form bent-metal corners to smallest radius possible without causing grain separation. Roll exposed edges back on underside to form folded, hemmed edge, 1/2 inch minimum (3/4 inch minimum to engage hold down). Slope exposed vertical bottom edges 45 degrees to form drip.
- D. Welding shall be per AWS for type of weld and material. Grind exposed welds smooth and flush. Coat welds and bare metal abrasions in galvanized steel with SSPC 20 zinc rich epoxy primer paint.
- E. Joints shall be weathertight and have provisions for expansion and contraction. Lap joints and corners watertight. Lap in direction of water flow. Provide slotted holes at exposed gasketed screws.

2.8 SHOP CLEANING AND PAINTING

- A. Clean metal prior to painting by "solvent cleaning" SP-1, followed by acid etch and "hand cleaning" SP-2 per SSPC.
- B. Shop paint 1 primer coat and 2 finish coats per finish paint manufacturer's instructions.
- C. Factory Coil paint PVDR coating per AAMA 621 is acceptable in lieu of shop paint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the DRAWING details and field conditions to receive the work for defects that will adversely effect the completed work and for deviations beyond allowable tolerances.

- B. Beginning of installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 DISSIMILAR MATERIALS

- A. Steel contacting aluminum, concrete, masonry or treated wood shall have contact surfaces separated by a heavy coat of bituminous paint, 40 mil self-adhering rubber sheet or by non-absorptive tape.
- B. Separation materials shall be trimmed to not be visible in exposed completed work.

3.3 INSTALLATION

- A. Install all flashings in accordance with the best commercial practice of SMACNA, NRCA and in accordance with approved submittals, plumb, level, or to alignment shown on the DRAWINGS.
- B. Joints shall be weathertight and have provisions for expansion and contraction. Lap to shed water flow outside.
 - 1. Lap metal flashing 4-inch minimum with sealant tape to shed water.
- C. Cut components neatly to fit against adjacent member.
- D. Field cut members exposed in the completed work so that finish is not damaged. Leave no exposed sharp edges.
- E. Length of screws shall be sufficient to fully penetrate sheet metal or plywood fastened and 1 1/2-inch minimum into solid backing.
- F. Cutting or drilling of building structural components shall not be permitted unless approved by ARCHITECT in writing.

3.4 ANCHORAGE AND ATTACHMENT

- A. Spacing and quantity of anchor fasteners as indicated and required to develop permanent weather tight joints on exterior work.
- B. Maximum spacing of exposed fasteners shall be 12-inches evenly spaced within 1-1/2 inches of panel edges unless closer spacing is indicated.

3.5 SEALANT APPLICATION

- A. As recommended by sealant manufacturer approved submittals, to provide permanent, weathertight joints. Set lapped seams in sealant bed or sealant tape.
- B. Joints shall be sealed continuously against the weather and have provisions for expansion and contraction.
- C. Seal moving lap flashing joints with 2 rows of sealant tape.

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 08 - OPENINGS

SECTION 08 16 10 - FIBERGLASS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 07 92 00 - Joint Sealants
- B. Section 08 71 10 - Door Hardware
- C. Section 09 21 16 – Gypsum Board Assemblies

1.2 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict the most stringent shall apply.
 - 1. ASTM C518 – Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
 - 2. ASTM D3841 Specification for Glass-Fiber-Reinforced Plastic Panels.
 - 3. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E330 – Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniforms Static Air Pressure Difference.
 - 5. ASTM E2112 – Standard Practice for installation of exterior windows, doors and skylights.
 - 6. Steel Door Institute (SDI) SDI-100 (ANSI A 250.8)-Recommended Specifications for Standard Steel Doors and Frames.
 - 7. International Building Code (IBC).

1.3 SUBMITTALS

- A. Indicate frame profile, construction, thickness, finish, anchor types and locations, location of backing reinforcing and cutouts for hardware, reinforcement, glass construction and installation-adjustment instructions.
- B. Indicate door elevations, construction, thickness, finish, internal reinforcement, construction method at edges, top and bottom, and installation-adjustment instructions.

- C. Certificate from fabricator that proposed products meet these SPECIFICATIONS and list of 5 successful jobs with reference phone numbers or E-mail addresses.
- D. Warranty.
- E. Finish Color: provide samples for selection.

1.4 QUALITY ASSURANCE

- A. Door and frame fabricator: manufactured 100 similar doors.

1.5 STORAGE AND PROTECTION

- A. Store above ground, vertical in dry area, spaced and vented, protected from weather.

1.6 WARRANTY

- A. Provide 10-year warranty from door manufacturer for the following:
 - 1. Failure of door or frame from corrosion or delamination.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to specified criteria.
 - 1. Chem-Pruf Door Company: www.chem-pruf.com
 - 2. Special-lite Company: www.special-lite.com
 - 3. Corrim Company Co: www.corrim.com
 - 4. Tiger Door Co.: www.tigerdoor.com
 - 5. Chase Doors: www.chasedoors.com

2.2 DOOR AND FRAME ASSEMBLY

- A. Provide frame and door compatible and from one fabricator.

2.3 DOORS

- A. Factory assembled 1 3/4 inch overall door thickness fiberglass reinforced plastic (FRP) face sheets.
- B. Door Face Sheets: .090 inch minimum thermoset non heat-softening FRP.
 - 1. Surface burning characteristics per ASTM E84: Flamespread 200 maximum, smoke: 45 maximum.
 - 2. Indentation Hardness per ASTM D2583.
- C. Door Edge Stiles and Rails: Pultruded fiberglass plastic molded U-shaped configuration conforming to standard SDI profile; stainless steel or extruded aluminum backers.
 - 1. Edge of FRP face sheets fully bonded or covered and held in place by door edge trims.
- D. Typical non-fire rated:
 - a. Core Material: expanded polyurethane or polystyrene rigid insulation, completely filling voids between the door face sheets.
- E. Internal Reinforcement: 1/8 inch galvanized sheet steel or aluminum at specified hardware.

2.4 FRAMES

- A. Pultruded fiberglass plastic with 1/8 inch minimum wall thickness and 5/8-inch high stop matching standard Steel Door Institute profile.
 - 1. Non fire rated: Fill voids with bonded foam insulation core.
- B. 5 3/4- inch minimum through wall dimension.
- C. Internal reinforcement: 1/8 inch galvanized sheet steel or aluminum at specified hardware.
- D. Frame metal corner and hardware backing reinforcing trim. Screw fastened: minimum 1/8 × 2 5/8 inch color matching adjacent frame where exposed to view.
- E. Wall Anchors: 1/4-inch minimum diameter stainless steel or hot-dip galvanized countersunk head screws evenly spaced not over 24-inches apart and 6-inches

maximum from top and bottom of door.

1. Provide screw length sufficient to penetrate jamb backing 1-1/4 inches.

2.5 FINISH

- A. Factory 15 mil minimum thick integral smooth gel-coat non heat-softening thermoset plastic resin with integral semi-gloss color of gray, tan, or brown, as selected.

2.6 HARDWARE

- A. Coordinate Hardware in accord with Section 08 71 10 – Door Hardware.

2.7 FABRICATION

- A. Fabricate in accordance with these specifications, and approved submittals. Doors and frames to be rigid, flush, smooth, neat in appearance, and free from defects, warp, or buckle.
- B. Factory prepare doors and frames to receive finish hardware, and glazing specified: Including cutouts, hardware, reinforcing plates backing behind face hardware attachment areas, drilling and tapping for mortised hardware in accordance with approved finish hardware schedule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine drawings and verify field conditions to receive frames for defects that will adversely affect the work and for deviations beyond allowable tolerances.
- B. Beginning of Work shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 INSTALLATION

- A. Install frames in accordance with ASTM E2112 and in accord with door manufacturer printed instructions and approved. Install frames with flush tight and even hairline crack joining faces.

- B. Frame Insulation: fill any voids in frames with foamed into place urethane insulation.
- C. Seal both sides of frame to adjoining wall surfaces with a continuous bead of silicone sealant.

3.3 TOLERANCES

- A. Smooth, visually flat surfaces with maximum Diagonal Distortion (Warp) 1/16 inch gap under a straight edge, corner to corner.
- B. Plumb and square within 1/16 inch.
- C. Doors centered in frames with the following maximum clearances:
 - 1. Jamb and Head: 1/16 to 1/8 inches.
 - 2. Bottom: 1/8 to 1/2 inch from threshold or floor finish.
- D. Allow for and accommodate interfacing substrate tolerances indicated in substrate specification sections.

3.4 HARDWARE

- A. Install in accordance with hardware manufacturer's written recommendations, using proper templates for approved hardware in accordance with Section 08 71 10 - Door Hardware.

3.5 ADJUSTING

- A. Adjust completed door assemblies to swing freely, close smoothly and latch easily with the latched door in uniform, continuous contact with stops or weather strips.
- B. Closed door shall not rattle.
- C. Doors with closers shall self-latch.

END OF SECTION

SECTION 08 36 13 - SECTIONAL DOORS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.02 REFERENCE STANDARDS

- A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.
- C. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- D. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors; 2011.
- E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- B. Product Data: Show component construction, anchorage method, and hardware.
- C. Samples: Submit two panel finish samples, 12 by 12 inch in size, illustrating color and finish.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.
- C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Protect materials from exposure to moisture until ready for installation.
- C. Store materials in a dry, ventilated weathertight location.

1.06 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Sectional Steel Door 416 manufactured by Overhead Door Corporation.
- B. Other Acceptable Manufacturers - Sectional Doors:
 - 1. Clopay Building Products; Model 522: www.clopaydoor.com/#sle.
 - 2. Raynor Garage Doors; SteelForm, Model S-20: www.raynor.com/#sle.

2.02 STEEL DOORS

- A. Steel Doors: Stile and rail steel with solid panels; standard lift operating style with track and hardware; complying with DASHMA 102, Commercial application.
 - 1. Panel Sections: 20 gauge, hot-dip galvanized per ASTM A 924/A 924M and ASTM A 653/A 653M.
 - 2. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
 - 3. Door Nominal Thickness: 2 inches thick.
 - 4. Exterior Finish: Factory finished with acrylic baked enamel; color as selected by Architect.
- B. Door Panels: Stile and rail construction, of steel sheet 0.058 inch minimum thickness, with welded joints; rabbeted weather joints at meeting rails.

2.03 COMPONENTS

- A. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.
- B. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.
- C. Head Weatherstripping: EPDM rubber seal, one piece full length.
- D. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

- E. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hardware for fiberglass doors.
- B. Thresholds.
- C. Weatherstripping and gasketing.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.
- B. Section 08 16 13 - Fiberglass Doors.

1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. BHMA A156.1 - American National Standard for Butts and Hinges; 2016.
- C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2017.
- D. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
- E. BHMA A156.18 - American National Standard for Materials and Finishes; 2016.
- F. BHMA A156.21 - American National Standard for Thresholds; 2014.
- G. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems Sponsor; 2017.
- H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Keying Requirements Meeting:
 - 1. Schedule meeting at project site prior to Contractor occupancy.
 - 2. Attendance Required:
 - a. Contractor.
 - b. Owner.
 - 3. Agenda:
 - a. Establish keying requirements.

4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - a. Key control system requirements.
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- B. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 2. Provide complete description for each door listed.
- C. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- D. Keying Schedule:
 1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- E. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.8 WARRANTY

- A. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.

1. Locksets and Cylinders: Three years, minimum.
2. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
 1. Applicable provisions of federal, state, and local codes.
 2. Accessibility: ADA Standards and ICC A117.1.

2.2 HINGES

- A. Manufacturers:
 1. McKinney; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
 2. Stanley, dormakaba Group; _____: www.stanleyhardwarefordoors.com/#sle.
 3. Ives, an Allegion brand; [_____]: www.allegion.com/us/#sle.
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 1. Provide hinges on every swinging door.
 2. Provide following quantity of butt hinges for each door:
 - a. Doors From 60 inches High up to 90 inches High: Three hinges.

2.3 CYLINDRICAL LOCKS

- A. Manufacturers:
 1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
 2. Best, dormakaba Group; _____: www.bestaccess.com/#sle.
 3. Schlage, an Allegion brand; _____: www.allegion.com/us/#sle.
 4. Stanley, dormakaba Group; _____: www.stanleyhardwarefordoors.com/#sle.
- B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
 1. Bored Hole: 2-1/8 inch diameter.
 2. Latchbolt Throw: 1/2 inch, minimum.
 3. Backset: 2-3/4 inch unless otherwise indicated.
 4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.

- a. Finish: To match lock or latch.

2.4 CLOSERS

A. Manufacturers; Surface Mounted:

1. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. LCN, an Allegion brand; _____: www.allegion.com/us/#sle.
3. Stanley, dormakaba Group; _____: www.stanleyhardwarefordoors.com/#sle.

B. Closers: Comply with BHMA A156.4, Grade 1.

1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.

2.5 KICK PLATES

A. Manufacturers:

1. Hiawatha, Inc, an Activar Construction Products Group company; _____: www.activarcpg.com/hiawatha/#sle.
2. Ives, an Allegion brand; _____: www.allegion.com/us/#sle.
3. Trimco; _____: www.trimcohardware.com/#sle.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.

1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.6 THRESHOLDS

A. Manufacturers:

1. Pemko; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Reese Enterprises, Inc; _____: www.reeseusa.com/#sle.
3. Zero International, Inc; _____: www.zerointernational.com/#sle.

B. Thresholds: Comply with BHMA A156.21.

1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: Flat surface.
3. Material: Aluminum.
4. Threshold Surface: Fluted horizontal grooves across full width.
5. Field cut threshold to profile of frame and width of door sill for tight fit.
6. Provide non-corroding fasteners at exterior locations.

2.7 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:

1. Pemko; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Reese Enterprises, Inc; _____: www.reeseusa.com/#sle.
3. Zero International, Inc; _____: www.zerointernational.com/#sle.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.

1. Head and Jamb Type: Adjustable.
2. Door Sweep Type: Encased in retainer.
3. Material: Aluminum, with brush weatherstripping.
4. Provide weatherstripping on each exterior door at head, jams, and meeting stiles of door pairs, unless otherwise indicated.
5. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.8 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.

1. Primary Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.

2.9 HARDWARE SCHEDULE

A. HARDWARE GROUP 01

- (3) Standard Hinge
- (1) Lockset - Storeroom Function - LH
- (1) Surface Closer
- (1) Kickplate
- (1) Weatherstripping
- (1) Theshold

B. HARDWARE GROUP 02

- (3) Standard Hinge
- (1) Lockset - Passage Function - RH
- (1) Surface Closer
- (1) Kickplate
- (1) Weatherstripping

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until application of finishes to substrate are fully completed.
- D. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch.
- E. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.3 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.4 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.

3.5 PROTECTION

- A. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 09 - FINISHES

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 06 83 16 – Fiber Reinforced Plastic Paneling
- B. Section 07 21 00 – Thermal Insulation
- C. Section 07 26 00 - Vapor Retarders
- D. Section 07 92 00 - Joint Sealants
- E. Section 08 16 10 – Fiberglass Doors and Frames
- F. Section 09 91 00 – Painting

1.2 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict only the most stringent shall apply.
 - 1. ASTM A568 - Specifications for General Requirements for Steel, Sheet, Carbon and High Strength Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet.
 - 2. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
 - 3. ASTM A1003 – Specification for Steel Sheet, Carbon, Metallic and Nonmetallic - Coated for Cold-Formed Framing Members.
 - 4. ANSI/ASTM C475 - Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 5. ANSI/ASTM C754 - Specification for Installation of Framing Members to Receive Screw Attached Gypsum Board.
 - 6. ASTM C834 - Specification for Latex Sealants.
 - 7. ASTM C840 - Specification for Application and Finishing of Gypsum Board.
 - 8. ASTM C841 – Standard Specification for Installation of Interior Lathing and Furring.
 - 9. ASTM C919 – Practice for Use of Sealants in Acoustical Applications.
 - 10. ASTM C954 - Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs 0.033 inches to 0.112 inches in Thickness.

11. ASTM C955 – Specification for Load-Bearing Steel Studs, Runners and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
12. ASTM C1002 - Specification for Steel Self-Piercing Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
13. ASTM C 1047 – Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
14. ASTM C1177 - Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
15. ASTM C1178 – Specification for Glass Mat Water-Resistant Gypsum Backing Board.
16. ASTM C1325 – Specification for Non-Asbestos Fiber-Mat Reinforced Cement Interior Substrate Sheets.
17. ASTM C1396 – Standard Specification for Gypsum Board.
18. ASTM C 1658 – Specifications for Glass Mat Gypsum Panels
19. ASTM D 3273 – Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
20. ASTM D5420 – Test Methods for Impact Resistance of Flat, Rigid Plastic Specimen.
21. ASTM D5034 – Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
22. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
23. ANSI/ASTM E90 – Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
24. ANSI/ASTM E119 – Test Method for Fire Tests of Building Construction and Materials.
25. ASTM E695 – Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.
26. Gypsum Association (GA) 201 - Using Gypsum Board for Walls and Ceilings.
27. GA 214 – Recommended Levels of Gypsum Board Finish.
28. GA 216 - Specifications for the Application and Finishing of Gypsum Panel Products.
29. GA 600 - Fire Resistance Design Manual.
30. Underwriters Laboratories (UL) Listing and Fire Resistance Directory.

1.3 QUALITY ASSURANCE

- A. Applicator: Company specializing in gypsum board systems with at least 25 jobs similar to this within the last 5 years.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Maintain work area, substrate and materials 55 to 85 degrees F, 70 percent maximum relative humidity for 48 hours prior to, during and 72 hours minimum after installation or until completely dry.
- B. Provide adequate ventilation.
- C. Provide lighting of 80 foot candles at work with explosion-proof electrical fixtures. Building lights may be used.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD (GWB)

- A. Gypsum Board: ASTM C 1658 with ASTM C1177 properties, moisture resistant core, fire resistive Type X, 5/8 inch thick, edges tapered, ends square cut, paper free glass mat faces recommended by manufacturer for paint finishing where painted. Mold resistance 10 per ASTM 3273. Georgia-Pacific "Dens Armor Plus", or approved.

2.2 SEALANT

- A. Single component silicone for fire penetrations in accordance with Section 07 92 00 JOINT SEALANTS.

2.3 CORNER BEADS

- A. "L"-Shaped paper faced galvanized steel or zinc tape-on-type per ASTM C1047 or GA 216.

2.4 EDGE TRIM

- A. Paper faced galvanized steel or zinc "LC" – shaped 3/4 inch minimum leg tape-on type, without screws, per GA 216, or ASTM C1047.

2.5 JOINT COMPOUND AND JOINT TAPE

- A. ASTM C475 and GA 216 compatible joint compound and adhesive, from a single manufacturer. Joint compound recommended in writing for additional mold resistance by manufacturer.
 - 1. Use glass fiber tape with setting type compound and with glass fiber surfaced gypsum board.

2. Glass Fiber Tape: Alkali resistant open weave glass-mesh fabric: 4 ounce per square yard minimum weight.

2.6 ANCHORAGE BACKING FOR WALL MOUNTED ACCESSORIES

- A. Minimum 16 gage sheet steel by 6 inches wide by length required and across 3 studs minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the DRAWING details and verify field conditions for defects that will adversely affect the work, and for deviations beyond allowable tolerances.
- B. Other work shall be substantially complete behind wall studs and above ceilings prior to start of GWB work particularly mechanical, electrical, structural, fire spray and insulation.
- C. Start of installation shall mean acceptance of the existing conditions as capable of producing an acceptable job.

3.2 GENERAL SYSTEMS INSTALLATION

- A. Per manufacturer's written instructions, referenced publications and IBC.
- B. Do not install interior products until installation area is enclosed and heated.

3.3 SEALANT INSTALLATION

- A. Apply sealants in accordance with Section 07 92 00 - Joint Sealants.
- B. Install acoustical sealant continuously at gypsum board perimeter in accord with ASTM C919 at:
 1. Metal Framing: track, header, and jamb intersect.
- C. Seal penetrations of gypsum assemblies by conduit, pipe, ductwork, rough-in boxes, and hardware with silicone sealant systems in accord with Section 07 92 00 – JOINT SEALANTS.

3.4 GYPSUM BOARD INSTALLATION

- A. Install GWB in accordance with ASTM C840, and GA 216 and manufacturer's instructions.
 1. Verify insulation and vapor retarder is installed and approved before installing GWB.
- B. Cut GWB neatly to fit in moderate contact and neatly against adjacent GWB. Cut

around penetrations for 1/4 to 1/2-inch space between gypsum and penetration. Bevel untapered panel edges approximately 1/8 inch at a 45 degrees angle using a sharp utility knife. Peel back and remove any loose facing from the edges.

- C. Use screws for fastening gypsum board: 8 inches maximum spacing over backing. Drive screws flush. Use appropriate short screws on resilient furring channels to avoid penetrating support.
- D. Use corrosion resistant screws.
- E. Use the longest practical GWB panel lengths. Keep butt end joints to a minimum.

3.5 GYPSUM EDGE TREATMENT

- A. Treat cut edges and holes in gypsum board with manufacturer recommended sealer.
- B. Place corner beads at external corners. Use longest practical length.
- C. Place edge trim where gypsum board abuts dissimilar materials and where gypsum ends are exposed to view.

3.6 JOINT AND SURFACE TREATMENT

- A. Embed tape at GWB joints and interior angles with joint finishing compound in accord with ASTM C840, and GA 216. Fill and smooth exposed joints, edges, and depressions to produce a smooth flush surface ready to receive finishes specified in accordance with manufacturer's instructions.
 - 1. Use setting type joint compound with fiberglass tape for fiberglass faced gypsum board.
 - 2. Allow sufficient drying time between coats to obtain a moisture content of 12 percent or less on GWB and joints.
 - 3. No heavy texture permitted.
- B. Smoothly feather joint compound coats onto adjoining surfaces.
- C. Finish joints to a width at least 6 inches each side.
- D. Levels of Surface Treatment in accord with ASTM C840 and GA214:
 - 1. Fiberglass faced gypsum board Level 5: three separate coats of joint compound; apply a thin smooth skim coat of joint compound or material manufactured especially for this purpose, and applied in accord with board manufacturer's recommendations to entire exposed GWB surfaces.
 - 2. Joints and fasteners behind fiber reinforced plastic panels: Level 2: Tape and fill and sand lightly to even surface.
- E. Use sandpaper or abrasive-mesh cloth with grit as fine as practical.

- F. Remove sanding dust with a damp rag before recoating.

3.7 GWB AND GWB STUD FRAMING TOLERANCES (NON-CUMULATIVE)

- A. To Base: 1/4 to 1/2 inch space. Smooth without abrupt changes. Space around Mechanical, Electrical, and Other Penetrations: 1/4 to 1/2 inch before sealing.
- B. Bowing or Warping From Proper Plane: plus minus 1/8 inch in 10 feet.
- C. Joint Surface Alignment Before Taping: flush surfaces plus or minus 1/16 inch.
- D. Joint Spacing Before Taping: 1/16 to 1/8 inch.
- E. Gaps Between Perimeter Edge Trim Molding and Abutting Surfaces: 1/8 inch maximum with no abrupt changes.
- F. Exposed Surface Texture: Smooth without texture, pock holes, or scratches over 1/64 inches within any 2 square feet.

3.8 CLEANING

- A. After final taping and sanding, lightly wipe GWB surfaces with a damp rag to remove dust and dirt.
- B. Leave in condition to receive primer - sealer.

END OF SECTION

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking within stud framing.

1.3 SUBMITTALS

- A. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. SCAFECO Corporation: www.scafco.com/#sle.
 - 3. Simpson Strong Tie: www.strongtie.com/#sle.

2.2 FRAMING MATERIALS

- A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
 - 1. Studs: C shaped with knurled or embossed faces.
 - a. Minimum base metal thickness: 0.033 inch (0.84 mm).
 - 2. Runners: U shaped, sized to match studs.
 - a. Minimum base metal thickness: 0.033 inch (0.84 mm).
 - 3. Ceiling Channels: C shaped.
 - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- B. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.

2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot-dipped galvanized coating.
 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
- C. Non-Loadbearing Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
 2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that rough-in utilities are in proper location.

3.2 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to ceiling.
- C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. Align and secure top and bottom runners at 24 inches on center.
- E. At partitions indicated with an acoustic rating:
1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
 2. Place two beads of acoustic sealant between runners and substrate, studs and adjacent construction.
- F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- G. Install studs vertically at 16 inches on center.
- H. Align stud web openings horizontally.
- I. Secure studs to tracks using crimping method. Do not weld.
- J. Fabricate corners using a minimum of three studs.
- K. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- L. Coordinate erection of studs with requirements of door frames; install supports and attachments.

- M. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- N. Furring: Coordinate with sound isolation clip spacing and locations. Lap splices a minimum of 6 inches.
- O. Blocking: Use mechanically fastened steel sheet, steel channels or wood blocking secured to studs as indicated. Provide blocking for support of plumbing fixtures, toilet partitions, toilet accessories, wall-mounted cabinets, wall-mounted hardware, and framed openings.

3.3 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- B. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- C. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- D. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- E. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- F. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.
- G. Laterally brace suspension system.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 90 00 - PAINTING AND COATING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Work of this section consists of furnishing and applying paint for miscellaneous non-galvanized ferrous surfaces. Galvanized ferrous surfaces and stainless steel surfaces will not be painted.

1.2 SUBMITTALS

A materials list and samples shall be submitted as required by MASS Section 10.05 Article 5.6 Product Data and as follows:

- A. Materials list naming each product to be used identified by manufacturer and type number.
- B. Volatile organic compound (VOC) level (gm/l) and manufacturer's certification of compliance with applicable air quality limits for each coating.
- C. Manufacturer's application recommendations for each product submitted.
- D. The Contractor shall submit a current chart of the Manufacturer's available colors for selection by the Engineer, 30 days prior to the start of coating and painting. Samples, when reviewed and accepted by the Engineer, shall establish the quality of the painted surface where these applications are indicated.
- E. The Owner shall select colors from the submittal information presented.

1.3 DEFINITION

The term "paint" as used herein includes enamels, paints, sealers, emulsions and other coatings used as prime intermediate or finish coats for protection or decoration.

1.4 COMPLIANCE WITH VOLATILE ORGANIC COMPOUND (VOC) LIMITS

All paint and coating products shall comply with the applicable limits on volatile organic compounds (VOC) as established by the United States Environmental Protection Agency and by State and local air quality regulating agencies. It shall be the Contractor's responsibility to verify compliance of all paints and coatings. In the event that any paint or coating listed herein is found to be non-compliant, the Contractor shall notify the Engineer and the Engineer will select a substitute coating or paint.

1.5 QUALITY ASSURANCE

- A. General: Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection throughout the duration

of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the Engineer.

- B. Workmen: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- C. Paint Coordination:
 - 1. Review other Sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
 - 2. Upon request, furnish information on the characteristics of the specific finish materials to assure that compatible prime coats are used.
 - 3. Provide barrier coats over non-compatible primers, or remove the primer and re-prime as required.
 - 4. Notify the Engineer in writing of anticipated problems in using the specified coating systems over prime-coatings supplied under other Sections.

1.6 DELIVERY AND STORAGE

- A. All materials shall be brought to the job site in original sealed containers. Each container shall bear the manufacturer's name, coating type, batch number, date of manufacture, storage life, and special directions. They shall not be used until the Engineer has inspected contents and obtained data from information on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- B. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings or paints must be stored to conform with City, State and Federal safety codes for flammable coatings or paint materials. At all times coatings or paints shall be protected from freezing.

1.7 REFERENCED SPECIFICATIONS AND STANDARDS

- A. Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of surfaces shall conform to the applicable requirements of the National Association of Corrosion Engineers, the Steel Structures Painting Council, and the Manufacturer's printed instructions.
- B. The Engineer's decision shall be final as to interpretation and/or conflict between any on the reference specifications and standards contained herein.

1.8 AS COATED SUMMARY SHEET

Contractor shall supply a list of all the coating products used on the Project, including the

exact stock number and the file numbers for the color tints added and amounts for each. The Summary Sheet should also list the local paint supply location for the particular brand of coating including the Name, address, phone number, and website for each product.

PART 2 MATERIALS

2.1 PAINT AND FINISH PRODUCTS

- A. Paint and coating products shall be fresh and well ground; shall not settle readily, cake, or thicken in the container; shall be broken up readily with paddle to a smooth consistency; and shall have easy application properties. Other painting materials such as linseed oil, turpentine, mineral spirits, miscellaneous thinners, varnish, and shellac shall be of the highest quality.
- B. All paints and coatings shall be specifically manufactured for use on projects of this type, and shall be used on surfaces intended by the paint manufacturer. Paints and coatings shall be Tnemec or approved equal. All paint and coatings shall be delivered in original containers, with seals unbroken.
- C. To establish a standard of quality, several specific paint and coating products are listed in the coating System Index under 2.4, this section.

2.2 COMPATIBILITY OF SHOP AND FIELD PAINTS

To ensure a satisfactory painting job it is essential that the paints applied in the shop and in the field be mutually compatible. Where prime coats are shop applied, the Contractor shall instruct suppliers to provide compatible primers with the finish coats selected by the Contractor. In no case will primers be allowed that are not manufactured by the suppliers of the finish coats unless approved by the Engineer.

2.3 COLORS

- A. Color for the various surfaces to be painted shall be selected by the Engineer. Use of different colors for the various structures or for surfaces of a single structure may be directed by the Engineer.

2.4 SYSTEMS

The coating systems in this section are for coatings manufactured by the Sherwin-Williams Company. The acceptance of "or equal" manufacturer's products is at the sole discretion and approval of the Owner. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer. The following index lists the various painting and coating systems by generic type:

Paint Coatings System Index

System ID.	Prime Coat	Intermediate Coat	Finish Coat
A.	Polyamide Epoxy (1 coat at 4-6 mils DFT)	Aliphatic Acrylic Polyurethane (1 coat at 3-5 mils DFT)	Aliphatic Acrylic Polyurethane (1 coat at 3-5 mils DFT)
B.	Amine Cured Epoxy (1 coat at 3-5 mils DFT)	Amine Cured Epoxy (1 coat at 3-5 mils DFT)	Amine Cured Epoxy (1 coat at 3-5 mils DFT)

A. System A – Exposed Ferrous Metal, Atmospheric Weathering:

1. Schedule/Service: For use with exposed miscellaneous metals or pipes subjected to water, condensation, or atmospheric weathering including pipes in ERA Vault. Do not paint surfaces in contact with potable water.
2. Generic Type(s): Polyamide Epoxy / Aliphatic Acrylic Polyurethane.
3. Surface Preparation: SSPC SP-6.
4. Prime Coat: 1 coat DURA-PLATE 235 Multi-Purpose Epoxy, 4 – 6 DFT.
5. Intermediate Coat: 1 coat Acrolon 218 HS Polyurethane, 3 – 5 DFT. Tint different shade from Finish Coat.
6. Finish Coat: 1 coat Acrolon 218 HS Polyurethane, 3 – 5 DFT. Tint different shade from Intermediate Coat.
7. Total System: 10 – 16 mils total dry film thickness (DFT).

B. System B – Below Grade Ferrous Metal:

1. Schedule/Service: Below grade metal such as structural steel. Do not paint surfaces in contact with potable water.
2. Generic Type(s): Amine Cured Epoxy, minimum 83% volume solids.
3. Surface Preparation: SSPC-SP-10 (Near White Blast Cleaning).
4. Prime Coat: 1 coat DURA-PLATE 235 Multi-Purpose Epoxy, 3-5 DFT. Color different from Intermediate and Finish Coats.
5. Intermediate Coat: 1 coat DURA-PLATE 235 Multi-Purpose Epoxy, 3-5 DFT. Tint different shade from Finish Coat.
6. Finish Coat: 1 coat DURA-PLATE 235 Multi-Purpose Epoxy, 3-5 DFT. Tint different shade from Intermediate Coat.
7. Total System: 9-15 mils total dry film thickness (DFT).

PART 3 EXECUTION

3.1 GENERAL

- A. During scheduled coating periods, daily weather reporting is required (including, but not limited to, air and surface temperature, dew point, relative humidity, rain, snow, mist, fog, and wind. Further, daily reports shall include conditions that have the potential to cause dust, insects, or debris adhere to coating.) Contractor is required to obtain preauthorization from Owner's representative and Engineer prior to coating and painting; authorization shall be whether dependent. At all times, Contractor shall comply with paint manufacturer's published recommendation for environmental conditions in which paint materials can be applied and as approved by the Engineer.
- B. All surface preparation, coating and painting shall conform to applicable standards of the National Association of Corrosion Engineers, the Steel Structures Painting Council, and the Manufacturer's printed instructions. Material applied prior to approval of surface by the Engineer shall be removed and re-applied to the satisfaction of the Engineer at the expense of the Contractor.
- C. All Work shall be performed by skilled craftsmen qualified to perform the required Work in a manner comparable with the best standards of practice.
- D. The Contractor shall provide a supervisor at the Work site during cleaning and application operations. The supervisor shall have the authority to sign any change orders, coordinate Work and make decisions pertaining to the fulfillment of the contract.
- E. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.
- F. Coatings and painting systems include surface preparation, prime coating and finish coatings. Unless otherwise specified, prime coatings shall be field applied. Where prime coatings are shop applied, the Contractor shall instruct suppliers to provide the prime coat compatible with the finish coat specified. Any off-site Work which does not conform to the specification is subject to rejection by the Engineer.
- G. Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer.
- H. The specified repair method and equipment may include wire-brushing, hand or power tool cleaning or dry air blast cleaning. In order to prevent injury to surrounding painted areas blast cleaning may require use of lower air pressure, smaller nozzle and abrasive particle sizes, short blast nozzle distance from surface, shielding and masking. If damage is too extensive, the item shall be re-cleaned and coated or painted as directed by the Engineer.

- I. Previously painted surfaces: Repair surface defects. Remove grease, oil and other contaminants as specified for steel surfaces. Scrape carefully to remove deteriorated coatings. Glossy or very hard coatings should be prepared in accordance with SSPC SP-3 to promote maximum adhesion of the subsequent coating. Surface must be thoroughly dry before coating.
- J. The Contractor's coating and painting equipment shall be designed for application of materials and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval by the Engineer.
- K. Application of the first coat shall follow immediately after surface preparation and cleaning and within an eight hour working day. Any cleaned areas not receiving first coat within eight-hour period shall be re-cleaned prior to application of first coat; this may include re-blasting. Alternatively, apply an additive to prevent flash rust such as Holdtight 102.
- L. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

3.2 SURFACE PREPARATION, METALLIC SURFACES

- A. Surface preparation will be based on comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces", SSPC-Vis 1, ASTM Designation D220: "Standard Methods of Evaluating Degree of Rusting on Painted Steel Surfaces", SSPC-Vis 2, ASTM Designation D610; Visual Standard for Surfaces of New Steel Air-blast Cleaned with Sand Abrasive", NACE Standard TM-01-70; and as described below. Anchor profile for prepared surfaces shall be measured by use of a non-destructive instrument such as a Keane-Tator Surface Profile Comparator or Testex Press-O-Film System.

To facilitate inspection the Contractor shall, on the first day of abrasive blast cleaning operations, blast clean metal panels to the standard specified. These panels shall be equivalent to the supplied plate stock which is to be coated or painted and shall have minimum measurements of 8-½-inches by 11-inches. After agreeing a specific panel meets the requirements of the specification, it shall be initialed by the Contractor and Engineer and coated with a clear non-changing finish. Panels shall be utilized for inspection purposes throughout the duration of blast cleaning operations.

- B. Heavy deposits of grease or oil shall be removed with solvent oil cleaner and any chemical contamination shall be neutralized and/or flushed off prior to any other surface preparation.
- C. Surfaces scheduled for Near White or Commercial Blast Cleaning shall have all welds, edges, and sharp corners ground to a 1/16-inch radius and all weld splatter removed, and sandblasted in accordance with Steel Structures Painting Council Specifications, removing mill scale, rust, dirt, paint, or other foreign matter, and shall be slightly roughened to form a suitable anchor pattern for the coating

application. Do not leave blasted surfaces overnight before coating. Remove all sand from the surface by brush or industrial vacuum.

- D. All other steel not scheduled for blast cleaning shall have all weld splatter removed, and rough edges and rough welds ground, and shall be cleaned by means of hand or power tools, in accordance with Steel Structures Painting Council Specification No. 2 or No. 3, removing all loose mill scale rust, dirt, paint, or other contaminants. Blast cleaning may be used if practical. The remaining mill scale, rust, and paint must be sufficiently abraded to provide for good bonding of the coating.
- E. Field blast cleaning for all surfaces shall be dry method unless otherwise directed.
- F. Particle size of abrasives used in blast cleaning shall be that which will produce a 2 mil (50.0 microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.
- G. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved by the Engineer.
- H. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paints are not exposed to abrasion from blast cleaning.
- I. The Contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to performance of work or operation of existing facilities.
- J. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paints by a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as directed by the Engineer.
- K. All welds shall be cleaned with a suitable chemical compatible with the specified coating materials.
- L. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.4 of this specification section and follow the recommended surface preparation per the product data sheets.
- M. Application SSPC specifications are as follows:
 - 1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
 - 2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding, and wire-brushing.

3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by power wire-brushing, power impact tools or power sanders.
4. White Metal Blast Cleaning (SSPC-SP5): Blast cleaning to a gray-white uniform metallic color until each element of surface is free of all visible residues.
5. Commercial Blast Cleaning (SSPC-SP6): Blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.
6. Brush-off Blast Cleaning (SSPC-SP7): Blast cleaning to remove loose rust, loose mill scale and other detrimental foreign matter to degree specified.
7. Near White Blast Cleaning (SSPC-SP10): Blast cleaning to nearly white metal cleanliness, until at least 95 percent of each element of surface area is free of all visible residues.

3.3 COATING APPLICATION

- A. Coating and paint application shall conform to the requirements of the Steel Structures Painting Council Paint Application Specifications SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting", and recommended practices of the National Association of Corrosion Engineers, and the Manufacturer of the paint and coating materials.
- B. Before applying any paint or finish, all surfaces shall be thoroughly cleaned and prepared for painting as herein specified. All cleaned metal shall be primed or painted, as specified, immediately after cleaning to prevent new rusting or oxidation of cleaned surfaces.
- C. Protective coverings or drop cloths shall be use to protect floors, fixtures, and equipment. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.
- D. Application – Environmental Conditions:
 1. Do not paint surfaces that exceed manufacturer specified moisture contents.
 2. Do not paint or coat:
 - a. Under dusty conditions.
 - b. When light on surface measures less than 15 foot-candles.
 - c. When ambient or surface temperature is less than 40 degrees Fahrenheit.
 - d. When relative humidity is higher than 85 percent.
 - e. When surface temperature is less than 5 degrees Fahrenheit above dew point.

- f. When surface temperature exceeds the manufacturer's recommendation.
 - g. When ambient temperature exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
3. No coating work shall be done under unfavorable weather conditions to wet or damp surfaces or in rain, snow, fog or mist.
 4. When it is expected the air temperature will drop below 40 degrees F or less than 5 degrees F above the dewpoint within eight hours after application of coating or paint.

Dewpoint shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with the US Department of Commerce Weather Bureau Psychrometric Tables.

If above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable, unless conditions are acceptable to the paint manufacturer for any given coating. The days coating or painting shall be completed in time to permit the film sufficient drying time to prevent damage by atmospheric conditions.

5. Provide fans, heating devices, dehumidifier unit, or other means recommended by coating manufacturer to prevent formation of condensation or dew on surface of substrate, coating between coats and within curing time following application of last coat.
 6. Provide adequate continuous ventilation and sufficient heating facilities to maintain minimum 45 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes.
- E. All painting shall be well applied, leaving no sags, laps, brush, or other defects. Each coat must thoroughly dry before applying next coat, and all work must be carefully cut into a true line and left smooth and clean. Hardware trim and other items shall be removed as required for proper application of coatings.
1. All painting shall conform to the following general conditions:
 - a. Thickness of coating in mils shall mean the dry film thickness. The number of coats specified shall mean the minimum number of coats to be used. Additional coatings shall be required if necessary to obtain the specified film thickness.
 - b. No coating work shall be done under unfavorable weather conditions.
 - c. Prime coats shall be provided where called for as a part of the painting system. Shop prime coats shall conform to the specified painting system for the given item. It shall be the responsibility of the Contractor to coordinate work so that factory prime items are primed or painted with a coating compatible with the specified finish painting system.
 - d. Particular attention shall be given to all welds, edges, and corners so as to get full and adequate coverage. Damaged shop prime coats or field applied prime coats shall be carefully replaced before finish painting.

Surface preparation for replacement of damaged coats shall be such as to give a clean surface for proper bonding of prime coat. Surfaces shall be strip coated per SSPC PA1 section 2.1,6.6. Finish coatings shall not be applied until touch-up prime coat has completely dried.

- e. Minimum between-coat drying items, as stated in the printed instructions of the coating manufacturer will be carefully observed.
- f. Thinning shall be done only if necessary for workability of the coating material in accordance with the manufacturer's printed instructions. Use only the appropriate thinner.
- g. Each coat shall be applied in a similar but different color from the preceding coat, the finish coat to be color selected by the Engineer.

3.4 INSPECTION

A. Inspection - General

- 1. Thickness of coatings and paints on metal surfaces shall be checked with a non-destructive type thickness gauge and shall follow the guidelines specified in SSPC-PA 2. Coating integrity shall be tested with an approved inspection device.
- 2. In cases of dispute concerning film thickness or holidays, the Engineer's calibrated instruments and measurements shall predominate. Wide film thickness discrepancies shall be measured and verified with a micrometer or other approved measuring instrument.

B. Inspection Devices

- 1. The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for measurement of dry-film thickness of coating and paint.
- 2. Dry-film thickness gauges and holiday testing device shall be made available for the Engineer's use at all times until final acceptance.

3.5 SAFETY AND HEALTH REQUIREMENTS

A. General: In accordance with requirements set forth by regulatory agencies applicable to the construction industry and Manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personnel protective lifesaving equipment for persons working in or about the project site.

B. Head and Face Protection and Respiratory Devices: Equipment shall include protective helmets which shall be worn by all persons in the vicinity of the Work. In addition, workers engaged in or near the Work during abrasive blasting shall wear eye and face protection devices and air purifying, half-mask or mouthpiece respirator with appropriate filter. Barrier creams shall be used on any exposed areas of skin.

- C. Ventilation: Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminant to the degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.
- D. Sound Levels: Whenever the occupational noise exposure exceed maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.
- E. Illumination: Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Illumination shall be as provided in SSPC-Guide 12. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the Engineer.
- F. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection and be removed by the Contractor to locations requested by the Engineer.

3.6 PRESERVATION

During construction, painter shall assume the preservation of all his work against damage by accident or otherwise, and shall leave the Work clean and whole. The Work will not be accepted until all of the Work has been completed and all retouching has been done. All Work which is rejected, or for any reason has to be done over, will be done by the Contractor at his expense.

3.7 CLEANING

During the progress of the Work, all other work shall be covered and fully protected from injury or painter's finish, and care shall be exercised not to splatter paint, enamel, etc., on adjacent work. Upon completion of the Work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Name and data plates on equipment shall not be painted and shall be left clean and legible upon completion of the project. All damage to surfaces resulting from the Work of this section shall be cleaned, repaired, or refinished to the satisfaction of the Engineer at no expense to the Agency.

3.8 SURFACES REQUIRING PAINTING

In general, the following surfaces are to be coated or painted:

- A. Exposed non-galvanized ferrous metal surfaces.
- B. Below grade metal surfaces.

3.9 SURFACES NOT REQUIRING PAINTING

- A. Galvanized surfaces.
- B. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section except as scheduled.
- C. Portions of metal embedded and contacting concrete, except for aluminum surfaces.
- D. Electrical equipment with factory applied finish.
- E. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts, unless otherwise indicated.
- F. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates.

END OF SECTION

SECTION 09 91 00 - BUILDING PAINTING

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 06 83 16 – Fiber Reinforced Plastic Paneling
- B. Section 07 92 00 – Joint Sealants
- C. Section 08 16 13 – Fiberglass Doors and Frames
- D. Section 09 21 16- Gypsum Board Assemblies

1.2 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this Specification. Publications may be referenced in the text by basic designation only. In case of conflict the most stringent apply.
 - 1. ASTM D16 – Standard Terminology for Paint Related Coatings, Materials, and Applications.
 - 2. ASTM D610 – Practice for Evaluating Degree of Rusting on Painted Steel Surfaces.
 - 3. ASTM D714 – Test Method for Evaluating Degree of Blistering of Paints.
 - 4. ASTM D2486 – Test Method for Scrub Resistance of Wall Paints
 - 5. ASTM D3359 – Standard Test Methods for Measuring Adhesion by Tape Test.
 - 6. ASTM D5894 – Practice for Cyclic Salt Fog/UV Exposure of painted Metal.
 - 7. ASTM D6677 – Standard Test Method for Evaluating Adhesion by Knife.
 - 8. Society for Protective Coatings/Steel Structures Painting Council (SSPC) - Standards and Specifications.
 - 1) SSPC-SP 1 – Solvent Cleaning.
 - 2) SSPC-SP 2 – Hand Tool Cleaning.

- 3) SSPC-SP 3 – Power Tool Cleaning.
- 4) SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
- 5) SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
- 6) SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
- 7) SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
- 8) SSPC-SP11, Power Tool Cleaning to Bare Metal.
- 9) SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
- 10) SSPC-SP13/NACE No. 6, Surface Preparation for Concrete.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.4 SUBMITTALS

- A. Provide product data on all coating and finishing products; indicating application instructions including: surface preparation, undercoating, reducing, and certification that product is “Best Line - Premium Grade”.
- B. Submit samples of selected colors representative of actual work as follows:
 1. Minimum size: 3 by 3-inches.
 2. Approved samples shall become final criteria for evaluating color and appearance of completed work.
 3. One set of approved samples shall be kept on the job.
 4. Identify each sample as to finish, formula, color name, and number.
- C. Submit manufacturer and applicator experience data with project owner phone numbers.

1.5 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing paint and coating finish products with 25 jobs similar in scope to work proposed.

- B. Applicator: Specializing in commercial painting and coating application with at least 10 successful jobs similar to that proposed.
- C. Verify coating thickness per manufacturers' instructions using an approved dry film coating testing instrument.
 - 1. Make 5 separate spot measurements where directed with 3 gage readings made for each location.
 - 2. The average of 5 spot measurements shall not be less than the specified thickness.
- D. Paint applicator shall certify the following:
 - 1. Immediately before painting, surfaces conformed to the specified preparation; they were in the specified condition; and were clean, dry, and free of dust, rust, and mill scale to the degree required by this Specification.
 - 2. Surface preparation and coating use, mixing, application, and curing were done in accordance with the current printed instructions and instructions of the coating manufacturer, and these Specifications.
 - 3. The products specified were used or a listing of the names of the products used and their manufacturer was submitted and approved.
 - 4. The products were used within the shelf-life dates of each container of each product used.
 - 5. The manufacturer's recommended dry film thickness of coatings on the work.
 - 6. Compatible paints were used where coatings are applied over previously applied coatings.

1.6 INDOOR AIR QUALITY

- A. Before painting inside building operate building permanent ventilation system at maximum outdoor airflow before mixing and applying paint, and for minimum 72 hours after application.

1.7 REGULATORY REQUIREMENTS

- A. Conform to International Building Code (IBC) for flame, fuel, smoke-rating requirements for completed finishes.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Store and protect products as recommended by paint manufacturer.
- B. Deliver products to site in sealed and labeled containers.
- C. Container labeling shall include manufacturer's name, type of paint, brand name, manufacture data, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
- D. Store paint materials at ambient temperature of 45 degrees F to 90 degrees F in well ventilated area, unless required otherwise by manufacturer's instructions. Only materials to be consumed within a 24-hour work period allowed at work site.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.9 TEMPERATURE AND HUMIDITY REQUIREMENTS

- A. Provide continuous ventilation and heating equipment to maintain paint products and substrate dry and at ambient temperatures between 50 and 85 degrees F. for 24 hours before, during and 48 hours after application of finishes, unless permitted otherwise by coating manufacturer's recommendations.
 - 1. Provide temperatures by temporary scaffold enclosures and heating as necessary.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 65 percent, unless permitted otherwise by coating manufacturer's recommendations.
- C. Provide lighting of 80 feet candles at work. Building lights may be used.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Companies meeting the "Quality Assurance" criteria and these

specifications.

2.2 MATERIALS – AIR QUALITY

- A. Conform to governing regulations including Federal and State requirements for pollution, safety and health.

2.3 PAINT MATERIALS

- A. Provide compatible products in accordance with approved paint manufacturer including paint, varnish, stain, enamel, lacquer, fillers and related products for prime, intermediate and finish coats.
- B. Accessory material not specifically indicated, but required, such as shellac, reducers, undercoats, primers, putty and the like, shall be of quality not less than required by applicable Specification Standards and recommended by the finish coat manufacturer in writing for compatibility and conditions of use.
- C. Paints containing lead shall not be used.
- D. All products “Best Line - PREMIUM GRADE” for professional trade sales recommended by paint manufacturer for the conditions of use.
- E. Mixing
 - 1. Furnish ready-mixed products except as otherwise specified.
 - 2. Follow manufacturer’s directions for:
 - a. Field-mixing of pastes and powders.
 - b. Field-catalyzing components.
 - 3. Coatings shall have good flowing application properties, capable of drying, or curing free of streaks or sags and yielding finish specified.

2.4 FINISHES

- A. Refer to schedule at end of specification for surface finishes.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect elements surrounding the work of this section from damage or disfiguration.
- B. Mask and shut down heat and ventilation intakes when painting adjacent exterior surfaces.
- C. Repair damage to other surfaces caused by work of this Section.
- D. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- E. Protection of work when stopping for the day:
 - 1. Erect barriers and post warning signs. Confirm that no dust generating activities will follow shutting down for the day.

3.2 ITEMS NOT TO BE PAINTED

- A. The following items shall be masked and not painted unless specifically scheduled:
 - 1. Items with factory finish paint, such as light fixtures, factory finished wall and soffit panels.
 - 2. Finished surfaces such as hardware trim, anodized aluminum, glass, stainless steel, bronze and the like.
 - 3. Moving equipment wearing surfaces.
 - 4. Equipment data plates, manufacturer's permanent maintenance labels.

3.3 PREPARATION

- A. General: Clean and prepare substrate for finish as specified and as recommended by coating manufacturer for conditions of use.
- B. Remove or coordinate and have removed electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces and finishing. Replace

removed items after painting.

- C. Clean surfaces and correct surface defects.
 - 1. Remove oil-grease and mildew with detergent or SSPC-SP1 cleaning solvent first (do not use paint thinner, hydrocarbons, or turpentine as they leave residue).
 - 2. Remove dirt, dust, loose material, rust-scale, oil-grease, mildew, release agents, non-adhering paint by sand papering, grinding, scraping or wire brushing.
 - 3. Sand paper thick and sharp edges of shop and existing paint and runs to smooth featheredge.
 - 4. Lightly sand or abrade surfaces dull to insure adhesion.
 - 5. Fill or sand out cracks, holes, pits and scratches, smooth to match adjacent finish.
 - 6. Remove sanding dust prior to painting.
- D. Seal stain marks, which may bleed through subsequent, finishes.
- E. Gypsum Board: Surfaces shall be clean, crack-free, joints finished, prior to painting.
 - 1. If surface defects appear after prime coating, repair defects.
- F. Galvanized Surfaces: Remove surfaces contamination and oils per SPC SP1 solvent cleaning and thoroughly rinse. Remove sheen per SPC SP2, hand tool cleaning. After cleaning, and prior to painting, remove dust and similar containments by air blast or vacuum. Apply primer immediately after cleaning.
- G. Uncoated Steel and Iron Surfaces: remove grease, scale, dirt and rust per SSPC-SP1, Solvent Cleaning. Clean per SSPC-SP3 power tool cleaning, or SSPC-SP2 hand cleaning.
- H. Shop Primed Steel Surfaces: Solvent clean per SSPC-SP1 followed by sanding, scraping and wire brushing per SSPC-SP2 hand cleaning to remove loose, scratched or weathered-corroded shop finish primer weld burns and rust. Feather edges to make inconspicuous. After cleaning and prior to painting remove dust and similar containments by air blast or

vacuum.

3.4 APPLICATION

- A. Apply coatings to all visible exposed surfaces scheduled in accordance with approved coating manufacturer's instructions and approved submittals for the conditions of use.
- B. Do not apply finishes to surfaces that are not clean, dull, and dry.
- C. Apply each coat to uniform finish.
- D. Sand or abrade lightly and clean between coats to achieve adhesion if recommended by coating manufacturer.
- E. Allow applied coat to dry before next coat is applied.
- F. Change colors or finishes at corners and joints.
- G. Apply materials so that the following results are obtained.
 - 1. Smooth uniform appearance, underlying paint edges feathered, free of brush marks, uneven orange peel, sags, runs or foreign matter.
 - 2. Complete coverage without skips or streaks and without heavy build-up in details.
 - 3. Close match with approved color.
 - 4. Sharp edges at adjoining materials or at color changes.
 - 5. Work stain finishes thoroughly into wood by brushing or rolling.
- H. Inspection of Coats: Do not apply additional coats until each completed coat has been inspected by the ENGINEER.
 - 1. Only inspected and approved coats of paint shall be considered in determining number of coats applied.
 - 2. Refinish entire surface if coat is not acceptable.

3.5 CLEANING

- A. As Work proceeds, promptly remove excess paint products where spilled, splashed or spattered.
- B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.
- C. Remove waste, cloths, and material, which may constitute fire or V.O.C. hazard daily from site.
- D. Clean Masonry per paint manufacturer's recommendations.
- E. Leave surfaces not required to be finished under this section undamaged and clean and free of paint products from work of this Section.

3.6 COATING SCHEDULE

- A. General:
 - 1. For the purposes of this schedule each coat shall be at least dry to the touch before proceeding with the following coat.
 - 2. Coating materials shall be recommended by manufacturer for condition of use and compatible with undercoats.
 - 3. Minimum number of coats is scheduled. Apply additional finish coats as necessary to provide uniform appearing coverage.
 - 4. Refer also to DRAWINGS.
 - 5. Sherwin Williams products are referenced. Other manufacturers having similar specifications meeting Quality Assurance specifications may be used. A substitute product from Sherwin Williams is preferred over another manufacturer.
- B. Coating Schedule:
 - 1. Gypsum Board:
 - a. Spot prime any stains with stain blocking primer sealer over stained area; Sherwin Williams "Quick Dry" B51 W08670, sealer primer surface, top coat compatible.
 - b. First Coat: Latex high build primer Surface: Sherwin Williams "Preprite

B28".

- c. 2 coats washable acrylic latex enamel, eggshell sheen. Sherwin Williams "ProMar 200" B31 2600.

3.7 COLOR SCHEDULE

- A. P-1 Gypsum Board Ceiling: Sherwin Williams, Westhighland White SW 7566.

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 22 - PLUMBING

SECTION 22 11 19 - PIPING AND TUBING SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish and install all piping and tubing as shown and specified, complete, including PVC pipe and tubing, fittings, valves, bolts, supports, insulating connections, manifolds, and such other specialties as required for a complete and operable piping system in accordance with the requirements of the Contract Documents.
- B. All items shall be manufactured from stainless steel.

1.2 CONTRACTOR SUBMITTALS

- A. For the materials and equipment items supplied under the provisions of this Section, the CONTRACTOR shall submit copies of the manufacturer's product specifications and performance details according to the requirements of Division 01.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL PIPE

- A. All mounting nipples for gauges, instruments and other appurtenances shall be stainless steel, Type 316 Schedule 80 threaded pipe conforming to ASTM A312 with stainless steel threaded fittings.

2.2 STAINLESS STEEL TUBING

- A. All instrument sensing lines shall be stainless steel tubing. Stainless steel tubing shall be seamless 316L stainless steel tubing meeting ASTM A213, ASME SA-213 specifications with a minimum wall thickness of 0.049 inches. All fittings shall be compression, guaranteed gas bubble-tight as Manufactured by **Swagelok**, or equal.

2.3 ISOLATION VALVES

- A. All instrument isolation valves shall be ball valves, 316 stainless steel, **Swagelok 40 Series**, or equal.

2.4 THREE VALVE INSTRUMENT MANIFOLDS

- A. All instrument manifolds shall be 316 stainless steel, **Swagelok V Series 3-Valve Manifold** or equal.

2.5 PIPE SUPPORTS

- A. Pipe supports, hangers, anchors, and guides shall be compatible with the pipe or tubing materials.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Supports: Pipe and tubing systems shall be securely anchored and supported to prevent undue deflection or vibration in accordance with the applicable codes and standards. Provide all hangers, supports, guides, anchors, bolts, and mounting accessories as required for the installation. Maximum spacing between supports shall be 4 feet for all tubing.
- B. Piping: Individual tubes shall run parallel and near the surfaces from which they are supported. Bends shall be formed to uniform radii with the proper tool without deforming or thinning the walls of the tubing. Ends of tubing shall be square-cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at all panels requiring pipe or tubing entries.
- C. Isolation Valves: All instrument mounting nipples and sensing lines shall be provided with isolation valves at the pipe tap.
- D. Instrument Manifolds: All pressure transmitters shall be provided with instrument manifolds for testing and calibration. All manifolds shall be independently supported. Differential pressure elements shall have three valve manifolds.
- E. Piping Taps: All piping taps shall be made at the horizontal centerline of the pipe to minimize the introduction of air into the sensing lines. Instruments shall be mounted vertically. All taps to include an isolation valve.
- F. Air Traps: All tubing shall be installed to avoid air traps and allow air to be bled off. In general, tubing shall be routed to provide a continuous rise from the tap to the instrument.
- G. Tubing Tags: All tubing lines shall be identified at the tap with a stamped, stainless-steel tag wired to the tap.

END OF SECTION

CITY OF WHITTIER, ALASKA

WHITTIER WELL FIELD UPGRADE

**DIVISION 23 - HEATING, VENTILATING, AND AIR-
CONDITIONING (HVAC)**

SECTION 23 11 23 - FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Natural gas piping above grade.
 2. Unions and flanges.
 3. Valves.
 4. Pipe hangers and supports.
 5. Strainers.
 6. Natural gas pressure regulators.
 7. Natural gas pressure relief valves.

1.2 REFERENCES

- A. American National Standards Institute:
1. ANSI Z21.15 - Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
- B. American Society of Mechanical Engineers:
1. ASME B16.3 - Malleable Iron Threaded Fittings.
 2. ASME B16.33 - Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 psig (sizes 1/2 - 2).
 3. ASME B31.9 - Building Services Piping.
- C. ASTM International:
1. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 2. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
 3. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
 4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- D. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
 4. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

- F. National Fire Protection Association:
 - 1. NFPA 54 - National Fuel Gas Code.
- G. Underwriters Laboratories Inc.:
 - 1. UL 842 - Valves for Flammable Fluids.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.
- B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves, equipment.
- C. Provide pipe hangers and supports in accordance with MSS SP 58.
- D. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.4 SUBMITTALS

- A. Submit Product Data in accordance with MASS Section 10.05 Article 5.6.
- B. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
 - 4. Piping Specialties: Submit manufacturers catalog information including capacity, rough-in requirements, and service sizes for the following:
 - a. Strainers.
 - b. Natural gas pressure regulators.
 - c. Natural gas pressure relief valves.
- C. Test Reports: Indicate results of piping system pressure test.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Execution and Closeout Requirements shall be in accordance with MASS 2015.

- B. Project Record Documents: Record actual locations of valves, piping system, and system components.
- C. Operation and Maintenance Data: Submit for valves and gas pressure regulators installation instructions, spare parts lists.

1.6 QUALITY ASSURANCE

- A. Perform natural gas work in accordance with NFPA 54.
- B. Perform work in accordance with applicable code and ENSTAR requirements.
- C. Perform Work in accordance with ASME B31.9 code for installation of piping systems.
- D. Perform Work in accordance with authority having jurisdiction AWS D1.1 for welding hanger and support attachments to building structure.
- E. Furnish shutoff valves complying with ASME B16.33 or ANSI Z21.15.
- F. Perform Work in accordance with State of Alaska standards as amended by the local authority having jurisdiction.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site shall be in accordance with MASS 2015.
- B. Product storage and handling requirements shall be in accordance with MASS 2015.
- C. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- D. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Furnish temporary protective coating on cast iron and steel valves.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 WARRANTY

- A. Warranty shall be in accordance with MASS Section 10.03 Article 3.7.
- B. The Contractor shall warranty all materials and workmanship for two (2) year from the Final Acceptance Date unless otherwise specified in the Special Provisions. This warranty shall require the Contractor to remedy promptly, without cost to the Owner, all defects in material and workmanship including any consequential damages resulting from defective materials or workmanship.
- C. All warranty Work shall be subject to the same Contract provisions, including materials, quality of work, authority of the Engineer and inspection, as provided for in the original Work. All warranty Work shall be at the sole expense of the Contractor. All materials and workmanship directly or indirectly involved in repairs or replacements shall carry an extended warranty of not less than one (1) year from the date of the Engineer's written acceptance of the repair or replacement Work, or through the warranty period for the original project Work, whichever is longer.

PART 2 - PRODUCTS

2.1 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53 Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron.
 - 2. Joints: Threaded for pipe 2 inch and smaller.

2.2 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.

2.3 BALL VALVES

- A. 1/4 inch to 2 inch: MSS SP 110, Class 125, two-piece, threaded ends, bronze body, chrome plated bronze ball, reinforced Teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, full port.

2.4 GAS COCKS

- A. Up to 2 Inches: Bronze body, bronze tapered plug. non-lubricated, Teflon packing, threaded ends.

2.5 STRAINERS

- A. 2 inch and Smaller: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32-inch stainless steel perforated screen.

2.6 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. ERICO International Corporation
 - 2. PHD Manufacturing, Inc.
 - 3. B-Line Systems, Inc
 - 4. Substitutions: 2015 MASS - Product Requirements.
- B. Conform to NFPA 54 and MSS SP 58.
- C. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or carbon steel, adjustable swivel, split ring.
- D. Vertical Support: Steel riser clamp.

2.7 NATURAL GAS PRESSURE REGULATORS

- A. Manufacturers:
 - 1. Fisher Control Valves & Instruments
 - 2. Maxitrol Company
 - 3. Substitutions: 2015 MASS - Product Requirements.
- B. Product Description: Spring loaded, general purpose, self-operating service regulator including internal relief type diaphragm assembly and vent valve. Diaphragm case can be rotated 360 degrees in relation to body.
 - 1. Comply with ANSI Z21.80.
 - 2. Temperatures: minus 20 degrees F to 150 degrees F.
 - 3. Body: Aluminum or cast iron.
 - 4. Spring case, lower diaphragm casing, union ring, seat ring and disk holder: Aluminum.
 - 5. Disk, diaphragm, and O-ring: Nitrile.
 - 6. Maximum inlet pressure: 150 psig.
 - 7. Furnish sizes 2 inches and smaller with threaded ends.

2.8 NATURAL GAS PRESSURE RELIEF VALVES

- A. Manufacturers:
 - 1. Emerson Process Management
 - 2. Fisher Control Valves & Instruments
 - 3. Substitutions: 2015 MASS - Product Requirements.

- B. Product Description: Spring loaded type relief valve.
 - 1. Body: Aluminum.
 - 2. Diaphragm: Nitrile.
 - 3. Orifice: Aluminum.
 - 4. Maximum operating temperature: 150 degrees F.
 - 5. Inlet Connections: Threaded.
 - 6. Outlet or Vent Connection: Same size as inlet connection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 2015 MASS - Administrative Requirements: Coordination and project conditions.

3.2 PREPARATION

- 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.

3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install hangers and supports in accordance with MSS SP 89.
- B. Support horizontal piping hangers as scheduled.
- C. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Install hangers to allow 1-1/2-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Support riser piping independently of connected horizontal piping.

3.4 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install natural gas piping in accordance with NFPA 54.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient.
- D. Where required, bend pipe with pipe bending tools in accordance with procedures intended for that purpose.
- E. Install piping to conserve building space and not interfere with use of space.
- F. Size and install gas piping to provide sufficient gas to supply maximum appliance demand at pressure higher than appliance minimum inlet pressure.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Sleeve pipe passing through partitions, walls, and floors.
- I. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.
- J. Provide clearance for installation of insulation and access to valves and fittings.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer.
- L. Provide support for utility meters in accordance with requirements of utility company.
- M. Install vent piping from gas pressure reducing valves to outdoors and terminate in weatherproof hood. Protect vent against entry of insects and foreign material.
 - 1. Minimum Vent Size: Connection size at regulator vent connection.
 - 2. Run individual vent line from each relief device, independent of breather vents.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- P. Install gas pressure regulator with independent vent full size opening on regulator and terminate outdoors.
- Q. Provide new gas service complete with gas meter and regulators. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.5 FIELD QUALITY CONTROL

- A. All field inspecting, testing, adjusting, and balancing shall be in accordance with MASS 2015.
- B. Where gas appliance will be damaged by test pressure, disconnect appliance and cap piping during pressure test. Reconnect appliance after pressure test and leak test connection.
- C. Where gas appliance is designed for operating pressures equal to or greater than piping test pressure, provide gas valve to isolate appliance or equipment from gas test pressure.
- D. Pressure test natural gas piping in accordance with NFPA 54.
- E. Inspect, test and purge gas piping in accordance with applicable code and ENSTAR requirements.
- F. Where new branch piping is extended from existing system, pressure test new branch piping only. Leak test joint between new and existing piping with noncorrosive leak detection fluid or other approved method.
- G. When pressure tests do not meet specified requirements, remove defective work, replace, and retest.
- H. Immediately after gas is applied to a new system, or a system has been restored after gas service interruption, check pipe for leakage.
 - 1. Where leakage is detected, shut off gas supply until necessary repairs are complete.
- I. Do not place appliances in service until leak testing and repairs are complete.

3.6 SCHEDULES

- A. Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING MINIMUM HANGER ROD DIAMETER Inches	STEEL PIPE MINIMUM HANGER ROD DIAMETER Inches
1/2	4	6	3/8	3/8
3/4	6	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	8	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8

END OF SECTION

SECTION 23 31 00 - HVAC DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Duct Materials.
 - 2. Ductwork fabrication.
- B. Related Sections:
 - 1. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A90 - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - 3. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 4. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
 - 5. A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - 6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association:
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- D. Underwriters Laboratories Inc.:
 - 1. UL 181 - Factory-Made Air Ducts and Connectors.

1.3 PERFORMANCE REQUIREMENTS

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission.

1.4 SUBMITTALS

- A. Submit Product Data in accordance with MASS Section 10.05 Article 5.6.
- B. Product Data: Submit data for duct materials.
- C. Manufacturer's Installation Instructions: Submit special procedures for glass fiber ducts.

1.5 CLOSEOUT SUBMITTALS

- A. Execution and Closeout Requirements shall be in accordance with MASS 2015.
- B. Project Record Documents: In addition to other requirements in MASS 2015, record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealant.

1.9 FIELD MEASUREMENTS

- A. Before ordering or fabricating 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 Engineer for consideration before proceeding with the work.

1.10 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 catalog 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.

1.11 SCHEDULE OF WORK

- A. The work 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 owner 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.

1.12 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 owner, 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.

1.13 COMPLETION REQUIREMENTS

- A. Project closeout requirements shall be in accordance with MASS 2015; before acceptance and final payment, the Contractor shall furnish:
 - 1. Accurate project record drawings, shown in red ink on blue line prints, showing all changes from the original plans made during installation of the work.
 - 2. All manufacturers' guarantees.
 - 3. Warranties.
 - 4. Operation and maintenance manuals.

1.14 WARRANTY

- A. Submit Product Data in accordance with MASS Section 10.03 Article 3.7.
- B. The Contractor shall warranty all materials and workmanship for two (2) year from the Final Acceptance Date unless otherwise specified in the Special Provisions. This warranty shall require the Contractor to remedy promptly, without cost to the Owner, all defects in material and workmanship including any consequential damages resulting from defective materials or workmanship.
- C. All warranty Work shall be subject to the same Contract provisions, including materials, quality of work, authority of the Engineer and inspection, as provided for in the original Work. All warranty Work shall be at the sole expense of the Contractor. All materials and workmanship directly or indirectly involved in repairs or replacements shall carry an extended warranty of not less than one (1) year from the date of the Engineer's written acceptance of the repair or replacement Work, or through the warranty period for the original project Work, whichever is longer.

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90.
- B. Fasteners: Rivets, bolts, or sheet metal screws.
- C. Hanger Rod: ASTM A36 steel, threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

- B. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Seal joints between duct sections and duct seams with welds, gaskets, mastic adhesives, mastic plus embedded fabric systems, or tape.
 - 1. Sealants, Mastics and Tapes: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.
 - 2. Do not provide sealing products not bearing UL approval markings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Coordination and project conditions to be in accordance with MASS 2015.
- B. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Install duct hangers and supports in accordance with SMACNA.
- D. Use double nuts and lock washers on threaded rod supports.
- E. Exhaust Outlet Locations:
 - 1. Minimum Distance from Property Lines: 3 feet.
 - 2. Minimum Distance from Building Openings: 3 feet.
 - 3. Minimum Distance from Outside Air Intakes: 10 feet.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

3.4 CLEANING

- A. Final cleaning to be in accordance with MASS 2015.

END OF SECTION

SECTION 23 33 00 - HVAC ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Control Dampers
 - 2. Louvers
- B. Related Sections:
 - 1. Section 23 31 00 - HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
 - 1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets.
- C. ASTM International:
 - 1. ASTM E1 - Standard Specification for ASTM Thermometers.
- D. National Fire Protection Association:
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- E. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- F. Underwriters Laboratories Inc.:
 - 1. UL 555C - Standard for Safety for Ceiling Dampers.

1.3 SUBMITTALS

- A. Submit Product Data in accordance with MASS 2015 - Submit data for shop fabricated assemblies and hardware used.
 - 1. Submit for the following. Include where applicable electrical characteristics and connection requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Execution and Closeout Requirements shall be in accordance with MASS 2015.
- B. Operation and Maintenance Data: Submit instructions for lubrication, maintenance, and operation.

1.5 QUALITY ASSURANCE

- A. Dampers tested, rated, and labeled in accordance with the latest UL requirements.
- B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
- C. Perform Work in accordance with City of Whittier and State of Alaska standards.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Product storage and handling requirements shall be in accordance with MASS 2015.
- B. Protect dampers from damage to operating linkages and blades.
- C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- D. Storage: Store materials in a dry area indoor, protected from damage.
- E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.8 MATERIALS

- A. In accordance with MASS 2015, all materials and equipment furnished under the Contract shall be new, unless otherwise specified, and shall be of good quality, free from defects, and shall conform to the requirements of the Contract Documents.

- B. In accordance with MASS 2015, substitute materials shall not be used unless approved through the substitution request process by the Engineer in writing prior to installation. 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 owner shall be the final authority regarding acceptability of substitutes.

1.9 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 Engineer 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 in the plans. Advise the owner of any such conflicts before installation.

1.11 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 catalog 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.

1.12 SCHEDULE OF WORK

- A. The work 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 meet scheduled completion dates, and to avoid delaying any other trade. The owner 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.

1.13 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 owner, 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.

1.14 COMPLETION REQUIREMENTS

- A. Project closeout requirements shall be in accordance with MASS 2015; before acceptance and final payment, the Contractor shall furnish:
 - 1. Accurate project record drawings, shown in red ink on blue line prints, showing all changes from the original plans made during installation of the work.
 - 2. All manufacturers' guarantees.
 - 3. Warranties.
 - 4. Operation and maintenance manuals.

1.15 WARRANTY

- A. Warranty shall be in accordance with MASS Section 10.03 Article 3.7.
- B. The Contractor shall warranty all materials and workmanship for two (2) year from the Final Acceptance Date unless otherwise specified in the Special Provisions. This warranty shall require the Contractor to remedy promptly, without cost to the Owner, any and all defects in material and workmanship including any consequential damages resulting from defective materials or workmanship.
- C. All warranty Work shall be subject to the same Contract provisions, including materials, quality of work, authority of the Engineer and inspection, as provided for in

the original Work. All warranty Work shall be at the sole expense of the Contractor. All materials and workmanship directly or indirectly involved in repairs or replacements shall carry an extended warranty of not less than one (1) year from the date of the Engineer's written acceptance of the repair or replacement Work, or through the warranty period for the original project Work, whichever is longer.

PART 2 - PRODUCTS

2.1 CONTROL DAMPERS

- A. Acceptable Manufacturers:
 - 1. Ruskin.
 - 2. Substitutions: 2015 MASS - Product Requirements.

- B. Multi-blade, Opposed blade action, control dampers of extruded aluminum, with airfoil type blades of maximum six-inch width, blades positioned across short air opening dimension, field replaceable extruded vinyl or silicon sealed edges, linked together in rattle-free manner, stainless steel bearings, square or hexagonal axles for positive locking connection to blades and linkage, with documented leakage rate not to exceed 6 CFM/sq. ft. at 4-inch W.G.

2.2 LOUVERS

- A. Acceptable Manufactures:
 - 1. Ruskin.
 - 2. Substitutions: 2015 MASS – Product Requirements.

- B. Construction to be all welded fixed blade type with frame and blades made from extruded aluminum with 57% Free Area. Drain gutter in each blade to minimize water cascading between blades.

- C. Beginning point of water penetration at .01 oz. per square foot to be 1023 feet per minute.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Coordination and project conditions in accordance with MASS 2015.

- B. Verify duct and equipment installations are ready for accessories.

3.2 INSTALLATION

- A. Install in accordance with NFPA 90A and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Install accessories in accordance with manufacturer's instructions.

END OF SECTION

SECTION 23 34 00 - HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Propeller fan.
- B. Related Sections:
 - 1. Section 23 31 00 - HVAC Ducts and Casings: Product requirements for hangers for placement by this section.
 - 2. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.
 - 3. Division 26 - Equipment Wiring Connections: Execution and product requirements for connecting equipment specified by this section.

1.2 REFERENCES

- A. American Bearing Manufacturers Association:
 - 1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
 - 2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- B. Air Movement and Control Association International, Inc.:
 - 1. AMCA 99 - Standards Handbook.
 - 2. AMCA 204 - Balance Quality and Vibration Levels for Fans.
 - 3. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - 4. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
 - 5. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- C. National Electrical Manufacturers Association:
 - 1. NEMA MG 1 - Motors and Generators.
 - 2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. Underwriters Laboratories Inc.:
 - 1. UL 705 - Power Ventilators.

1.3 SUBMITTALS

- A. Submit Product Data in accordance with MASS Section 10.05 Article 5.6.
- B. Shop Drawings: Indicate size and configuration of fan assembly, mountings, weights, ductwork, and accessory connections.

- C. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics, and connection requirements.
- D. Manufacturer's Installation Instructions: Submit fan manufacturer's instructions.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Execution and Closeout Requirements shall be in accordance with MASS 2015.
- B. Operation and Maintenance Data: Submit instructions for maintenance, lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.5 QUALITY ASSURANCE

- A. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- D. Balance Quality: Conform to AMCA 204.
- E. Perform Work in accordance with State of Alaska standards and as amended by the local Authority Having Jurisdiction..

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Product storage and handling requirements shall be in accordance with MASS 2015.
- B. Protect motors, shafts, and bearings from weather and construction dust.

1.8 FIELD MEASUREMENTS

- 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 Engineer for consideration before proceeding with the work.

1.9 WARRANTY

- A. Warranty shall be in accordance with MASS Section 10.03 Article 3.7.
- B. The Contractor shall warranty all materials and workmanship for two (2) year from the Final Acceptance Date unless otherwise specified in the Special Provisions. This warranty shall require the Contractor to remedy promptly, without cost to the Owner, any and all defects in material and workmanship including any consequential damages resulting from defective materials or workmanship.
- C. All warranty Work shall be subject to the same Contract provisions, including materials, quality of work, authority of the Engineer and inspection, as provided for in the original Work. All warranty Work shall be at the sole expense of the Contractor. All materials and workmanship directly or indirectly involved in repairs or replacements shall carry an extended warranty of not less than one (1) year from the date of the Engineer's written acceptance of the repair or replacement Work, or through the warranty period for the original project Work, whichever is longer.

PART 2 - PRODUCTS

2.1 PROPELLER FANS

- A. Manufacturers:
 - 1. Greenheck Fan Corporation.
 - 2. Loren Cook Company.
 - 3. Substitutions: 2015 MASS - Product Requirements.
- B. Construction:
 - 1. Wall mounted fan to be UL listed and AMCA certified.
 - 2. Propeller: Aluminum blade with steel hub, statically and dynamically balanced, locked to shaft.
 - 3. Frame: One-piece, square steel with die formed venturi orifice, mounting flanges and supports, with baked enamel finish.
- C. Accessories:

1. Intake and Outlet Damper: Multiple blades with offset hinge pin, blades linked, line voltage motor drive, power open, spring return.
 2. Safety Screens: Expanded galvanized metal over inlet, motor, and drive; to comply with OSHA regulations.
 3. Hood: Weather shield, to exclude rain and snow
 4. Provide Wall housing mounting/wall collar.
- D. Capacity:
1. As scheduled on Contract Drawings.
- E. Electrical Characteristics and Components:
1. Electrical Characteristics: In accordance with Division 26 and as scheduled on Contract Drawings.
 2. Motors: In accordance with Division 26.
 3. Controls: Wall mounted thermostat.
 4. Disconnect Switch: Factory mounted disconnect switch.
 5. Fan speed controller: Factory mounted controller.
 6. Thermal overload protection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 2015 MASS - Administrative Requirements: Coordination and project conditions.

3.2 PREPARATION

- A. Remove scale and dirt, on inside and outside, before assembly.

3.3 INSTALLATION

- A. Secure wall fans with stainless steel lag screws to structure.
- B. Install safety screen where inlet or outlet is exposed.
- C. Install backdraft dampers on discharge of exhaust fans and as indicated on Drawings.

3.4 DEMONSTRATION

- A. Requirements for demonstration and training shall be in accordance with MASS 2015.
- B. Demonstrate fan operation and maintenance procedure.

3.5 PROTECTION OF FINISHED WORK

- A. Execution and Closeout Requirements shall be in accordance with MASS 2015 - Requirements for protecting finished Work.
- B. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

3.6 FIELD QUALITY CONTROL

- A. All field inspecting, testing, and adjusting shall be in accordance with 2015 MASS.

END OF SECTION

SECTION 23 55 00 - FUEL-FIRED HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gas fired unit heaters.
- B. Related Sections:
 - 1. Section 23 11 23 - Facility Natural-Gas Piping.
 - 2. Section 23 33 00 - Air Duct Accessories.
 - 3. Division 26 - Equipment Wiring Connections.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z83.8 - Gas Unit Heaters.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- C. National Fire Protection Association:
 - 1. NFPA 54 - National Fuel Gas Code.
 - 2. NFPA 70 - National Electric Code.
 - 3. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

1.3 SUBMITTALS

- A. Submit shop drawings and product data in accordance with MASS Section 10.05 Article 5.6.
- B. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.
- C. Product Data: Submit manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- D. Manufacturer's Installation Instructions: Submit Indicate rigging and assembly.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Execution and Closeout Requirements shall be in accordance with MASS 2015.
- B. Project Record Documents: Record actual locations of thermostats or other products not mounted on unit.
- C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.

1.5 QUALITY ASSURANCE

- A. Gas-Fired Unit Heater Performance Requirements: Conform to minimum efficiency prescribed by ASHRAE 90.1 when tested in accordance with ANSI Z83.8.
- B. Perform Work in accordance with State of Alaska standard and as amended by the local Authority Having Jurisdiction.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site shall be in accordance with MASS 2015.
- B. Product storage and handling requirements shall be in accordance with MASS 2015.
- C. Accept units on site in factory packing. Inspect for damage. Store under roof.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Warranty shall be in accordance with MASS Section 10.03 Article 3.7.
- B. The Contractor shall warranty all materials and workmanship for two (2) year from the Final Acceptance Date unless otherwise specified in the Special Provisions. This

warranty shall require the Contractor to remedy promptly, without cost to the Owner, any and all defects in material and workmanship including any consequential damages resulting from defective materials or workmanship.

- C. All warranty Work shall be subject to the same Contract provisions, including materials, quality of work, authority of the Engineer and inspection, as provided for in the original Work. All warranty Work shall be at the sole expense of the Contractor. All materials and workmanship directly or indirectly involved in repairs or replacements shall carry an extended warranty of not less than one (1) year from the date of the Engineer's written acceptance of the repair or replacement Work, or through the warranty period for the original project Work, whichever is longer.

PART 2 - PRODUCTS

2.1 GAS FIRED UNIT HEATERS

- A. Manufacturers:
 - 1. Modine.
 - 2. Sterling HVAC Products.
 - 3. Substitutions: 2015 MASS - Product Requirements.
- B. Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:
 - 1. Heating fuel: Natural gas fired.
 - 2. Discharge Louvers: Individually adjustable horizontal louvers to match cabinet finish.
 - 3. Gas Control: Single stage.
 - 4. Ignition System: Electric direct ignition.
 - 5. Control Voltage: 24-volt, 60 hertz.
 - 6. Location: Suspended from ceiling.
 - 7. Electrical: UL listed.
 - 8. Motor: Open Drip Proof.
- C. Cabinet: 22-gauge aluminized steel, easily removed and secured access panels, insulated or double panel construction. Baked on polyester powder corrosion resistance finish.
- D. Supply Fan: Propeller type with fan guard.
- E. Heat Exchanger: 18-gauge aluminized steel welded construction, indirect fired tubular exchanger with individual fired tubes. Minimum 82% efficient for all air flow ranges.
- F. Gas Burner: Atmospheric type. Gas pressure shall be between 6–7-inch water column for natural gas. Provide with solid state ignition system.
- G. Gas Burner Safety Controls:

1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
2. Flame rollout switch: Installed on burner box and prevents operation.
3. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
4. Pressure switch: Automatic reset vent pressure switch to prevent operation of the burner if restricted venting of flue conditions exist.
5. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic reset.

H. Controls:

1. General: Gas fired unit heaters shall have wall-mounted low voltage contactors, to control burner operation and supply fan to maintain temperature setting.
2. Low-Level Thermostats: Low-level thermostats shall be digital type with internal adjustable maximum setting stop. Setpoints shall be adjustable from 40 to 80 degrees F. Thermostats shall meet the Energy Conservation Standard approval where required by the State. Thermostat shall be of steel construction and have a keyed locking fastener.
3. Cooling Thermostats: Cooling thermostats shall be digital type. Setpoints shall be adjustable from 55 to 95 degrees F, close on rise. Thermostats shall meet the Energy Conservation Standard approval where required by the State. Thermostat shall be of steel construction and have a keyed locking fastener.
4. Manufacturers: Control system components and thermostats shall be as manufactured by White Rodgers, or equal.
5. Supply Fan Control: Energize either from discharge temperature independent of burner controls or with timed off delay and timed on delay.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Administrative Requirements in accordance with MASS 2015: Coordination and project conditions.
- B. Verify space is ready for installation of units and openings are as indicated on shop drawings.

3.2 INSTALLATION

- A. Install units in accordance with gas fired units to NFPA 54.
- B. Installation - Natural Gas Piping:
 1. Connect natural gas piping in accordance with NFPA 54.
 2. Connect natural gas piping to unit, full size of unit gas train inlet. Arrange piping with clearances for burner service.
 3. Install the following piping accessories on natural gas piping connections. Refer to Section 23 11 23.

- a. Strainer.
 - b. Pressure gage.
 - c. Shutoff valve.
 - d. Pressure reducing valve.
- C. Install vent connections in accordance with NFPA 211. Install vents and stacks.
- D. Provide watertight drip pan below vent connections were routed over electrical panels or in electrical clearance areas in accordance with code. Coordinate with Electrical.
- E. Provide hangers and supports for units.
- F. Provide operating controls.
- G. Provide connection to electrical power systems. Refer to Division 26.

END OF SECTION

SECTION 23 82 39 - ELECTRIC HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Electric unit heaters.
- B. Related Sections:
 - 1. Division 26 - Equipment Wiring Connections.

1.2 REFERENCES

- A. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. National Fire Protection Association:
 - 1. NFPA 70 - National Electric Code.
 - 2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

1.3 SUBMITTALS

- A. Submit Shop drawings and product data in accordance with MASS Section 10.05 Article 5.6.
- B. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.
- C. Product Data: Submit manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- D. Manufacturer's Installation Instructions: Submit assembly and setting operations.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site shall be in accordance with MASS 2015.
- B. Product storage and handling requirements shall be in accordance with MASS 2015.
- C. Accept units on site in factory packing. Inspect for damage. Store under roof.

1.6 WARRANTY

- A. Warranty shall be in accordance with MASS Section 10.03 Article 3.7.
- B. The Contractor shall warranty all materials and workmanship for two (2) year from the Final Acceptance Date unless otherwise specified in the Special Provisions. This warranty shall require the Contractor to remedy promptly, without cost to the Owner, any and all defects in material and workmanship including any consequential damages resulting from defective materials or workmanship.
- C. All warranty Work shall be subject to the same Contract provisions, including materials, quality of work, authority of the Engineer and inspection, as provided for in the original Work. All warranty Work shall be at the sole expense of the Contractor. All materials and workmanship directly or indirectly involved in repairs or replacements shall carry an extended warranty of not less than one (1) year from the date of the Engineer's written acceptance of the repair or replacement Work, or through the warranty period for the original project Work, whichever is longer.

PART 2 - PRODUCTS

2.1 ELECTRIC UNIT HEATERS

- A. Manufactures:
 - 1. Modine
 - 2. Chromalox
 - 3. Substitutions: 2015 MASS - Product Requirements.
- B. Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, and accessories:
 - 1. Discharge Louvers: Individually adjustable horizontal louvers to match cabinet finish.
 - 2. Controls: Unit-mounted thermostat adjustable from 40-90°F.
 - 3. Location: Suspended from ceiling.
 - 4. Motor: Totally enclosed.
- C. Cabinet: Steel with baked on powder coat factory finish.
- D. Supply Fan: Propeller type with fan guard.

- E. Heating Element: Nickel-chromium wire elements enclosed in metallic tubes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Administrative Requirements in accordance with MASS 2015: Coordination and project conditions.
- B. Verify space is ready for installation of units and openings are as indicated on shop drawings.

3.2 INSTALLATION

- A. Install in accordance with Manufacture installation instructions.
- B. Provide hangers and supports for units.
- C. Provide connection to electrical power systems. Refer to Division 26.

END OF SECTION

SECTION 23 84 00 - HUMIDITY CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Dehumidifier.
- B. Related Sections:
 - 1. Section 22 11 19 - Piping and Tubing Systems.
 - 2. Division 26 – Equipment Wiring Connections.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- B. Underwriters Laboratories Inc.

1.3 SUBMITTALS

- A. Submit Product Data in accordance with MASS Section 10.05 Article 5.6.
- B. Product Data: Submit catalog sheet indicating general assembly, dimensions, weights, materials, and certified performance ratings, duct and service connections, electric nameplate data, and wiring diagrams.
- C. Manufacturer's Installation Instructions: Submit assembly and setting operations.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Alaska standard and as amended by the local Authority Having Jurisdiction.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data in accordance with MASS 2015.

- B. Submit manufacturer's descriptive literature, operating instructions, maintenance, and repair data, including instructions for lubrication, filter replacement, cleaning and spare parts lists.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site shall be in accordance with MASS 2015.
- B. Product storage and handling requirements shall be in accordance with MASS 2015.
- C. Protect motors, shafts, and bearings from weather and construction dust.

1.7 WARRANTY

- A. Warranty shall be in accordance with MASS Section 10.03 Article 3.7.
- B. The Contractor shall warranty all materials and workmanship for two (2) year from the Final Acceptance Date unless otherwise specified in the Special Provisions. This warranty shall require the Contractor to remedy promptly, without cost to the Owner, any and all defects in material and workmanship including any consequential damages resulting from defective materials or workmanship.
- C. All warranty Work shall be subject to the same Contract provisions, including materials, quality of work, authority of the Engineer and inspection, as provided for in the original Work. All warranty Work shall be at the sole expense of the Contractor. All materials and workmanship directly or indirectly involved in repairs or replacements shall carry an extended warranty of not less than one (1) year from the date of the Engineer's written acceptance of the repair or replacement Work, or through the warranty period for the original project Work, whichever is longer.

PART 2 - PRODUCTS

2.1 DEHUMIDIFIER

- A. Manufacturers:
 - 1. Quest
 - 2. Substitutions: 2015 MASS - Product Requirements.
- B. General
 - 1. High efficiency self-contained, dehumidifier, sealed R410A Refrigerant system, operating range 33° F to 100° F, wiring factory installed, eight foot power cord minimum.
- C. Filters:
 - 1. Pleated Media – MERV-13

- D. Compressor:
 - 1. Compressor to be equipped with an external overload and run capacitor.
- E. Controller:
 - 1. Integral adjustable control by dehumidistat and positive on/off setting.
 - 2. Defrost cycle to accommodate operation down to 33 degrees Fahrenheit.
- F. For Sequence of Operations reference Contract Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in strict compliance with manufacturer's instructions. Maintain clearances around unit as listed in manufacturer's recommendations.
- B. Provide control wiring for field installed accessories.

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 26 - ELECTRICAL

SECTION 26 01 26 - ELECTRICAL TESTS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. This Section specifies the Work necessary to test, commission, and demonstrate that the electrical Work satisfies the criteria of these Specifications and functions as required by the Contract Documents.
- B. The requirements of Section 26 05 00 – Electrical Work, General, apply to the Work of this Section.

1.2 TESTING

- A. The following test requirements supplement test and acceptance criteria that may be stated elsewhere.
 - 1. Lighting: Switching, including remote control, if indicated. Circuitry is in accordance with panel schedules.
 - 2. Power Instrumentation: Demonstrate that power monitor, power monitoring, current monitoring, and voltage monitoring is functional.
 - 3. Demonstrate mechanical and/or electrical interlocking by attempting to subvert the intended sequence.
 - 4. Activate ground fault tripping by operating test features provided with ground current protective systems and by injecting a known and reasonable current in the ground current sensor circuit. In general, ground fault tripping should occur at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amps or less.
 - 5. Cable Testing: 480-volt circuits shall be tested for insulation resistance with a 1000-volt megohm meter. Testing shall be done after the 480-volt equipment is terminated. Control and signal wires shall be tested for continuity and resistance to ground.
 - 6. Test Ground Fault Interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle manufacturer.
 - 7. A functional test and check of all electrical components is required prior to performing subsystem testing and commissioning. Compartments and equipment shall be cleaned as required by other provisions of these Specifications before commencement of functional testing. Functional testing shall comprise:
 - a. Visual and physical check of cables, circuit breakers, transformers and connections associated with each item of new and modified equipment.
 - b. Circuit breakers that have adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or long-time overcurrent, shall be field-adjusted by a representative of the circuit breaker manufacturer. Setting shall be tabulated and proven for each circuit breaker in its installed position. Test results shall be certified by the person performing the tests and be transmitted to the Engineer.

8. Complete ground testing of grounding electrodes per requirements prior to operating the equipment.
- B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the Engineer and after process control devices have been adjusted as accurately as possible. It is intended that the Contractor will adjust limit switches and level switches to their operating points prior to testing and will set pressure switches, flow switches, and timing relays as dictated by operating results.
- C. After initial settings have been completed, each subsystem shall be operated in the manual mode and it shall be demonstrated that operation is in compliance with the Contract Documents. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify such items as proper start and stop sequence of pumps, proper operation of valves, proper speed control, etc.
- D. Motor operated valves shall be tested after having been phased and tested for correct motor rotation and after travel and torque limit switches have been adjusted by a representative of the valve manufacturer. Tests shall verify status indication, proper valve travel, and correct command control from local and remote devices.
- E. Provide ground resistance tests on the main grounding bars in all control panels in the presence of the Engineer and submit results.
- F. Subsystems shall be defined as individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, etc.
- G. General: Carry out tests indicated herein for individual items of materials and equipment in other Sections.
- H. Megger each complete phase wire, cable, termination, and submersible pump winding to ground.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 26 05 00 - ELECTRICAL WORK, GENERAL

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide electrical work, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section apply to all sections in Division 26, except as indicated otherwise.
- C. All material and equipment covered by this section shall be NRTL listed for its use and location, and all work performed shall meet or exceed NEC requirements.
- D. The Work of this Section is required for operation of electrically-driven equipment provided under specifications in other Divisions. The Contractor's attention is directed to the requirement for proper coordination of the Work of this Section with the Work of equipment specifications, and the Work of instrumentation sections.
- E. Concrete, excavation, backfill, and steel reinforcement required for encasement, installation, or construction of the Work of the various sections of Division 26 is included as a part of the Work under the respective sections, including duct banks, manholes, handholes, equipment housekeeping pads, and light pole bases.

1.2 REFERENCE STANDARDS

- A. The Work of this Section and all sections in Division 26 shall comply with the following, as applicable:

NEC (NFPA 70)	National Electrical Code
NETA	International Electrical Testing Association
NEMA 250	Enclosure for Electrical Equipment (1000 Volts Maximum)
- B. Electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL) or any OSHA identified Nationally Recognized Testing Laboratory (NRTL).
- C. Installation of electrical equipment and materials shall comply with OSHA Safety and Health Standards, state building standards, and applicable local codes and regulations.
- D. Where the requirements of the specifications conflict with UL, NEMA, NFPA, or other applicable standards, the more stringent requirements shall govern.

1.3 SIGNAGE

- A. Local Disconnect Switches:
 - 1. Each local disconnect switch for motors and equipment shall be legibly marked to indicate its purpose, unless the purpose is indicated by the location and arrangement.

- B. Warning Signs:
 - 1. 600 volts nominal, or less. – Entrances to rooms and other guarded locations that contain live parts shall be marked with conspicuous signs prohibiting entry by unqualified persons.

- C. Isolating Switches: Isolating switches not interlocked with an approved circuit interrupting device shall be provided with a sign warning against opening them under load.

- D. Distribution Panels, MCC's and Service Placards
 - 1. OSHA compliant labeling shall be included on all
 - a. electrical panels,
 - b. equipment, and
 - c. Applicable raceways.
 - 2. This includes the following warning placards:
 - a. high voltage warning,
 - b. arc flash hazard rating,
 - c. system voltage,
 - d. maximum fault current,
 - e. series combination rating,
 - f. amps interrupting rating (AIC),
 - g. clearance requirement warning,
 - h. turn off power prior to working inside equipment,
 - i. color coded conductor label,
 - j. power fed from label, and,
 - k. all other required installation dependent OSHA/NEC labelling.

1.4 PUBLIC UTILITIES REQUIREMENTS

- A. The Contractor shall contact the serving utility Chugach Electric Association and verify compliance with requirements before construction. The Contractor shall coordinate schedules for work by all utilities.

- B. Electrical service shall be as indicated and be as required by the serving utility.

- C. The Contractor shall verify and provide all service conduits, fittings, grounding devices, and all service wires not provided by the serving utility.

- D. The Contractor shall provide service components as specified by the electric utility guidelines

1.5 PERMITS AND INSPECTION

- A. All electrical permits shall be obtained and inspection fees shall be paid by the Contractor.
- B. All electrical permits shall be obtained by the Contractor. The Owner has paid for the inspection fees.
- C. The Contractor shall pay all connection and turn-on service charges required by the utility company.

1.6 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with 26 06 00.
- B. Shop Drawings: Include the following:
 - 1. Complete material lists stating manufacturer and brand name of each item or class of material.
 - 2. Shop Drawings for all grounding Work not specifically indicated.
 - 3. Front, side, rear elevations, and top views with dimensional data.
 - 4. Location of conduit entrances and access plates.
 - 5. Component data.
 - 6. Connection diagrams, terminal numbers, internal wiring diagrams, conductor size, and cable numbers.
 - 7. Method of anchoring, seismic requirements, weight.
 - 8. Types of materials and finish.
 - 9. Nameplates.
 - 10. Temperature limitations, as applicable.
 - 11. Voltage requirement, phase, and current, as applicable.
 - 12. Front and rear access requirements.
 - 13. Test reports.
 - 14. Grounding requirements.
 - 15. Catalog cuts of applicable pages of bulletins or brochures for mass produced, non-custom manufactured material. Catalog data sheets shall be stamped to indicate the project name, applicable Section and paragraph, model number, and options. This information shall be marked in spaces designated for such data in the Engineer's stamp.
- C. Manufacturer Shop Drawings shall be custom prepared. Drawings or data indicating "optional" or "as required" equipment are not acceptable. Options not proposed shall be crossed out or deleted from Shop Drawings.

- D. Contractor Shop Drawings shall be prepared for final component location and conduit routing.
 - 1.
- E. Materials and Equipment Schedules: The Contractor shall deliver to the Engineer within 30 days of the commencement date in the Notice to Proceed, a complete list of all materials, equipment, apparatus, and fixtures proposed for use. The list shall include type, sizes, names of manufacturers, catalog numbers, and other such information required to identify the items.
- F. Owner's Manuals: Complete information as appropriate
- G. Record Drawings: The Contractor shall show invert and top elevations and routing of all duct banks and concealed below-grade electrical installations. Record Drawings shall be prepared, be available to the Engineer, and be submitted.
- H. Equipment Summary Sheets: The Contractor shall provide Electrical Equipment Summary Form 1302 CM 1207 for all electrical devices, panels, motor starters, and miscellaneous equipment. The data shall be provided in electronic format, **Microsoft Excel**, or approved equal.

1.7 AREA DESIGNATIONS

- A. General:
 - 1. Raceway system enclosures shall comply with Section 26 05 33 – Electrical Raceway Systems.
 - 2. Electrical Work specifically indicated in sections within any of the Specifications shall comply with those requirements.
 - 3. Electrical Work in above ground indoor facilities shall be NEMA 12.
 - 4. Electrical Work in below ground facilities and outdoors shall be NEMA 4X.
 - 5. Installations in hazardous locations shall conform strictly to the requirements of the Class, Group, and Division indicated.
- B. Material Requirements:
 - 1. NEMA 4X enclosures shall be stainless steel.
 - 2. NEMA 12 enclosures shall be steel, coated with ANSI 61 grey paint.

1.8 TESTS

- A. The Contractor shall be responsible for factory and field tests required by specifications in Division 26 and by the Engineer or other authorities having jurisdiction. The Contractor shall furnish necessary testing equipment and pay costs of tests, including all replacement parts and labor, due to damage resulting from damaged equipment or from testing and correction of faulty installation.
- B. Where test reports are indicated, proof of design test reports for mass-produced equipment shall be submitted with the Shop Drawings, and factory performance test

reports for custom-manufactured equipment shall be submitted and be approved prior to shipment. Field test reports shall be submitted for review prior to Substantial Completion.

- C. Equipment or material which fails a test shall be removed and replaced.

1.9 DEMOLITION AND RELATED WORK

- A. The Contractor shall perform electrical demolition Work as indicated on the electrical drawings and in parts of this Specification Section. The Contractor is cautioned that demolition Work may also be indicated on non-electrical drawings. Coordinate electrical de-energization, disconnection, and removal with all trades and the overall sequence of construction.
- B. Electrical requirements associated with removed equipment shall be:
 - 1. Remove control and signal wiring as indicated.
 - 2. Remove all abandoned raceways.
 - 3. Encased conduits shall be cut flush to the floor and be grouted.
 - 4. Remove remote mounted starters, disconnect switches, circuit breakers, sensors, and transmitters.
 - 5. Remove remote mounted status lights and switches where indicated on the electrical drawings, and blank off openings in existing panels with field-fabricated stainless steel plates. Plates shall be attached with stainless steel finish screws.
 - 6. Remove control panels, equipment sheds, and concrete bases and posts for panels and sheds.
 - 7. Pump cords, level sensors, level switches.
- C. Where new lighting and receptacles are installed, old lighting, receptacles, switches, wiring, and conduits shall be removed.
- D. Raceways to be reused or extended shall be terminated in a new junction box. The junction box shall have a NEMA rating in accordance with the area in which it is located and shall be sized as required.
- E. Materials and equipment not indicated to be removed and returned to the Owner shall, upon removal, become the Contractor's property and shall be disposed of off-site.
- F. Material and equipment indicated to be relocated or reused shall be removed and relocated, and reinstalled with care to prevent damage thereto.
- G. Materials indicated to be returned to the Owner shall be placed in boxes with the contents clearly marked and be stored at a location determined by the Engineer.
- H. Where MCCs or panelboards are indicated to have circuits removed and reconnected, the MCC shall have a new engraved phenolic nameplate worded as indicated, and the panelboard schedule shall be modified to indicate the revised

circuits. Pencil or magic marker markings directly on the MCC or panelboard breaker are not permitted.

1.10 CONSTRUCTION SEQUENCING

- A. Continuance of facility operation during demolition and the installation process is critical at some facilities. Therefore, the Contractor shall carefully examine all work to be done in, on, or adjacent to existing equipment. Work shall be scheduled, subject to the Owner's approval, to minimize required process or equipment shutdown time. The Contractor shall submit a written request including sequence and duration of activities to be performed during plant shutdown.
- B. All switching, safety tagging, etc., required for process or equipment shutdown or to isolate existing equipment shall be performed by the Contractor. In no case shall the Contractor begin any work in, on, or adjacent to existing equipment without written authorization by the City of Whittier. The Contractor shall remove the lock within 4 hours upon request of the City of Whittier, in an emergency, and if the equipment is operable.
- C. The Contractor shall make all modifications or alterations to existing electrical facilities required to successfully install and integrate the new electrical equipment as indicated on the electrical drawing. Modifications to existing equipment, panels, or cabinets shall be made in a professional manner with all coatings repaired to match existing. The Contractor is responsible for ensuring all panels and equipment are UL-listed. The costs for modifications (including UL listing) to existing electrical facilities required for a complete and operating system shall be included in the Contractor's original Bid amount and no additional payment for this Work will be authorized. Extreme caution shall be exercised by the Contractor in digging trenches in order not to damage existing underground utilities. Cost of repairs of damages caused during construction shall be the Contractor's responsibility without any additional compensation from the Owner.
- D. The Contractor shall be responsible for identifying available existing circuit breakers in lighting panels for the intended use as required by the Drawings. The Contractor shall also be responsible for field-verifying the available space in substation switchboards to integrate new power circuit breakers. Costs for this Work shall be included in the Contractor's original Bid amount.
- E. The Contractor is advised to visit the Site before submitting a Bid to better acquaint itself with the Work of this Contract. Lack of knowledge will not be accepted as a reason for granting extra compensation to perform the Work.
- F. Installation of New Equipment:
 - 1. The Contractor will install and terminate the new switchboards, motor starters, control panels, wireways, cables, and instruments in accordance with the agreed schedule. The Contractor shall provide a list, daily, of the points that are ready for service as they are connected, calibrated, and tested. The Contractor shall only connect to equipment that is new or is out of service.
 - 2. The recommended construction sequence is as follows:

- a. Remove all demolition items and make good all surfaces before applying appropriate surface finish and paint.
 - b. Install new switchboards, motor starters, SCADA panels and instruments.
 - c. Install new raceways between switchboards, motor starters, instruments, and new SCADA panel.
 - d. Install all new wiring as specified.
 - e. Complete wiring modifications to existing equipment.
3. The recommended construction sequence for those stations where a new Pump Station Control Panel is not displacing the existing panel is as follows:
- a. Install the new concrete base, Pump Station Control Panel, and instruments.
 - b. Run new conduit and wire.
 - c. Energize the Pump Control Panel and test radio communications.
 - d. Test remote alarms.
 - e. Remove the power cable from first pump, install new power cable, connect to pump control panel and test operation.
 - f. Remove the power cable from second pump, install new power cable, connect to pump control panel and test operation.
 - g. Remove old pump control panel, meter base, and remaining conduit and wire.
4. The recommended construction sequence for those stations where the existing Pump Station Panel is being displaced and must be removed before the new panel can be installed:
- a. Provide and schedule a pumping truck to pump the station as required.
 - b. Remove the existing Pump Control Panel, meter base, pump cords, and conduit and wire.
 - c. Install the new concrete base, Pump Station Control Panel, and instruments.
 - d. Run new conduit and wire.
 - e. Energize the Pump Control Panel and test radio communications.
 - f. Test remote alarms.
 - g. Remove the power cable from all pumps, install new power cable, connect the pumps to the Control Panel and test operation.
5. The Contractor shall sequence the Work so that only two (2) sites at any one time are in temporary condition where only one pump is connected to the new panel, or the station is being discharged by a pump truck.
6. Minimum down time Requirements: The Contractor shall minimize the amount of time a facility is out of service. The Contractor shall provide the Engineer with an estimate of the amount of time a facility will be out of service.
7. The Engineer will coordinate with the Contractor to load and commission the PLC software after the Contractor makes the wiring modifications.
8. The Owner shall take beneficial occupancy of each facility as the Work is signed off.
- a. Warranty: The warranty shall start from the date of final acceptance of the completed project, and shall extend for 1 year, in accordance with 26 06 00.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Equipment and materials shall be new, shall be listed by UL, and shall bear the UL label where UL requirements apply. Equipment and materials shall be the products of experienced and reputable manufacturers in the industry. Similar items in the Work shall be products of the same manufacturer. Equipment and materials shall be of industrial grade standard of construction.
- B. Where a NEMA enclosure type is indicated in a non-hazardous location, the Contractor shall utilize that type of enclosure, despite the fact that certain modifications, such as cutouts for control devices, may negate the NEMA rating.
- C. On devices indicated to display dates, the year shall be displayed as 4 digits.

2.2 MOUNTING HARDWARE

- A. Miscellaneous Hardware:
 - 1. Nuts, bolts, and washers shall be stainless steel.
 - 2. Threaded rods for trapeze supports shall be continuous-threaded, galvanized steel, 3/8-inch diameter minimum.
 - 3. Strut for mounting of raceways and equipment shall be galvanized or stainless steel as required by the area classification. Where contact with concrete or dissimilar metals may cause galvanic corrosion, suitable non-metallic insulators shall be utilized to prevent such corrosion. Strut shall be as manufactured by **Unistrut, B-Line**, or equal.
 - 4. Anchors for attaching equipment to concrete walls, floors and ceilings shall be stainless steel expansion anchors, such as "**Rawl-Bolt**," "**Rawl-Stud**" or "**Lok-Bolt**" as manufactured by **Rawl**; similar by **Star**, or equal. Wood plugs shall not be permitted.

2.3 ELECTRICAL IDENTIFICATION

- A. Nameplates: Nameplates shall be fabricated from black-letter, white-face laminated plastic engraving stock, **Formica type ES-1**, or equal. Each shall be fastened securely, using fasteners of brass, cadmium-plated steel, or stainless steel, screwed into inserts or tapped holes, as required. Engraved characters shall be block style, with no characters smaller than 1/8-inch in height.
- B. Conductor and Equipment Identification: Conductor and equipment identification devices shall be heat-shrink plastic tubing with machine printing. Lettering shall read from left to right and shall face toward the front of the panel.

PART 3 - EXECUTION

3.1 GENERAL

- A. Incidentals: The Contractor shall provide all materials and incidentals required for a complete and operable system, even if not required explicitly by the Specifications or the Drawings. Typical incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor-furnished equipment to connect with other equipment indicated in the Contract Documents.
- B. Field Control of Location and Arrangement: The Drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items. Exact locations shall be determined by the Contractor in the field, based on the physical size and arrangement of equipment, finished elevations, and other obstructions. Locations on the Drawings, however, shall be followed as closely as possible.
1. Where raceway development drawings, or "home runs," are shown, the Contractor shall route the raceways in accordance with the indicated installation requirements. Routings shall be exposed.
 2. Conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve headroom and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms as indicated. Where the Drawings do not indicate exact locations, the Engineer shall determine such locations. If equipment is installed without instruction and must be moved, it shall be moved without additional cost to the Owner. Lighting fixture locations shall be adjusted slightly to avoid obstructions and to minimize shadows.
 3. Wherever raceways and wiring for lighting and receptacles are not indicated, it shall be the Contractor's responsibility to provide all lighting and receptacle-related conduits and wiring as required, based on the actual installed fixture layout and the circuit designations as indicated. Wiring shall be #12 AWG minimum, and conduits shall be 3/4-inch minimum. Where circuits are combined in the same raceway, the Contractor shall derate conductor ampacities in accordance with NEC requirements.
 4. Where complete raceway systems are not shown on the plans, Contractor shall submit a raceway plan for approval. Intent is to minimize number of raceway systems.
- C. Workmanship: Materials and equipment shall be installed in strict accordance with printed recommendations of the manufacturer. Installation shall be accomplished by workers skilled in the work. Installation shall be coordinated in the field with other trades to avoid interferences.
- D. Protection of Equipment and Materials: The Contractor shall fully protect materials and equipment against damage from any cause. Materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. Moving parts shall be kept clean and dry. The Contractor shall replace or refinish

damaged materials or equipment, including faceplates of panels and switchboard sections, as part of the Work.

- E. Incoming utility power equipment shall be provided in conformance with the utility's requirements.
- F. The Contractor shall provide power wiring in raceways for the motor starters in accordance with Section 26 24 19 – Low Voltage Motor Control Center, for starters in MCC's and Section 25 14 05 – Local Control Stations and Miscellaneous Electrical Devices, for starters not in MCC's.

3.2 CORE DRILLING

- A. The Contractor shall perform core drilling required for installation of raceways through concrete walls and floors. Locations of floor penetrations, as may be required, shall be based on field conditions. Verify all exact core drilling locations based on equipment actually furnished, as well as exact field placement. To the extent possible, identify the existence and locations of encased raceways and other piping in existing walls and floors with the Owner prior to any core drilling activities. Damage to any encased conduits, wiring, and piping shall be repaired as part of the Work.
- B. All penetrations required to extend raceways through concrete walls, roofs, and floors or masonry walls shall be core drilled.

3.3 CONCRETE HOUSEKEEPING PADS

- A. Concrete housekeeping pads shall be provided for indoor floor standing electrical equipment. Housekeeping pads for equipment, including future units, shall be 3-1/2 inches above surrounding finished floor or grade, and 2 inches larger in both dimensions than the equipment, unless otherwise indicated.
- B. Concrete housekeeping curbs shall be provided for all conduit stub-ups in indoor locations that are not concealed by equipment enclosures. Such curbing shall be 3 inches above finished floor or grade.

3.4 EQUIPMENT ANCHORING

- A. Floor supported, wall-, or ceiling-hung equipment and conductors shall be anchored in place by methods that will meet seismic requirements in the area where the project is located. Wall-mounted panels that weigh more than 500 pounds, or which are within 18 inches of the floor, shall be provided with fabricated steel support pedestals. If the supported equipment is a panel or cabinet enclosed within removable side plates, it shall match supported equipment in physical appearance and dimensions. Transformers hung from 4-inch stud walls and weighing more than 300 pounds shall have auxiliary floor supports.

- B. Anchoring methods and leveling criteria in the printed recommendations of the equipment manufacturers are a part of the Work of this Contract. Such recommendations shall be submitted as Shop Drawings.
- C. Panels, raceways, and other equipment shall be anchored and supported for Seismic requirements.

3.5 EQUIPMENT IDENTIFICATION

- A. General: Equipment and devices shall be identified as follows:
 - 1. Nameplates shall be provided for all panelboards, control and instrumentation panels, starters, switches, and pushbutton stations. In addition to nameplates, control devices shall be equipped with standard collar-type legend plates.
 - 2. Control devices within enclosures shall be identified as indicated. Identification shall be similar to the subparagraph above.
 - 3. Equipment names and tag numbers, where indicated on the Drawings, shall be utilized on all nameplates.
 - 4. The Contractor shall furnish typewritten circuit directories for panelboards; circuit directory shall accurately reflect the equipment connected to each circuit.
 - 5. Generator receptacles shall be identified with the incoming service voltage with 1" lettering.
 - 6. Generator transfer switches shall be labeled "Main" and "Generator" with ½" lettering.

3.6 CLEANING

- A. Before final acceptance, the electrical Work shall be thoroughly cleaned. Exposed parts shall be thoroughly clean of cement, plaster, and other materials. Oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped, and all cracks and corners cleaned out. Touch-up paint shall be applied to scratches on panels and cabinets. Electrical cabinets or enclosures shall be vacuum-cleaned.
- B. Contractor shall group, coil, and tie wrap all spare cables at the bottom of the Local Control Panels. The wires shall be grouped according to the device, control panel, or MCC section they originate from. Cable groups shall be tagged according to their point of origin.
- C. All debris shall be removed from the void below the panels.

3.7 CONTROL PANEL WIRING

- A. The Contractor shall ensure all panels are UL-listed upon completion of the Work.

END OF SECTION

SECTION 26 05 05 - ELECTRIC MOTORS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. General: The Contractor shall provide electric motors, accessories, and appurtenances complete and operable, in conformance with the specifications and the Contract Documents. This specification does not cover Owner furnished motors.
- B. The provisions of this Section apply to constant torque AC squirrel cage induction motors throughout the Contract Documents, except as indicated otherwise.
- C. The Contractor shall assign to the equipment supplier the responsibility to select suitable electric motors for the equipment. The choice of motor manufacturer shall be subject to review by the ENGINEER. Such review will consider future availability of replacement parts and compatibility with driven equipment.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 26 05 00 Electrical Work, General.
- B. Complete motor data shall be submitted. Motor data shall include:
 - 1. Motor manufacturer.
 - 2. Motor type or model and dimension drawing. Include motor weight.
 - 3. Nominal horsepower.
 - 4. NEMA design.
 - 5. Enclosure.
 - 6. Frame size.
 - 7. Winding insulation class and temperature rise class.
 - 8. Voltage, phase, and frequency ratings.
 - 9. Service factor.
 - 10. Full load current at rated horsepower for application voltage.
 - 11. Full load speed.
 - 12. Torque characteristics.
 - 13. Guaranteed minimum full load efficiency. Also nominal efficiencies at 1/2 and 3/4 load.
 - 14. Type of thermal protection or overtemperature protection, if required when operated with VFD.
 - 15. Wiring diagram for devices such as motor leak detection, temperature, or zero speed switches, as applicable.
 - 16. Bearing data. Include recommendation for lubricants of relubricatable type bearings.
 - 17. Power factor at 1/2, 3/4 and full load.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

- A. General: Electric motors shall comply with NEMA MG-1 - Motor and Generator.
- B. NEMA Design: Electric motors shall be NEMA Design B unless otherwise indicated. In no case shall starting torque or breakdown torque be less than the value in NEMA MG 1. Motors shall be suitable for the indicated starting method.
- C. Insulation: Three phase motors shall be provided with Class F insulation, rated to operate at a maximum ambient temperature of 40 degrees C and at the altitudes where the motors will be installed and operated, without exceeding Class B temperature rise limits stated in NEMA MG 1-12.44. Motors shall be provided with insulation systems to withstand 1600-volt spikes, with dV/dt as defined in NEMA MG 1-31.
- D. Motors shall be totally enclosed, fan-cooled (TEFC) with a Service Factor of 1.15, unless otherwise indicated.

2.2 ACCESSORY REQUIREMENTS

- A. General: Motors shall have split-type cast metal conduit boxes.
- B. Lifting Devices: Motors weighing 265 lb (120 Kg) or more shall have suitable lifting eyes for installation and removal.
- C. Grounding Lugs: Provide motor grounding lug suitable to terminate ground wire, sized as indicated.
- D. Motors installed in exterior locations shall be rated weatherproof and provided with heaters as required to mitigate condensation. Heaters shall be 120V rated.
- E. Nameplate: Motors shall be fitted with permanent stainless steel nameplates indelibly stamped or engraved with NEMA Standard motor data, in conformance with NEMA MG-1-10.40.

2.3 MOTOR THERMAL PROTECTION

- A. Thermostats: Winding thermostats shall be snap action, bi-metallic, temperature-actuated switch. Thermostats shall be provided with one normally closed contact for each phase. The thermostat switch point shall be precalibrated by the manufacturer.

2.4 MOTOR BEARINGS

- A. Motors shall have bearings designed for 100,000 hours (coupled) L-10 life.

- B. Motors that are indirectly coupled and are controlled by VFD's shall have provisions to limit bearing currents.

2.5 MANUFACTURERS

- A. **U.S. Motors, Reliance Electric**, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Motor installation shall be performed in accordance with the motor manufacturer's written recommendations and the written requirements of the manufacturer of the driven equipment.
- B. Motors shall be installed as required by the existing field conditions, including coupling and shims.
- C. Related electrical WORK involving connections, controls, switches, and disconnects shall be performed in accordance with the applicable sections of Division 26.

3.2 FIELD TESTING

- A. The Contractor shall perform the following field tests:
 1. Inspect each motor installation for any deviation from rated voltage, phase, frequency, and improper installation.
 2. Visually check for proper phase and ground connections. Verify that multi-voltage motors are connected for proper voltage.
 3. Check winding and bearing temperature detectors and space heaters for functional operation.
 4. Test for proper rotation prior to connection to the driven equipment.
 5. Test insulation (megger test) of new and re-used motors in accordance with NEMA MG-1. Test voltage shall be 1000 VAC plus twice the rated voltage of the motor.

END OF SECTION

SECTION 26 05 19 - WIRE AND CABLES

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide wires and cable, complete and operable, in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

- A. The Contractor shall submit Shop Drawings in accordance with 01 33 00 Submittal Procedures and 26 05 00 – Electrical Work, General.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Conductors, include grounding conductors, shall be copper. Aluminum conductor wire and cable will not be permitted. Insulation shall bear the label of Underwriters' Laboratories, Inc. (UL), the manufacturer's trademark, and identify the type, voltage, and conductor size. All conductors except flexible cords and cables, fixture wires, and conductors that form an integral part of equipment, such as motors and controllers, shall conform to the requirements of Article 310 of the National Electric Code, latest edition, for current carrying capacity. Flexible cords and cables shall conform to Article 400, and fixture wires shall conform to Article 402. Wiring shall have wire markers at each end.
- B. Conductors for the field wiring of Owner furnished equipment shall be as specified in the PALL drawings and terminated in accordance with the shop drawings. PALL equipment that does not have a specified cable shall be wired using the cable/cord/conduit/conductor specified on the raceway and conduit schedules.

2.2 LOW VOLTAGE WIRE AND CABLE

- A. Power and Lighting Wire
 1. Power and lighting wire shall be No. 12 copper AWG minimum size.
 2. Wire rated for 600 volts in duct or conduit for all power shall be
 - a. In above grade interior locations: Class B Type THWN-2
 - b. In underground and below grade installations XHHW-2
 - c. Direct burial shall use XLPE outer jacketed cable.
 3. Wiring for 600-volt class power and lighting shall be as manufactured by General Cable, Okonite, or Rome Cable.
- B. Control Wire

1. Control wire in duct or conduit shall be the same type as power and lighting wire indicated above.
 2. Control wiring shall be copper as sized on the drawings.
- C. Instrumentation Cable
1. Instrumentation cable shall be rated at 600 volts.
 2. Individual conductors shall be No. 18 AWG stranded, tinned copper. Insulation shall be color-coded polyethylene: black-red for two-conductor cable, and black-red-white for three-conductor cable.
 3. Instrumentation cables shall be composed of the individual conductors, an aluminum polyester foil shield, a No. 18 AWG stranded, tinned copper drain wire, and a PVC outer jacket with a thickness of 0.048-inches.
 4. Single pair, No. 18 AWG, twisted, shielded cable shall be Belden Part No. 9341, or equal.
 5. Single triad, No. 16 AWG, twisted, shielded cable shall be Belden Part No. 1119A, or equal.
- D. Tray Cable - Tray cable is not to be used.
- E. Cat 6 Cable: Cat 6 patch cable shall be 4-pair 24-gauge twisted pair rated to TIA/EIA 568-B Cat. SE and UL-listed. The Contractor shall install RJ-45 connectors as required.
- F. Radio Cable: As provided by Synetcom, no exceptions allowed.
- G. Submersible Pump Power Cable: Where not provided by the pump supplier, submersible pumps shall be wired with submersible multi-conductor cable as required by the Drawings. The cable shall be Type W Portable Power Cable rated at 600V and 70C temperature with (2) #14 control cables. The insulation shall be EPR, and conduction shall be rope-lay-stranded copper per UL-62. The cabling shall be round with round or flat fillers as needed, with an extra-hard usage, oil resistant, thermoset, CPE jacket, per UL-1581. Cable shall be Flygt SubCab, or equal.
- H. VFD motor branch cable: Motors circuits operated under VFD control shall be run with shielded cable. Cable shall be Belden 295xx (where xx= wire gauge) or VFD Manufacturer recommended equal. Twisted shielded THHN is not permitted.

2.3 CABLE TERMINATIONS

- A. Terminations for the Owner furnished equipment shall be as specified on the PALL shop drawings.
- B. Compression connectors shall be Burndy "Hi Lug", Thomas & Betts "Sta-Kon," or equal. Threaded connectors shall be split bolt type of high strength copper alloy. Pressure type, twist-on connectors will not be acceptable.
- C. Pre-insulated fork tongue lugs shall be Thomas & Betts, Burndy, or equal.

- D. General purpose insulating tape shall be Scotch No. 33, Plymouth "Slip-knot," or equal. High temperature tape shall be polyvinyl as manufactured by Plymouth, 3M, or equal.
- E. Labels for coding 600-volt wiring shall be heat-shrink plastic tubing type with machine print. Lettering shall read from left to right and face the front of the panel. Field wires terminating at a Control Panel shall be labeled with the wire number shown on the LCP Panel wiring diagrams. The Contractor shall mark all as-built drawings with wire labels.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall provide and terminate all power, control, and instrumentation conductors, except where indicated.

3.2 INSTALLATION

- A. Conductors for feeders as defined in Article 100 of the NEC shall be sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5 percent.
- B. Conductors for branch circuits as defined in Article 100 of the NEC, shall be sized to prevent a voltage drop exceeding 3 percent at the farthest connected load or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5 percent.
- C. Conductors shall not be pulled into raceway until raceway has been cleared of moisture and debris.
- D. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL-approved.
- E. The following wiring shall be run in separate raceways:
 - 1. 24 and 12 VDC discrete signal and instrument power supply.
 - 2. 4-20 mA analog signal.
 - 3. All AC circuits.
- F. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps and shall be fanned out to terminals.
- G. Wet Well Conduit Seals: Conduit entering wet wells shall be sealed with duct seal at the end of the conduit where the conduit enters the wet well. Provide cloth rag backing and 1" of duct seal so duct seal can be removed in the future.

3.3 SPLICES AND TERMINATIONS

A. General

1. Wire taps and splices are not to be used unless the Contractor can convince the Engineer that they are essential, and the Engineer gives written permission.
2. There shall be no cable splices in underground manholes or pullboxes.
3. Stranded conductors shall be terminated directly on equipment box lugs, making sure that all conductor strands are confined within the lug. Use forked-tongue lugs where equipment box lugs have not been provided.
4. Excess control and instrumentation wire shall be properly taped and terminated as spares.

B. Control Wire and Cable

1. Control conductors shall be spliced or terminated only on terminal strips in panels or vendor-furnished equipment.
2. In terminal cabinets, junction boxes, motor control centers, and control panels, control wire and spare wire shall be terminated to terminal strips.

C. Instrumentation Wire and Cable

1. Shielded instrumentation cables shall be grounded at one end only, the receiving end (i.e., in the SCADA panel) on a 4-20 mA system.

D. Power Wire and Cable

1. No 120/208-volt, 120/240-volt, and 480/277-volt branch circuit conductors may be spliced unless the Contractor can convince the Engineer that they are essential, and the Engineer gives written permission.
2. Shielded power cable shall be terminated with pre-assembled stress cones in a manner approved by the cable and terminal manufacturer. The Contractor shall submit the proposed termination procedure as a Shop Drawing.

3.4 CABLE IDENTIFICATION

A. General: Wires and cables shall be identified for proper control of circuits and equipment and to reduce maintenance effort.

B. Identification Numbers: The Contractor shall assign to each control and instrumentation wire and cable a unique identification number. Numbers shall be assigned to all conductors having common terminals and shall be shown on "as built" drawings. Identification numbers shall appear within 3 inches of conductor terminals. "Control Conductor" shall be defined as any conductor used for alarm, annunciator, or signal purposes.

1. Multiconductor cable:

- a. Assign a number that shall be attached to the cable at intermediate pull boxes and at stub-up locations beneath freestanding equipment.
- b. Cable number shall form a part of the individual wire number.
- c. Individual control conductors and instrumentation cable shall be identified at pull points as described above.

- d. The instrumentation cable numbers shall incorporate the loop numbers assigned in the Contract Documents.
2. All 120/208-volt system feeder cables and branch circuit conductors shall be color-coded as follows:
 - a. Phase A - Black
 - b. Phase B - Red
 - c. Phase C - Blue
 - d. Neutral - White
3. The 480/277-volt system conductors shall be color-coded as follows:
 - a. Phase A - Brown
 - b. Phase B - Orange
 - c. Phase C - Yellow
 - d. Neutral - Gray
4. Color-coding tape shall be used where colored insulation is not available.
 - a. Branch circuit switch shall be Yellow.
 - b. Insulated ground wire shall be Green.
 - c. Neutral shall be Gray.
5. Color coding and phasing shall be consistent throughout the Site, but bars at panelboards, switchboards, and motor control centers shall be connected Phase A-B-C, top to bottom, or left to right, facing connecting lugs.
6. General purpose AC control cables shall be Red.
7. General purpose DC control cables shall be Blue.
8. Spare cable shall be terminated on terminal screws and shall be identified with a unique number as well as with destination.
9. Terminal strips shall be identified by computer-printable, cloth, self-sticking marker strips attached under the terminal strip.

3.5 TESTING

- A. Cable Assembly and Testing: Cable assembly and testing shall comply with applicable requirements of ICEA Publication No. S-68-516 - Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy. Factory test results shall be submitted in accordance with Section 01 30 00 – Contractor Submittals, prior to shipment of cable. The following field tests shall be the minimum requirements:
 1. Power cable rated at 600 volts shall be tested for insulation resistance between phases and from each phase to a ground using a megohmmeter.
 2. Field testing shall be done after cables are installed in the raceways.
 3. Field tests shall be performed by a certified test organization acceptable to the cable manufacturer. Test results shall be submitted to the Engineer for review and acceptance.
 4. Cables failing the tests shall be replaced with a new cable or be repaired. Repair methods shall be as recommended by the cable manufacturer and shall be performed by persons certified by the industry.

- B. Continuity Test: Control and instrumentation cables shall be tested for continuity, polarity, undesirable ground, and origination. Such tests shall be performed after installation and prior to placing all wires and cables in service.

END OF SECTION

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide the electrical grounding system, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 26 05 00 – Electrical Work, General apply to this Section.
- C. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts and manufacturer's services.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 Submittal Procedures and Section 26 05 00 – Electrical Work, General.
- B. Shop Drawings: Manufacturer's product information for connections, clamps, and grounding system components, showing compliance with the requirements of this Section.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Components of the grounding electrode system shall be manufactured in accordance with ANSI/UL 467 - Standard for Safety Grounding and Bonding Equipment, and shall conform to the applicable requirements of National Electrical Code Article 250 and local codes.

2.2 GROUNDING SYSTEM

- A. Grounding Network bonded to service ground consists of
 1. All metallic water pipe
 2. Metallic frame of the building
 3. Ground rods as shown on the plans
 4. UFER ground in the building slab

- B. Grounding ring conductors shall be bare annealed copper conductors suitable for direct burial. Conductors shall be No. 4 for 100A services, or No. 4/0, unless indicated otherwise.
- C. Ground Rods
 - 1. Unless indicated otherwise, the ground rod shall be a minimum of 3/4-inch in diameter, 8 feet long, and have a uniform covering of electrolytic copper metallurgically bonded to a rigid steel core. The copper to steel bond shall be corrosion resistant.
 - 2. Conform to ANSI/UL 467.
 - 3. Sectional type joined by threaded copper alloy couplings.
- D. Buried cable-to-cable and cable-to-ground rod connections shall be made using exothermic welds by Cadweld, Enrico Products, or equal.
- E. Exposed grounding connectors shall be of the compression type (connector to cable), made of high copper alloy, and be manufactured specifically for the particular grounding application. The connectors shall be Burndy, O.Z. Gedney, or equal.
- F. Grounding clamps shall be used to bond each separately derived system to the grounding electrode conductors.
- G. Equipment Grounding Circuit Conductors
 - 1. These conductors shall be the same type and insulation as the load circuit conductors. The minimum size shall be as outlined in Table 250.122 of the National Electrical Code, unless indicated otherwise.
 - 2. Metallic conduit systems shall have equipment grounding wires as well as being equipment grounding conductors themselves.
- H. Ground clamps in concrete shall be rated for use with rebar and embedded in concrete.
- I. Manufacturers of grounding materials shall be Copperweld, Blackburn, Burndy, or equal.

PART 3 - EXECUTION

3.1 GROUNDING

- A. Provide a separate grounding conductor, securely grounded in each raceway independent of raceway material.
- B. Provide a separate grounding conductor for each motor and connect at motor box. Do not use bolts securing motor box to frame or cover for grounding connectors.
- C. Size in accordance with the NEC-Article 250 and local amendments.

- D. Route conductors inside raceway.
- E. Provide a grounding type bushing for secondary feeder conduits which originate from the secondary section of each MCC section, switchboard, or panelboard.
- F. Individually bond these raceways to the ground bus in the secondary section.
- G. Provide a green insulated wire as grounding jumper from the ground screw to a box grounding screw and, for grounding type devices, to equipment grounding conductor.
- H. Provide a separate grounding conductor in each individual raceway for parallel feeders.
- I. Interconnect the secondary switchgear neutral bus to the ground bus in the secondary switchgear compartment only at service entrance point or after a transformer.
- J. Bond cold water pipe systems and metallic building structure per NEC. Bond ALL metallic water pipe penetrations.
- K. Measure ground impedance in accordance with IEEE STD 81 after installation but before connecting the electrode to the remaining grounding system.
- L. Low Voltage Grounded System (600-volt or less): A low voltage grounded system is a system where the local power supply is a transformer with the transformer secondary grounded.
 - 1. Grounding system connections for a premises wired system supplied by a grounded AC service shall have a grounding electrode connector connected to the grounded service conductor at each service, in accordance with the NEC.
 - 2. The grounded circuit conductor shall not be used for grounding non-current carrying parts of equipment, raceways, and other enclosures except where specifically listed and permitted by the NEC.
- M. Embedded Ground Connections
 - 1. Underground and grounding connections embedded in concrete shall be UL listed compression type ground grid connectors.
 - 2. The connection shall be made in accordance with the manufacturer's instructions.
 - 3. The Contractor shall not conceal or cover any ground connections until the Engineer or authorized representative has established that every grounding connection conforms to the Contract Documents and has given the Contractor written confirmation.
- N. Ground Rods
 - 1. Locations shall be as determined in the field.
 - 2. Rods forming an individual ground array shall be equal in length.
 - 3. Rod spacing shall be a minimum of the rod length.

O. Shield Grounding

1. Shielded instrumentation cable shall have its shield grounded at one end only unless Shop Drawings indicate the shield will be grounded at both ends.
2. The grounding point shall be at the control panel or otherwise at the receiving end of the signal carried by the cable.
3. Termination of shield drain wire shall be on its own terminal screw.
4. Terminal screws shall be jumpered together using manufactured terminal block jumpers.
5. Connection to the ground bus shall be via a green No. 12 conductor to the main ground bus for the panel.

END OF SECTION

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
 - 1. Section 26 05 03 - Equipment Wiring Connections.
 - 2. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 3. Section 26 05 29 - Hangers and Supports for Electrical Systems.
 - 4. Section 26 05 53 - Identification for Electrical Systems.
 - 5. Section 26 27 26 - Wiring Devices.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

- A. Raceway as scheduled and boxes located as indicated on Drawings, and at other locations as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway schedule locations and boxes are

shown in approximate locations unless dimensioned. Provide raceway and boxes to complete wiring system.

1.4 DESIGN REQUIREMENTS

- A. Minimum Raceway Size: $\frac{3}{4}$ " inch unless otherwise specified.
- B. Raceway routing is to be developed by the Contractor and shop drawings reflecting the individual routing and supporting means shall be submitted for review and approval. In-slab routing is to be depicted by dashed lines and riser locations dimensioned.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit for the following:
 - 1. Flexible metal conduit.
 - 2. Liquidtight flexible metal conduit.
 - 3. Raceway fittings.
 - 4. Conduit bodies.
 - 5. Wireway.
 - 6. Pull and junction boxes.
 - 7. Handholes.
 - 8. Galvanized rigid conduit
 - 9. Polyolefin Coated Rigid steel conduit
 - 10. Intermediate metal conduit
 - 11. Electrical metallic tubing
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- D. Raceway Routing
 - 1. May be hand drawn with annotated sketches
 - 2. Include intended combining of circuits

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents:
 - 1. Record actual routing of all raceways including underground and concealed conduits.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

1.8 COORDINATION

- A. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.
- B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.
- C. Coordinate equipment penetrations and access ports prior to rough-in.

PART 2 - PRODUCTS

2.1 METAL CONDUIT

- A. Manufacturers:
 - 1. Allied Tube & Conduit.
 - 2. EGS/Appleton Electric.
 - 3. Republic Conduit.
 - 4. Thomas & Betts Corporation; a member of the ABB Group.
 - 5. Western Tube and Conduit Corporation.
 - 6. Wheatland Tube Company.
 - 7. Substitutions: Section 01 25 00 Substitution Procedures.
- B. Galvanized Rigid Steel Conduit (GRC): ANSI C80.1.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 PVC COATED METAL CONDUIT

- A. Manufacturers:
 - 1. GALCO.

2. Substitutions: Section 01 25 00 Substitution Procedures.

B. Product Description: NEMA RN 1, UL 514B ; galvanized rigid steel conduit with external Polyolefin coating, 40 mil thick interior Thermoset Polymer coating 2 mil thick,

C. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; galvanized rigid steel fittings with external Polyolefin coating, 40 mil thick interior Thermoset Polymer coating 2 mil thick.

2.3 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. EGS/Appleton Electric.
3. Southwire Company.
4. Substitutions: Section 01 25 00 Substitution Procedures.

B. Product Description: Interlocked aluminum construction.

C. Fittings: NEMA FB 1.

1. Insulated throat Connectors

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Anamet Electrical, Inc.
2. Carlon Electrical Products.
3. EGS/Appleton Electric.
4. Southwire Company
5. Substitutions: Section 01 25 00 Substitution Procedures.

B. Product Description: Interlocked aluminum construction with PVC jacket.

C. Fittings: NEMA FB 1.

1. Insulated throat connectors

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Carlon Electrical Products.
2. Emerson Process Management.
3. Republic Conduit.
4. Western Tube and Conduit Corporation.

5. Wheatland Tube Company.
 6. Substitutions: Section 01 25 00 Substitution Procedures.
- B. Product Description: ANSI C80.3; galvanized tubing.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron, compression type.
1. Insulated throat connectors.
- D. Set screw or indenter type fittings and conduit bodies not permitted.

2.6 NONMETALLIC CONDUIT

- A. Manufacturers:
1. Carlon Electrical Products.
 2. EGS/Appleton Electric.
 3. Hubbell Premise Wiring.
 4. Substitutions: Section 01 25 00 Substitution Procedures.
- B. Product Description: NEMA TC 2; Schedule 40 or 80 PVC as indicated on plans. If not indicated than SCH 80 is to be used.
- C. Fittings and Conduit Bodies: NEMA TC 3.
- D. Transition to threaded conduits shall use ShurLok II fittings. Provide Direct burial rated Heat Shrink outer jacket extending a minimum of 2" past fitting ends.

2.7 WIREWAY

- A. Manufacturers:
1. Carlon Electrical Products.
 2. Cooper B-Line, Inc.; a division of Cooper Industries.
 3. Hammond Mfg. Co. Inc.
 4. Hoffman; a brand of Pentair Equipment Protection.
 5. Panduit Corp.
 6. Square D; by Schneider Electric.
 7. Wiremold / Legrand.
 8. Substitutions: Section 01 25 00 Substitution Procedures
- B. Product Description: Weather-tight NEMA 4 type wireway.
- C. Knockouts: Manufacturer's standard.
- D. Size and length as indicated on Drawings. If not shown, provide 6x6 wireway, length as required.

- E. Cover: Hinged cover with full gaskets.
- F. Connector: Flanged.
- G. Fittings: Lay-in type with removable top, bottom, and side; captive screws.
- H. Finish: Rust inhibiting primer coating with gray enamel finish.

2.8 OUTLET BOXES

- A. Manufacturers:
 - 1. Allied Moulded Products, Inc.
 - 2. Carlon Electrical Products.
 - 3. Emerson Electric Co.
 - 4. RACO; Hubbell.
 - 5. Substitutions: Section 01 25 00 Substitution Procedures.
- B. Nonmetallic Outlet Boxes: NEMA OS 2.
- C. Sheet Steel Boxes
- D. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
- E. Wall Plates for Finished Areas: As specified in Section 26 27 26.
- F. Wall Plates for Unfinished Areas and Surface mounted raceway: Furnish gasketed cover.

2.9 PULL AND JUNCTION BOXES

- A. Manufacturers:
 - 1. Emerson Process Management.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. Kraloy.
 - 4. RACO; Hubbell.
 - 5. Substitutions: Section 01 25 00 Substitution Procedures.
- B. Hinged Enclosures: As specified in Section 26 27 16.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4X; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless-steel cover screws.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

- A. Remove exposed abandoned raceway.
- B. Remove concealed abandoned raceway to its source.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- E. Extend existing raceway and box installations using materials and methods as specified.
- F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify raceway and boxes in accordance with Section 26 05 53.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.
- E. In or Under Slab on Grade: Provide plastic coated rigid steel conduit sweeps and risers and schedule 80PVC for horizontal runs. Provide cast or metal boxes. At nearest point where risers terminal provide sealing compound PolySeal FST or equal.
- F. Outdoor Locations, Above Grade: Provide Plastic coated galvanized rigid conduit. Provide plastic coated cast metal outlet, pull, and junction boxes.

- G. Wet and Damp Locations: Provide rigid steel conduit, intermediate metal conduit. Provide electrical metallic tubing above 8'AFF. Provide cast metal or nonmetallic outlet, junction, and pull boxes.
- H. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes with access. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.
- I. Exposed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide hinged enclosure for large pull boxes.

3.4 INSTALLATION - RACEWAY

- A. Raceway routing to be developed by Contractor. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29; provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wireway supports from steel channel specified in Section 26 05 29.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Maintain clearance between raceway and piping for maintenance purposes.
- L. Maintain 12-inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings; fasten securely.

- O. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- P. Provide thread lubricant on all threaded connections.
- Q. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes without hubs.
- R. Install no more than equivalent of three 90-degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2-inch size.
- S. Avoid moisture traps; install junction box with drain fitting at low points in conduit system where accessible.
- T. Install fittings to accommodate expansion and deflection where raceway crosses, control and expansion joints.
- U. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- V. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- W. Close ends and unused openings in wireway.
- X. Duct seal interior of conduits where they pass from exterior to interior.

3.5 INSTALLATION - BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings (notes or elevations) unless specified in section for outlet device.
- B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- F. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.

- G. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- H. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- J. Install adjustable steel channel fasteners for hung ceiling outlet box.
- K. Do not fasten boxes to ceiling support wires or other piping systems.
- L. Support boxes independently of conduit.
- M. Install gang box where more than one device is mounted together. Do not use sectional box.
- N. Install gang box with plaster ring for single device outlets.

3.6 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
- C. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.
- D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused openings in boxes.

3.8 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 43 - UNDERGROUND RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide underground raceway systems, including trenching, backfill, compaction, and restoration, complete and in place, in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

- A. Shop Drawings
 - 1. Complete catalog cuts of all conduits, fittings, and pullboxes, marked where applicable to show proposed materials and finishes.
- B. Record Drawings
 - 1. Show routings, burial depths, and pullbox locations and sizes.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pullboxes, and fittings that are dedicated to the underground raceway system shall comply with the requirements of this Section.

2.2 PULLBOXES

- A. Shall be precast with construction and load rating as indicated.
 - 1. Covers shall be traffic type, H-20 loading, except as indicated otherwise.
 - 2. Pullbox covers shall be identified as "Electric" by raised letters cast into the covers.
- B. Shall have frost-proof and water-tight grey iron frames and covers with solid lids and inner lids with 28-inch clear openings. Covers and lids shall be bolted to cast-in-place steel frames with corrosion resistant hardware. Frames shall be factory-primed; covers shall be cast-iron and shall have pick-holes.
- C. Shall be equipped with pulling-in irons opposite and below each raceway entrance.
- D. Unless noted otherwise, pull boxes shall have closed bottoms. Open bottom pullboxes will not be accepted.
- E. Precast pullboxes shall be **Jensen Precast, Mack, Quikset, U.S. Precast**, or equal. Cast-iron covers shall be by **U.S. Foundry**, or equal.

2.3 UNDERGROUND CONDUITS

- A. Underground raceways shall be:
 - 1. Schedule 80 PVC conduit as indicated, sunlight resistant. Conduit shall be manufactured in accordance with NEMA TC-2 - Electrical Plastic Tubing and Conduit, and UL-651 - Standard for Rigid Non-metallic Conduit, or where called for on the Drawings,
 - 2. HDPE for buried horizontal runs shall be Listed. Compliant with NEC articles 300 and 353 and Listed to UL 651 A&B.
- B. Identification Tape: Continuous lengths of underground warning tapes shall be installed 12-inches above and parallel to conduits. Tape shall be 6-inches wide polyethylene film imprinted "CAUTION - ELECTRIC UTILITIES BELOW." Tape shall have non-ferrous metal foil conductor sandwiched in the tape for detection purposes. Tape shall be as manufactured by **Brady**, or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Underground raceways shall be installed between structures and pullboxes as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be fabricated with tools designed for this purpose. Factory elbows shall be utilized wherever possible. Unless otherwise noted provide plastic coated RSC for vertical sweeps and risers.
- B. Raceway routing shall be adjusted to avoid obstructions.

3.2 INSTALLATION

- A. Raceways shall be installed in accordance with the criteria below:
 - 1. Raceway shall be laid on a grade line of at least 3-inches per 100-feet, sloping towards pullboxes or structures. Conduit shall be installed and pullbox depths adjusted so that the top of the conduit is a minimum of 24-inches below grade and a minimum of 24-inches below roadways, driveways, and bike trails.
 - 2. Changes in direction of the duct envelope by more than 10 degrees horizontally or vertically shall be accomplished using factory elbows.
 - 3. Raceway shall be installed in accordance with the Manufacturer's requirements and recommendations. The bottom of trench shall be of select backfill or sand.
 - 4. Each of the completed raceways shall be cleaned by drawing through it a standard flexible mandrel one foot long and 1/4-inch smaller than the nominal size of the duct. After passing of the mandrel, a wire brush and swab shall be drawn through.
 - 5. Provide heat shrink tubing around conversion fittings when converting between different raceway materials (i.e.: HDPE to PVC coated RSC).

- B. Sections of prefabricated pullboxes shall be assembled with waterproof mastic and shall be set on a 6-inch bed of gravel or as recommended by the manufacturer.
- C. Raceway penetration through walls of structures and pullboxes below grade shall be watertight.
- D. When raceway enters a building, conduit shall transition to rigid steel PVC-coated conduit on stub-up.
- E. Where an underground raceway enters a structure through a concrete wall, provide a **Link-Seal**, or equal sealing device. The sealing device shall be utilized with plastic coated rigid steel conduit. Transition from PVC to plastic coated RSC prior to building entry.

END OF SECTION

SECTION 26 22 00 05 - DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide dry-type transformers, complete and operable, in accordance with the Contract Documents.
- B. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.

1.2 CONTRACTOR SUBMITTALS

- A. Shop Drawings
 - 1. Transformers
 - a. Dimension drawings
 - b. Technical certification sheets
 - c. Drawing of conduit entry/exit locations
 - d. Transformer ratings, including:
 - 1) Voltage
 - 2) Continuous current
 - 3) Basic impulse level for equipment over 600 volts
 - 4) kVA
 - e. Descriptive bulletins
 - f. Product sheets

PART 2 - PRODUCTS

2.1 GENERAL

- A. Transformers
 - 1. The transformers shall be dry type, designed, manufactured, and tested in accordance with the latest applicable standards of ANSI and NEMA.
 - 2. Transformers shall be UL-listed and bear the UL label.

2.2 TRANSFORMERS

- A. Ratings
 - 1. kVA and voltage ratings shall be as indicated.
 - 2. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96 - Guide for Loading Dry Type Distribution and Power Transformers

3. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings:
 - Up to 9 kVA 40 db
 - 10 to 50 kVA 45 db
 - 51 to 150 kVA 50 db

B. Construction

1. Insulation Systems

- a. Transformers shall be insulated as follows:
 - 1) 2 kVA and below: 150 degrees C insulation system based upon 80 degree C rise.
 - 2) 3 to 15 kVA: 185 degrees C insulation system based upon 115 degrees C rise. 15 kVA and above: 220 degrees C insulation system based upon 150 degrees C rise.
- b. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 degrees C maximum ambient.
- c. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM D 635 – Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.

2. Transformer windings shall be copper.

3. Transformers shall have four 2-1/2 percent taps, two above and two below 480 volts.

C. Drive Isolation transformers shall be sized per the table below:

HP	KVA
2	3
3	6
5	7.5
7.5	11
10	14
15	20
20	27
25	34
30	40
40	51
50	63
60	75
75	93
100	118
125	145
150	175
200	220
250	275

300	330
400	440
500	550

- D. Manufacturers: Transformers shall be floor- or wall-mounted type by **General Electric, Cutler-Hammer, Square D**, or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. All Work of this Section shall be installed as indicated in Section 26 05 00 – Electrical Work, General.

END OF SECTION

SECTION 26 24 16 05 - PANELBOARDS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide panelboards complete and operable, in accordance with the Contract Documents.
- B. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.

1.2 CONTRACTOR SUBMITTALS

- A. General: Submittals shall be in accordance Section 26 05 00 – Electrical Work, General.
- B. Shop Drawings
 - 1. Breaker layout drawings with dimensions and nameplate designations
 - 2. Component list
 - 3. Drawings of conduit entry/exit locations
 - 4. Assembly ratings including:
 - a. Short circuit rating
 - b. Voltage
 - c. Continuous current
 - 5. Cable terminal sizes
 - 6. Descriptive bulletins
 - 7. Product sheets
 - 8. Installation information
 - 9. Seismic certification and equipment anchorage details

PART 2 - PRODUCTS

2.1 PANELBOARDS

- A. Panelboards shall be dead front factory assembled. Panelboards shall comply with NEMA PB-1-Panelboards, as well as the provisions of UL 50 – Safety Enclosures for Electrical Equipment and UL 67 – Safety Panelboards. Panelboards used for service equipment shall be UL labeled for such use. Lighting panelboards shall be rated for 120/208-volt, 3-phase operation or 120/240-volt for single phase operation as indicated. Power panelboards shall be rated for 480 volts, 3-phase, 4-wire operation.
- B. The manufacturer of the panelboard shall be the manufacturer of the major components within the assembly, including circuit breakers.

C. Ratings

1. Panelboards rated 240 VAC or less shall have short circuit ratings not less than 18,000 amps RMS symmetrical or as indicated by the Short Circuit Study, whichever is greater.
2. Panelboards rated 480 VAC shall have short circuit ratings not less than 25,000 amps RMS symmetrical or as indicated by the Short Circuit Study, whichever is greater.
3. Panelboards shall be labeled with a UL short circuit rating. Series ratings are not acceptable.

D. Construction

1. All lighting and power distribution panels shall have copper bus bars.
2. Breakers shall be one, two, or three pole as indicated, with ampere trip ratings as required by the equipment. Breakers shall be quick-make and quick-break, inverse time trip characteristics, to trip free on overload or short circuit, and to indicate trip condition by the handle position.
3. The panels shall have hinged doors with combination catch and latch. The front panels shall be so arranged that when the plates are removed, the gutters, terminals and wiring will be exposed and accessible. The doors shall have inner doors within the plates to have only the breaker operating mechanism exposed when they are opened. Live conductors and terminals shall be concealed behind the plates.
4. All panelboards shall be rated for the intended voltage.
5. All circuit breakers shall be interchangeable and capable of being operated in any position as well as being removable from the front of the panelboard without disturbing adjacent units. No plug-in circuit breakers will be acceptable.
6. Lighting and power distribution panels which are not part of a motor control center shall be constructed in accordance with Section 26 05 00 – Electrical Work, General. Panels shall have the necessary barriers, supports, and liberal wiring gutters. Trim screws shall be stainless steel. All panelboard parts of metal other than copper, aluminum, or stainless steel shall be cadmium plated. Panelboards shall be as manufactured by Allen-Bradley, General Electric, or Cutler-Hammer.
7. Panelboards shall be UL listed except for special enclosures which are not available with UL listing.
8. Panelboards shall be suitable for use as service entrance as indicated or as otherwise required by the N.E.C.

PART 3 - EXECUTION

3.1 GENERAL

- A. All WORK of this Section shall be installed as indicated in Section 26 05 00 – Electrical Work, General.

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide all wiring devices, plates, and nameplates in accordance with the Contract Documents.
- B. The requirements of Section 26 05 00 – Electrical Work, General apply to this Section.
- C. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 Submittal Procedures and Section 26 05 00.
- B. Shop Drawings
 - 1. Complete catalog cuts of switches, receptacles, enclosures, covers, and appurtenances, marked to clearly identify proposed materials.
 - 2. Documentation showing that proposed materials comply with the requirements of NEC and UL.
 - 3. Documentation of the manufacturer's qualifications.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All devices shall carry the UL label.
- B. General purpose duplex receptacles and toggle switch handles shall be brown everywhere except in finished rooms where they shall be ivory. Special purpose receptacles shall have a body color as indicated. Receptacles and switches shall conform to Federal Specifications W-C-596E and W-S-896E, respectively.

2.2 LIGHTING SWITCHES

- A. Local branch switches shall be toggle type, rated at 20 amps, 120-277 VAC, and shall be General Electric Cat. No. GE-5951-1 for single pole, GE-5953-1 for 3-way and GE-5954-1 for 4-way, or similar types as manufactured by Hubbell, or equal.

2.3 GENERAL PURPOSE RECEPTACLES

- A. Duplex receptacles rated 120-volt, 20 amps shall be polarized 3-wire type for use with 3-wire cord with grounded lead and 1 designated stud shall be permanently grounded to the conduit system (NEMA 5-20R). Duplex 120-volt receptacles shall be G.E. 5362, Hubbell 5362, or equal. Single receptacles shall be G.E. 4102, Hubbell 4102, or equal.
- B. Ground-fault circuit interrupting receptacles (GFCI's) shall be installed at the locations indicated. GFCI's shall be rated 125-volt, 20 amps and shall be Hubbell GF-5362, or equal.
- C. Receptacles for hazardous locations shall be single gang receptacles with spring door. Receptacles shall have a factory sealed chamber. The receptacles shall have a delayed action feature requiring the plug to be inserted in the receptacle and rotated before the electrical connection is made. The receptacle shall not work with non-hazardous rated plugs. One plug shall be furnished with each receptacle. The receptacles shall be rated for 20 amps at 125 VAC. Hazardous location receptacles shall be Appleton EFSB, Crouse-Hinds ENR, or equal.
- D. Where indicated, hazardous location receptacles shall be provided with ground fault protection. Ground fault protection shall be Appleton EFSR-GFI, Crouse-Hinds GFS 1, or equal.

2.4 ENCLOSURES AND COVERS

- A. Surface mounted switches and receptacles shall be in FS or FD type cast device boxes.
- B. In finished areas, switch and receptacle boxes shall be provided with SUPER STAINLESS STEEL COVERS as manufactured by Harvey Hubbell, Arrow Hart, Bryant, or equal.
- C. In areas where cast boxes are used, switch and receptacle covers shall be Crouse-Hinds Catalogue No. DS185 and WLRD-1, or Adalet No. WSL and WRD, or equal.
- D. Receptacles in exterior locations shall be with s-hinged cover/enclosure marked "Suitable for Wet Locations when in use" and "UL Listed." There shall be a gasket between the enclosure and the mounting surface and between the hinged cover and mounting plate/base. The cover shall be TayMac Specification Grade, or equal.

2.5 NAMEPLATES

- A. Provide nameplates or equivalent markings on switch enclosures to indicate ON and OFF positions of each switch. ON and OFF for 3-way or 4-way switches is not acceptable. Provide receptacles for special purposes with nameplates indicating their use. Conform to requirements of Section 26 05 00 – Electrical Work, General.

PART 3 - EXECUTION

3.1 CONNECTION

- A. Securely fasten nameplates using screws, bolts, or rivets centered under or on the device, unless otherwise indicated.

3.2 GROUNDING

- A. Ground all devices, including switches and receptacles, in accordance with NEC, ART 250, and Section 26 05 26 – Grounding.
- B. Ground switches and associated metal plates through switch mounting yoke, outlet box, and raceway system.
- C. Ground flush receptacles and their metal plates through positive ground connections to outlet box and grounding system. Maintain ground to each receptacle by spring-loaded grounding contact to mounting screw or by grounding jumper, each making positive connection to outlet box and grounding system at all times.

3.3 FIELD TESTING

- A. Provide checkout, field, and functional testing of wiring devices in accordance with Section 26 05 00 – Electrical Work, General.
- B. Test each receptacle for polarity and ground integrity with a standard receptacle tester.

END OF SECTION

SECTION 26 29 23 - VARIABLE FREQUENCY DRIVE UNITS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. General: The Contractor shall provide variable frequency drive (VFD) units, complete and operable, in accordance with the Contract Documents. It is the intent of this Section to require complete, reliable, fully tested variable frequency drive systems suitable for attended or unattended motor control operation.
- B. Related Sections:
 - 1. Section 26 05 00 – Electrical Work, General
 - 2. Section 26 24 19 – Motor Control Centers
 - 3. Section 26 08 00 – Commissioning of Electrical and Control Systems

1.2 SUBMITTALS

- A. Furnish submittals in accordance with Section 01 30 00.
- B. Product Data Sheets: include the following information:
 - 1. Equipment information
 - a. Name of drive manufacturer
 - b. Type and model with complete catalog number and explanation
 - c. Assembly drawing and nomenclature
 - d. Maximum heat dissipation capacity in kW
 - 2. Enclosure rating, ampere/horsepower ratings, fault ratings, nameplate data, etc.
 - 3. Operator and communications interface provisions.
 - 4. Warranty.
 - 5. Circuit breaker type and rating requirements.
 - 6. UL listing.
- C. Shop Drawings:
 - 1. Elevation drawings: Include dimensions and conduit entrance provisions.
 - 2. Assembly drawing and nomenclature.
 - 3. Wiring diagrams:
 - a. Power diagram: Include amperage ratings, circuit breaker type and ratings.
 - b. Control diagram: Include disconnect, indication, and control interface devices.

1.3 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 33 00 Submittal Procedures.

- B. The Technical Manual shall contain the following documentation:
 - 1. Manufacturer's 2-year warranty.
 - 2. Field test report.
 - 3. Shop drawings: final as shipped.
 - 4. Operation and Maintenance data:
 - a. VFD and Operator Interface user manuals.
 - b. Programming procedure and program settings as commissioned.
 - c. Troubleshooting/Service Manuals.
 - d. Service and contact information.
 - e. Spare Parts List: Information for parts required by this Section plus any other spare parts recommended by the controller manufacturer.

1.4 QUALITY ASSURANCE

- A. Single Manufacturer: Provide the products of one manufacturer in order to standardize appearance, operation, maintenance, spare parts, and manufacturer's services.
- B. Qualifications:
 - 1. VFD units and all associated optional equipment shall be UL Listed or Recognized, and shall contain a UL label attached on the inside of the enclosure cabinet.
 - a. Listed to UL 61800-5-1 up to 600Vac.
 - 2. VFD units shall be factory pre-wired, assembled and tested as a complete package.
 - 3. Certified compliant with Electric Power Research Institute (EPRI) standards SEMI F47 and IEC 61000-4-34.
 - 4. The VFD shall meet the seismic requirements of the following standards when installed according to the manufacturer's instructions:
 - a. American Society of Civil Engineering ASCE 7-10 (2010)
 - b. The International Building Code IBC (2015)
- C. Coordinate VFD units for operation with Owner Furnished process equipment and motor provisions under this project. The Contractor shall be responsible for matching the controller to the load, speed and current of the actual motor being controlled.
- D. Comply with NFPA 70.

1.5 WARRANTY

- A. The manufacturer shall provide their standard parts warranty for eighteen (18) months from the date of shipment or twelve (12) months from the date of being energized, whichever occurs first.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The Contractor shall provide variable frequency drives, stand-alone units or units integrated into motor control centers arranged as shown on the Drawings.
- B. Variable-frequency drives for motors rated 10 Hp (7.5 kW) and larger shall use an Active Front End (AFE) low harmonic design and shall contain all components required to meet the performance, protection, safety and certification criteria of this specification.
- C. Unless otherwise indicated by exception, VFD units shall be selected and rated for:
 - 1. NORMAL duty applications as specified herein.
 - 2. Variable torque application (centrifugal pumps, typical).
 - 3. 480VAC 3-phase 60 Hertz power supply.
- D. Service Conditions: VFD units shall be designed and constructed to satisfactorily operate within the following service conditions without derating.
 - 1. Ambient temperature: -20 to +40 degrees C.
 - 2. Humidity: 5 to 95 percent, non-condensing.
 - 3. AC line voltage variation: plus 10 percent to minus 10 percent.
 - 4. AC line frequency variation: plus and minus 2 hertz.
 - 5. Duty load ratings:
 - a. Systems rated at Normal Duty loads shall provide 110% overload capability for up to one minute and 150% for up to 3 seconds.
 - b. Systems rated at Heavy-Duty loads shall provide 150% overload capability for up to one minute and 180% for up to 3 seconds.

2.2 MANUFACTURERS

- A. Variable frequency drive units shall be Allen-Bradley Powerflex 755TL, or an approved equal product. See Section 01-25-00 for substitutions.
 - 1. Basis of design: Space for equipment on Drawings is based on Allen-Bradley products. Contractor shall make all necessary modifications as required for equipment by other manufacturer.
 - 2. VFDs are sized and selected for heavy duty service.
 - 3. 75 HP VFD Model Number:
 - 4. 50 HP VFD Model Number: 20G17ND077LNANNNNN-C0

2.3 EQUIPMENT

- A. VFD Architecture:
 - 1. Adjustable frequency motor controllers designed to convert the incoming 3 phase, 60 Hertz power to a DC voltage and then to adjustable

frequency 3-phase AC by use of a 3-phase inverter. VFD units shall vary both the AC voltage and frequency simultaneously to operate the motor at required speeds.

2. Voltage source design producing a pulse-width-modulated type output. Current source inverters will not be acceptable.
3. Shall use a transistor-based Active Front End (AFE) as the input rectifier equipped with a Selective Harmonic Elimination algorithm that mitigates harmonic levels in compliance with IEEE-519-2014, without the need for phase shifting transformers and multi-pulse diode rectifiers. Total current harmonic distortion shall not exceed 5% at the VFD input terminals at full load conditions. AFE rectifier shall be phase rotation insensitive, tolerant of line voltage imbalance up to 10% without affecting the harmonic mitigation or VFD output, and capable of operating the motor at full output with a 10% drop on input voltage.
4. Shall use an LCL filter assembly to filter up to and including the 50th harmonic to reduce EMI/RFI emissions. The LCL filter assembly shall include Passive Dampening. The drive will provide Active Resonance Detection and Protection to minimize any damage to the drive from supply side resonance.
5. Designed to operate 3-phase, 60 Hertz, NEMA-B, open drip-proof (1.15 SF) or TEFC (1.15 SF), squirrel-cage high efficiency inverter duty induction motors over the range of 50-100 percent of base speed without derating or requiring any motor modifications.
6. Capable of delivering nameplate horsepower exclusive of service factor without the need for mandatory thermostats or feedback tachometers. VFD units shall be sized to match the KVA and inrush characteristics of the motors.
7. The VFDs shall be of modular design with the following major components:
 - a. AC pre-charge module.
 - b. LCL filter modules
 - c. Line side converter IGBT power modules
 - d. Motor side inverter IGBT power modules
8. Motor side inverters, line side converters and LCL filter modules (for drives greater than 250 Hp) shall be on roll-out chassis with front accessible connections for ease of repair or replacement and to provide access to load cables. Motor side inverter modules shall be removable without disturbing the load cables after installation. Line converter modules and load inverter modules sections (for drives greater than 250 Hp) shall be interchangeable so as to reduce necessary spare parts.
9. The drive shall have a built-in circuit breaker as part of the drive's pre-charge circuit (250 hp and up) or provide built-in electrical connections for one to be field connected (10hp-250hp).

B. Features:

1. The drive shall have two sets of tuning settings for the configuration of the line side converter such that appropriate values can be selected for two input sources (example: main utility power or back-up generator) and can

be selected from the Human Interface Module or communications network.

2. Voltage Sag Ride-Through: The VFD shall meet voltage sag ride-through requirements of EPRI standard SEMI-F47, in which the VFD system shall attempt to ride through power dips up to 20% of nominal. The duration of ride-through shall be inversely proportional to load. For outages with greater than 20% dip, the drive shall stop the motor and issue a power loss alarm signal.
3. Run on Power Up: The VFD system shall provide circuitry to allow for remote restart of equipment after a power outage. Unless indicated in the contract drawings, faults due to power outages shall be remotely resettable.
4. Use latest generation IGBT inverter and converter sections that shall not require commutation capacitors.
5. Auto Reset/Run: For faults other than those caused by a loss of power or any other non-critical fault, the drive system shall provide a means to automatically clear the fault and resume operation.
6. The VFD lineside converter carrier frequency shall be fixed at 4 kHz.
7. The VFD motor side inverter frequency output will be sine coded PWM with a carrier frequency that can be selected at 1.33 kHz, 2 kHz, or 4 kHz, and shall be capable of the following maximum frequency outputs:
 - a. 325 Hz when operating with an output carrier frequency of 1.33 kHz or 2 kHz.
 - b. 590 Hz when operating with an output carrier frequency of 4 kHz

C. Enclosure:

1. Shall be rated UL Type 12 unless otherwise indicated.
2. Shall be painted per the manufacturer's standard.
3. Shall provide entry and exit locations for power cables.
4. The drive system nameplate shall be marked with system Short Circuit Current Rating (SCCR).
5. Drive Enclosure Input Disconnect:
 - a. Provide an enclosure door interlocked disconnect with fusing, or disconnect, or thermal magnet circuit breaker.
 - b. Operator Handles:
 - 1) Provide externally operated main disconnect handle.
 - 2) Handles shall be lockable.

D. Efficiency: The minimum VFD unit efficiency shall be 95 percent at 100 percent speed and load, and 85 percent at 50 percent speed and load.

E. Displacement Power Factor: The AFE line side converter shall be capable of maintaining a minimum true power factor of up to 0.98 across the entire speed range.

F. Control Logic:

1. The VFD shall shut down in an orderly manner when a power outage occurs on one or more phases. Upon restoration of power and a "start" signal, the motor shall restart and run at the speed corresponding to the current process input signal.
2. Ability to operate with motor disconnected when in V/Hz mode.
3. Provide a controlled shutdown, when properly protected, with no component failure in the event of an output phase-to-phase or phase-to-ground short circuit. Provide annunciation of the fault condition.
4. Provide multiple programmable stop modes including Ramp, Coast, Decel-to-Hold, and Current Limit Stop.
5. Provide multiple acceleration and deceleration rates
6. Ability to configure the VFD for an emergency operation mode.
7. Ability to control outputs and manage status information locally within the VFD.
8. Ability to function stand-alone or complementary to supervisory control.
9. Ability to provide scaling, selector switches, or other data manipulations not already built into the VFD.
10. Inrush current adjustable between 50 and 110 percent of motor full load current (factory set at 100 percent).
11. On loss of input reference signal, the VFD shall operate at a preset speed or hold last state at time of signal loss.
12. Provide a minimum of three selectable frequency jump points that lock out continuous operation at critical resonance frequencies of the driven system.

G. Reference Signals:

1. VFD units shall be capable of using the following input reference signals:
 - a. Analog inputs
 - b. Preset speeds
 - c. Remote potentiometer
 - d. Digital motor operated potentiometer (MOP)
 - e. Human Interface Module
 - f. Communication networks
2. Loss of Reference: The drive shall be capable of sensing reference loss conditions. In the event of loss of the reference signal, the drive shall be user programmable to perform the following:
 - a. Fault the drive and coast to stop.
 - b. Issue a minor fault - allows the drive to continue running while some types of faults are present.
 - c. Alarm and maintain last reference.
3. When using a communications network to control the drive, the communications adapter shall have these configurable responses to network disruptions and controller idle (fault or program) conditions:
 - a. Fault
 - b. Stop
 - c. Zero Data

- d. Hold Last State
- e. Send Fault Configuration

H. Adjustments

- 1. A digital interface can be used for all set-up, operation and adjustment settings.
- 2. Adjustments shall be stored in nonvolatile memory.
- 3. No potentiometer adjustments shall be required.

I. Process PID Control

- 1. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.
- 2. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set-point, the regulator shall adjust the drive output until the feedback equals the reference.
- 3. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
- 4. Protection shall be provided for a loss of feedback or reference signal.

J. Inputs and Outputs

- 1. Input / Output option modules shall consist of both analog and digital I/O.
- 2. No jumpers or switches shall be required to configure digital inputs and outputs.
- 3. All digital input and output functions shall be fully programmable.
- 4. Inputs shall be optically isolated from the drive control logic.
- 5. The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.
- 6. The VFD shall be capable of supporting up to 10 analog inputs, 10 analog outputs, 31 digital inputs, 10 relay outputs, 10 transistor outputs, and 5 positive temperature coefficient (PTC) inputs.
- 7. Input / Output option modules shall be as shown on the contract drawings.

K. Motor Control

- 1. Selectable Sensorless Vector, Flux Vector, V/Hz, economizer mode selectable through programming.
- 2. The drive shall be supplied with an auto-tune mode.
- 3. V/Hz mode shall be programmable for fan or pump curve, or full custom patterns.
- 4. Capable of Open Loop V/Hz.
- 5. Capable of operating induction and permanent magnet motors.
- 6. Economizer Mode:
 - a. An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operating in an idle

- mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.
- b. When the load increases, the drive shall automatically return to normal operation.
7. Flying Start: Ability to determine speed and direction of a spinning motor and adjust drive output to “pick-up” the rotating motor (forward or reverse rotation).
- L. Output filtering: Provide a 3 percent line reactor DV/DT output filter as required for motor protection, when indicated on the drawings. Output filter shall be a standard accessory furnished by the VFD manufacturer.
- M. Protection: The VFD shall have, as a minimum, the following protection features:
1. Branch Circuit Protection: Input fusing shall be provided as specified by the manufacturer.
 2. Overload Protection
 - a. The drive shall provide internal class 10 adjustable overload protection.
 - b. Overload protection shall be speed sensitive and adjustable.
 3. Input phase-to-phase and phase-to-ground line protection provided with metal oxide varistor (MOV) and RC network.
 4. Protection against single phasing.
 5. Instantaneous overcurrent protection.
 6. Electronic overcurrent protection.
 7. Ground fault protection.
 8. Over-temperature protection for electronics.
 9. Protection against internal faults.
 10. Additional protection and control as indicated and as required by the motor and driven equipment.
- N. Control Power:
1. Provide a control power transformer mounted and wired inside of the drive system enclosure. The transformer shall be rated for the VFD power requirements.
 2. Provision for external 24V DC Auxiliary Control Power Supply.
- O. Operator Interface: The drive shall have an operator interface with backlit LCD and graphics display capability, and full numeric keypad. The operator interface shall be accessible from the front of the enclosure without opening any doors, and include the following features
1. Shall indicate drive operating conditions, adjustments and fault indications.
 2. Shall be configured to concurrently display in a single screen:
 - a. Status of direction, drive condition, fault / alarm conditions and Auto / Manual mode.
 - b. Drive output frequency.

3. Shall provide digital speed control.
 4. Keypad with programming keys, drive operating keys (Start, Stop, Direction, Jog and Speed Control), and numeric keys for direct entry.
- P. Door-Mounted Controls:
1. Hand/Off/Auto Selector Switch
 - a. Provide a "Hand/Off/Auto" selector switch, mounted on the enclosure door.
 - b. The "Hand/Off/Auto" selector switch shall start the drive in the "Hand" mode and stop the drive in the "Off" mode.
 - c. 3. In the "Auto" mode, the drive shall be started and stopped from a remote "RUN" contact.
 2. Drive Disable Mushroom Push Button: Provide a maintained mushroom style push button, mounted on the enclosure door that when pushed, will open the drive enable input.
 3. Pilot Lights: Provide LED pilot lights, mounted on the enclosure door, for indication of the following status:
 - a. Run
 - b. Drive Fault
 - c. Control Power On
 - d. Motor Fault
 4. Motor Run Time Meter: Provide a digital, non-resettable, door-mounted elapsed time meter. The meter shall be electrically interlocked with the Drive Run relay and Bypass contactor to indicate actual motor operating hours.
- Q. Communications: Built-in managed dual EtherNet/IP ports for direct network connections, allowing linear or Device Level Ring (DLR) topologies. The same network for control must support safety, I/O, and motion control, as well as be able to switch using standard unmodified Ethernet networking equipment.
- R. Terminal Blocks
1. For drives rated 250 Hp and larger, power wiring is landed on robust brackets behind the drive unit. This wiring remains in-place if the drive unit is removed.
 2. Terminal blocks shall be provided for control wiring on all frames.
 3. I/O terminal blocks shall be removable with wiring in place.
 4. I/O control terminal blocks shall be rated for 115V AC.

2.4 SPARE PARTS

- A. The Contractor shall furnish the spare parts listed below, suitably packaged and labeled with the corresponding equipment number.
- B. The following spare parts shall be furnished:
 1. Three (3) sets of spare fuses of each size.
 2. One (1) spare keypad access device (HIM).

PART 3 - EXECUTION

3.1 SERVICES OF MANUFACTURER

- A. General: An authorized service representative of the manufacturer shall be present at the sites as necessary to furnish the inspection, startup, and field adjustment services listed below.
- B. Inspection, Startup, Field Adjustment: The authorized service representative shall supervise the following and certify the equipment and controls have been properly installed, aligned, and readied for operation.
 - 1. Installation of the equipment
 - 2. Inspection, checking, and adjusting the equipment
 - 3. Startup and field testing for proper operation
 - 4. Performing field adjustments such that the equipment installation and operation comply with requirements.
- C. Instruction of Owner's Personnel: The authorized representative shall instruct the Owner's personnel in the operation and maintenance of the equipment, including step by step troubleshooting with test equipment. Instruction shall be specific to the VFD models provided.
- D. Telephone Support: The drive Manufacturer shall provide one (1) year of telephone technical support for the Owner during normal business hours. The technical support shall include the drive, HIM, and Devicenet, and shall start on the date of substantial completion.

3.2 INSTALLATION

- A. Conduit stub-ups for interconnected cables and remote cables shall be located and terminated in accordance with the drive manufacturer's recommendation.
- B. Drives shall be mounted a minimum of 1-1/2 inches from any wall surface.
- C. Strut supports for drives shall not be mounted directly to wood surfaces. Install ½-inch thick cement board (Dura-rock or equal) to the wood surface, a minimum of 2 inches larger than the drive outline all around.
- D. The Contractor shall perform programming of drive parameters required for proper operation of the VFD's included in this project. Submit records of programming data in the equipment Technical Manual, including setup and protective settings

3.3 FIELD TESTING

- A. Testing, checkout, and startup of the VFD equipment in the field shall be performed under the technical direction of the manufacturer's service engineer. Under no circumstances shall any portion of the drive system be energized without authorization from the manufacturer's representative.

END OF SECTION

SECTION 26 36 05 - HEAVY-DUTY SAFETY SWITCHES

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. Furnish and install heavy-duty, double-throw safety switches for manual transfer of loads between alternate sources of supply and single-throw safety switches for motor disconnect.

1.2 CODES AND STANDARDS

- A. The heavy-duty safety switches shall conform to the requirements of:
 - 1. UL 98 – Enclosed Switches

1.3 SUBMITTALS

- A. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage and short circuit in accordance with Specification Section 26 05 00.

PART 2 - PRODUCTS

2.1 SAFETY SWITCH

- A. The safety switches used as transfer switches shall be heavy-duty, manually operated, single-throw or double-throw switches, full load make or break rated. Switches shall include a NO contact that is made in the A and B position.
- B. Switch shall be UL listed for use as service equipment and is to be labeled for this application.
- C. Switch shall have switch blades which are visible when the switch is OFF and the cover is open.
- D. Lugs shall be front removable and UL listed for aluminum or copper.
- E. All current carrying parts shall be plated to resist corrosion.
- F. The UL listed short circuit current rating of the double throw switch shall be 10,000 rms symmetrical amperes.
- G. Provisions for padlocking the switch in the OFF position shall be provided.
- H. Motor disconnect switches installed in control panels shall be rotary disconnect switches Allen-Bradley Bulletin 194RF, or equal.

2.2 ENCLOSURE

- A. The safety switch shall be furnished in a NEMA Type 3R (Exterior) or NEMA 12 (Interior) enclosure.
- B. The enclosure shall be supplied with a metal nameplate which includes ON-OFF markings.

2.3 MANUFACTURERS

- A. Safety switches shall be manufactured by Square D, Allen-Bradley, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The safety switch shall be installed in accordance with the Manufacturer's requirements and recommendations.
- B. Provide appropriately sized disconnecting means where required.
- C. Provide placard indicating device served and source.

END OF SECTION

SECTION 26 36 23 - AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. Furnish and install automatic transfer switches (ATS) with number of poles, amperage, voltage, withstand and close-on ratings specified herein and as shown on the plans. Each automatic transfer switch shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

1.2 CODES AND STANDARDS

- A. The automatic transfer switches and controls shall conform to the requirements of:
 - 1. UL 1008 - Standard for Transfer Switch Equipment
 - 2. IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment
 - 3. NFPA 70 - National Electrical Code
 - 4. NFPA 99 - Essential Electrical Systems for Health Care Facilities
 - 5. NFPA 110 - Emergency and Standby Power Systems
 - 6. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 - 7. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
 - 8. UL 508 Industrial Control Equipment

PART 2 - PRODUCTS

2.1 MECHANICALLY HELD TRANSFER SWITCH

- A. The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single-solenoid mechanism. Main operators which include overcurrent disconnect devices, linear motors or gears shall not be acceptable. The switch shall be mechanically interlocked to ensure only two possible positions, normal or emergency.
- B. OPEN transition operation with preset delay before closing only.
- C. The switch shall be positively locked and unaffected by momentary outages. All main contacts shall be silver composition. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.

- D. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.

2.2 MICROPROCESSOR CONTROLLER

- A. The controller's sensing and logic shall be provided by a single built-in microprocessor.
- B. A single controller shall provide twelve selectable nominal voltages. Voltage sensing shall be true RMS type and shall be accurate to $\pm 1\%$ of nominal voltage. Frequency sensing shall be accurate to $\pm 0.2\%$. The panel shall be capable of operating over a temperature range of -20 to +60 degrees F and storage from -55 to +85 degrees F.
- C. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit.
- D. All customer connections shall be wired to a common terminal block to simplify field-wiring connections.
- E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
 - 1. EN 55011:1991 Emission standard - Group 1, Class A
 - 2. EN 50082-2:1995 Generic immunity standard, from which:
 - EN 61000-4-2:1995 Electrostatic discharge (ESD) immunity
 - ENV 50140:1993 Radiated Electro-Magnetic field immunity
 - EN 61000-4-4:1995 Electrical fast transient (EFT) immunity
 - EN 61000-4-5:1995 Surge transient immunity
 - EN 61000-4-6:1996 Conducted Radio-Frequency field immunity
 - 3. IEEE472 (ANSI C37.90A) Ring Wave Test.

2.3 ENCLOSURE

- A. The ATS shall be furnished with a NEMA 12.

2.4 CONTROLLER DISPLAY AND KEYPAD

- A. A four-line, 20 character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters.

2.5 VOLTAGE, FREQUENCY AND PHASE ROTATION SENSING

- A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal):

<u>Parameter</u> <u>Reset</u>	<u>Sources</u>	<u>Dropout / Trip</u>	<u>Pickup /</u>
Undervoltage	N&E, 3 ϕ	70 to 98%	85 to 100%
Overvoltage	N&E, 3 ϕ	102 to 115%	2% below trip
Underfrequency	N&E 85 to 98%	90 to 100%	
Overfrequency	N&E 102 to 110%	2% below trip	
Voltage unbalance	N&E 5 to 20%	1% below dropout	

- B. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.
- C. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).
- D. Source status screens shall be provided for both normal and emergency to provide digital readout of voltage on all 3 phases, frequency, and phase rotation.

2.6 TIME DELAYS

- A. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals.
- B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
- C. Two-time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
- D. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.

- E. All time delays shall be adjustable in 1 second increments using the LCD display and keypad.

2.7 ADDITIONAL FEATURES

- A. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
- B. Auxiliary contacts rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed, when the ATS is connected to the emergency source.
- C. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
- D. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.
- E. An inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer.
- F. The controller shall be capable of accepting a normally open contact that will allow the transfer switch to function in a non-automatic mode using an external control device.
- G. Self-Diagnostics: The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
- H. Communications Interface: The controller shall be capable of interfacing through an optional serial communication module.
- I. Data Logging: The controller shall have the ability to log time and date stamped data and to maintain the last 99 events in the event of total power loss, including:
 - 1. Event Logging
 - a. Data and time and reason for transfer normal to emergency.
 - b. Data and time and reason for transfer emergency to normal.
 - c. Data and time and reason for engine start.
 - d. Data and time engine stopped.
 - e. Data and time emergency source available.
 - f. Data and time emergency source not available.

2. Statistical Data
 - a. Total number of transfers.
 - b. Total number of transfers due to source failure.
 - c. Total number of days controller is energized.
 - d. Total number of hours both normal and emergency sources are available.

2.8 WITHSTAND AND CLOSING RATINGS

- A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans.
- B. The ATS shall be UL listed in accordance with UL 1008 and be labeled in accordance with that standard's 1½ and 3 cycle, long-time ratings.

2.9 ACCEPTABLE MANUFACTURERS

- A. Automatic transfer switches shall be **EATON**, no exceptions allowed.
 1. Controller shall be **ATC-300+**.
 2. Transfer Switch shall be **ATC3C2X40400XJU**

PART 3 - EXECUTION

3.1 TESTS AND CERTIFICATION

- A. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.
- B. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, and installation and servicing in accordance with ISO 9001.

END OF SECTION

SECTION 26 50 00 - LIGHTING

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide lighting fixtures, supports, and lamps, and accessories, complete and operable, in accordance with the Contract Documents.

1.2 REFERENCE

- A. 26 05 00 Electrical Work, General

1.3 CONTRACTOR SUBMITTALS

- A. If the Contractor proposes to install equivalent equipment to that suggested, then he shall furnish the following product information in accordance with Section 26 05 00.
 - 1. Interior luminaires
 - a. Catalog data sheets and pictures.
 - b. Luminaire finish and metal gauge.
 - c. Lens material, pattern, and thickness.
 - d. Candle power distribution curves in two or more planes.
 - e. Candle power chart 0 to 90 degrees.
 - f. Lumen output chart.
 - g. Average maximum brightness data in foot lamberts.
 - h. Coefficients of utilization for zonal cavity calculations.
 - i. Mounting or suspension details.
 - j. Heat exchange and air handling data.
 - 2. Exterior luminaires
 - a. Catalog data sheets and pictures.
 - b. Luminaire finish and metal gauge.
 - c. Lens material, pattern, and thickness.
 - d. IES lighting classification and isolux diagram.
 - e. Fastening details to wall or pole.
 - f. Ballast type, location, and method of fastening.
 - g. For light poles, submit wind loading, complete dimensions, and finish.
 - 3. Lamps
 - a. Voltages (120V Only).
 - b. Colors.
 - c. Approximate life (in hours).
 - d. Approximate initial lumens.
 - e. Lumen maintenance curve.
 - f. Lamp type and base.
 - 4. Ballasts / Drivers

- a. Type.
 - b. Wiring diagram
 - c. Nominal watts and input watts.
 - d. Input voltage (120V unless with special permission) and power factor.
 - e. Starting current, line current, and restrike current values.
 - f. Sound rating.
 - g. Temperature rating.
 - h. Efficiency ratings.
 - i. Low temperature characteristics.
 - j. Emergency ballasts rating and capacity data.
- B. Seismic Bracing
- 1. Provide calculations and intended means of providing required seismic bracing of all pendant and suspended fixtures.

PART 2 - PRODUCTS

2.1 FIXTURES - GENERAL

- A. Luminaires: Specific requirements relative to execution of WORK of this Section are located in the Luminaire Schedule on Contract Drawings.
- B. All fixtures shall be pre-wired with leads of 18-AWG, minimum, for connection to building circuits.

2.2 EXTERIOR FIXTURES

- A. Exterior fixtures in combination with their mounting pole and bracket shall be capable of withstanding 100 MPH winds without damage. Exterior fixtures shall have corrosion-resistant hardware and hinged doors or lens retainer. Fixtures specified to be furnished with integral photo-electrical control shall be of the fixture manufacturer's standard design.

2.3 INTERIOR FIXTURES

- A. Interior fixtures without diffusers shall be furnished with end plates. Where diffusers are required, they shall be of high molecular strength acrylic. Minimum thickness of the acrylic shall be 0.125 inches for all diffusers, except that those on 4-foot square fixtures shall be 0.187 inches thick.
- B. Emergency Exit Signs
 - 1. As shown on the plans.

2.4 PHOTO-ELECTRIC CELLS

- A. Photoelectric cells for control of multiple fixtures shall be self-contained, weatherproof type, rated for 1800 VA 120-volt, single pole, single throw, and shall be provided with time-delay features. Photoelectric cell shall be Tork Model 2101, or equal.

2.5 FIXTURE TYPES

- A. Specific requirements are located in the Lighting Fixture Schedule on the Contract Drawings.

PART 3 - EXECUTION

3.1 LUMINAIRES

- A. Install in accordance with manufacturer's recommendations.
- B. Provide necessary hangers, pendants, and canopies.
- C. Provide additional ceiling bracing, hanger supports, and other structural reinforcements to building required to safely mount. Provide seismic bracing as required by
- D. Install plumb and level.
- E. Locate luminaires to avoid both conflict with other building systems and blockage of luminaire light output.

3.2 LAMPS

- A. Provide in each fixture, the number and type for which the fixture is designed, unless otherwise indicated.

3.3 BALLASTS

- A. Install in accordance with manufacturer's recommendations.
- B. Utilize all ballast mounting holes to fasten securely within luminaire.
- C. Replace noisy or defective ballasts.

3.4 CLEANING FOLLOWING INSTALLATION

- A. Remove all labels and other markings, except UL listing mark.
- B. Wipe luminaires inside and out to remove construction dust.

- C. Clean luminaire plastic lenses with antistatic cleaners only.
- D. Touch up all painted surfaces of luminaires and poles with matching paint ordered from manufacturer.
- E. Replace all defective lamps at time of Substantial Completion.

END OF SECTION

SECTION 26 99 90 - ELECTRICAL HEAT TRACE

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 00 00 - Electrical Work, General.

1.2 WORK INCLUDED

- A. This section describes specific requirements, products, and methods of execution relating to providing Electrical Heat Trace used on this project.

1.3 QUALITY ASSURANCE

- A. Heat Trace shall be listed or labeled.
- B. Heat Trace shall be identified as acceptable for use on plastic pipe.
- C. Codes, Approvals and Standards the electric heat-trace system shall conform to this specification. It shall be designed, manufactured, and tested in accordance with the applicable requirements of the latest edition of the following codes and standards.
 - 1. ANSI American National Standards Institute
 - 2. CEC Canadian Electrical Code
 - 3. CSA CSA International
 - 4. FM FM Approvals
 - 5. IEC International Electro-Mechanical Commission
 - 6. IEEE Institute of Electrical and Electronics Engineers
 - 7. ITS Intertek Testing Services (Intertek ETL SEMKO)
 - 8. NEC U.S. National Electrical Code (NFPA 70)
 - 9. NEMA National Electrical Manufacturers Association
 - 10. NESC National Electrical Safety Code
 - 11. UL Underwriters' Laboratories, Inc.

1.4 SUBMITTALS

- A. The following items shall be included in the submittal:
 - 1. Quality Assurance: Verification that product is listed for the intended use
 - 2. "Cut" sheets are an acceptable format if all required data is presented in a readable manner. Where options are identified as available but not provided, they shall be marked out alternately identify only those options intended to be supplied with the component if none, then state so on the submittal.

PART 2 - PRODUCTS

- A. Self-Regulating Heat Trace for Service Lines and Watering Point
 - 1. Self-regulating heater cable is a parallel circuit electric heater strip.
 - 2. An irradiation cross-linked conductive polymer core material is extruded over the multi-stranded, tin-plated, 18-gauge copper bus wires.
 - 3. The conductive core material increases or decreases its heat output in response to temperature changes.
 - 4. Two jackets provide extra dielectric strength, moisture resistance, and protection from impact and abrasion damage.
 - 5. A thermoplastic elastomer over jacket is then extruded over the inner jacket.
 - 6. A tinned copper braid is installed over the second jacket, providing a continuous ground path.
 - 7. A standard option UV stabilized polyolefin over jacket is available to cover the braid for wet applications.
 - 8. 12 Watts/Ft @120V
- B. Manufacturer NELSON SLT-1 with SS-1 Controller or approved equal.
- C. Provide SLT-LPS Power Connection Kit and SLT-E End Seal Kit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall consist of Heat Cable, Controller, Power Connection Kit, End Seal Kit, XHHW cable as required, junction box as required, and use of AT-50 Aluminum Heat Trace Transfer tape.
- B. Intended use is for metal vents.

3.2 TESTING

- A. Factory inspections and tests for self-regulating heater cables shall include but are not limited to the following:
 - 1. Testing shall be done per the latest IEEE Std. 515 test section and applicable manufacturer's standards.
- B. Upon receipt OWNER will perform megger test to verify heating cable was not damaged during transit.
 - 1. The megger readings upon receipt shall be greater than 20 megohms. Otherwise, the heater cable is not acceptable and shall be replaced.
- C. After installation, complete the following forms (Examples included):

1. Periodic Inspection Form
2. Heat Trace Installation record

NELSON HEAT TRACE

Periodic Inspection Record

Freeze Protection Circuits - Perform these checks as season requiring use approaches.

Temperature Maintenance Circuits -

Perform these checks at least twice per year.

Circuit Number Heater Type Circuit Length

Visual inspection inside connection box	Initial						
Damage or cracks (leaks) in insulation	Initial						
Heater cable properly connected and	Initial						
Thermostat checked for moisture, corrosion, set point, switch operation, and capillary damage	Set Point						
	Initial						
Date							
Megger tests performed at power	Reading						
Watts/Ft.							
All connections, boxes, and thermostats	Initial						
End seals, covered splices and tees marked	Initial						

Heat Trace Installation Record



Location	System	Project Number	Reference Drawing(s)	
Trace Heater	Line Number	Area	AIT / T-Classification	
Panel Number	Location	Circuit Number	Circuit Amp / Voltage	
Trace Heater Mfg	Heater Model	Trace Heater Wattage unit length / Voltage Rating		
Megohmmeter Manufacturer / Model		Voltage Setting	Accuracy / Full Scale	
Megohmmeter date of last calibration				
Multimeter Manufacturer / Model		Ohm Setting	Accuracy / Full Scale	
TRACE HEATER TESTING:		Test Value / remarks	Date	Initials
1. Receipt of Material on Reel				
Continuity Test on Reel (see note 1)				
Insulation Resistance Test on Reel				
2. Piping Completed (Approval to start heater installation)				
3. After Installation				
Continuity Test (see note 1)				
Insulation Resistance Test				
4. Trace heater Installed (Approval to start Thermal Insulation Installation)				
Trace heater correctly installed on pipe, vessel or equipment				
Trace heater correctly installed at valves, pipe supports, other heat sinks				
Components correctly installed and terminated (Power, Tee, End Seal)				
Installation agrees with manufacturer's instructions and circuit design				
5. Thermal Insulation Installation Complete				
Continuity Test (see note 2)				
Insulation Resistance Test (5 megohm min)				

Performed by	Company	Date
Witnessed by	Company	Date
Accepted by	Company	Date
Approved by	Company	Date
NOTES		
<ol style="list-style-type: none"> 1. Note Minimum acceptable insulation resistance should be 20 megohms. Minimum acceptable test voltage is 500 Vdc. However, 1000 Vdc recommended for MI, 2500 Vdc for polymeric cables. 2. Continuity test on self-regulating heat trace only used for short or open circuit. 		

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

DIVISION 40 - PROCESS INTEGRATION

SECTION 40 90 00 - PROCESS CONTROL AND INSTRUMENTATION SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall install all Process Control and Instrumentation Systems (PCIS), complete and operable, in accordance with the Contract Documents. All programming and configuration shall be the responsibility of the Contractor. The intent is for the Contractor to provide the infrastructure in support of the process requirements.
- 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 qualified electrical and mechanical installers, shall be responsible to the Owner for the installation of the PCIS and integration of the PCIS with other required instrumentation and control devices.
 - 2. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that an Integrator 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.
 - 3. As a minimum, the Integrator shall perform the following Work:
 - a. Provide a Control System Panel Designer and Fabricator (CSPDF): Panel MCP-1, RCP-1, CPP-1, and CPP-2 shall be designed and fabricated by the CSPDF. The CSPDF shall perform the following work:
 - 1) Design panels in accordance with the materials and performing the functions specified on the drawings and herein.
 - 2) Submit for approval and where changes or modifications are made, edit the contract loop drawings and control panel designs to show any and all changes to the design.
 - 3) Fabricate, Test and List the panel) at the factory.
 - 4) Ship the panels with a copy of the marked-up drawings.
 - b. Implementation of the PCIS
 - 1) prepare analog hardware submittals for instruments provided under this contract
 - 2) furnish hardware as needed to support all field installed instrumentation and control requirements
 - 3) oversee and certify hardware installation of all field installed equipment including field installed, Owner – furnished, equipment
 - 4) Program the Data Recorder as required
 - 5) Oversee, document, and certify loop testing
 - 6) prepare Technical Manuals for instrumentation and controls provided under this contract

- 7) prepare edited set of record drawings
4. Any Integrator responsibilities in addition to the list above are at the discretion of the Owner.

1.2 CONTRACTOR SUBMITTALS

- A. Submit per 01 33 00 Submittal Procedures:
 1. Instrumentation and hardware manufacturers data
 2. Panel design, including but not limited to
 - a. Wire list
 - b. Loop diagrams
 3. Test Plan,
 4. Training Plan,
 5. Spare Parts list,
 6. Loop test results,
 7. Updated Control Narrative
 8. Updated Wiring Schematic
 9. Updated Troubleshooting Matrix
 10. Updated Alarm Matrix
 11. Manufacturer Technical Manuals
 12. Record As-Built Drawings.
- B. AUTOCAD drawings of the contract documents will be available to the Contractor after award.
- C. Note that the Owner's Engineer will develop the O&M manual based on contract drawings, submittals noted in 1.2.A, and record as-built drawings.

1.3 WARRANTY

- A. The warranty shall start from the date of final acceptance of the completed project and shall extend for 4 years.

PART 2 - PRODUCTS

2.1 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. Pneumatic signals shall be 3 to 15 psig, with 3 psig equal to 0 percent, and 15 psig equal to 100 percent.

- 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 in Section 01 25 00 Substitution Procedures. 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.

2.2 OPERATING CONDITIONS

- A. The PCIS shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
 - 1. Environment - water treatment/supply facility
 - 2. Indoor Temperature Range - 32 through 84 degrees F
 - 3. Relative Humidity - 20 through 90 percent, non-condensing
 - 4. Seismic Zone 4

2.3 SPARE PARTS AND SPECIAL TOOLS

- A. The Contractor shall provide the following:
 - 1. Spare parts as listed on drawings.
- 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.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING

- A. Shipping Precautions: After completion of shop assembly, factory test, and approval, equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the Site.

- B. Special Instructions: Special instructions for proper field handling, storage, and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.
- C. 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.
- D. 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.

3.2 INSTALLATION

- A. General
 - 1. Instrumentation, including instrumentation furnished under other Divisions, shall be installed under Division 40 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. Conduit shall be provided under Division 26.
 - 2. 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 shall be provided under Division 26 or in accordance with the Owner Furnished equipment manufacturers specifications.
 - 3. All 24VAC, 12-24VDC, control, Coaxial, network and other cables other than power cables shall be provided under this specification
 - 4. Terminations and wire identification at PCIS equipment furnished under this or any other Division shall be provided under Division 40.
- C. Instrumentation Tie-Downs: Instruments, control panels, and equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

- D. Existing Instrumentation: Each existing instrument to be removed and reinstalled shall be cleaned, reconditioned, and recalibrated by an authorized service facility of the instrument manufacturer. The Contractor shall provide certification of this work prior to reinstallation of each instrument.
- E. Ancillary Devices: The Contract Documents show all necessary conduit and 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.
- F. 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. Instrument process sensing lines shall be installed under Section 22 11 19 – Piping and Tubing Systems.
 - 5. Flexible cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.
 - 6. Power and signal wires shall be terminated with crimped type lugs.
 - 7. Connectors shall be, as a minimum, watertight.
 - 8. Wires shall be mounted clearly with an identification tag that is of a permanent and reusable nature.
 - 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. Fasteners using adhesives are not permitted.
 - 11. Mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.
 - 12. 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.
 - 13. The Owner will not be responsible for any additional cost of rework attributable to actions of the Contractor or the Instrumentation Supplier.

3.3 CALIBRATION

- A. General: Devices provided under Division 40 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 ensure 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.

3.4 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. Control Valve Tests: Control valves, cylinders, drives and connecting linkages shall be stroked from the operator interface units as well as local control devices and adjusted to verify proper control action, hand switch action, limit switch settings, torque settings, remote control actions, and remote feedback of valve status and position. Control valve actions and positioner settings shall be checked with the valves in place to ensure that no changes have occurred since the bench calibration.
- C. 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.
- D. 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.
- E. 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 Integrator and date
 - 9. Space for Engineer witness signature and date
- F. 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.

3.5 RADIO SYSTEM TEST

A. Two measurements are to be made during the initial installation. They will confirm proper operation of the unit and serve as a benchmark in troubleshooting should difficulties appear in the future. These measurements must be performed by a skilled radio-technician (or under guidance of one) are: Antenna System SWR (Standing-Wave Ratio), and Antenna Direction Optimization, as defined below.

B. Antenna System SWR and Transmitter Power Output

1. General: A proper impedance match between the Synetcom Wireless IO radio and the antenna system is important. It ensures the maximum signal transfer between the radio and antenna. The impedance match can be checked indirectly by measuring the SWR of the antenna system. If the results are normal (as defined in the next paragraph), record them for comparison for use during future routine preventative maintenance. Abnormal readings indicate possible trouble with the antenna or the transmission line that must be corrected and the test then repeated.

The SWR of the antenna system is to be checked before the radio is put into regular service. For accurate readings, a wattmeter suited to 1000 MHz measurements is required. One unit meeting this criterion is the Bird Model 43 directional wattmeter with a 5J element installed. The reflected power must be less than 10 percent of the forward power ($\approx 2:1$ SWR).

If the reflected power is more than 10 percent, check the feedline, antenna and its connectors for damage and repair or replace as necessary.

Set the transmitter power output level to 30 dBm for the duration of the test to provide an adequate signal level for the directional wattmeter.

C. Antenna Direction Optimization

1. General: Directional antennas require some fine-turning of their bearing to optimize the received signal strength. The Synetcom radio has a built-in received signal strength indicator (RSSI) that is to be used to tell when the antenna is in a position that provides the optimum received signal. RSSI measurements and Wireless Packet Statistics are based on multiple samples over a period of several seconds. The average of these measurements will be displayed by the radio Management System. The measurement and antenna alignment process is expected to take 10 or more minutes.
2. Use the Microwave Data Systems recommended test procedure.
 - a. Optimize RSSI (less negative is better) by slowly adjusting the direction of the antenna. Watch the RSSI indication for several seconds after making each adjustment so that the RSSI accurately reflects any change in the link signal strength.
 - b. View the Wireless Packets Dropped and Received Error rates at the point of maximum RSSI level. They should be the same or lower than the previous reading. (Main Menu>Performance Information>Packet Statistics>Wireless Packet Statistics)

3.6 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.

3.7 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

- A. For the purpose of this Section, the following conditions, in addition to the requirements in 01 91 00 Commissioning, 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.

END OF SECTION

SECTION 40 91 19 29 - PRESSURE MEASURING SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. General: The Contractor shall provide pressure measuring systems, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to the Work of this Section.
- C. All instruments shall be FM-approved, or equal.

1.2 SUBMITTALS

- A. General: Shop Drawings, Owner's Manual, and Record Drawings shall be submitted in conformance with the requirements of Section 40 90 00 – Process Control and Instrumentation Systems.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Electrical interface and code compliance shall conform to the requirements of Section 40 90 00 – Process Control and Instrumentation Systems.

2.2 ELECTRONIC PRESSURE TRANSMITTERS

- A. The devices shall be smart devices that can be calibrated with a **Fluke 744 HART protocol calibrator**.
- B. Pressure Transmitters: **Endress + Hauser, Model PMP51-AA12ID2PGFACJA1 + F1HALRMHPA**, or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Pressure measuring and control systems shall be handled, installed, calibrated, loop-tested, pre-commissioned, and performance tested according to Section 40 90 00 – Process Control and Instrumentation Systems.

- B. Mounting hardware and sensing lines shall be stainless steel in accordance with Section 22 11 19 – Piping and Tubing Systems.

END OF SECTION

SECTION 40 91 23 33 - IN-LINE LIQUID FLOW MEASURING SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. General: The Contractor shall provide in-line liquid flow measuring systems, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to this Section.
- C. All parts and components shall be of a single manufactured and designed as a single system.
- D. All instruments shall be FM-approved, or equal.

1.2 SUBMITTALS

- A. General: Shop Drawings shall be submitted in conformance with the requirements of Section 40 90 00 – Process Control and Instrumentation Systems.
- B. General:
 - 1. Submittals shall be furnished for the purpose of evaluating bids.
 - 2. Shop Drawings, Owner's Manual, and Record Drawings shall be submitted in conformance with the requirements of Section 40 90 00 – Process Control and Instrumentation Systems.
- C. Shop Drawings: Provide detail drawings of the metering body (i.e.: flow tube or propeller meter) for the purpose of verifying sizes, fit and application.
- D. Technical Data: Provide data sheets along with operations and maintenance manuals for bid evaluation purposes.
- E. Startup Services: The Instrument Supplier shall provide startup services including verifying factory calibration.
 - 1. Startup services are to include installation verification, commissioning, calibration and 1 hour of informal training.

PART 2 - PRODUCTS

2.1 MAGNETIC FLOW SENSORS

- A. Manufacturer **ABB**, or equal

- B. Model number: **FEV121.150.V.1.S.1.A1.B.1.A.1.A.2.A.3.B.4.A.1-M5.V0.CWC.T3** or approved equal.
- C. Flowmeter to have less than 1% error from 450 GPM to 850 GPM.
- D. Provide armored vendor cable between flow element and transmitter.

PART 3 - EXECUTION

3.1 GENERAL

- A. Flow measuring systems shall be handled, installed in accordance with the Manufacturers installation instructions and calibrated, loop-tested, precommissioned, and performance tested by authorized manufacturer's representatives according to Section 40 90 00 – Process Control and Instrumentation Systems.
- B. The Manufacturer shall provide 4 hours of on-site training for each type of instrument.
- C. The Contractor shall cut, patch, fit, and weld fittings to existing pipes as necessary. Pipes shall be cleaned and painted to match existing pipe finish. All fittings and fixtures shall be disinfected following the standard procedure before being put into service.

END OF SECTION

SECTION 40 91 23 36 - LEVEL MEASURING SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. General: The Contractor shall provide level measuring systems, complete and operable in accordance with the Contract Documents.
- B. "Smart" transmitters shall be furnished when or wherever possible.
- C. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to this Section.
- D. All instruments shall be FM-approved, or equal.

1.2 SUBMITTALS

- A. Furnish submittals in accordance with Section 40 90 00 – Process Control and Instrumentation Systems.

PART 2 - PRODUCTS

2.1 WELL SUBMERSIBLE TRANSDUCER AND SENSOR TYPE LEVEL MEASUREMENT (WATER)

- A. Submersible level transducers/transmitters for water service shall be **Endress + Hauser FMX21-AA111MDE25H + F1LRPOPRPUPW**, and accessories as noted on drawings, or equal.

2.2 TANK LEVEL TRANSMITTER

- A. Manufacturer: **Endress + Hauser CERABAR** or **DELTAPILOT** depending on installation location as per drawings, or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Level measuring systems shall be handled, installed, calibrated, loop-tested, precommissioned, and performance tested according to Section 40 90 00 – Process Control and Instrumentation Systems.

3.2 INSTALLATION

- A. Coordinate with the manufacturer prior to installation to identify installation requirements.
- B. Install the level transducers in accordance with the Manufacturer's requirements.

END OF SECTION 40 91 23.36

SECTION 40 95 13 - CONTROL PANELS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. General: The Contractor shall provide control panels, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to this Section.
- C. The provisions of this Section apply to local panels provided in equipment systems specified in other sections, unless indicated otherwise in those sections.
- D. Control and Control Power panels shall be built to UL 508, or an independent testing laboratory acceptable to the local code enforcement agency having jurisdiction. The panels shall have NRTL labels attached to them by the panel builder. The panel builder shall provide with each panel a certification from the independent testing lab inspector that the panel is built to their standards.
- E. All control enclosures and power panel enclosures shall be built to NEC standards for enclosures.

1.2 REFERENCE DOCUMENTS

- A. UL 508A –Standard for Industrial Control Panels
- B. NFPA 79 – Electrical Standard for Industrial Machinery
- C. NFPA 70 – Article 409

1.3 SUBMITTALS

- A. General: Submittals shall be furnished in accordance Section 01 33 00 Submittal Procedures.
- B. Control Panel Engineering Submittal: The Contractor shall submit a control panel engineering submittal (CPES) for each control panel and enclosure provided under Division 40. The CPES shall completely define and document the construction, finish, fuses, circuit breakers, internally mounted hardware, communications hardware, and PLC system components. All panel drawings shall, as a minimum, be "B" size with all data sheets and manufacturer specification sheets being "A" size. The submittal shall be in conformance with ISA-S20 – Standard Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, shall be submitted as a singular complete

bound volume or multi volume package within 60 calendar days after Notice to Proceed, and shall have the following contents:

1. A complete index shall appear in the front of each bound volume. All drawings and data sheets associated with a panel shall be grouped together with the panels being indexed by systems or process areas. All panel tagging and nameplate nomenclature shall be consistent with the requirements of the Contract Documents.
2. Scale construction drawings which define and quantify the type and gauge of steel to be used for panel fabrication, the ASTM grade to be used for structural shapes and straps, panel door locks and hinge mechanisms, type of bolts and bolt locations for section joining and anchoring, details and proposed locations for "UNISTRUT" members, stiffener materials and locations, electrical terminal box and outlet locations, electrical access locations, print pocket locations, writing board locations, and lifting lug material and locations.
3. Cutout locations with nameplate identifications shall be shown.
4. The Contract Drawing wiring diagrams shall be edited to identify electrical devices, terminals, and interconnecting wiring. These diagrams shall show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all electrical and control devices.
5. Completed ISA S20 data sheets for all instrumentation devices associated with each control panel supplemented with manufacturer specification sheets which verify conformance to the requirements of the Contract Documents.
6. A bill of material which enumerates all devices associated with the control panel.
7. Refer to 40 90 00 PROCESS CONTROL AND INSTRUMENTATION SYSTEMS for Maintenance Manual.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Environmental Suitability: All 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 as shown on the Drawings in order to maintain all instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The Contractor shall provide all power wiring for these devices. Enclosures suitable for the environment shall be provided. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.
- B. Panel construction shall conform to NFPA 70 (NEC) Article 409 and NFPA 79.
- C. The control panel controls shall be the voltages as indicated on the drawings. Control conductors shall be provided in accordance with the indicated requirements.

- D. If the control panel is the source of power equipment interconnected with the control panel the circuit shall be derived from the panel with its own distribution and main breaker. All equipment associated with the control panel shall be ready for service after connection of conductors to equipment, controls, and control panel.
- E. Unless indicated otherwise, control panels shall be housed in NEMA-rated enclosures as shown on the Drawings. Control panels shall be either wall-mounted, pedestal-mounted or equipment skid-mounted, as indicated. Internal control components shall be mounted on an internal back-panel or side-panel as required.
1. All interior control or relay panels mounted above ground level shall be NEMA 12.
 2. All control or relay panels mounted below ground level, unless noted otherwise on the Drawings, shall be NEMA 4X.
 3. All exterior control panels and enclosures mounted above ground level, unless noted otherwise on the Drawings, shall be NEMA 4 with rain shield across top of doors.
 4. All control panels mounted in enclosures meeting the above requirements shall be NEMA 1.
- F. Each source of 'external' voltage shall be isolated by providing disconnecting fused terminal blocks, circuit breaker or DIN rail mounted relays. Each control panel shall be provided with identified terminal strips for the connection of all external conductors. The Contractor shall provide sufficient terminal blocks as shown on the Drawings.
- G. Motor starters, where required, shall be in accordance with Section 26 24 19 – Low Voltage Motor Control Centers. Each motor starter shall be provided with PLC interface circuits as indicated on the drawings. Electrical components shall be of standard American manufacture.
- H. All control panel mounted devices shall be provided as shown on the Drawings.
- I. Painting: Steel control panels shall be thoroughly cleaned and sand blasted per Steel Structures Painting Council Specification SSPC SP 6 (Commercial Blast) after which surfaces shall receive a prime coat of **Amercoat 185**, or equal, 3 mils DFT, for a total thickness of the prime plus finish system of 6 mils. The finished color of the outside surfaces shall be ANSI 61 gray paint. Interior of the control panel, back-panel, and side-panels shall have a white finish coat.

2.2 CONTROL PANELS

A. NEMA 4X

1. Enclosure shall be 16-gauge or 14-gauge thickness, unless otherwise indicated on the Drawings, Type 304 or 316L stainless steel.
2. Enclosures shall have stainless steel hinges, hinge pins, and door clamps.

3. Finish shall be unpainted, smooth #4 brushed finish, as specified for steel control panels.
4. Enclosures and Panels shall be as manufactured by **Hoffman**, or equal.

B. NEMA 12

1. Steel panel section faces shall be No. 14 gauge minimum thickness, unless otherwise indicated on the Drawings. All materials shall be selected for levelness and smoothness.
2. Structural shapes and strap steel shall comply with ASTM A 283 – Low and Intermediate Tensile Strength Carbon Steel Plates, Grade C.
 - a. Bolting Material: Commercial quality carbon steel bolts, nuts, and washers shall be 1/2-inch diameter with UNC threads. Carriage bolts shall be used for attaching end plates. All other bolts shall be hex end machine bolts. Nuts shall be hot pressed hex, American Standard, heavy. Standard wrought washers shall be used for foundation bolts and attachments to building structures. All other bolted joints shall have SAE standard lock washers.
3. Construction: Dimensions shall be as shown on the Drawings.
4. Enclosures and Panels shall be as manufactured by **Hoffman**, or equal.

C. Weatherproof NEMA 3R Enclosures: Large, weatherproof enclosures, 4 feet high or higher, shall be built to NEMA 4 standards and shall be rated for outdoor use in wet environments. The enclosures shall be built of 12ga steel to the size shown on the Drawings, and have the following features:

1. Fully gasketed single or double door access as shown on the Drawings, with removable post.
2. Seams continuously welded.
3. Lifting eyes.
4. 3-point latching pad lockable handle on each door.
5. Rollers for the latching rods for 3-point latch.
6. Back panels (full size).
7. Deadfront with inner operator door
8. Insulation.
9. Open bottom with 2" flange for pad mounting.
10. Provision for mounting fluorescent lights.
11. Enclosures shall be Hoffman, or equal.

D. Fabrication

1. End plates, top plates, and top closure panels (to hung ceiling) shall be provided when required by the material requisition. End plates, top plates, and top closure panels shall be removable with countersunk bolts to match panels. Top closure panels shall be furnished in lengths that match the widths of standard panels, except that one top closure panel may extend across two 4 feet 6 inches wide or five 2 feet wide standard panels. The vertical joints of these panels shall align with the vertical joints of the standard panels.

2. Doors shall be flush fitting, gasketed, and be of the hinged type with door handles. Screwdriver 1/4 turn or Dzus type fasteners are not acceptable.
 - a. The flanged edges of all panels shall be straight and smooth. Corners shall be welded and ground smooth.
 - b. The face of the panel shall be true and level after flanging.
 - c. All panel cut outs and holes may be cut or drilled by any standard method that does not cause deformation. Burrs shall be ground smooth.
 - d. Adjacent panels shall assemble with faces flush. Gaps or cracks shall not be visible from the front of the assembled instrument board.
 - e. Stiffeners shall be welded to the back of panels, as required to prevent panel deformation due to the weight of face-mounted instruments.
 - f. Panels shall be self-supporting as defined below.

E. Framework and Supports

1. The rear of each panel section shall have a steel framework assembled to it for supporting conduit, wireways, switches, piping, and all instrument accessory items such as relay or terminal enclosures, transducers, pressure switches, valves, and air relays. The main framework shall be constructed of standard structural shapes. Special shapes such as "Unistrut" may be used for secondary supports. Framework must neither interfere with instrument connections nor interfere with access needed for maintenance or adjustments.
2. Steel framework shall extend 2 feet 4 inches back from the panel face, or as indicated in the material requisition. Where indicated, individual adjustable leg supports shall be provided at the back of the framework so that the entire panel is self-supporting.

F. Preparation of Panel Surface

1. The following requirements apply to the front and rear face of the panel, both sides and the edges of all flanges, and the periphery of all holes or cut outs.
 - a. All high spots, burrs, and rough spots shall be ground smooth.
 - b. The surfaces shall be sanded or sandblasted to a smooth, clean, bright finish.
 - c. All traces of oil shall be removed with a solvent.
 - d. The first coat of primer shall be applied immediately.

G. Instrument Finishing: The final coats applied to painted surface of instrument cases, doors, or bezels that are visible from the front of panels shall be manufacturer's standard, unless otherwise indicated. Black japan or "crinkle" finishes on instrument cases are not acceptable.

H. Mounting of Instruments

1. The panel vendor shall provide cut outs and shall mount all instrument items indicated to be panel-mounted, including any instruments indicated to be furnished by other vendors but installed in the panel.
2. The panel vendor shall also mount behind the panels other instrument accessory items as required for functionality or as indicated.
3. Equipment mounted at the rear of panel shall be installed to allow for commissioning adjustments, servicing requirements, and cover removal.
4. Spare space shall be kept clear of wiring, etc., to give maximum space for future additions.

I. Electrical Requirements

1. The Contractor shall provide conduit, wireways, switches, wire, and electrical fittings for all 24 VDC and 120 VAC circuits to instruments and other electrical devices as required for a complete and operable installation.
2. Conduit, wireways, junction boxes and fittings shall include those required between sensors and transmitters and between the junction boxes and instruments.
3. Each terminal connection shall have a plastic plate with a terminal and instrument tag number. Wiring shall be identified with stamped tubular wire end markers. Terminals shall be DIN rail mounted, rated at 400 VAC, manufactured by **Entrelec**, or equal.
4. Each panel shall be provided with a switched 60-watt incandescent T-10 style light fixture, as shown on the Drawings. The fixture shall include a 120-volt receptacle and door switch. The fixture shall be **Hoffman model A-LTDB1**, or equal.
5. Wiring Methods: Wiring methods and materials for all panels shall be in accordance with the N.E.C. requirements for General Purpose (no open wiring) unless otherwise indicated.
6. Signal and Control Circuit Wiring
 - a. Wire type and sizes: Conductor shall be flexible stranded copper wire, UL. Wires for instrument signal circuits and alarm input circuits shall be No. 16 AWG Type MTW rated for 300 volts. The analog cables internal the panel terminal strips shall be (8) conductor No. 18 AWG cable rated 300 volts for loop powered devices and 8-pair shielded No. 18 AWG cable rated 300 volts for 4-wire loops.
 - b. Wire Insulation Colors:
 - 1) 120 VAC Power - Black 14 AWG minimum
 - 2) 120 VAC Neutral - White 14 AWG minimum
 - 3) 120 VAC Ground - Green 14 AWG minimum
 - 4) 120 VAC Control - Red 14 AWG minimum
 - 5) 24 VAC Power - Yellow 16 AWG minimum
 - 6) 24 DC Positive - Blue 16 AWG minimum
 - 7) 12 DC Positive - Orange 16 AWG minimum
 - 8) DC Common - White/Green 16 AWG minimum

All 120 VAC power wiring protected by the main circuit breaker and incoming power service shall be No. 12 AWG.

- c. Wire Marking: Wire numbers shall be marked using white numbered wire markers made from heat shrink plastic. Wires shall be marked as shown on the Drawings. Numbers shall read from left to right.
 - d. Flexible conduit is only to be used where specified.
 - e. Conduit fittings shall be **Crouse Hinds cast fittings**, or equal.
 - f. For equipment grounding, panels shall be provided with a 1/4 inch by 1 inch copper ground bus complete with solder-less connector for one No. 4 AWG bare stranded copper cable. The copper cable shall be provided by the Contractor and be connected to the electrical equipment ground of the 120-volt panel supplying power.
7. Power Supply Wiring
- a. Unless otherwise indicated, all instruments, alarm systems, and motor controls shall operate on 24 VDC circuits.
 - b. The panel fabricator shall provide terminal box connections for the main power supply entry as shown on the Drawings.
 - c. When instruments do not come equipped with integral fuses, provide fuses as required for the protection of individual instruments against fault currents. Fuses shall be mounted on the back of the panel in a fuse holder, and each fuse shall be identified by a service name tag. Fuses shall be as manufactured by **Bussmann Manufacturing Division, Type KAW TRON**, or equal. Circuit breakers shall be provided as shown on the Drawings.

J. Relays:

- 1. Refer to drawings for relay type, voltage, and if approved equals are allowed.

K. Terminals: Fused Terminals for analog input and output points shall be a 3-wire terminal with a fused circuit, a feed through circuit and a ground terminal. Fused Terminals for the discrete input points shall be 2-wire terminal with a fused circuit and a feed through circuit. Provide a one-tenth of an ampere rapid blow 250-volt fuse for all analog circuits and all discrete input circuits. The analog terminals shall be **Weidmuller model KDKS 1 part 953245**, and the discrete input terminal shall be **Weidmuller model KDKS 1 PE part 953245**.

L. Spare Fuses: For each panel, provide the following spare fuses:

- 1. A minimum of two spare fuses of each size
- 2. One spare fuse for every ten fused circuits

Provide the fuses in a spare fuse box mounted on the interior wall of the panel. Fuse box shall be **Plano Tackle Systems 1061 Accessory Box, Plano, IL**, www.planomolding.com, or equal.

M. 120 VAC Surge Arrestor: A 120 VAC three-stage surge protector shall be provided on the main leads of each control power panel. The surge protector shall include a first stage inline inductor, a second stage MOV to ground with a thermal fuse, and a third stage array of MOVs to provide a small amount of capacitance. The unit shall be DIN rail-mounted. The MOV shall include green LED to indicate the status of the second stage MOV. Provide two (2) spare units for each panel. The unit shall be rated for 120 VAC and shall be either **Advance Surge Suppressor model TSP-WG6-120VAC-10A-01**, **Control Concepts 'Islatrol Elite' model IE-110**, or equal.

N. Miscellaneous Parts:

1. RCP-1 and MCP-1 shall be provided with a large steel folding shelf, 12 inches deep by 18 inches wide, **Hoffman model A-ASHLF1218**, or equal.
2. RCP-1, MCP-1, CPP-1, and CPP-2 shall be provided with a data pocket holder 1 inch deep by 12 inches wide by 12 inches high, **Hoffman model A-DP2**, or equal, installed on the panel door as shown on the Drawings.

O. Labor and Workmanship: Panels shall be fabricated, piped, and wired by fully qualified workmen who are properly trained, experienced, and supervised.

P. Spare Parts:

1. Provide spares as per drawings indicated.

Q. No components in any control panels other than the data recorder shall be required to be configured via programming.

2.3 MARKING

A. Control panels shall be marked with the following information that is plainly visible after installation:

1. Manufacturer's name
2. Supply voltage
3. Short-circuit rating of the main breaker
4. Name of the project and site
5. Enclosure rating
6. Additional marking as required by the drawings.

2.4 ADDITIONAL SIGNAGE

A. Provide the following posters located near each panel:

1. To scale poster of each panel front and backplane, identifying components and providing a legend outlining basic functionality and purpose. These posters shall be single sided.
 - a. Poster shall be either a photo (in color) of the panel and backplane or a print of the as-built drawings

- b. Poster shall be laminated and mounted on wallspace near the related panel.
 - 2. 11x17 poster of the sequence of the panel. This poster panel be double sided as required. Provide with large text for ease of reading.
 - a. Poster shall be laminated, removeable (Velcro, removable clasp, or similar) and located on or near the related panel.
- B. Integrate the posters and printed sequence in the training the operators in the usage and maintaining of the panels.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Preparation for Shipment and Shipping

- 1. Panels shall be crated for shipment using a heavy framework and skids. Panel sections shall be cushioned to protect the finish of the instruments and panel during shipment. Instruments that are shipped with the panel shall further have suitable shipping stops and cushioning material installed to protect parts that could be damaged due to mechanical shock. Each separate panel unit shall be provided with removable lifting lugs to facilitate handling.
- 2. All control panel factory testing and inspection shall be performed prior to crating and shipping.
- 3. Control panels shall be installed in accordance with Section 40 90 00 – Process Control and Instrumentation Systems.

3.2 PENETRATIONS

- A. All penetrations in underground vaults or NEMA 4X areas shall be bottom entry.

3.3 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING

A. Wiring Installation:

- 1. All wires shall be run in plastic wireways except
 - a. field wiring,
 - b. wiring between mating blocks in adjacent sections,
 - c. wiring from components on a swing out panel to components on a part of the fixed structure, and
 - d. wiring to panel mounted components.
- 2. Wiring run from components on a swing out panel to other components on a fixed panel shall be made up in tied bundles. These bundles shall be contained with spiral wrap and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.

3. Terminals intended to be used for external connections shall be installed on raised supports to permit space for conductor routing and ease of access for installation and troubleshooting.
- B. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and be secured to the inside face of the panel using adhesive mounts.
- C. Enclosures Wiring: All wiring between NEMA enclosures within cabinets shall be run in liquidtight flexible conduit (LFMC), unless otherwise noted on the Drawings. All enclosure wiring and raceways shall be installed by the panel builder in the shop.
- D. Wiring to rear terminals on panel mount instruments shall be in plastic wireway0s secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.
- E. Shop Drawings shall show conformance to the above wiring installation requirements.
- F. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number as shown on the Contract Drawings. These numbers shall be marked on all conductors at every terminal.

3.4 CALIBRATION, TESTING, AND INSTRUCTION

- A. General: Calibration, testing, and instruction shall be performed in accordance with Section 40 90 00 – Process Control and Instrumentation Systems.
- B. Inspection and Approval
 1. Panel fabricator shall conduct the following tests prior to arrival of the Engineer or before shipment, if the Engineer chooses not to witness factory testing.
 - a. All status, control, analog and alarm circuits rung out to determine their operability.
 - b. All electrical power circuits checked for continuity and where applicable, operability.
 - c. Any other test required to place the panel in an operating condition.
 2. Contractor shall notify the Owner at least fourteen days prior to the FAT when and where the FAT will occur.
 3. In the event an in-person attendance is not possible, panel fabricator shall make reasonable accommodation for remote viewing of the testing by the Owner and the Engineer. Use of video conference software and cameras meets this intent.
 4. It shall be the responsibility of the Contractor to furnish all necessary testing devices and sufficient manpower to perform the tests required by the Engineer.

5. Field Testing: Each control panel shall be tested again for functional operation in the field after the connection of external conductors and prior to equipment startup.

C. Instruction

1. Provide no less than three hours of training in the use and maintenance of MCP-1, RCP-1, CPP-1, and CPP-2. This includes but is not limited to:
 - 1) Sequence of Operation
 - 2) How RCP-1 and MCP-1 interact
 - 3) Meaning of lights and alarms
 - 4) Purpose of each switch
 - 5) Typical issues and how to resolve them
2. Contractor shall notify the Owner at least fourteen days prior to the training.
3. Training shall occur at the Manifold building, and City Office, using the actual panels
4. Training shall be recorded for clients use and future training purposes.
5. Training shall incorporate the use of the posters from section 2.4

END OF SECTION

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION V
CONSTRUCTION FORMS

DEVIATION REQUEST (DR)

PROJECT _____ **DR NO.** _____
CONTRACTOR _____ **CONTRACT NO.** _____
ORIGINATOR _____ **SPEC. SECTION** _____
DATE SUBMITTED _____ **DRAWING NO.** _____ **SHEET** _____ **OF** _____

DESCRIPTION OF DR A. Original Contract Requirements: B. Reason for Deviation Request: C. Proposed Deviation: D. Any Changes in Contract Time or Cost <input type="checkbox"/> YES <input type="checkbox"/> NO CONTRACTOR SIGNATURE - Date _____ RESPONSE REQUIRED BY (Date) _____	
---	--

RESPONSE TO DR RESPONSE BY (Name/Company) _____
--

ROUTING	RECEIVED BY NAME / COMPANY	DATE RECEIVED	DATE FORWARDED	COMMENTS
Project Manager				
Designer				
Project Manager				
Contractor				

DIRECTION

Approved
 Approved as Noted **BY** _____
 Disapproved (Signature)

SUBSTITUTION REQUEST (SR)

PROJECT _____ **SR NO.** _____
CONTRACTOR _____ **CONTRACT NO.** _____
ORIGINATOR _____ **SPEC. SECTION** _____
DATE SUBMITTED _____ **DRAWING NO.** _____ **SHEET** _____ **OF** _____

SPECIFIED ITEM:

SECTION	PAGE	PARAGRAPH	DESCRIPTION
---------	------	-----------	-------------

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs and performance and test adequate for evaluation of the request. Applicable portions of the data are clearly identified.

The undersigned states that the following paragraphs, unless modified on attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings and will not require any change in any of the Contract Documents.
2. The undersigned will pay for changes to the design, including engineering design, detailing, and construction costs caused by the requested substitution which is estimated to be \$ _____.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule (specifically the date of substantial completion), or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The incorporation or use of the substitution in connection with the work is not subject to payment of any license fee or royalty.

The undersigned further states that the function, appearance, and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by CONTRACTOR	Reviewed by ENGINEER
<p>Signature: _____</p> <p>Firm: _____</p> <p>_____</p> <p>Date: _____</p> <p>Telephone: _____</p> <p>Attachments:</p> <p>_____</p> <p>_____</p>	<p><input type="checkbox"/> Accepted</p> <p><input type="checkbox"/> Accepted as Noted</p> <p><input type="checkbox"/> Not Accepted</p> <p><input type="checkbox"/> Received too Late</p> <p>By: _____</p> <p>Title: _____</p> <p>Date: _____</p> <p>Remarks: _____</p>

DESIGN CLARIFICATION/VERIFICATION REQUEST (DC/VR)

PROJECT _____ **DC/VR NO.** _____
CONTRACTOR _____ **CONTRACT NO.** _____
ORIGINATOR _____ **SPEC. SECTION** _____
DATE SUBMITTED _____ **DRAWING NO.** _____ **SHEET** _____ **OF** _____

DESCRIPTION OF DC/VR

RESPONSE REQUESTED BY (Date) _____

RESPONSE TO DC/VR

RESPONSE BY (Name/Company) _____

ROUTING	RECEIVED BY NAME / COMPANY	DATE RECEIVED	DATE FORWARDED	COMMENTS
Project Manager				
Designer				
Project Manager				
Contractor				

DIRECTION

- Proceed per Engineers Response. No change in contract price or time is recognized.
 Do not proceed until _____

SUBMITTAL TRANSMITTAL

PROJECT _____ SUBMITTAL NO. _____

CONTRACTOR _____ CONTRACT NO. _____

ORIGINATOR _____ SPEC. SECTION _____

DATE SUBMITTED _____ DRAWING NO. _____ SHEET _____ OF _____

TO: CITY OF WHITTIER
 Whittier Well Field Upgrade
 P.O. Box 608
 Whittier, Alaska 99693

ATTN:

ITEM: _____		REVIEW ACTION						
SUPPLIER/CONTRACTOR:		COPIES SENT	NO EXCEPTION TAKEN	CORRECTIONS AS NOTED	AMEND AND RESUBMIT	REJECTED RESUBMIT	COPIES RETURNED	NOTES ATTACHED
<input type="checkbox"/> Original Submittal <input type="checkbox"/> 3rd <input type="checkbox"/> 2nd <input type="checkbox"/> 4th								
IDENT. NO.	DETAILED DESCRIPTION (Provide Itemized List of Contents of this Submittal)	A	B	C	D			

Complete either (a) or (b), following:

- (a) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown (no exceptions).

- (b) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown, except for the following deviations (list deviations, attach a separate sheet if necessary).

Corrections or comments made relative to submittals during this review do not relieve the Contractor from compliance with the requirements of the drawings and specifications. This submittal is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of other trades, and performing his work in a safe and satisfactory manner.

CONTRACTOR: _____
(Signature)

ENGINEER: _____
(Signature)

ROUTING	RECEIVED BY NAME / COMPANY	DATE RECEIVED	DATE FORWARDED	COMMENTS
Project Manager				
Designer				
Project Manager				
Contractor				



STATE OF ALASKA
MUNICIPAL GRANTS & LOANS
ALASKA CLEAN/DRINKING WATER FUND
USE OF AMERICAN IRON AND STEEL

Sample Step Manufacturer Certification

(Documentation must be provided on company letterhead)

Date

Company Name

Company Address

City, State Zip

Subject:

American Iron and Steel Step Manufacturer Certification for
Project Name _____

I, _____ (company representative), certify that the _____
(melting, bending, coating, galvanizing, cutting, etc.) process for _____
(manufacturing or fabricating) the following products and/or materials shipped or provided for
the project is in full compliance with the American Iron and Steel requirement as mandated in
EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. _____
2. _____
3. _____

Such process took place at the following location: _____ (address)

If any of the above compliance statements change while providing material to this project we
will immediately notify the prime contractor and the engineer.

Company representative

Signature

Date

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION VI
OTHER UTILITY REQUIREMENTS
CEA Facility Requirements
ENSTAR Safety Requirements



December 7, 2020

ELECTRICAL FACILITY CLEARANCE REQUIREMENTS

Enclosed please find a copy of Chugach Electric Association, Inc.'s (Chugach) Electrical Facility Clearance Requirements policy. Periodically, copies of this policy are mailed out to various companies and agencies whose activities may bring their personnel in close proximity to Chugach's electrical facilities. Chugach distributes copies of this policy in an effort to help minimize and identify potential hazards for construction personnel and the general public. In addition, Chugach is concerned with preventing damage to its electrical facilities and any disruption of electrical service to its customers. Please note that the Electrical Facility Clearance Requirements publication may be found on Chugach's website at: www.chugachelectric.com. Click on the "Member Services" tab and go to "Regulations & Requirements", click on "Electrical Facility Clearance Requirements" (December 7, 2020).

For your additional information, Alaska State Statute ("AS 42.30.400 "Excavator's Notice of Proposed Excavation") has been included as an attachment.

Please thoroughly read and understand the entire document. It could save your life or the life of your employees and the public. We request that particular attention be paid to the following provisions:

(Paragraph B. 2.) "Under no circumstances will Chugach allow any of its underground cable(s) to remain energized after it has been exposed, unless it is protected by supplementary mechanical protection approved by Chugach or unless a *qualified person* is on site at all times".

(Paragraph H. 7.) "Chugach defines a *qualified person* as a journeyman lineman who holds a current Certificate of Fitness in the Journeyman Lineman category issued by the State of Alaska". These two provisions clearly emphasize Chugach's position relating to the exposure and approach to energized facilities.

Chugach strongly recommends that prior coordination takes place between Chugach and the construction entity or contractor, either during the design phase of a project or prior to the start of construction, to help eliminate or minimize conflicts. If you have questions, please contact the Line Operations Division at (907) 762-7679 and your call will be directed to the appropriate department for assistance.

Sincerely,

A handwritten signature in black ink that reads "James Mullican".

James Mullican
Senior Manager Line Operations

Enclosures

cc: MOA Development Services; State of Alaska OSHA Inspector; SOA Electrical Inspector; AGC, Cook Inlet Housing, GCI, ACS, Enstar, AWWU, Anchorage Home Builders Association

Chugach Electric Association, Inc.

5601 Electron Drive, P.O. Box 196300, Anchorage, Alaska 99519-6300 • (907) 563-7494 • Fax (907) 562-0027 • (800) 478-7494
www.chugachelectric.com

CHUGACH ELECTRIC ASSOCIATION, INC.

CLEARANCE REQUIREMENTS FOR CONSTRUCTION OR MAINTENANCE NEAR ELECTRICAL FACILITIES

Chugach's concern for the safety of non-qualified personnel working adjacent to its electrical facilities, its concern for the public in general, and its requirement that only *qualified personnel* under the employ of *qualified electrical contractors* handle electrical facilities such as conductors, cables, poles, transformers, padmounted equipment, etc., is based upon the following considerations:

- The potential for serious injury and resulting liability is extremely high when dealing with all electric utility voltage levels up to 230,000 volts on overhead and underground lines.
- Certain types of equipment, particularly cable, can easily be damaged by improper handling. For example, when cable is hit or improperly suspended (common during excavation adjacent to cables), the scraped, cut, or stressed insulation will almost always result in premature cable failure. The highest risk to unqualified personnel is a cable failure while the cable is being handled during excavation or construction. Undetected cable damage may result in a subsequent cable failure with consumer outages for periods of up to a week's duration during winter conditions.
- The inherent stability of overhead pole lines or padmounted equipment is jeopardized with improper excavation and backfill, often resulting in hazardous voltage exposure to the public and contractors and leads to consumer power outages.

The above concerns can be minimized by the use of properly trained, licensed, and certified electrical outside linework personnel. The National Electrical Safety Code (NESC), the United States Occupational Safety and Health Administration (OSHA) and the Alaska State OSHA support this position as well as the clearances addressed herein.

The NESC, defines "*qualified*" as "*Having been trained in and having demonstrated adequate knowledge of the installation, construction, or operation of lines and equipment and the hazards involved, including identification of and exposure to electric supply and communication lines and equipment in or near the workplace.*" Only qualified persons are permitted to handle or work on or adjacent to energized electrical facilities. This includes not only overhead pole lines but also padmounted

and underground facilities. Within the NESC, two rules specifically address the need for qualified persons to perform work on or near energized facilities:

Rule 420B1 states, *"Employees whose duties require working on or in the vicinity of energized equipment or lines shall perform only those tasks for which they are trained, equipped, authorized, and so directed. Inexperienced employees shall: (a) work under the direction of an experienced and qualified person at the site; and (b) perform only directed tasks."*

Rule 420B4 states, *"Employees who do not normally work on or in the vicinity of electric supply lines and equipment but whose work brings them into these areas for certain tasks shall proceed with this work only when authorized by a qualified person."*

OSHA 29CFR 1910.269 contains the training and documentation requirements for a qualified person.

OSHA 29CFR 1926.1408 addresses equipment operations near electrical lines. If any part of the equipment, when operated up to the equipment's maximum working radius, could get closer than twenty (20) feet to a power line, then the operator must notify the utility, verify line voltage, and implement one of the safety options in OSHA 29CFR 1926.1408.

At no time may equipment violate minimum required clearance to an energized power line: ten (10) feet for lines up to 50 kilovolts (kV), or ten (10) feet plus 0.4 inches per one (1) kV over 50 kV. Minimum clearances are provided below for common Chugach system voltages.

CHUGACH SYSTEM VOLTAGES	
Normal Voltage (Phase-to-Phase)	Minimum Clearance Required At All Times
Operations Near High-Voltage Overhead Power Lines to 50 kV	10 Feet
Over 50 kV to 200 kV	15 Feet
Over 200 kV to 350 kV	20 Feet

Specifically, 29CFR1926.1408 (b)(4)(ii) requires a "Safety Observer" during equipment operations if the equipment is operating where it is difficult for the operator to maintain twenty (20) feet of clearance to the overhead power line(s) by visual means. Alaska Statutes (AS) Sections 18.60.670 through Section 18.60.695 govern placement and operation of equipment near electrical lines or conductors. 29CFR1926, Subpart P addresses the specific requirements involved with trenching operations. These include prior notice to utility companies, prior location of utility facilities, and proper supports once the facilities are exposed. Furthermore, 29CFR Sections 1910.180; 1910.333; 1926.416; and 1926.651 regulate activities relative to job site electrical facilities.

In summary, Chugach's concern for the safety of all personnel affected by work adjacent to its energized facilities has led to the development of the attached policy.

ELECTRICAL FACILITY CLEARANCE REQUIREMENTS

The following requirements have been developed to help provide a safer work site to those personnel working adjacent to Chugach's electrical facilities and to protect Chugach facilities that are in proximity to the area of work being done by State or Municipal entities and private construction and maintenance projects.

A. NOTIFICATION

It is recommended that Chugach be informed of construction/maintenance activities as early as possible in the design process and be included in timely plan reviews. Any work that needs to be performed on Chugach facilities must have prior Chugach approval.

1. Overhead Facilities

Any work in the proximity of overhead power lines shall be preceded by a call to Chugach at (907) 762-7679, at least 48 hours in advance, as notification of the planned work and compliance with OSHA 29CFR1926 (1408), and AS 18.60.670. If equipment, tools, machinery, or material must work in proximity closer than the minimum clearances outlined in OSHA 29CFR1926 (1408), and AS 18.60.670, the requirements of AS 18.60.680 shall be implemented before work can proceed. All necessary arrangements with Chugach by the requesting party for compliance with AS 18.60.680 shall be arranged in advance of the project start date.

2. Underground Facilities

Alaska Statutes 42.30.400 through 42.30.490, Anchorage Municipal Code, 24.40 and 26.90, and 29CFR1926, Subpart P place requirements on contractors who will be excavating around or adjacent to underground utilities. Advance notification requirements, underground facility locates, and the responsibilities for protection of utility facilities by contractors are specified in these regulations. All requests for locates of Chugach's underground facilities are to be made through the Alaska Digline at 811. Prior to excavation, Chugach's Line Operations Department shall be contacted at (907) 762-7679 a minimum of two (2) business days in advance of construction.

Locate surface markings are only reasonably accurate to +/- two (2) feet. Chugach and State law require hand-digging within two (2) feet of locate marks. In some cases, hand-digging may be required within three (3) or four (4) feet of the markings, depending on the facility involved and field

conditions at the project site. Maintaining locate marks is the responsibility of the party requesting the locate. Chugach may charge for re-locating and re-marking facilities that were previously marked.

B. UNDERGROUND CABLE EXCAVATION

1. Any excavation which is within a three (3) foot radius of a cable and parallels a cable for a distance greater than twenty (20) feet in length (see Section H.1 below) may require relocation of that cable. Excavations shorter in length and/or closer may also require relocation. At a minimum, cables that will require exposure must be exposed by *hand-digging* only, by a *qualified person* under the employ of a *qualified electrical contractor* (see Section H). See Drawing No. F-062388 attached.
2. Any excavation, such as a trench which crosses cable and/or conduit, shall be limited to twenty (20) feet in width and have provisions for the exposed cable/conduit to be supported every two (2) feet on a Chugach approved support system, to prevent cable damage. The cable support work and excavation within the three (3) foot radius (see Section H-1) shall be performed by a *qualified person* under the employ of a *qualified electrical contractor*.

NOTE: When excavation must occur within the limits specified in B.1, and B.2, above, reasonable efforts will be made by Chugach to de-energize the cable if system conditions and personnel requirements allow. Even if the cable has been de-energized, a "Cable Watch" by a qualified person under the employ of a qualified contractor is still required. To request the de-energization of the cable, contact the Chugach Line Operations Department at (907) 762-7679 and your call will be directed to the appropriate department for assistance. Requests must be made three (3) business days in advance of the outage date requested. For emergencies, contact Chugach's Dispatch Center at (907) 762-4660.

Under no circumstances will Chugach allow any of its underground cable(s) to remain energized after it has been exposed, unless it is protected by supplementary mechanical protection approved by Chugach or unless a qualified person is on site at all times.

3. Should any cable be exposed by non-qualified personnel, Chugach must be immediately contacted for field investigation before work may resume in the immediate area of such exposed cable.

Chugach recognizes that reasonable continuation of work may be required around energized underground cables after Chugach inspects the site. When this occurs, it is the responsibility of the construction contractor working at the site to arrange for qualified personnel as well as payment of the costs of said personnel and/or equipment. Chugach will neither arrange for, nor provide qualified personnel to satisfy this requirement unless Chugach determines this course of action is in its best interest, on a case-by-case basis. Where Chugach is otherwise forced to subsequently take steps to ensure the safety of the site, Chugach will advise the construction contractor that Chugach will pass these costs to the construction contractor.

4. In all cases, a final minimum burial depth of forty (40) to sixty (60) inches for primary-voltage (above 1000 volts) circuits and thirty (30) inches for secondary voltage (480V or below) circuits shall be maintained. If, however, existing Federal, State, or Municipal permit conditions require depths in excess of forty (40) inches, then the cable/conduit shall be buried at the depth required in the permit. The depth is measured from the top of the cable/conduit to final grade at the shallowest depth. Burial shall be in compliance with Chugach Construction Standard SUR 2-3, 5 or 6 (supplied upon request).
5. Projects that will increase final grade to sixty (60) inches or greater above Chugach direct buried cable shall require relocation at the customer's expense. Where cables are in conduit, review and written approval by Chugach is required for proposed grade changes resulting in a burial depth of sixty (60) inches or greater.
6. Projects which propose to modify the grade over Chugach's underground cables/circuits at voltages above 25kV require review and written approval by Chugach in all cases.
7. Excavations near underground cable/circuits energized above 25kV will require the following:
 - a) Excavation Adjacent to Cables/Circuits Energized Above 24kV
Chugach will require its Locate Contractor to notify excavators when a locate request includes the locating of cables are energized above 25kV.

When excavation is planned that will come within ten (10) feet, expose, parallel, or undermine sections of Chugach's underground cables energized above 25kV, special precaution and safety

consideration must be taken. These distribution and sub-transmission cables operate at voltages of 34.5kV (34,000 volts) and transmission cables operate above 34.5kV up to 230kV (230,000 volts), provide power to tens of thousands of Chugach customers and require extraordinary protection. The following guidelines shall apply:

Chugach Line Operations Department shall be contacted at (907) 762-7679 in advance of the planned excavation a minimum of five (5) business days prior to beginning excavation. Chugach requires that a *qualified person* be on site at all times during excavation activity that comes within ten (10) feet of any circuit cable energized above 24kV. The contractor shall arrange and pay for a *qualified person* from Chugach or, with approval, from one of Chugach's approved and *qualified contractors*. Excavations closer than ten (10) feet shall require exposure of the cables (vac-truck, pot-holing or other approved means) at the intersecting point or at intervals of not less than every twenty-five (25) feet for parallel excavations by *qualified personnel* to determine the exact location of the cable prior to machine excavation.

Excavations within ten (10) feet of cables energized above 25kV can expose unqualified workers to potentially high fault currents and extremely unsafe conditions. Prior planning by the construction contractor with coordination and approval from Chugach for any excavation projects within ten (10) feet of circuits or cables energized above 25kV is mandatory.

Chugach may require a special locate utilizing Ground Penetrating Radar to locate critical facilities. "Pothole" locates utilizing vacuum excavation in conjunction with an air-knife tool may be used, with Chugach approval.

C. STRUCTURE EXCAVATION

1. Equipment Pads or Vaults

Temporary excavation is allowed with a maximum slope of 1:1 beginning three (3) feet from the exterior edge of a concrete pad or vault. The final grade shall consist of a level area radiating out a minimum of four (4) feet, measured from the exterior edge of the pad or vault, and a maximum slope of 2:1 beginning from that four (4) foot distance from the exterior edge of the pad or vault. For both temporary and final grade situations, a level

area extending ten (10) feet out from the edge of the concrete pad in front of equipment doors or access panels is necessary. Refer to Drawing No. F-062388 attached.

If the slope cannot be maintained at the grades specified above, additional protection such as barriers or piling is required. All shoring and excavation (closer than the above limits) shall be done by a qualified person(s) under the employ of a qualified electrical contractor.

2. Concrete-Encased Duct

Excavation wider than five (5) feet under a concrete-encased duct requires a method designed and certified by an Alaska-registered civil engineer and approved by Chugach. Installation of the temporary shoring or bracing shall be done under the supervision of a qualified person under the employ of a qualified electrical contractor.

D. POLE/GUY ANCHOR EXCAVATION

Excavation beginning no closer than a three (3) foot radius from a pole or guy anchor in stable soil conditions or a ten (10) foot radius from a pole or guy anchor in organic/unstable soil conditions is allowed, provided the slope from that point does not exceed 1:1. Refer to Drawing No. F-062388 attached.

Excavation closer than the limits defined above or within a ten (10) foot radius of more than one consecutive pole where excavation will be open while more than one pole is affected, may require shoring of each pole. Chugach review and approval of a shoring plan is required for all excavations where more than one pole is subject to an open excavation. Pole shoring shall be approved by Chugach for the specific excavation. All work for installing poles must be performed within OSHA guidelines. Shoring by other methods requires prior approval by Chugach on a case-by-case basis. Streetlight poles may be temporarily removed, subject to a written agreement with Chugach, prior to excavation.

Any excavation that may expose the pole butt requires a structural analysis of the pole shoring method. The analysis shall be performed by an Alaska-licensed professional engineer familiar with electrical transmission and distribution design standards in use by Chugach. Chugach also reserves the right, at contractor expense, to have a structural engineer examine any excavation deeper than the pole butt within a fifteen (15) foot radius of the pole.

All shoring and excavation (closer than the above limits) shall be done by a qualified person under the employ of a qualified electrical contractor.

E. RELOCATION REQUIRED

Where protection of the cable and structures cannot be maintained, as required in Sections A, B, and C, relocation of those facilities will be required prior to the intended work and at the contracting agency's expense.

F. BACKFILL

Replacement backfill for electrical facilities must be in accordance with Chugach specifications and performed by a qualified person under the employ of a qualified electrical contractor.

A damaged underground facility may not be reburied until it is repaired or relocated to the satisfaction of Chugach.

G. INSPECTION AND APPROVAL

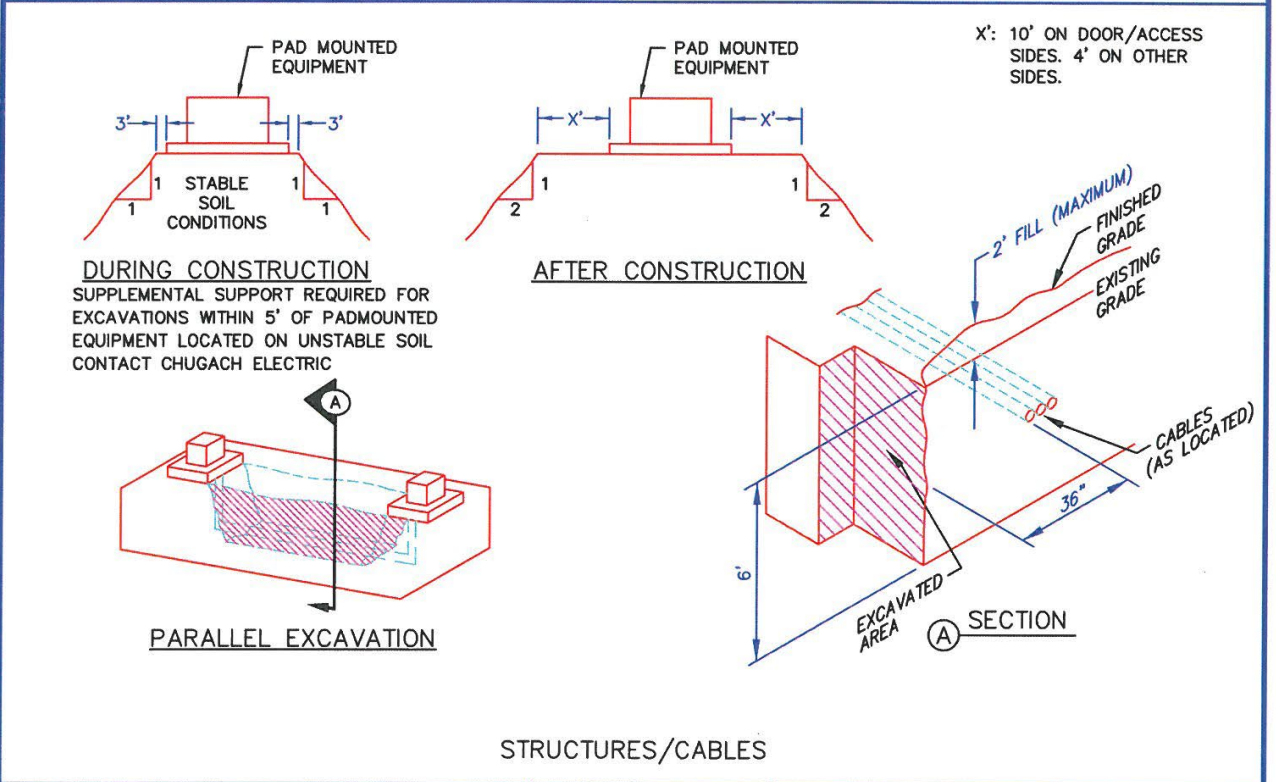
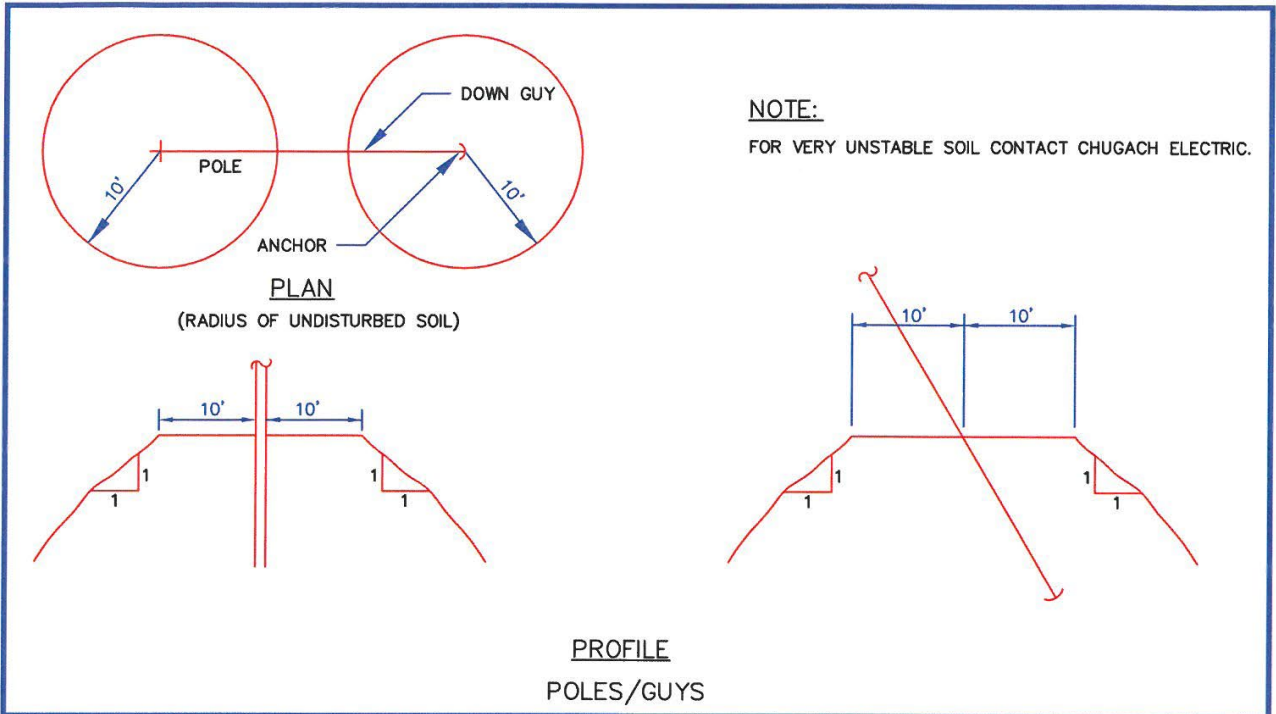
All work on or in the immediate vicinity of Chugach facilities, such as backfilling, temporary support, shoring, and relocations are subject to prior approval and inspection by Chugach. On large projects where inspection time is substantial, all costs for inspection shall be the responsibility of the agency or entity contracting for the work. Reimbursement to Chugach shall be in accordance with Chugach's tariff, Section 8.

For any questions or approvals involving these requirements contact Chugach Line Operations at (907) 762-7679 and your call will be directed to the appropriate department for assistance.

H. MISCELLANEOUS

1. Depending on the soil type, depth and length of the excavation, type of Chugach facility involved, and the certainty of the cable locate markings, excavations can be approved within a two (2) foot radius of cable on a case-by-case basis.
2. Stable soil conditions are defined as all dry and non-organic. Soil conditions shall be evaluated and approved on a case-by-case basis by Chugach. The evaluation will be done using 29CFR1926, Subpart P, "*Excavations*" as a guide.

3. Excavation, except as noted, shall be defined as mechanically performed by a backhoe, trencher, scraper, grader, auger, or other equipment.
4. Cables are defined as insulated conductors whether buried directly or in conduit. The guidelines for cables also include 600-Volt pedestals and other small electrical apparatus associated with cables but not included under pads or vaults.
5. Spare conduit is not included in these provisions except to the extent of providing temporary support when exposed and inspected by Chugach prior to the placement of proper backfill.
6. Chugach defines a *qualified electrical contractor* as a contractor registered in the State of Alaska who has an Electrical Administrator's License in the Outside Linework category; or who has an employee with an Electrical Administrator's License in the same category registered with the contractor.
7. Chugach defines a *qualified person* as a journeyman lineman who holds a current Certificate of Fitness in the Journeyman Lineman category issued by the State of Alaska.
8. Chugach defines *hand-digging* as the removal of soil with hand tools, an air-knife tool (compressed air jet), or a vacuum truck.



REV. NO.: 3 DATE: 1/28/98
 Standards Engineer: _____
 Mgr., Dist. Engineering: _____
 Mgr., Const. & Maint.: _____
 Dir., T&D Services Div.: _____



EXCAVATION LIMITS
 DEFINITION OF LIMITS REQUIRING
 NO ADDITIONAL STRUCTURAL SUPPORT

DRAWING NUMBER F-062388 SHEET 1 OF 1

Sec. 42.30.450. Waiver of requirements by written agreement.

An operator and an excavator may, by written agreement, waive the requirements of AS 42.30.400 - 42.30.490 that the excavator notify the operator of planned excavations and that the operator locate underground facilities. The agreement must identify the geographic areas to which the waiver applies and the time period for which the waiver is valid.

Sec. 42.30.460. Underground facility owner.

If the operator of an underground facility is not the owner of the facility and if the operator cannot be identified or has been identified but cannot be reached in a reasonable amount of time, the excavator may give the notice required by AS 42.30.400 - 42.30.490 to the owner of the underground facility and the owner shall assume the duties and responsibilities of the operator under AS 42.30.400 - 42.30.490.

Sec. 42.30.490. Definitions.

(1) "damage" means

(A) the substantial weakening of structural or lateral support of an underground facility;

(B) penetration, impairment, or destruction of any underground protective coating, housing, or other protective device; and

(C) the partial or complete severance of an underground facility to the extent that the project owner or facility operator determines that repairs are required;

(2) "emergency" means

(A) a condition that constitutes a clear and present danger to life, health, or property; or

(B) an unplanned service interruption;

(3) "excavation" means

(A) an activity in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means;

(B) road maintenance that changes the original road grade;

(C) demolition or movement of earth by equipment, tools, or explosive device except tilling of the soil less than 12 inches in depth for agricultural purposes;

(4) "excavator" means a person who conducts excavation in the state;

(5) "inaccessible" means impossible or unreasonably difficult to reach due to conditions beyond the control of the underground facility operator;

(6) "notification center" or "center" means a service through which a person is able to call one number to notify member operators of underground facilities that an excavation is proposed and to request the operators to mark facilities located inside of the proposed excavation area;

(7) "operator" means a person who supplies a service for commercial or public use by means of an underground facility;

(8) "person" means any individual, public or private corporation, political subdivision, government agency, municipality, industry, partnership, copartnership, association, firm, trust, estate, or any other entity whatsoever;

(9) "remote" means not accessible by road;

(10) "underground facility" means a pipe, sewer, conduit, cable, valve, line, or wire, including attachments and those parts of poles or anchors that are below ground, for use in connection with the storage or conveyance of water, sewage, telecommunications, cable television, electricity, petroleum, petroleum products, hazardous liquids, or flammable, toxic, or corrosive gas;

(11) "unstaffed" means not normally staffed with employees;

(12) "working day" means a day on which an underground facility operator is open for regular business.

ALASKA STATUTES

TITLE 42

**PUBLIC UTILITIES
&
CARRIERS**

Sec. 42.30.400. Excavator's notice of proposed excavation.

(a) Before beginning an excavation, an excavator shall give notice of the proposed excavation to each underground facility operator who has an underground facility in the area of the proposed excavation and request the operator to field mark the location of its underground facility. The excavator shall notify an underground facility operator who subscribes to a notification center by giving notice to the center. The excavator shall notify an underground facility operator listed in the applicable telephone directory who is not a subscriber to a notification center by giving notice directly to the operator.

(b) Except in the case of an emergency locate request or a request to locate in a remote, unstaffed, or inaccessible location, the excavator shall notify an underground facility operator who may have a facility in the area of a proposed excavation at least two but not more than 15 working days before the date scheduled for beginning the excavation. In the case of a request to locate in a remote or unstaffed location, the excavator shall notify the operator at least 10 but not more than 20 working days before the scheduled date for beginning excavation.

(c) In an emergency, the excavator shall immediately notify each underground facility operator in the area of the emergency and of the need for the excavation and request prompt location of underground facilities.

Sec. 42.30.410. Operator's response to request to locate; immunity related to unmarked or inaccurately marked facilities.

(a) An underground facility operator shall accept requests to locate underground facilities during the operator's regular business hours. An operator who receives a request to locate shall maintain for at least one year an accurate record of the request and responses to the request.

(b) When an underground facility operator receives a request to locate, it shall notify the excavator of the location of the underground facilities that the operator is able to field mark with reasonable accuracy and field mark those facilities. If the operator owns, uses, or operates an underground facility that is identified as being in the area of the proposed excavation but that the operator cannot field mark with reasonable accuracy, the operator shall provide the excavator with the best information available to the operator about its location and shall provide on-site assistance until the facility is located or until the excavator no longer needs assistance in locating that facility.

(c) The field marks for an underground facility buried 10 feet deep or less must be located within 24 horizontal inches of the outside dimensions of the facility. For a facility buried deeper than 10 feet, the operator shall locate the field marks within 30 horizontal inches of the outside dimensions of the facility. The operator shall use stakes, paint, or other clearly identifiable material to show the field location of the underground facility. The marker used to designate the approximate location of an underground facility must follow the current color code standard used by the American Public Works Association.

(d) Except for an underground facility in a remote, unstaffed, or inaccessible location, an underground facility operator shall respond to a request to locate promptly. A response is considered to be prompt if it is made within two working days after the operator receives the request or at a later time so long as the response occurs before the beginning of the excavation. For an underground facility in an accessible remote or unstaffed location, the operator shall respond within 10 working days after the operator receives the request or at a later time

so long as the response occurs before the beginning of excavation.

(e) After an operator has field marked an underground facility, the excavator is responsible for maintaining the markings.

(f) An excavator may not begin to excavate until each underground facility has been field marked.

(g) When an operator has field marked an underground facility once at the request of an excavator, the operator has the right to receive compensation from the excavator for costs incurred in responding to subsequent requests to locate the same underground facility during the same excavation project if the excavator failed to maintain the original marking.

(h) If an excavator discovers an underground facility that was not field marked or was inaccurately field marked, the excavator shall immediately stop excavating in the vicinity of the facility and shall notify the operator of the discovery. The excavator may notify the operator by means of a notification center. The operator shall treat the notification as a request to locate in an emergency and shall respond accordingly. An excavator may not be held liable for inadvertent damage caused to an unmarked or an inaccurately marked underground facility.

(i) Unless the request to locate is made in response to an emergency, an underground facility operator has the right to receive compensation for costs incurred in responding to a request to locate that gives the operator less notice than the minimum notice required by this section. This subsection may not be interpreted to require the operator to respond to the request to locate within the time requested in the notice.

Sec. 42.30.420. Responsibility of construction project owners.

The owner of a construction project that will require excavation shall indicate in bid documents or contracts for construction the existence of underground facilities that the project owner knows are located inside of the proposed area of excavation. This requirement does not release the

excavator from the excavator's responsibility under AS 42.30.400 - 42.30.490.

Sec. 42.30.430. Obligations concerning the conduct of excavations.

(a) An excavator shall use reasonable care to avoid damaging an underground facility. The excavator shall

(1) determine, without damage to the facility, the precise location of an underground facility whose location has been marked;

(2) plan the excavation to avoid damage to and minimize interference with an underground facility in or near the excavation area; and

(3) to the extent necessary to protect a facility from damage, provide support for an underground facility in and near the construction area during the excavation.

(b) An excavator who, in the course of excavation, contacts or damages an underground facility shall notify the operator. If the damage causes an emergency, the excavator shall also alert appropriate local public safety agencies and take reasonable steps to ensure public safety. A damaged underground facility may not be reburied until it is repaired or relocated to the satisfaction of the operator. The operator of an underground facility that was damaged during excavation shall arrange for repair or relocation of the facility as soon as practical.

Sec. 42.30.440. Penalties; injunctive relief.

(a) In addition to all other remedies provided by law, a person who violates a provision of AS 42.30.400 - 42.30.490 is subject to a civil penalty of not less than \$50 nor more than \$1,000 for each offense if the violation results in or significantly contributes to damage to an underground facility.

(b) If the court finds that an excavator is violating or threatening to violate a provision of AS 42.30.400 - 42.30.490 and the violation may result in damage to an underground facility, the court may grant injunctive relief to the underground facility operator.



Excavation Safety for Natural Gas Pipelines

Safety



ENSTAR Natural Gas Company provides natural gas service through 3,580 miles of gas mains to over 142,000 customers in South Central Alaska. ENSTAR's gas pipeline system is designed, installed, and maintained with the highest regard for safety in compliance with applicable federal, state, and local government statutes and regulations. ENSTAR is regularly inspected to ensure that its operation meets industry standards.

The US Department of Transportation, Pipeline & Hazardous Materials Safety Administration (PHMSA) oversees minimum safety regulations for the transportation of natural gas by pipelines. The DOT safety regulations are currently published in Title 49, Part 190, 191, 192 & 199 of the Code of Federal Regulations (CFR).

The Law

Call **811** before you dig; it's free and it's the law. Calling for locates is now as simple as dialing **811** or go online to www.akonecall.com. In Alaska, dialing **811** connects you with Alaska Digline Inc. Alaska Digline Inc. will take your excavation information and notify all affected utilities. Utilities have two business days to mark their utilities after receiving your call.

PHMSA is the excavation damage enforcement agency in the State of Alaska. The enforcement program protects the public from the risk of pipeline ruptures caused by excavation damage. Should an excavator violate any of the damage prevention requirements prescribed in 49 CFR part 196, Subpart B, they may face civil and or criminal penalties. Civil penalties of not more than \$200,000 for each violation, not to exceed \$2,000,000 may be levied. Criminal penalties may be enforced with imprisonment of not more than 5 years per violation. More information about the PHMSA ruling can be found at <http://www.phmsa.dot.gov/>.



Excavation Safety for Natural Gas Pipelines

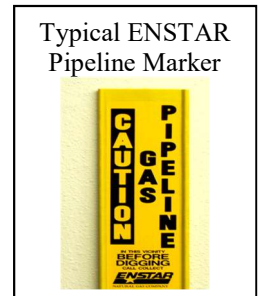
Pipeline Markers

Do not assume there is not a pipeline if there is no marker.

ENSTAR transmission pipelines are generally marked above ground with pipeline markers similar to the one shown. Transmission pipelines are located in the vicinity of the pipeline markers. Transmission pipelines are steel and range in size from 2" to 20" in diameter. They are typically coated with a protective coating. Pipeline coatings are predominantly yellow and black, but may also be green or brown.

Distribution pipelines are steel, or High Density polyethylene with locate wire. These pipelines range in size from 1" diameter to 12" in diameter. Gas "Mains" are typically found in street right-of-ways or utility easements and supply the natural gas to an entire street or subdivision.

Natural gas service lines are connected to the gas main. Service lines generally serve a single building or small group of buildings on private property. Service lines are typically 1/2" to 2" in diameter. Service lines can be rigid steel, steel tubing, copper or polyethylene with locate wire. Gas mains and service lines are generally black or yellow in color.



Steps to Follow

- 1 Line Locating: A Free Service:** To request a locate, dial **811**, the Nationally recognized One-Call number and you will be connected to Alaska Digline Inc. Call at least 2 but not more than 15 working days before the date scheduled for beginning the excavation.
- 2 Request a Relocate Ticket when:** the marks have not been maintained, the excavator is unable to accurately "read" the locate marks, the marks have been destroyed, or the marks are more than 15 working days old.
- 3 Excavating around Locate Marks:** In Alaska, you must use reasonable care when digging within 24 horizontal inches of the outside dimensions of the locate marks. If you are digging to a depth of 10 feet or greater, you must use reasonable care within 30 horizontal inches. *Treat all buried lines as if they were active.*

Typical means of excavating around locate marks:

- Hand Dig
- Air Knife
- Vac Truck

- 4 Standby/Inspection Requirements:** Extreme caution must be exercised whenever pipelines are encountered. All excavations in the immediate vicinity of ENSTAR Natural Gas facilities (including backfill, compaction, temporary support, and shoring), are subject to prior approval and inspection by ENSTAR personnel. Pipeline inspections are provided whenever an excavator is working within 10 feet of a transmission pipeline, or within 5 feet of a distribution line. If excavation occurs without either locates or standby (qualified ENSTAR personnel), ENSTAR Natural Gas reserves the right to excavate to determine if there has been any damage to ENSTAR Natural Gas facilities. If damage has occurred ENSTAR Natural Gas has the right to charge the excavator for repairs.





Excavation Safety for Natural Gas Pipelines

- 5 Support for Steel Pipeline Crossings:** If an excavation below a **steel gas** pipeline leaves the pipeline unsupported for a distance of more than 20 feet, the excavator must provide additional support for the pipeline. Support must be provided in a way as to not damage the pipe or its coating during construction, backfill placement, and compaction. Generally, a support spacing of 5 feet or less will provide the required support. ENSTAR Engineering must approve all excavations crossing steel pipelines above 4-inch diameter. If support is required, ENSTAR engineering written approval is required prior to beginning construction. Call ENSTAR Engineering (907)334-7740 for further information. Extra care must be taken when geotextile fabric and/or rigid insulation are used. Geotextile fabric and/or rigid insulation shall be sufficiently separated from steel pipeline and in addition to continuous support under the pipeline, compacted fill material shall be placed between the geotextile fabric/rigid insulation and the pipeline (see item 10 clearance). Care shall be taken to insure stability for the ENSTAR facility. Failure to properly protect ENSTAR's facilities could result in future damage if differential settlement occurs.
- 6 Support for Polyethylene Line Crossings:** If an excavation is below a **polyethylene gas pipeline** the excavator must continuously support such pipeline during construction, backfill placement, and compaction. Geotextile fabric and/or rigid insulation shall be sufficiently separated from the polyethylene gas pipeline to prevent undue stress during the compaction/settlement process. (see item 10 clearance)
- 7 Excavation Parallel to Pipeline: Whenever an excavation (horizontal or vertical) is performed within 5 feet of a distribution pressure pipeline and 10 feet of a transmission pressure pipeline, the gas pipeline must be exposed to visually determine the exact location.** When parallel excavations are expected to expose or undermine sections of pipeline, the excavator must notify ENSTAR engineering in advance. Care must be taken not to damage the pipeline, or to induce stresses due to differential settlement following construction. **Long parallel excavations exposing pipelines can be very dangerous if not properly performed and shall not be attempted without prior approval by ENSTAR.** Unless otherwise approved by ENSTAR engineering, all excavations parallel to a gas pipeline require that the pipeline be exposed at intervals no greater than every 25 feet to visually determine the pipeline's exact location. Contact ENSTAR Engineering at (907)334-7740 for additional information.
- 8 Blasting:** All plans for blasting that will occur within 500' of any Company Facility, shall be reviewed by an ENSTAR engineer. The person performing the blasting shall take all appropriate measures as recommended by ENSTAR engineering, (i.e. require minimum distance from facilities, minimize blasting charge intensity, etc.) to protect the integrity of the Company's Facilities. A leak survey shall be performed before and after any blasting activity, within 500' of any Company Facility.
- 9 Trenchless Excavation (Vertical or Horizontal): Whenever a trenchless excavation (horizontal or vertical) is performed within 5 feet of a distribution pressure pipeline and 10 feet of a transmission pressure pipeline, the gas pipeline must be exposed to visually determine the exact location.** If the trenchless excavation is expected to cross the pipeline within the aforementioned distances, the pipeline in question shall be fully exposed to a minimum of 1 foot beneath the pipeline prior to the expected crossing to ensure that the pipeline is not unduly damaged due to ground movement in the immediate vicinity of the pipeline. **When performing a trenchless excavation parallel to a gas pipeline, the gas pipeline must be exposed at intervals of 25 feet or less to visually determine the pipeline's exact location.** Trenchless excavation is defined as drilling, directional drilling, boring, pile installation etc.
- 10 Clearance:** Natural Gas pipelines require a **12 inch minimum separation from other underground structures** not associated with ENSTAR's pipeline system. Additional clearance from other underground structures may be required to allow proper maintenance and reduce the possibility of damage due to



Know what's below.
Call before you dig.



Excavation Safety for Natural Gas Pipelines

the proximity of other structures (49 CFR § 192.325.) This clearance requirement includes rigid insulation and geotextile fabrics. **ENSTAR requires a 36-inch minimum separation from certain electrical facilities, including any grounded components i.e. ground rods, non-insulated conductors and associated structures.**

- 11 Pipeline Cover:** ENSTAR pipelines in public rights-of-way are generally installed with 36 inches to 48 inches of cover, and in private rights-of-way with 12 inches to 36 inches of cover. Projects that decrease cover or increase cover in excess of 60 inches must receive prior approval from ENSTAR Engineering Department (907)334-7740. ENSTAR has limited ability to prevent the removal of cover over gas pipelines. Increasing pipeline cover more than 5 feet or decreasing pipeline cover to less than 3 feet may be considered a damage that may result in relocation of the gas pipeline at the expense of the Excavator. The depth of cover listed above cannot be assumed after installation. The excavator is responsible for any damage to ENSTAR pipelines regardless of the depth at which they are encountered.
- 12 Landscaping:** Most landscaping activities require locates, and when it is determined that landscaping activities are within 5 feet of a distribution pipeline, or 10 feet of a transmission pipeline, Inspection/Standby requirements as listed above are applicable. Planting of trees and shrubs over existing pipelines is not permissible and can present a safety and reliability hazard to the pipeline.

Damage Reporting

If you damage a gas line, immediately Call 911 and ENSTAR at 1-844-SMELL GAS (1-844-763-5542). It's the Law.

Gas lines that have been pulled, stretched, kinked or bent could be damaged underground away from where the line is connected. If you pull or stretch gas lines call ENSTAR at (907)277-5551 and an ENSTAR Representative will investigate for possible underground leakage.

Pipe Wall Protection

Dents, scrapes, gouges and scratches reduce pipeline wall thickness and affect the safety of the facility in two ways. First, the reduced wall thickness decreases the pressure at which the pipeline can safely operate. Second, the damage serves as a stress concentration that can cause a future brittle failure of the pipeline. **An ENSTAR representative must inspect each dent, scrape, gouge or scratch, no matter how small, before it is reburied.**

Corrosion Protection

ENSTAR's **steel** pipelines are protected from corrosion by a dielectric coating and an impressed current or galvanic anode cathodic protection system. Direct contact with metallic objects (a short) or removal of the protective coating can compromise this system. Contact the ENSTAR Engineering Department (907)334-7740, whenever coating damage or a short is encountered. **An ENSTAR representative must inspect each short or section of damaged coating before it is reburied.**

Locate Wire Protection

ENSTAR's **polyethylene** pipelines are installed with a parallel copper wire, which is used to locate the pipeline. If the locate wire or wire coating is damaged, ENSTAR's ability to properly locate the pipeline may be severely compromised. Electrical continuity must be maintained. **An ENSTAR representative must**





Excavation Safety for Natural Gas Pipelines

inspect and/repair each possible locate wire damage before it is reburied, accidental locate wire damage repair is free of charge.

Excess Flow Valves

An Excess Flow Valve (EFV) is a safety device installed in a natural gas service line near the gas main that is designed to automatically shut off the flow of natural gas in the event that the service line is broken. Effective April 14th, 2017, all gas companies nationwide are required to install an EFV or a curb-side shut off valve in any new or renewed service lines.

What does this mean to you as an Excavator?

Should you damage a natural gas service line that has an EFV, the gas will blow for a short duration and shut off automatically if the flow of gas is sufficient to close the EFV. Damages that do not sever the service line completely may not cause the EFV to close and the gas will continue to blow. Regardless, **you must report all damages to ENSTAR immediately**. EFVs are designed to allow a small amount of "bleed-by" so they can be reset without excavating the gas main. Backfilling a damaged service line with gas bleeding underground is extremely dangerous and could fuel an explosion if it is not repaired timely. **Do not assume a damaged service is dead or abandoned if it is not blowing gas**. The EFV may have shut down the flow of gas. Report all damages immediately by calling **1-844-SMELL-GAS**.

Please remember that the vast majority of ENSTAR service lines WILL NOT have an EFV. Should you damage a service line without an EFV, gas will blow at full line pressure until ENSTAR can arrive to shut it off. Your best protection against damaging underground utilities is to call **811** for locates and hand dig within 2 feet of the locate marks.

What to do if You Smell Gas

Natural gas actually does not have a natural odor, but mercaptan compounds are added to distribution system gas to enable you to smell a leak. If you smell the characteristic Sulphur odor, call ENSTAR at 1-844-SMELL GAS (1-844-763-5542)

Qualified Personnel Requirements

Only qualified individuals meeting all applicable requirements may perform work on Natural Gas facilities. At a minimum, such individuals must comply with applicable federal, state and local regulation, statutes, and ordinances.

Additional pipeline information can be found on the following websites:

PHMSA/DOT	https://phmsa.dot.gov/pipeline
Common Ground Alliance	http://www.commongroundalliance.com
Pipeline 101	http://www.pipeline101.com
Alaska Digline, Inc.	http://www.akonecall.com/



Excavation Safety for Natural Gas Pipelines

811 Know what's below.
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BURIED CABLE
BURIED SEWER
BURIED GAS LINE
BURIED WATER
BURIED ELECTRIC

**SMELL GAS?
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CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION VII
MINIMUM RATES OF PAY
A. State of Alaska Wage Rate



MINIMUM RATES OF PAY For Laborers and Mechanics

Effective September 1, 2023

Issue 47

PAMPHLET No. 600

Title 36. Public Contracts
AS 36.05

DEPARTMENT OF LABOR
AND WORKFORCE DEVELOPMENT
Wage and Hour

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September 1, 2023

TO ALL CONTRACTING AGENCIES:

At the Alaska Department of Labor and Workforce Development our goal is putting Alaskans to work. This pamphlet is designed to help contractors awarded public construction contracts understand the most significant laws of the State of Alaska pertaining to prevailing wage.

This pamphlet identifies current prevailing wage rates for public construction contracts (any construction projects awarded for the State of Alaska or its political subdivisions, such as local governments and certain non-profit organizations). Because these rates may change in a subsequent determination, please be sure you are using the appropriate rates. The rates published in this edition become effective September 1, 2023.

The prevailing wage rates contained in this pamphlet are applicable to public construction projects with a final bid date of September 11, 2023, or later. As the law now provides, these rates will remain stable during the life of a contract or for 24 calendar months, whichever is shorter. **The 24-month period begins on the date the prime contract is awarded.** Upon expiration of the initial 24-month period, the latest wage rates issued by the department shall become effective for a subsequent 24-month period or until the original contract is completed, whichever occurs first. This process shall be repeated until the original contract is completed.

The term "original contract" means the signed contract that resulted from the original bid and any amendments, including changes of work scope, additions, extensions, change orders, and other instruments agreed to by the parties that have not been subject to subsequent open bid procedures.

If a higher federal rate is required due to partial federal funding or other federal participation, the higher rate must be paid.

For additional copies of this pamphlet go to: <http://labor.state.ak.us/lss/pamp600.htm>

For questions regarding prevailing wage or employment preference requirements, please contact the nearest Wage and Hour office. These offices are listed on Page x.

Sincerely,

A handwritten signature in blue ink that reads "Catherine Muñoz".

Catherine Muñoz
Acting Commissioner

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Table of Contents

Excerpts from Alaska Law

Sec. 36.05.005. Applicability.....	iv
Sec. 36.05.010. Wage rates on public construction.	iv
Sec. 36.05.040. Filing schedule of employees, wages paid and other information	iv
Sec. 36.05.045. Notice of work and completion; withholding of payment	iv
Sec. 36.05.060. Penalty for violation of this chapter	v
Sec. 36.05.070. Wage rates in specifications and contracts for public works	v
Sec. 36.05.080. Failure to pay agreed wages.....	v
Sec. 36.05.090. Payment of wages from withheld payments and listing contractors who violate contracts	v
Sec. 36.05.900. Definition.. ..	vi

Excerpts from Alaska Administrative Code

8 AAC 30.051. Purpose	vi
8 AAC 30.052. Board and lodging; remote sites	vi
8 AAC 30.054. Per diem instead of board and lodging	vi
8 AAC 30.056. Alternative arrangement	vii
8 AAC 30.900. General definitions (selected excerpts).....	vii

Additional Information

Per Diem	vii
Laborer Classification Clarification.....	viii
Apprentice Rates.....	viii
Fringe Benefit Plans.....	viii
Special Prevailing Wage Rate Determination.....	ix
Alaska Employment Preference Information.....	ix
Labor Standards and Safety Notice Requests	x
Debarment List	x

Wage Rates Pages 1-26

Shipyard Rate Addendum..... Pages 27

Note to Readers: The statutes and administrative regulations listed in this publication were taken from the official codes, as of the effective date of the publication. However, there may be errors or omissions that have not been identified and changes that occurred after the publication was printed. This publication is intended as an informational guide only and is not intended to serve as a precise statement of the statutes and regulations of the State of Alaska. To be certain of current laws and regulations, please refer to the official codes.

EXCERPTS FROM ALASKA LAW

Sec. 36.05.005. Applicability.

This chapter applies only to a public construction contract that exceeds \$25,000.

Sec. 36.05.010. Wage rates on public construction.

A contractor or subcontractor who performs work on a public construction contract in the state shall pay not less than the current prevailing rate of wages for work of a similar nature in the region in which the work is done. The current prevailing rate of wages is that contained in the latest determination of prevailing rate of wages issued by the Department of Labor and Workforce Development at least 10 days before the final date for submission of bids for the contract. The rate shall remain in effect for the life of the contract or for 24 calendar months, whichever is shorter. At the end of the initial 24-month period, if new wage determinations have been issued by the department, the latest wage determination shall become effective for the next 24-month period or until the contract is completed, whichever occurs first. This process shall be repeated until the contract is completed.

Sec. 36.05.040. Filing schedule of employees, wages paid, and other information.

All contractors or subcontractors who perform work on a public construction contract for the state or for a political subdivision of the state shall, before the Friday of every second week, file with the Department of Labor and Workforce Development a sworn affidavit for the previous reporting period, setting out in detail the number of persons employed, wages paid, job classification of each employee, hours worked each day and week, and other information on a form provided by the Department of Labor and Workforce Development.

Sec. 36.05.045. Notice of work and completion; withholding of payment.

- (a) Before commencing work on a public construction contract, the person entering into the contract with a contracting agency shall designate a primary contractor for purposes of this section. Before work commences, the primary contractor shall file a notice of work with the Department of Labor and Workforce Development. The notice of work must list work to be performed under the public construction contract by each contractor who will perform any portion of work on the contract and the contract price being paid to each contractor. The primary contractor shall pay all filing fees for each contractor performing work on the contract, including a filing fee based on the contract price being paid for work performed by the primary contractor's employees. The filing fee payable shall be the sum of all fees calculated for each contractor. The filing fee shall be one percent of each contractor's contract price. The total filing fee payable by the primary contractor under this subsection may not exceed \$5,000. In this subsection, "contractor" means an employer who is using employees to perform work on the public construction contract under the contract or a subcontract.
- (b) Upon completion of all work on the public construction contract, the primary contractor shall file with the Department of Labor and Workforce Development a notice of completion together with payment of any additional filing fees owed due to increased contract amounts. Within 30 days after the department's receipt of the primary contractor's notice of completion, the department shall inform the contracting agency of the amount, if any, to be withheld from the final payment.
- (c) A contracting agency
 - (1) may release final payment of a public construction contract to the extent that the agency has received verification from the Department of Labor and Workforce Development that
 - (A) the primary contractor has complied with (a) and (b) of this section;
 - (B) the Department of Labor and Workforce Development is not conducting an investigation under this title; and
 - (C) the Department of Labor and Workforce Development has not issued a notice of a violation of this chapter to the primary contractor or any other contractors working on the public construction contract; and

- (2) shall withhold from the final payment an amount sufficient to pay the department's estimate of what may be needed to compensate the employees of any contractors under investigation on this construction contract, and any unpaid filing fees.
- (d) The notice and filing fee required under (a) of this section may be filed after work has begun if
 - (1) The public construction contract is for work undertaken in immediate response to an emergency; and
 - (2) The notice and fees are filed not later than 14 days after the work has begun.
- (e) A false statement made on a notice required by this section is punishable under AS 11.56.210.

Sec. 36.05.060. Penalty for violation of this chapter.

A contractor who violates this chapter is guilty of a misdemeanor and upon conviction is punishable by a fine of not less than \$100 nor more than \$1,000, or by imprisonment for not less than 10 days nor more than 90 days, or by both. Each day a violation exists constitutes a separate offense.

Sec. 36.05.070. Wage rates in specifications and contracts for public works.

- (a) The advertised specifications for a public construction contract that requires or involves the employment of mechanics, laborers, or field surveyors must contain a provision stating the minimum wages to be paid various classes of laborers, mechanics, or field surveyors and that the rate of wages shall be adjusted to the wage rate under AS 36.05.010.
- (b) Repealed by §17 ch 142 SLA 1972.
- (c) A public construction contract under (a) of this section must contain provisions that
 - (1) the contractor or subcontractors of the contractor shall pay all employees unconditionally and not less than once a week;
 - (2) wages may not be less than those stated in the advertised specifications, regardless of the contractual relationship between the contractor or subcontractors and laborers, mechanics, or field surveyors;
 - (3) the scale of wages to be paid shall be posted by the contractor in a prominent and easily accessible place at the site of the work;
 - (4) the state or a political subdivision shall withhold so much of the accrued payments as is necessary to pay to laborers, mechanics, or field surveyors employed by the contractor or subcontractors the difference between
 - (A) the rates of wages required by the contract to be paid laborers, mechanics, or field surveyors on the work; and
 - (B) the rates of wages in fact received by laborers, mechanics, or field surveyors.

Sec. 36.05.080. Failure to pay agreed wages.

Every contract within the scope of AS 36.05.070 shall contain a provision that if it is found that a laborer, mechanic, or field surveyor employed by the contractor or subcontractor has been or is being paid a rate of wages less than the rate of wages required by the contract to be paid, the state or its political subdivision may, by written notice to the contractor, terminate the contractor's right to proceed with the work or the part of the work for which there is a failure to pay the required wages and to prosecute the work to completion by contract or otherwise, and the contractor and the contractor's sureties are liable to the state or its political subdivision for excess costs for completing the work.

Sec. 36.05.090. Payment of wages from withheld payments and listing contractors who violate contracts.

- (a) The state disbursing officer in the case of a state public construction contract and the local fiscal officer in the case of a political subdivision public construction contract shall pay directly to laborers, mechanics, or field surveyors from accrued payments withheld under the terms of the contract the wages due laborers, mechanics, or field surveyors under AS 36.05.070.
- (b) The state disbursing officer or the local fiscal officer shall distribute to all departments of the state government and to all political subdivisions of the state a list giving the names of persons who have disregarded their obligations to employees. A person appearing on this list and a firm, corporation, partnership, or association in which the person has an interest may not work as a contractor or

subcontractor on a public construction contract for the state or a political subdivision of the state until three years after the date of publication of the list. If the accrued payments withheld under the contract are insufficient to reimburse all the laborers, mechanics, or field surveyors with respect to whom there has been a failure to pay the wages required under AS 36.05.070, the laborers, mechanics, or field surveyors have the right of action or intervention or both against the contractor and the contractor's sureties conferred by law upon persons furnishing labor or materials, and in the proceedings it is not a defense that the laborers, mechanics, or field surveyors accepted or agreed to accept less than the required rate of wages or voluntarily made refunds.

Sec. 36.05.900. Definition.

In this chapter, "contracting agency" means the state or a political subdivision of the state that has entered into a public construction contract with a contractor.

EXCERPTS FROM ALASKA ADMINISTRATIVE CODE

*****Notice:** Regulations relating to board and lodging and per diem went into effect on November 25, 2018. The new regulations are excerpted here***

8 AAC 30.051. Purpose. The purpose of 8 AAC 30.052 – 8 AAC 30.056 is to ensure that wages paid to laborers, mechanics, and field surveyors do not fall below the prevailing rate of pay.

8 AAC 30.052. Board and lodging; remote sites. (a) A contractor on a public construction project located 65 or more road miles from the international airport closest to the project area in either Fairbanks, Juneau, or Anchorage, or that is inaccessible by road in a two-wheel drive vehicle, shall provide adequate board and lodging to each laborer, mechanic, or field surveyor while the person is employed on the project. If commercial lodging facilities are not available, the contractor shall provide temporary lodging facilities. Lodging facilities must comply with all applicable state and federal laws. For a highway project, the location of the project is measured from the midpoint of the project.

(b) A contractor is not required to provide board and lodging:

(1) to a laborer, mechanic, or field surveyor who is a domiciled resident of the project area; or

(2) on a laborer, mechanic, or field surveyor's scheduled days off, when the person can reasonably travel between the project and the person's permanent residence; for the purposes of this paragraph, "scheduled day off" means a day in which a person does not perform work on-site, is not required to remain at or near the job location for the benefit of the contractor, and is informed of the day off at least seven days before the day off.

(c) Upon a contractor's written request, the commissioner may waive the requirements of (a) of this section where:

(1) the project is inaccessible by road in a two-wheel drive vehicle, but the laborer, mechanic, or field surveyor can reasonably travel between the project and the person's permanent residence within one hour; or

(2) a laborer, mechanic, or field surveyor is not a domiciled resident of the project area, but has established permanent residence, with the intent to remain indefinitely, within 65 road miles of the project, or for a highway project, the mid-point of the project.

8 AAC 30.054. Per diem instead of board and lodging. (a) A contractor may pay a laborer, mechanic, or field surveyor per diem instead of providing board and lodging, when the following conditions are met:

(1) the department determines that per diem instead of board and lodging is an established practice for the work classification; the department shall publish and periodically revise its determinations in the pamphlet *Laborers and Mechanics Minimum Rates of Pay*;

(2) the contractor pays each laborer, mechanic, or field surveyor the appropriate per diem rate as published and periodically revised in the pamphlet *Laborers and Mechanics Minimum Rates of Pay*; and

(3) the contractor pays the per diem to each laborer, mechanic, or field surveyor on the same day that wages are paid.

(b) A contractor may not pay per diem instead of board and lodging on a highway project located

- (1) west of Livengood on the Elliot Highway, AK-2;
- (2) on the Dalton Highway, AK-11;
- (3) north of milepost 20 on the Taylor Highway, AK-5;
- (4) east of Chicken on the Top of the World Highway; or
- (5) south of Tetlin Junction to the Alaska-Canada border on the Alaska Highway, AK-2.

8 AAC 30.056. Alternative arrangement. Upon a contractor’s written request, the commissioner may approve an alternative board and lodging or per diem arrangement, provided

- (1) the arrangement does not reduce the laborer, mechanic, or field surveyor’s wages below the prevailing wage rate; and
- (2) the laborer, mechanic, or field surveyor voluntarily enters into and signs the written arrangement; a labor organization representing laborers, mechanics, or field surveyors may enter into the written agreement on their behalf.

8 AAC 30.900. General definitions (selected excerpts only):

In this chapter and in AS 36

- (22) “domiciled resident” means a person living within 65 road miles of a public construction project, or in the case of a highway project, the mid-point of the project, for at least 12 consecutive months prior to the award of the public construction project;
- (23) “employed on the project” means the time period from the date the laborer, mechanic, or field surveyor first reports on-site to the project through the final date the person reports on-site to the project.

ADDITIONAL INFORMATION

PER DIEM

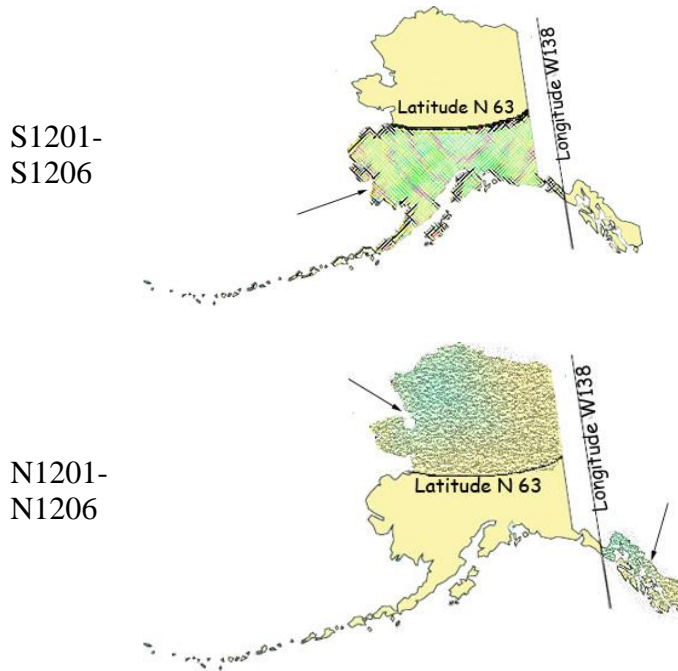
Notice: New regulations relating to board and lodging and per diem went into effect on November 25, 2018. The regulations provide a comprehensive set of requirements for the provision of board and lodging or per diem for workers on remote projects. Please refer to Alaska Administrative Code 8 AAC Chapter 30 and read the chapter carefully.

The Alaska Department of Labor and Workforce Development has determined that per diem is an established work practice for certain work classifications. These classifications are indicated throughout the Pamphlet by an asterisk (*) under the classification title. If all of the conditions of 8 AAC 30.054 are met, an employer may pay workers in these classifications per diem instead of providing board and lodging on a remote project.

Per Diem Rate: As of May 1st, 2019, the minimum per diem rate is \$100.00 per day, or part thereof, the worker is employed on the project. In the event that a contractor provides lodging facilities, but no meals, the department will accept a payment of \$48 per day for meals to meet the per diem requirements.

LABORER CLASSIFICATION CLARIFICATION

The laborer rates categorized in class code S1201-S1206 apply in one area of Alaska; the area that is south of N63 latitude and west of W138 Longitude. The laborer rates categorized in class code N1201-N1206 apply in two areas of Alaska; the Alaska areas north of N63 latitude and east of W138 longitude. The following graphic representations should assist with clarifying the applicable wage rate categories:



APPRENTICE RATES

Apprentice rates at less than the minimum prevailing rates may be paid to apprentices according to an apprentice program which has been registered and approved by the Commissioner of the Alaska Department of Labor and Workforce Development in writing or according to a bona fide apprenticeship program registered with the U.S. Department of Labor, Office of Apprenticeship Training. **Any employee listed on a payroll at an apprentice wage rate who is not registered as above shall be paid the journeyman prevailing minimum wage in that work classification.** Wage rates are based on prevailing crew makeup practices in Alaska and apply to work performed regardless of either the quality of the work performed by the employee or the titles or classifications which may be assigned to individual employees.

FRINGE BENEFIT PLANS

Contractors/subcontractors may compensate fringe benefits to their employees in any one of three methods. The fringe benefits may be paid into a union trust fund, into an approved benefit plan, or paid directly on the paycheck as gross wages.

Where fringe benefits are paid into approved plans, funds, or programs including union trust funds, the payments must be contributed at least monthly. If contractors submit their own payroll forms and are paying fringe benefits into approved plans, funds, or programs, the employer’s certification must include, in addition to those requirements of 8 AAC 30.020(c), a statement that fringe benefit payments have been or will be paid at least monthly. Contractors who pay fringe benefits to a plan must ensure the plan is one approved by the Internal Revenue Service and that the plan meets the requirements of 8 AAC 30.025 (eff. 3/2/08) in order for payments to be credited toward the prevailing wage obligation.

SPECIAL PREVAILING WAGE RATE DETERMINATION

Special prevailing wage rate determinations may be requested for special projects or a special worker classification if the work to be performed does not conform to traditional public construction for which a prevailing wage rate has been established under 8 AAC 30.050(a) of this section. Requests for special wage rate determinations must be in writing and filed with the Commissioner at least 30 days before the award of the contract. An applicant for a special wage rate determination shall have the responsibility to support the necessity for the special rate. An application for a special wage rate determination filed under this section must contain:

- (1) a specification of the contract or project on which the special rates will apply and a description of the work to be performed;
- (2) a brief narrative explaining why special wage rates are necessary;
- (3) the job class or classes involved;
- (4) the special wage rates the applicant is requesting, including survey or other relevant wage data to support the requested rates;
- (5) the approximate number of employees who would be affected; and
- (6) any other information which might be helpful in determining if special wage rates are appropriate.

Requests made pursuant to the above should be addressed to:

Director
Alaska Department of Labor and Workforce Development
Labor Standards and Safety Division
Wage and Hour
P.O. Box 111149
Juneau, AK 99811-1149
-or-
Email: statewide.wagehour@alaska.gov

EMPLOYMENT PREFERENCE INFORMATION

In October 2019, the Alaska Attorney General issued a formal opinion stating that the Alaska Statutes 36.10.150 of the State’s 90% Employment Preference law, also known as the Alaska Resident Hire law, violates both the U.S. and Alaska Constitutions. As a result, the state has stopped all enforcement activity. A copy of the Attorney General opinion is found here:

http://law.alaska.gov/pdf/opinions/opinions_2019/19-005_AK-hire.pdf

**Alaska Department of Labor and Workforce Development
Labor Standards and Safety Division
Wage and Hour
Web site: <http://labor.state.ak.us/lss/pamp600.htm>**

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Fairbanks, Alaska 99701-4593
Phone: (907) 451-2886

Email:
statewide.wagehour@alaska.gov

LABOR STANDARDS AND SAFETY NOTICE REQUESTS

If you would like to receive Wage and Hour or Mechanical Inspection **regulation notices** or **publications information**, they are available via electronic mail, by signing up in the GovDelivery System, <https://public.govdelivery.com/accounts/AKDOL/subscriber/new> and selecting topics *LSS – Wage and Hour – Forms and Publications*, *LSS – Mechanical Inspection Regulations*, or *LSS – Wage and Hour Regulations*.

Publications are also available online at <http://labor.alaska.gov/lss/home.htm>

DEBARMENT LIST

AS 36.05.090(b) states that “the state disbursing officer or the local fiscal officer shall distribute to all departments of the state government and to all political subdivisions of the state a list giving the names of persons who have disregarded their obligations to employees.”

A person appearing on the following debarment list and a firm, corporation, partnership, or association in which the person has an interest may not work as a contractor or subcontractor on a public construction contract for the state or a political subdivision of the state for three years from the date of debarment.

Company Name

Debarment Expires

No companies are currently debarred.

Laborers' & Mechanics' Minimum Rates of Pay

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Boilermakers

*See per diem note on last page

A0101	Boilermaker (journeyman)	48.15	8.57	18.40	2.15	VAC	SAF	81.86
						4.25	0.34	

Bricklayers & Blocklayers

*See per diem note on last page

A0201	Blocklayer	42.01	9.00	10.20	0.62	L&M		62.03
						0.20		

Bricklayer
Marble or Stone Mason
Refractory Worker (Firebrick, Plastic, Castable, and Gunitite Refractory Applications)
Terrazzo Worker
Tile Setter

A0202	Tuck Pointer Caulker	42.01	9.00	10.20	0.62	L&M		62.03
						0.20		

Cleaner (PCC)

A0203	Marble & Tile Finisher	35.84	9.00	10.20	0.62	L&M		55.86
						0.20		

Terrazzo Finisher

A0204	Torginal Applicator	35.84	9.00	10.20	0.62	L&M		55.86
						0.20		

Carpenters, Region I (North of 63 latitude)

*See per diem note on last page

N0301	Carpenter (journeyman)	44.39	10.35	15.82	1.75	L&M	SAF	72.71
						0.20	0.20	

Lather/Drywall/Acoustical

Carpenters, Region II (South of N63 latitude)

*See per diem note on last page

S0301	Carpenter (journeyman)	44.39	10.35	16.36	1.75	L&M	SAF	73.25
						0.20	0.20	

Lather/Drywall/Acoustical

Cement Masons

*See per diem note on last page

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Cement Masons
 *See per diem note on last page

							L&M	
A0401	Group I, including:	44.43	8.80	11.80	1.53	0.10		66.66
	Application of Sealing Compound							
	Application of Underlayment							
	Building, General							
	Cement Finisher							
	Cement Mason (journeyman)							
	Concrete							
	Concrete Paving							
	Concrete Polishing							
	Concrete Repair							
	Curb & Gutter, Sidewalk							
	Curing of All Concrete							
	General Concrete Pour Tender							
	Grouting & Caulking of Tilt-Up Panels							
	Grouting of All Plates							
	Patching Concrete							
	Screed Pin Setter							
	Screeder or Rodder							
	Spackling/Skim Coating							

A0402	Group II, including:	44.43	8.80	11.80	1.53	0.10		66.66
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Form Setter

							L&M	
A0403	Group III, including:	44.43	8.80	11.80	1.53	0.10		66.66

- Concrete Saw Cutter Operator (All Control Joints and Self-powered)
- Curb & Gutter Machine
- Floor Grinder
- Pneumatic Power Tools
- Power Chipping & Bushing
- Sand Blasting Architectural Finish
- Screed & Rodding Machine Operator
- Troweling Machine Operator (all concrete surfaces)

							L&M	
A0404	Group IV, including:	44.43	8.80	11.80	1.53	0.10		66.66

- Acoustical or Imitation Acoustical Finish
- Application of All Composition Mastic
- Application of All Epoxy Material
- Application of All Plastic Material
- Finish Colored Concrete
- Gunite Nozzleman
- Hand Powered Grinder

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Cement Masons
*See per diem note on last page

A0404	Group IV, including:	44.43	8.80	11.80	1.53		L&M 0.10	66.66
	Preparing, scratching and browsing of all ceilings and walls, finished with terrazo or tile							
	Tunnel Worker							

A0405	Group V, including:	44.43	8.80	11.80	1.53		L&M 0.10	66.66
	Casting and finishing							
	EIFS Systems							
	Finishing of all interior and exterior plastering							
	Fireproofing (Pryocrete, Cafco, Albi-Clad, sprayed fiberglass)							
	Gypsum, Portland Cement							
	Kindred material and products							
	Operation and control of all types of plastering machines, including power tools and floats, used by the industry							
	Overcoating and maintenance of interior/exterior plaster surfaces							
	Plasterer							
	Veneer plastering process (Rapid Plaster, U.S.G. "Imperial Systems", and Pabcoat Systems")							
	Venetian plaster and color-integrated Italian/Middle-Eastern line plaster							

Culinary Workers

A0501	Baker/Cook	29.95	7.53	8.83			LEG	46.31
A0503	General Helper	25.92	7.53	8.83			LEG	42.28
	Housekeeper							
	Janitor							
	Kitchen Helper							
A0504	Head Cook	29.95	7.53	8.83			LEG	46.31
A0505	Head Housekeeper	26.20	7.53	8.83			LEG	42.56
	Head Kitchen Help							

Dredgemen
*See per diem note on last page

A0601	Assistant Engineer	46.91	11.40	14.75	1.00		L&M 0.10	0.05	74.21
	Craneman								

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
------------	--	-----	-----	-----	-----	-------	----------	-----

Dredgemen
*See per diem note on last page

A0601	Assistant Engineer	46.91	11.40	14.75	1.00		L&M	74.21
	Electrical Generator Operator (primary pump/power barge/dredge)							
	Engineer							
	Welder							
A0602	Assistant Mate (deckhand)	45.65	11.40	14.75	1.00		L&M	72.95
A0603	Fireman	46.13	11.40	14.75	1.00		L&M	73.43
A0605	Leverman Clamshell	49.64	11.40	14.75	1.00		L&M	76.94
A0606	Leverman Hydraulic	47.74	11.40	14.75	1.00		L&M	75.04
A0607	Mate & Boatman	46.91	11.40	14.75	1.00		L&M	74.21
A0608	Oiler (dredge)	46.13	11.40	14.75	1.00		L&M	73.43

Electricians
*See per diem note on last page

A0701	Inside Cable Splicer	46.44	14.40	14.22	0.95		L&M	LEG	76.41
A0702	Inside Journeyman Wireman, including: Technicians (including use of drones in electrical construction)	46.44	14.40	14.22	0.95		L&M	LEG	76.41
A0703	Power Cable Splicer	65.19	14.40	19.15	0.95		L&M	LEG	100.09
A0704	Tele Com Cable Splicer	52.53	14.40	17.98	0.95		L&M	LEG	86.26
A0705	Power Journeyman Lineman, including: Power Equipment Operator Technician (including use of drones in electrical construction)	63.44	14.40	19.09	0.95		L&M	LEG	98.28
A0706	Tele Com Journeyman Lineman, including: Technician (including use of drones in telecommunications construction) Tele Com Equipment Operator	50.78	14.40	17.92	0.95		L&M	LEG	84.45

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Electricians
*See per diem note on last page

A0707	Straight Line Installer - Repairman	50.78	14.40	17.92	0.95	L&M	LEG	84.45
A0708	Powderman	61.44	14.40	19.03	0.95	L&M	LEG	96.22
A0710	Material Handler	28.07	14.02	5.84	0.15	L&M	LEG	48.38
A0712	Tree Trimmer Groundman	31.78	14.40	14.30	0.15	L&M	LEG	60.93
A0713	Journeyman Tree Trimmer	40.71	14.40	14.57	0.15	L&M	LEG	70.13
A0714	Vegetation Control Sprayer	44.26	14.40	14.68	0.15	L&M	LEG	73.79
A0715	Inside Journeyman Communications CO/PBX	46.44	14.40	14.22	0.95	L&M	LEG	76.41

Elevator Workers
*See per diem note on last page

A0802	Elevator Constructor	46.08	16.07	20.56	0.70	L&M	VAC	89.52
A0803	Elevator Constructor Mechanic	65.83	16.07	20.56	0.70	L&M	VAC	111.46

Heat & Frost Insulators/Asbestos Workers
*See per diem note on last page

A0902	Asbestos Abatement-Mechanical Systems	41.35	9.24	11.12	1.50	IAF	LML	63.40
A0903	Asbestos Abatement/General Demolition All Systems	41.35	9.24	11.12	1.50	IAF	LML	63.40
A0904	Insulator, Group II	41.35	9.24	11.12	1.50	IAF	LML	63.40
A0905	Fire Stop	41.35	9.24	11.12	1.50	IAF	LML	63.40

IronWorkers
*See per diem note on last page

A1101	Ironworkers, including:	42.99	10.16	26.45	0.77	L&M	IAF	80.81
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Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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IronWorkers
 *See per diem note on last page

						L&M	IAF	
A1101	Ironworkers, including:	42.99	10.16	26.45	0.77	0.20	0.24	80.81
	Bender Operators							
	Bridge & Structural							
	Hangar Doors							
	Hollow Metal Doors							
	Industrial Doors							
	Machinery Mover							
	Ornamental							
	Reinforcing							
	Rigger							
	Sheeter							
	Signalman							
	Stage Rigger							
	Toxic Haz-Mat Work							
	Welder							

						L&M	IAF	
A1102	Helicopter	43.99	10.16	26.45	0.77	0.20	0.24	81.81
	Helicopter (used for rigging and setting)							
	Tower (energy producing windmill type towers to include nacelle and blades)							

						L&M	IAF	
A1103	Fence/Barrier Installer	39.49	10.16	26.45	0.77	0.20	0.24	77.31

						L&M	IAF	
A1104	Guard Rail Layout Man	40.23	10.16	26.45	0.77	0.20	0.24	78.05

						L&M	IAF	
A1105	Guard Rail Installer	40.49	10.16	26.45	0.77	0.20	0.24	78.31

Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)
 *See per diem note on last page

						L&M	LEG	
N1201	Group I, including:	36.00	9.55	21.16	1.65	0.30	0.20	68.86
	Asphalt Worker (shovelman, plant crew)							
	Brush Cutter							
	Camp Maintenance Laborer							
	Carpenter Tender or Helper							
	Choke Setter, Hook Tender, Rigger, Signalman							
	Concrete Labor (curb & gutter, chute handler, curing, grouting, screeding)							
	Crusher Plant Laborer							
	Demolition Laborer							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)

*See per diem note on last page

						L&M	LEG	
N1201 Group I, including:	36.00	9.55	21.16	1.65	0.30	0.20	68.86	

- Ditch Digger
- Dumpman
- Environmental Laborer (hazard/toxic waste, oil spill)
- Fence Installer
- Fire Watch Laborer
- Flagman
- Form Stripper
- General Laborer
- Guardrail Laborer, Bridge Rail Installer
- Hydro Seeder Nozzleman
- Laborer, Building
- Landscaper or Planter
- Laying of Mortarless Decorative Block (retaining walls, flowered decorative block 4 feet or less - highway or landscape work)
- Material Handler
- Pneumatic or Power Tools
- Portable or Chemical Toilet Serviceman
- Pump Man or Mixer Man
- Railroad Track Laborer
- Sandblast, Pot Tender
- Saw Tender
- Slurry Work
- Steam Cleaner Operator
- Steam Point or Water Jet Operator
- Storm Water Pollution Protection Plan Worker (SWPPP Worker - erosion and sediment control Laborer)
- Tank Cleaning
- Utiliwalk & Utilidor Laborer
- Watchman (construction projects)
- Window Cleaner

						L&M	LEG	
N1202 Group II, including:	37.00	9.55	21.16	1.65	0.30	0.20	69.86	

- Burning & Cutting Torch
- Cement or Lime Dumper or Handler (sack or bulk)
- Certified Erosion Sediment Control Lead (CESCL Laborer)
- Choker Splicer
- Chucktender (wagon, air-track & hydraulic drills)
- Concrete Laborer (power buggy, concrete saws, pumpcrete nozzleman, vibratorman)
- Culvert Pipe Laborer
- Cured Inplace Pipelayer

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)
 *See per diem note on last page

N1202 Group II, including:	37.00	9.55	21.16	1.65	L&M 0.30	LEG 0.20	69.86
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- Environmental Laborer (asbestos, marine work)
- Floor Preparation, Core Drilling
- Foam Gun or Foam Machine Operator
- Green Cutter (dam work)
- Gunite Operator
- Hod Carrier
- Jackhammer/Chipping Gun or Pavement Breaker
- Laser Instrument Operator
- Laying of Mortarless Decorative Block (retaining walls, flowered decorative block over 4 feet - highway or landscape work)
- Mason Tender & Mud Mixer (sewer work)
- Pilot Car
- Pipelayer Helper
- Plasterer, Bricklayer & Cement Finisher Tender
- Powderman Helper
- Power Saw Operator
- Railroad Switch Layout Laborer
- Sandblaster
- Scaffold Building & Erecting
- Sewer Caulker
- Sewer Plant Maintenance Man
- Thermal Plastic Applicator
- Timber Faller, Chainsaw Operator, Filer
- Timberman

N1203 Group III, including:	37.90	9.55	21.16	1.65	L&M 0.30	LEG 0.20	70.76
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- Bit Grinder
- Camera/Tool/Video Operator
- Guardrail Machine Operator
- High Rigger & Tree Topper
- High Scaler
- Multiplate
- Plastic Welding
- Slurry Seal Squeegee Man
- Traffic Control Supervisor
- Welding Certified (in connection with laborer's work)

N1204 Group IIIA	41.78	9.55	21.16	1.65	L&M 0.30	LEG 0.20	74.64
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- Asphalt Raker, Asphalt Belly Dump Lay Down
- Drill Doctor (in the field)

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)

*See per diem note on last page

						L&M	LEG	
N1204	Group IIIA	41.78	9.55	21.16	1.65	0.30	0.20	74.64

- Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)
- Pioneer Drilling & Drilling Off Tugger (all type drills)
- Pipelayers
- Powderman (Employee Possessor)
- Storm Water Pollution Protection Plan Specialist (SWPPP Specialist)
- Traffic Control Supervisor, DOT Qualified

						L&M	LEG	
N1205	Group IV	25.57	9.55	21.16	1.65	0.30	0.20	58.43

- Final Building Cleanup
- Permanent Yard Worker

						L&M	LEG	
N1206	Group IIIB	47.36	5.50	21.16	1.65	0.30	0.20	76.17

- Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)(over 5,000 hours)
- Federal Powderman (Responsible Person in Charge)
- Grade Checking (setting or transferring of grade marks, line and grade, GPS, drones)
- Pioneer Drilling & Drilling Off Tugger (all type drills)(over 5,000 hours)
- Stake Hopper

Laborers (The area that is south of N63 latitude and west of W138 longitude)

*See per diem note on last page

						L&M	LEG	
S1201	Group I, including:	36.00	9.55	21.16	1.65	0.30	0.20	68.86

- Asphalt Worker (shovelman, plant crew)
- Brush Cutter
- Camp Maintenance Laborer
- Carpenter Tender or Helper
- Choke Setter, Hook Tender, Rigger, Signalman
- Concrete Labor (curb & gutter, chute handler, curing, grouting, screeding)
- Crusher Plant Laborer
- Demolition Laborer
- Ditch Digger
- Dumpman
- Environmental Laborer (hazard/toxic waste, oil spill)
- Fence Installer
- Fire Watch Laborer
- Flagman

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Laborers (The area that is south of N63 latitude and west of W138 longitude)

*See per diem note on last page

						L&M	LEG	
S1201	Group I, including:	36.00	9.55	21.16	1.65	0.30	0.20	68.86

- Form Stripper
- General Laborer
- Guardrail Laborer, Bridge Rail Installer
- Hydro Seeder Nozzleman
- Laborer, Building
- Landscaper or Planter
- Laying of Mortarless Decorative Block (retaining walls, flowered decorative block 4 feet or less - highway or landscape work)
- Material Handler
- Pneumatic or Power Tools
- Portable or Chemical Toilet Serviceman
- Pump Man or Mixer Man
- Railroad Track Laborer
- Sandblast, Pot Tender
- Saw Tender
- Slurry Work
- Steam Cleaner Operator
- Steam Point or Water Jet Operator
- Storm Water Pollution Protection Plan Worker (SWPPP Worker - erosion and sediment control Laborer)
- Tank Cleaning
- Utiliwalk & Utilidor Laborer
- Watchman (construction projects)
- Window Cleaner

						L&M	LEG	
S1202	Group II, including:	37.00	9.55	21.16	1.65	0.30	0.20	69.86

- Burning & Cutting Torch
- Cement or Lime Dumper or Handler (sack or bulk)
- Certified Erosion Sediment Control Lead (CESCL Laborer)
- Choker Splicer
- Chucktender (wagon, air-track & hydraulic drills)
- Concrete Laborer (power buggy, concrete saws, pumpcrete nozzleman, vibratorman)
- Culvert Pipe Laborer
- Cured Inplace Pipelayer
- Environmental Laborer (asbestos, marine work)
- Floor Preparation, Core Drilling
- Foam Gun or Foam Machine Operator
- Green Cutter (dam work)
- Gunite Operator
- Hod Carrier

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Laborers (The area that is south of N63 latitude and west of W138 longitude)

*See per diem note on last page

						L&M	LEG	
S1202	Group II, including:	37.00	9.55	21.16	1.65	0.30	0.20	69.86

- Jackhammer/Chipping Gun or Pavement Breaker
- Laser Instrument Operator
- Laying of Mortarless Decorative Block (retaining walls, flowered decorative block over 4 feet - highway or landscape work)
- Mason Tender & Mud Mixer (sewer work)
- Pilot Car
- Pipelayer Helper
- Plasterer, Bricklayer & Cement Finisher Tender
- Powderman Helper
- Power Saw Operator
- Railroad Switch Layout Laborer
- Sandblaster
- Scaffold Building & Erecting
- Sewer Caulker
- Sewer Plant Maintenance Man
- Thermal Plastic Applicator
- Timber Faller, Chainsaw Operator, Filer
- Timberman

						L&M	LEG	
S1203	Group III, including:	37.90	9.55	21.16	1.65	0.30	0.20	70.76

- Bit Grinder
- Camera/Tool/Video Operator
- Guardrail Machine Operator
- High Rigger & Tree Topper
- High Scaler
- Multiplate
- Plastic Welding
- Slurry Seal Squeegee Man
- Traffic Control Supervisor
- Welding Certified (in connection with laborer's work)

						L&M	LEG	
S1204	Group IIIA	41.78	9.55	21.16	1.65	0.30	0.20	74.64

- Asphalt Raker, Asphalt Belly Dump Lay Down
- Drill Doctor (in the field)
- Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)
- Pioneer Drilling & Drilling Off Tugger (all type drills)
- Pipelayers
- Powderman (Employee Possessor)
- Storm Water Pollution Protection Plan Specialist (SWPPP Specialist)

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Laborers (The area that is south of N63 latitude and west of W138 longitude)

*See per diem note on last page

S1204	Group IIIA	41.78	9.55	21.16	1.65	L&M	LEG	74.64
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Traffic Control Supervisor, DOT Qualified

S1205	Group IV	25.57	9.55	21.16	1.65	L&M	LEG	58.43
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Final Building Cleanup
Permanent Yard Worker

S1206	Group IIIB	47.36	5.50	21.16	1.65	L&M	LEG	76.17
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Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)(over 5,000 hours)
Federal Powderman (Responsible Person in Charge)
Grade Checking (setting or transferring of grade marks, line and grade, GPS, drones)
Pioneer Drilling & Drilling Off Tugger (all type drills)(over 5,000 hours)
Stake Hopper

Millwrights

*See per diem note on last page

A1251	Millwright (journeyman)	51.38	10.35	12.87	1.10	L&M		76.15
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A1252	Millwright Welder	52.38	10.35	12.87	1.10	L&M		77.15
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Painters, Region I (North of N63 latitude)

*See per diem note on last page

N1301	Group I, including:	37.83	9.77	15.10	1.08	L&M		63.85
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Brush
General Painter
Hand Taping
Hazardous Material Handler
Lead-Based Paint Abatement
Roll

N1302	Group II, including:	38.35	9.77	15.10	1.08	L&M		64.37
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Bridge Painter
Epoxy Applicator
General Drywall Finisher
Hand/Spray Texturing
Industrial Coatings Specialist

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Painters, Region I (North of N63 latitude)
 *See per diem note on last page

N1302	Group II, including:	38.35	9.77	15.10	1.08		L&M 0.07	64.37
	Machine/Automatic Taping							
	Pot Tender							
	Sandblasting							
	Specialty Painter							
	Spray							
	Structural Steel Painter							
	Wallpaper/Vinyl Hanger							

N1304	Group IV, including:	42.24	9.77	18.21	1.05		0.05	71.32
	Glazier							
	Storefront/Automatic Door Mechanic							

N1305	Group V, including:	39.86	9.77	5.00	1.10		0.10	55.83
	Carpet Installer							
	Floor Coverer							
	Heat Weld/Cove Base							
	Linoleum/Soft Tile Installer							

N1306	Group VI, including:	70.00	10.79	5.00	1.10		0.10	86.99
	Traffic Control Striper							

Painters, Region II (South of N63 latitude)
 *See per diem note on last page

S1301	Group I, including :	34.47	9.77	16.45	1.08		L&M 0.07	61.84
	Brush							
	General Painter							
	Hand Taping							
	Hazardous Material Handler							
	Lead-Based Paint Abatement							
	Roll							
	Spray							

S1302	Group II, including :	35.72	9.77	16.45	1.08		L&M 0.07	63.09
	General Drywall Finisher							
	Hand/Spray Texturing							
	Machine/Automatic Taping							
	Wallpaper/Vinyl Hanger							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Painters, Region II (South of N63 latitude)
 *See per diem note on last page

							L&M	
S1303	Group III, including :	35.72	9.77	16.45	1.08	0.07		63.09
	Bridge Painter							
	Epoxy Applicator							
	Industrial Coatings Specialist							
	Pot Tender							
	Sandblasting							
	Specialty Painter							
	Structural Steel Painter							

							L&M	
S1304	Group IV, including:	42.45	9.77	17.25	1.08	0.07		70.62
	Glazier							
	Storefront/Automatic Door Mechanic							

							L&M	
S1305	Group V, including:	39.86	9.77	5.00	1.10	0.10		55.83
	Carpet Installer							
	Floor Coverer							
	Heat Weld/Cove Base							
	Linoleum/Soft Tile Installer							

							L&M	
S1306	Group VI, including:	70.00	10.79	5.00	1.10	0.10		86.99
	Traffic Control Striper							

Piledrivers
 *See per diem note on last page

							L&M	IAF	
A1401	Piledriver	44.39	10.35	15.82	1.75	0.20	0.20		72.71
	Assistant Dive Tender								
	Carpenter/Piledriver								
	Rigger								
	Sheet Stabber								
	Skiff Operator								

							L&M	IAF	
A1402	Piledriver-Welder/Toxic Worker	45.39	10.35	15.82	1.75	0.20	0.20		73.71

							L&M	IAF	
A1403	Remotely Operated Vehicle Pilot/Technician	48.70	10.35	15.82	1.75	0.20	0.20		77.02
	Single Atmosphere Suit, Bell or Submersible Pilot								

							L&M	IAF	
A1404	Diver (working) **See note on last page	88.50	10.35	15.82	1.75	0.20	0.20		116.82

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Piledrivers
*See per diem note on last page

A1405	Diver (standby) **See note on last page	48.70	10.35	15.82	1.75	L&M	IAF	77.02
A1406	Dive Tender **See note on last page	47.70	10.35	15.82	1.75	L&M	IAF	76.02
A1407	Welder (American Welding Society, Certified Welding Inspector)	49.95	10.35	15.82	1.75	L&M	IAF	78.27

Plumbers, Region I (North of N63 latitude)
*See per diem note on last page

N1501	Journeyman Pipefitter	46.86	12.00	18.20	1.75	L&M	S&L	80.01
	Plumber							
	Welder							

Plumbers, Region II (South of N63 latitude)
*See per diem note on last page

S1501	Journeyman Pipefitter	41.00	12.38	15.27	1.55	L&M		70.40
	Plumber							
	Welder							

Plumbers, Region IIA (1st Judicial District)
*See per diem note on last page

X1501	Journeyman Pipefitter	43.50	14.17	11.75	2.95	L&M		72.61
	Plumber							
	Welder							

Power Equipment Operators
*See per diem note on last page

A1601	Group I, including:	47.74	11.40	14.75	1.00	L&M		75.04
	Asphalt Roller: Breakdown, Intermediate, and Finish							
	Back Filler							
	Barrier Machine (Zipper)							
	Belcrete with Power Pack & similar conveyors							
	Bending Machine							
	Boat Coxswain							
	Bulldozer							
	Cableways, Highlines & Cablecars							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Power Equipment Operators

*See per diem note on last page

	L&M						
A1601 Group I, including:	47.74	11.40	14.75	1.00	0.10	0.05	75.04
Cleaning Machine							
Coating Machine							
Concrete Hydro Blaster							
Cranes (45 tons & under or 150 feet of boom & under (including jib & attachments))							
(a) Hydralifts or Transporters, (all track or truck type)							
(b) Derricks							
(c) Overhead							
Crushers							
Deck Winches, Double Drum							
Ditching or Trenching Machine (16 inch or over)							
Drag Scraper, Yarder, and similar types							
Drilling Machines, Core, Cable, Rotary and Exploration							
Finishing Machine Operator, Concrete Paving, Laser Screed, Sidewalk, Curb & Gutter Machine							
Grade Checker and/or Line and Grade including Drone							
Helicopters							
Hover Craft, Flex Craft, Loadmaster, Air Cushion, All-Terrain Vehicle, Rollagon, Bargecable, Nodwell, & Snow Cat							
Hydro Ax, Feller Buncher & similar							
Hydro Excavation (Vac-Truck and Similar)							
Loaders (2 1/2 yards through 5 yards, including all attachments):							
(a) Forklifts (with telescopic boom & swing attachment)							
(b) Front End & Overhead, (2-1/2 yards through 5 yards)							
(c) Loaders, (with forks or pipe clamp)							
(d) Loaders, (elevating belt type, Euclid & similar types)							
Material Transfer Vehicle (Elevating Grader, Pickup Machine, and similar types)							
Mechanic, Welder, Bodyman, Electrical, Camp & Maintenance Engineer							
Micro Tunneling Machine							
Mixers: Mobile type with hoist combination							
Motor Patrol Grader							
Mucking Machine: Mole, Tunnel Drill, Horizontal/Directional Drill Operator and/or Shield							
Off-Road Hauler (including Articulating and Haul Trucks)							
Operator on Dredges							
Piledriver Engineer, L.B. Foster, Puller or similar paving breaker							
Plant Operator (Asphalt & Concrete)							
Power Plant, Turbine Operator 200 k.w & over (power plants or combination of power units over 300 k.w.)							
Remote Controlled Equipment							
Scraper (through 40 yards)							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Power Equipment Operators								
*See per diem note on last page								

		L&M						
A1601	Group I, including:	47.74	11.40	14.75	1.00	0.10	0.05	75.04
	Service Oiler/Service Engineer							
	Shot Blast Machine							
	Shovels, Backhoes, Excavators with all attachments, and Gradealls (3 yards & under)							
	Sideboom (under 45 tons)							
	Sub Grader (Gurries & similar types)							
	Tack Tractor							
	Truck Mounted Concrete Pump, Conveyor/Tele-belt, & Creter							
	Wate Kote Machine							

		L&M						
A1602	Group IA, including:	49.64	11.40	14.75	1.00	0.10	0.05	76.94
	Camera/Tool/Video Operator (Slipline)							
	Certified Welder, Electrical Mechanic, Camp Maintenance Engineer, Mechanic (over 10,000 hours)							
	Cranes (over 45 tons or 150 feet including jib & attachments)							
	(a) Clamshells & Draglines (over 3 yards)							
	(b) Tower Cranes							
	Licensed Water/Waste Water Treatment Operator							
	Loaders (over 5 yards)							
	Motor Patrol Grader, Dozer, Grade Tractor (finish: when finishing to final grade and/or to hubs, or for asphalt)							
	Power Plants (1000 k.w. & over)							
	Profiler, Reclaimer, and Roto-Mill							
	Quad							
	Scrapers (over 40 yards)							
	Screed							
	Shovels, Backhoes, Excavators with all attachments (over 3 yards)							
	Sidebooms (over 45 tons)							
	Slip Form Paver, C.M.I. & similar types							
	Topside (Asphalt Paver, Slurry machine, Spreaders, and similar types)							

		L&M						
A1603	Group II, including:	46.91	11.40	14.75	1.00	0.10	0.05	74.21
	Boiler - Fireman							
	Cement Hogs & Concrete Pump Operator							
	Conveyors (except those listed in Group I)							
	Hoists on Steel Erection, Towermobiles & Air Tuggers							
	Horizontal/Directional Drill Locator							
	Locomotives, Rod & Geared Engines							
	Mixers							
	Screening, Washing Plant							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Power Equipment Operators								
*See per diem note on last page								

A1603	Group II, including:	46.91	11.40	14.75	1.00	L&M		74.21
	Sideboom (cradling rock drill, regardless of size)					0.10	0.05	
	Skidder							
	Trenching Machines (under 16 inches)							
	Water/Waste Water Treatment Operator							

A1604	Group III, including:	46.13	11.40	14.75	1.00	L&M		73.43
	"A" Frame Trucks, Deck Winches							
	Bombardier (tack or tow rig)							
	Boring Machine							
	Brooms, Power (sweeper, elevator, vacuum, or similar)							
	Bump Cutter							
	Compressor							
	Farm Tractor							
	Forklift, Industrial Type							
	Gin Truck or Winch Truck (with poles when used for hoisting)							
	Hoists, Air Tuggers, Elevators							
	Loaders:							
	(a) Elevating-Athey, Barber Greene & similar types							
	(b) Forklifts or Lumber Carrier (on construction job sites)							
	(c) Forklifts, (with tower)							
	(d) Overhead & Front End, (under 2-1/2 yards)							
	Locomotives: Dinkey (air, steam, gas & electric) Speeders							
	Mechanics, Light Duty							
	Oil, Blower Distribution							
	Posthole Digger, Mechanical							
	Pot Fireman (power agitated)							
	Power Plant, Turbine Operator, (under 200 k.w.)							
	Pumps, Water							
	Roller (other than Asphalt)							
	Saws, Concrete							
	Skid Hustler							
	Skid Steer (with all attachments)							
	Stake Hopper							
	Straightening Machine							
	Tow Tractor							

A1605	Group IV, including:	39.42	11.40	14.75	1.00	L&M		66.72
	Crane Assistant Engineer/Rig Oiler					0.10	0.05	
	Drill Helper							
	Parts & Equipment Coordinator							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Power Equipment Operators
 *See per diem note on last page

		L&M						
A1605	Group IV, including:	39.42	11.40	14.75	1.00	0.10	0.05	66.72
	Spotter							
	Steam Cleaner							
	Swamper (on trenching machines or shovel type equipment)							

Roofers
 *See per diem note on last page

		L&M						
A1701	Roofer & Waterproofer	47.62	13.75	3.91	0.81	0.10	0.06	66.25

		L&M						
A1702	Roofer Material Handler	34.23	13.75	3.91	0.81	0.10	0.06	52.86

Sheet Metal Workers, Region I (North of N63 latitude)
 *See per diem note on last page

		L&M						
N1801	Sheet Metal Journeyman	51.93	12.55	15.86	1.80	0.12		82.26

- Air Balancing and duct cleaning of HVAC systems
- Brazing, soldering or welding of metals
- Demolition of sheet metal HVAC systems
- Fabrication and installation of exterior wall sheathing, siding, metal roofing, flashing, decking and architectural sheet metal work
- Fabrication and installation of heating, ventilation and air conditioning ducts and equipment
- Fabrication and installation of louvers and hoods
- Fabrication and installation of sheet metal lagging
- Fabrication and installation of stainless steel commercial or industrial food service equipment
- HVAC-R Service Mechanic, servicing and maintaining HVAC-R Systems
- Manufacture, fabrication assembly, installation and alteration of all ferrous and nonferrous metal work
- Metal lavatory partitions
- Preparation of drawings taken from architectural and engineering plans required for fabrication and erection of sheet metal work
- Sheet Metal shelving
- Sheet Metal venting, chimneys and breaching
- Skylight installation

Sheet Metal Workers, Region II (South of N63 latitude)
 *See per diem note on last page

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
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Sheet Metal Workers, Region II (South of N63 latitude)

*See per diem note on last page

						L&M	
S1801	Sheet Metal Journeyman	47.05	12.55	14.90	2.01	0.43	76.94
	Air Balancing and duct cleaning of HVAC systems						
	Brazing, soldering or welding of metals						
	Demolition of sheet metal HVAC systems						
	Fabrication and installation of exterior wall sheathing, siding, metal roofing, flashing, decking and architectural sheet metal work						
	Fabrication and installation of heating, ventilation and air conditioning ducts and equipment						
	Fabrication and installation of louvers and hoods						
	Fabrication and installation of sheet metal lagging						
	Fabrication and installation of stainless steel commercial or industrial food service equipment						
	HVAC-R Service Mechanic, servicing and maintaining HVAC-R Systems						
	Manufacture, fabrication assembly, installation and alteration of all ferrous and nonferrous metal work						
	Metal lavatory partitions						
	Preparation of drawings taken from architectural and engineering plans required for fabrication and erection of sheet metal work						
	Sheet Metal shelving						
	Sheet Metal venting, chimneys and breaching						
	Skylight installation						

Sprinkler Fitters

*See per diem note on last page

						L&M	
A1901	Sprinkler Fitter	54.01	11.45	18.25	0.52	0.25	84.48

Surveyors

*See per diem note on last page

						L&M	
A2001	Chief of Parties	54.50	12.48	13.64	1.20	0.10	81.92
A2002	Party Chief	50.69	12.48	13.64	1.20	0.10	78.11
A2003	Line & Grade Technician/Office Technician/GPS, Drones	47.94	12.48	13.64	1.20	0.10	75.36
A2004	Associate Party Chief (including Instrument Person & Head Chain Person)/Stake Hop/Grademan	45.69	12.48	13.64	1.20	0.10	73.11

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Surveyors
*See per diem note on last page

A2006	Chain Person (for crews with more than 2 people)	41.09	12.48	13.64	1.20		L&M 0.10	68.51
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Truck Drivers
*See per diem note on last page

A2101	Group I, including:	46.84	12.48	13.64	1.20		L&M 0.10	74.26
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- Air/Sea Traffic Controllers
- Ambulance/Fire Truck Driver (EMT certified)
- Boat Coxswain
- Captains & Pilots (air & water)
- Deltas, Commanders, Rollagons, & similar equipment (when pulling sleds, trailers or similar equipment)
- Dump Trucks (including articulating end dumps, rockbuggy, side dump, belly dump, & trucks with pups) over 40 yards up to & including 60 yards
- Fueler
- Helicopter Transporter
- Liquid Vac Truck/Super Vac Truck
- Material Coordinator or Purchasing Agent
- Oil Distributor Truck
- Ready-mix (over 12 yards up to & including 15 yards) (over 15 yards to be negotiated)
- Semi with Double Box Mixer
- Tireman, Medium Duty (Truck Tires up to 1200-24")
- Water Wagon (250 Bbls and above)

A2102	Group 1A including:	48.19	12.48	13.64	1.20		L&M 0.10	75.61
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- Dump Trucks (including rockbuggy, side dump, belly dump & trucks with pups) over 60 yards up to & including 100 yards (over 100 yards to be negotiated)
- Jeeps (driver under load)
- Lowboys, including tractor attached trailers & jeeps, up to & including 12 axles (over 12 axles or 150 tons to be negotiated)
- Tireman Heavy Duty (earthmover tires, i.e., loader, scraper, haul truck)

A2103	Group II, including:	45.51	12.48	13.64	1.20		L&M 0.10	72.93
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- All Deltas, Commanders, Rollagons, & similar equipment
- Batch Trucks (8 yards & up)
- Batch Trucks (up to & including 7 yards)
- Boom Truck/Knuckle Truck (over 5 tons)
- Cacasco Truck/Heat Stress Truck
- Construction and Material Safety Technician

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Truck Drivers
 *See per diem note on last page

A2103	Group II, including:	45.51	12.48	13.64	1.20		L&M 0.10	72.93
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- Dump Trucks (including articulating end dump, rockbuggy, side dump, belly dump, & trucks with pups) over 20 yards up to & including 40 yards
- Gin Pole Truck, Winch Truck, Wrecker (truck mounted "A" frame manufactured rating over 5 tons)
- Mechanics
- Partsman
- Ready-mix (up to & including 12 yards)
- Stringing Truck
- Turn-O-Wagon or DW-10 (not self loading)

A2104	Group III, including:	44.64	12.48	13.64	1.20		L&M 0.10	72.06
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- Boom Truck/Knuckle Truck (up to & including 5 tons)
- Dump Trucks (including articulating end dump, rockbuggy, side dump, belly dump, & trucks with pups) over 10 yards up to & including 20 yards
- Expeditor (electrical & pipefitting materials)
- Gin Pole Truck, Winch Truck, Wrecker (truck mounted "A" frame manufactured rating 5 tons & under)
- Greaser - Shop
- Semi or Truck & Trailer
- Thermal Plastic Layout Technician
- Traffic Control Technician
- Trucks/Jeeps (push or pull)

A2105	Group IV, including:	44.02	12.48	13.64	1.20		L&M 0.10	71.44
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- Air Cushion or similar type vehicle
- All Terrain Vehicle
- Buggymobile
- Bull Lift & Fork Lift, Fork Lift with Power Boom & Swing Attachment (over 5 tons)
- Bus Operator (over 30 passengers)
- Cement Spreader, Dry
- Combination Truck-Fuel & Grease
- Compactor (when pulled by rubber tired equipment)
- Dump Trucks (including rockbuggy, side dump, belly dump, & trucks with pups) up to & including 10 yards
- Dumpster
- Expeditor (general)
- Fire Truck/Ambulance Driver
- Flat Beds, Dual Rear Axle
- Foam Distributor Truck Dual Axle
- Front End Loader with Fork

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Truck Drivers
 *See per diem note on last page

						L&M	
A2105	Group IV, including:	44.02	12.48	13.64	1.20	0.10	71.44
	Grease Truck						
	Hydro Seeder, Dual Axle						
	Hyster Operators (handling bulk aggregate)						
	Loadmaster (air & water operations)						
	Lumber Carrier						
	Ready-mix, (up to & including 7 yards)						
	Rigger (air/water/oilfield)						
	Tireman, Light Duty						
	Track Truck Equipment						
	Truck Vacuum Sweeper						
	Warehouseperson						
	Water Truck (Below 250 Bbls)						
	Water Truck (straight)						
	Water Wagon, Semi						

						L&M	
A2106	Group V, including:	43.22	12.48	13.64	1.20	0.10	70.64
	Buffer Truck						
	Bull Lifts & Fork Lifts, Fork Lifts with Power Boom & Swing Attachments (up to & including 5 tons)						
	Bus Operator (up to 30 passengers)						
	Farm Type Rubber Tired Tractor (when material handling or pulling wagons on a construction project)						
	Flat Beds, Single Rear Axle						
	Foam Distributor Truck Single Axle						
	Fuel Handler (station/bulk attendant)						
	Gear/Supply Truck						
	Gravel Spreader Box Operator on Truck						
	Hydro Seeder, Single Axle						
	Pickups (pilot cars & all light-duty vehicles)						
	Rigger						
	Swamper						
	Tack Truck (welders/gear)						
	Team Drivers (horses, mules, & similar equipment)						

Tunnel Workers, Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)
 *See per diem note on last page

						L&M	LEG	
N2201	Group I, including:	39.60	9.55	21.16	1.65	0.30	0.20	72.46
	Brakeman							
	Mucker							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Tunnel Workers, Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)
 *See per diem note on last page

N2201	Group I, including:	39.60	9.55	21.16	1.65	0.30	0.20	72.46
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- Nipper
- Storm Water Pollution Protection Plan Worker (SWPPP Worker - erosion and sediment control Laborer)
- Topman & Bull Gang
- Tunnel Track Laborer

N2202	Group II, including:	40.70	9.55	21.16	1.65	0.30	0.20	73.56
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- Burning & Cutting Torch
- Certified Erosion Sediment Control Lead (CESCL Laborer)
- Concrete Laborer
- Floor Preparation, Core Drilling
- Jackhammer/Chipping Gun or Pavement Breaker
- Laser Instrument Operator
- Nozzlemen, Pumpcrete or Shotcrete
- Pipelayer Helper

N2203	Group III, including:	41.69	9.55	21.16	1.65	0.30	0.20	74.55
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- Miner
- Retimberman

N2204	Group IIIA, including:	45.96	9.55	21.16	1.65	0.30	0.20	78.82
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- Asphalt Raker, Asphalt Belly Dump Lay Down
- Drill Doctor (in the field)
- Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)
- Pioneer Drilling & Drilling Off Tugger (all type drills)
- Pipelayer
- Powderman (Employee Possessor)
- Storm Water Pollution Protection Plan Specialist (SWPPP Specialist)
- Traffic Control Supervisor, DOT Qualified

N2206	Group IIIB, including:	52.10	5.50	21.16	1.65	0.30	0.20	80.91
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- Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)(over 5,000 hours)
- Federal Powderman (Responsible Person in Charge)
- Grade Checking (setting or transferring of grade marks, line and grade, GPS, drones)
- Pioneer Drilling & Drilling Off Tugger (all type drills)(over 5,000 hours)
- Stake Hopper

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Tunnel Workers, Laborers (The area that is south of N63 latitude and west of W138 longitude)
 *See per diem note on last page

S2201	Group I, including:	39.60	9.55	21.16	1.65	L&M	LEG	72.46
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- Brakeman
- Mucker
- Nipper
- Storm Water Pollution Protection Plan Worker (SWPPP Worker - erosion and sediment control Laborer)
- Topman & Bull Gang
- Tunnel Track Laborer

S2202	Group II, including:	40.70	9.55	21.16	1.65	L&M	LEG	73.56
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- Burning & Cutting Torch
- Certified Erosion Sediment Control Lead (CESCL Laborer)
- Concrete Laborer
- Floor Preparation, Core Drilling
- Jackhammer/Chipping Gun or Pavement Breaker
- Laser Instrument Operator
- Nozzlemen, Pumpcrete or Shotcrete
- Pipelayer Helper

S2203	Group III, including:	41.69	9.55	21.16	1.65	L&M	LEG	74.55
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- Miner
- Retimberman

S2204	Group IIIA, including:	45.96	9.55	21.16	1.65	L&M	LEG	78.82
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- Asphalt Raker, Asphalt Belly Dump Lay Down
- Drill Doctor (in the field)
- Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)
- Pioneer Drilling & Drilling Off Tugger (all type drills)
- Pipelayer
- Powderman (Employee Possessor)
- Storm Water Pollution Protection Plan Specialist (SWPPP Specialist)
- Traffic Control Supervisor, DOT Qualified

S2206	Group IIIB, including:	52.10	5.50	21.16	1.65	L&M	LEG	80.91
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- Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)(over 5,000 hours)
- Federal Powderman (Responsible Person in Charge)
- Grade Checking (setting or transferring of grade marks, line and grade, GPS, drones)
- Pioneer Drilling & Drilling Off Tugger (all type drills)(over 5,000 hours)

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Tunnel Workers, Laborers (The area that is south of N63 latitude and west of W138 longitude)
 *See per diem note on last page

S2206	Group IIIB, including:	52.10	5.50	21.16	1.65		L&M	LEG	
	Stake Hopper						0.30	0.20	80.91

Tunnel Workers, Power Equipment Operators
 *See per diem note on last page

A2207	Group I	52.51	11.40	14.75	1.00		L&M		
							0.10	0.05	79.81
A2208	Group IA	54.60	11.40	14.75	1.00		L&M		
							0.10	0.05	81.90
A2209	Group II	51.60	11.40	14.75	1.00		L&M		
							0.10	0.05	78.90
A2210	Group III	50.74	11.40	14.75	1.00		L&M		
							0.10	0.05	78.04
A2211	Group IV	43.36	11.40	14.75	1.00		L&M		
							0.10	0.05	70.66

* Per diem is an established practice for this classification. This means that per diem is an allowable alternative to board and lodging if all criteria are met. See 8 AAC 30.051-08 AAC 30.056, and the per diem information on page vii of this Pamphlet.

** Work in combination of classifications: Employees working in any combination of classifications within the diving crew (working diver, standby diver, and tender) in a shift are paid in the classification with the highest rate for a minimum of 8 hours per shift.

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Shipyards Rates Addendum

This Addendum was developed to address the specialized industry of shipbuilding/repair in Alaska, as it relates to public works. For the purposes of providing rates for shipyard work the Department is adopting Shipyards rates from the state of Washington (King County). These rates only apply to work done in shipbuilding/repair in Alaska, under a public contract. This addendum will be updated two times a year to coincide with the corresponding Issue of *Laborers and Mechanics MINIMUM RATES OF PAY*.

Class Code	BHR H&W PEN TRN Other Benefits	THR
Shipyards Workers *See total hourly(THR) note below		
A2300	Ship Building/Repair Boilermaker	50.35
A2305	Ship Building/Repair Carpenter	50.95
A2310	Ship Building/Repair Crane Operator	45.06
A2315	Ship Building/Repair Electrician	50.42
A2320	Ship Building/Repair Heat & Frost Insulator	84.84
A2325	Ship Building/Repair Laborer	50.95
A2330	Ship Building/Repair Mechanist	50.95
A2335	Ship Building/Repair Operating Engineer	45.06
A2340	Ship Building/Repair Painter	50.95
A2345	Ship Building/Repair Pipefitter	50.95
A2350	Ship Building/Repair Rigger	50.35
A2355	Ship Building/Repair Sheet Metal	50.35
A2360	Ship Building/Repair Shipwright	50.95
A2365	Ship Building/Repair Warehouse	45.06

*The THR includes the base hourly rate (BHR) and fringe benefits. Employers must pay a BHR and fringe benefit package that adds up to the THR. Fringe benefits included in the THR can be paid to employees in three ways; paid into a union trust fund, into an approved benefit plan, or paid directly on the paycheck as gross wages.

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION VII

MINIMUM RATES OF PAY

B. Federal Wage Determination with Attachments

"General Decision Number: AK20240001 01/05/2024

Superseded General Decision Number: AK20230001

State: Alaska

Construction Types: Building and Heavy

Counties: Alaska Statewide.

BUILDING AND HEAVY CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number Publication Date
 0 01/05/2024

ASBE0007-006 02/27/2023

	Rates	Fringes
Asbestos Workers/Insulator (includes application of all insulating materials protective coverings, coatings and finishings to all types of mechanical systems).....	\$ 41.35	16.46
HAZARDOUS MATERIAL HANDLER (includes preparation, wetting, stripping, removal scrapping, vacuming, bagging, and disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....	\$ 37.38	19.55

BOIL0502-002 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 47.03	30.59

BRAK0001-002 07/01/2020

	Rates	Fringes
Bricklayer, Blocklayer, Stonemason, Marble Mason, Tile Setter, Terrazzo Worker.....	\$ 42.16	19.67
Tile & Terrazzo Finisher.....	\$ 35.99	19.67

CARP1281-001 09/01/2022

	Rates	Fringes
CARPENTER Including Lather and Drywall Hanging.....	\$ 43.34	28.86

CARP1281-002 09/01/2022

	Rates	Fringes
MILLWRIGHT.....	\$ 46.48	24.32

CARP2520-003 09/01/2022

	Rates	Fringes
Diver		
Stand-by.....	\$ 47.65	28.32
Tender.....	\$ 46.65	28.32
Working.....	\$ 87.45	28.32
Piledriver		
Piledriver; Skiff Operator and Rigger.....	\$ 38.34	26.51
Sheet Stabber.....	\$ 38.34	26.51
Welder.....	\$ 43.90	26.51

DEPTH PAY PREMIUM FOR DIVERS BELOW WATER SURFACE:

50-100 feet \$1.00 per foot
 101 feet and deeper \$2.00 per foot

ENCLOSURE PAY PREMIUM WITH NO VERTICAL ASCENT:
 5-50 FEET \$1.00 PER FOOT/DAY
 51-100 FEET \$2.00 PER FOOT/DAY
 101 FEET AND ABOVE \$3.00 PER FOOT/DAY

SATURATION DIVING:
 The standby rate applies until saturation starts. The saturation diving rate applies when divers are under pressure continuously until work task and decompression are complete. the diver rate shall be paid for all saturation hours.

WORK IN COMBINATION OF CLASSIFICATIONS:
 Employees working in any combination of classifications within the diving crew (except dive supervisor) in a shift are paid in the classification with the highest rate for that shift.

 ELEC1547-004 09/01/2023

	Rates	Fringes
CABLE SPLICER.....	\$ 46.44	3%+28.39
ELECTRICIAN.....	\$ 46.44	3%+28.39

 ELEC1547-005 04/01/2023

Line Construction

	Rates	Fringes
CABLE SPLICER.....	\$ 63.44	3%+31.90
Linemen (Including Equipment Operators, Technician).....	\$ 61.29	3%+30.98
Powderman.....	\$ 61.44	3%+32.69
TREE TRIMMER.....	\$ 40.71	3%+28.05

 ELEV0019-002 01/01/2023

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 65.83	37.335+a+b

FOOTNOTE: a. Employer contributes 8% of the basic hourly rate for over 5 year's service and 6% of the basic hourly rate for 6 months to 5 years' of service as vacation paid credit. b. Eight paid holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day; Friday after Thanksgiving, and Christmas Day

 ENGI0302-002 04/01/2023

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 47.74	27.20
GROUP 1A.....	\$ 49.64	27.20
GROUP 2.....	\$ 46.91	27.20
GROUP 3.....	\$ 46.13	27.20

GROUP 4.....	\$ 39.42	27.20
TUNNEL WORK		
GROUP 1.....	\$ 52.51	27.20
GROUP 1A.....	\$ 54.60	27.20
GROUP 2.....	\$ 51.60	27.20
GROUP 3.....	\$ 50.74	27.20
GROUP 4.....	\$ 43.36	27.20

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt Roller: Breakdown, Intermediate, and Finish; Back Filler; Barrier Machine (Zipper); Beltcrete with power pack and similar conveyors; Bending Machine; Boat Coxwains; Bulldozers; Cableways, Highlines and Cablecars; Cleaning Machine; Coating Machine; Concrete Hydro Blaster; Cranes-45 tons and under or 150 foot boom and under (including jib and attachments): (a) Hydralifts or Transporters, all track or truck type,(b) Derricks; Crushers; Deck Winches-Double Drum; Ditching or Trenching Machine (16 inch or over); Drilling Machines, core, cable, rotary and exploration; Finishing Machine Operator, Concrete Paving, Laser Screed, Sidewalk, Curb and Gutter Machine; Helicopters; Hover Craft, Flex Craft, Loadmaster, Air Cushion, All Terrain Vehicle, Rollagon, Bargecable, Nodwell, and Snow Cat; Hydro Ax: Feller Buncher and similar; Loaders (2 1/2 yards through 5 yards, including all attachments): Forklifts with telescopic boom and swing attachment, Overhead and front end, 2 1/2 yards through 5 yards, Loaders with forks or pipe clamps; Loaders, elevating belt type, Euclid and similar types; Mechanics, Bodyman; Micro Tunneling Machine; Mixers: Mobile type w/hoist combination; Motor Patrol Grader; Mucking Machines: Mole, Tunnel Drill, Horizontal/Directional Drill Operator, and/or Shield; Operator on Dredges; Piledriver Engineers, L. B. Foster, Puller or similar Paving Breaker; Power Plant, Turbine Operator, 200 k.w. and over (power plants or combination of power units over 300 k.w.); Scrapers-through 40 yards; Service Oiler/Service Engineer; Sidebooms-under 45 tons; Shot Blast Machine; Shovels, Backhoes, Excavators with all attachments, and Gradealls (3 yards and under), Spreaders, Blaw Knox, Cedarapids, Barber Greene, Slurry Machine; Sub-grader (Gurries, Reclaimer, and similar types); Tack tractor; Truck mounted Concrete Pumps, Conveyor, Creter; Water Kote Machine; Unlicensed off road hauler

GROUP 1A: Camera/Tool/Video Operator (Slipline), Cranes-over 45 tons or 150 foot (including jib and attachments): (a) Clamshells and Draglines (over 3 yards), (b) Tower cranes; Licensed Water/Waste Water Treatment Operator; Loaders over 5 yds.; Certified Welder, Electrical Mechanic, Camp Maintenance Engineer, Mechanic (over 10,000 hours); Motor Patrol Grader, Dozer, Grade Tractor, Roto-mill/Profiler (finish: when finishing to final grade and/or to hubs, or for asphalt); Power Plants: 1000 k.w. and over; Quad; Screed; Shovels, Backhoes, Excavators with all attachments (over 3 yards), Sidebooms over 45 tons; Slip Form Paver, C.M.I. and similar types; Scrapers over 40 yards;

GROUP 2: Boiler-fireman; Cement Hog and Concrete Pump Operator; Conveyors (except as listed in group 1); Hoist on steel erection; Towermobiles and Air Tuggers; Horizontal/Directional Drill Locator; Licensed Grade Technician; Loaders, (i.e., Elevating Grader and Material

Transfer Vehicle); Locomotives: rod and geared engines; Mixers; Screening, Washing Plant; Sideboom (cradling rock drill regardless of size); Skidder; Trenching Machine under 16 inches; Waste/ Waste Water Treatment Operator.

GROUP 3: ""A"" Frame Trucks, Deck Winches: single power drum; Bombardier (tack or tow rig); Boring Machine; Brooms-power; Bump Cutter; Compressor; Farm tractor; Forklift, industrial type; Gin Truck or Winch Truck with poles when used for hoisting; Grade Checker and Stake Hopper; Hoist, Air Tuggers, Elevators; Loaders: (a) Elevating-Athey, Barber Green and similar types (b) Forklifts or Lumber Carrier (on construction job site) (c) Forklifts with Tower (d) Overhead and Front-end, under 2 1/2 yds. Locomotives: Dinkey (air, steam, gas and electric) Speeders; Mechanics (light duty); Oil, Blower Distribution; Post Hole Diggers, mechanical; Pot Fireman (power agitated); Power Plant, Turbine Operator, under 200 k.w.; Pumps-water; Roller-other than Plantmix; Saws, concrete; Skid Steer with all attachments; Straightening Machine; Tow Tractor

GROUP 4: Rig Oiler/Crane Assistant Engineer; Parts and Equipment Coordinator; Swamper (on trenching machines or shovel type equipment); Spotter; Steam Cleaner; Drill Helper.

FOOTNOTE: Groups 1-4 receive 10% premium while performing tunnel or underground work. Rig Oiler/Crane Assistant Engineer shall be required on cranes over 85 tons or over 100 feet of boom.

IRON0751-003 07/01/2023

	Rates	Fringes
IRONWORKER		
BENDER OPERATOR.....	\$ 42.99	37.38
BRIDGE, STRUCTURAL, ORNAMENTAL, REINFORCING MACHINERY MOVER, RIGGER, SHEETER, STAGE RIGGER, BENDER OPERATOR.....	\$ 42.99	37.38
FENCE, BARRIER INSTALLER....	\$ 39.49	37.38
GUARDRAIL INSTALLERS.....	\$ 40.49	37.38
GUARDRAIL LAYOUT MAN.....	\$ 40.23	37.38
HELICOPTER, TOWER.....	\$ 43.99	37.38

LAB00341-001 04/01/2023

	Rates	Fringes
LABORER (South of the 63rd Parallel & West of Longitude 138 Degrees)		
GROUP 1.....	\$ 36.00	32.56
GROUP 2.....	\$ 37.00	32.56
GROUP 3.....	\$ 37.90	32.56
GROUP 3A.....	\$ 41.78	32.56
GROUP 3B.....	\$ 47.36	28.51
GROUP 4.....	\$ 25.57	32.56
TUNNELS, SHAFTS, AND RAISES		
GROUP 1.....	\$ 39.60	32.56
GROUP 2.....	\$ 40.70	32.56
GROUP 3.....	\$ 41.69	32.56

GROUP 3A.....	\$ 45.96	32.56
GROUP 3B.....	\$ 52.10	28.51

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer (curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds); Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree toppler; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transferring of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transferring of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

LAB00942-001 04/01/2023

	Rates	Fringes
Laborers: North of the 63rd Parallel & East of Longitude 138 Degrees		
GROUP 1.....	\$ 36.00	32.56
GROUP 2.....	\$ 37.00	32.56
GROUP 3.....	\$ 37.90	32.56
GROUP 3A.....	\$ 41.78	32.56
GROUP 3B.....	\$ 47.36	28.51
GROUP 4.....	\$ 25.57	32.56
TUNNELS, SHAFTS, AND RAISES		
GROUP 1.....	\$ 39.60	32.56
GROUP 2.....	\$ 40.70	32.56
GROUP 3.....	\$ 41.69	32.56
GROUP 3A.....	\$ 45.96	32.56
GROUP 3B.....	\$ 52.10	32.56

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer (curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer

operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transferring of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transferring of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

PAIN1959-001 07/01/2022

NORTH OF THE 63RD PARALLEL

Rates Fringes

PAINTER

BRUSH/ROLLER PAINT OR WALL COVERER.....	\$ 36.08	25.45
TAPING, TEXTURING, STRUCTURAL PAINTING, SANDBLASTING, POT TENDER, FINISH METAL, SPRAY, BUFFER OPERATOR, RADON MITIGATION, LEAD BASED PAINT ABATEMENT, HAZARDOUS		

MATERIAL HANDLER.....\$ 36.60 25.45

PAIN1959-002 12/01/2021

SOUTH OF THE 63RD PARALLEL

Rates Fringes

PAINTER

General Painter.....\$ 32.64 25.95

Industrial Painter.....\$ 32.74 25.95

Taper / Paper & Vinyl

Hanger.....\$ 32.64 25.95

PAIN1959-003 12/01/2021

NORTH OF THE 63RD PARALLEL

Rates Fringes

GLAZIER.....\$ 41.16 28.16

PAIN1959-004 07/01/2019

Rates Fringes

FLOOR LAYER: Carpet.....\$ 28.75 14.44

PAIN1959-006 12/01/2021

SOUTH OF THE 63RD PARALLEL

Rates Fringes

GLAZIER.....\$ 41.37 27.25

PLAS0528-006 04/01/2023

Rates Fringes

PLASTERER

North of the 63rd parallel..\$ 44.43 22.13

South of the 63rd parallel..\$ 44.43 22.13

PLAS0528-007 04/01/2023

Rates Fringes

CEMENT MASON/CONCRETE FINISHER

North of the 63rd parallel..\$ 44.43 22.13

South of the 63rd parallel..\$ 44.43 22.13

PLUM0262-002 01/01/2023

East of the 141st Meridian

Rates Fringes

Plumber; Steamfitter.....\$ 41.50 27.62

PLUM0367-002 07/01/2021

South of the 63rd Parallel

Rates Fringes

Plumber; Steamfitter.....\$ 41.00 27.95

PLUM0375-002 07/01/2023

North of the 63rd Parallel

Rates Fringes

Plumber; Steamfitter.....\$ 46.86 32.50

PLUM0669-002 04/01/2023

Rates Fringes

SPRINKLER FITTER.....\$ 54.01 30.22

ROOF0189-006 04/01/2023

Rates Fringes

ROOFER.....\$ 47.62 18.53

SHEE0023-003 07/01/2023

South of the 63rd Parallel

Rates Fringes

SHEET METAL WORKER.....\$ 47.05 29.41

SHEE0023-004 07/01/2023

North of the 63rd Parallel

Rates Fringes

SHEET METAL WORKER.....\$ 51.93 30.16

TEAM0959-003 04/01/2023

Rates Fringes

TRUCK DRIVER
GROUP 1.....\$ 46.84 24.33
GROUP 1A.....\$ 48.19 24.33
GROUP 2.....\$ 45.51 24.33
GROUP 3.....\$ 44.64 24.33
GROUP 4.....\$ 44.02 24.33
GROUP 5.....\$ 43.22 24.33

GROUP 1: Semi with Double Box Mixer; Dump Trucks (including rockbuggy and trucks with pups) over 40 yards up to and including 60 yards; Deltas, Commanders, Rollogans and similar equipment when pulling sleds, trailers or similar equipment; Boat Coxswain; Lowboys including attached trailers and jeeps, up to and including 12 axles; Ready-mix over 12 yards up to and including 15 yards); Water Wagon (250 Bbls and above); Tireman, Heavy Duty/Fueler

GROUP 1A: Dump Trucks (including Rockbuggy and Trucks with pups) over 60 yards up to and including 100 yards; Jeeps (driver under load)

GROUP 2: Turn-O-Wagon or DW-10 not self-loading; All Deltas,

Commanders, Rollogans, and similar equipment; Mechanics; Dump Trucks (including Rockbuggy and Trucks with pups) over 20 yards up to and including 40 yards; Lowboys including attached trailers and jeeps up to and including 8 axles; Super vac truck/cacasco truck/heat stress truck; Ready-mix over 7 yards up to and including 12 yards; Partsman; Stringing Truck

GROUP 3: Dump Trucks (including Rockbuggy and Trucks with pups) over 10 yards up to and including 20 yards; batch trucks 8 yards and up; Oil distributor drivers; Oil Distributor Drivers; Trucks/Jeeps (push or pull); Traffic Control Technician

GROUP 4: Buggymobile; Semi or Truck and trailer; Dumpster; Tireman (light duty); Dump Trucks (including Rockbuggy and Truck with pups) up to and including 10 yards; Track Truck Equipment; Grease Truck; Flat Beds, dual rear axle; Hyster Operators (handling bulk aggregate); Lumber Carrier; Water Wagon, semi; Water Truck, dual axle; Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted "A" Frame manufactured rating over 5 tons; Bull Lifts and Fork Lifts with Power Boom and Swing attachments, over 5 tons; Front End Loader with Forks; Bus Operator over 30 passengers; All Terrain Vehicles; Boom Truck/Knuckle Truck over 5 tons; Foam Distributor Truck/dual axle; Hydro-seeders, dual axle; Vacuum Trucks, Truck Vacuum Sweepers; Loadmaster (air and water); Air Cushion or similar type vehicle; Fire Truck/Ambulance Driver; Combination Truck-fuel and grease; Compactor (when pulled by rubber tired equipment); Rigger (air/water/oilfield); Ready Mix, up to and including 7 yards;

GROUP 5: Gravel Spreader Box Operator on Truck; Flat Beds, single rear axle; Boom Truck/Knuckle Truck up to and including 5 tons; Pickups (Pilot Cars and all light duty vehicles); Water Wagon (Below 250 Bbls); Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted "A" Frame, manufactured rating 5 tons and under; Bull Lifts and Fork Lifts (fork lifts with power broom and swing attachments up to and including 5 tons); Buffer Truck; Tack Truck; Farm type Rubber Tired Tractor (when material handling or pulling wagons on a construction project); Foam Distributor, single axle; Hydro-Seeders, single axle; Team Drivers (horses, mules and similar equipment); Fuel Handler (station/bulk attendant); Batch Truck, up to and including 7 yards; Gear/Supply Truck; Bus Operator, Up to 30 Passengers; Rigger/Swamper

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including

preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material,

etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION"

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION VIII

EEO CONTRACT COMPLIANCE SPECIFICATIONS

DISADVANTAGE BUSINESS ENTERPRISE OVERVIEW

EQUAL EMPLOYMENT OPPORTUNITY STATEMENT OF ACKNOWLEDGEMENT

**DISADVANTAGE BUSINESS ENTERPRISES (MINORITY AND WOMEN-OWNED
BUSINESS ENTERPRISES) COMPLIANCE STATEMENT**

**STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALASKA CLEAN WATER FUND & ALASKA DRINKING WATER FUND**

**DISADVANTAGE BUSINESS ENTERPRISES
OVERVIEW**

The loan recipient, consultant and contractor of an Alaska Clean Water or Drinking Water Fund revolving loan project are required to comply with EPA regulations (40 CFR Part 33) concerning the use of disadvantage owned businesses enterprises (DBE). Also required is compliance with EEO/Affirmative Action Regulations of the Department of Labor (see attached Statement of Acknowledgement). These regulations help ensure that economic opportunities are available to all people of this country.

The expenditure of Federal funds must reflect equal opportunity, anti-discrimination provisions of the 1964 Civil Rights Act, affirmative action and DBE or more specifically small, minority and women-owned businesses utilization under EPA's DBE program. Utilization may be through prime contracting, subcontracting, joint-venture, procurement of supplies, material or equipment, or other business participation utilized in completing a project. For all situations, contractors must take necessary and reasonable steps to ensure DBE's have the maximum opportunity to compete for and/or perform contracts. Contractors shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of projects where assistance is provided from an ADEC revolving loan fund program.

NOTE: On March 26, 2008, the Environmental Protection Agency (EPA) Office of Small Business Programs (OSBP) published its final rule, "Participation by Disadvantaged Business Enterprises in Procurement under Environmental Protection Agency Financial Assistance Agreements (DBE Rule) in the Federal Register (40 CFR part 30-40). The final rule took effect on May 25, 2008." The EPA DBE Program encompasses many of the components of the former MBE/WBE Program and also includes changes.

Some changes are:

- Creation of the Disadvantaged Business Enterprise (DBE) Program (formerly the Minority Business Enterprise/Women's Business Enterprise (MBE/WBE) Program).
- Recipients receiving a total of \$250K or less in financial assistance in a given fiscal year are exempt from this requirement.
- The "Six Affirmative Steps" and "Six Positive Efforts" were combined into the "Six Good Faith Efforts."
- A recipient must require its prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient.
- The loan recipient must be notified in writing by its prime contractor prior to any termination of a DBE subcontractor.

- If a DBE subcontractor fails to complete work under the subcontract for any reason, the prime contractor must use the Six Good Faith Efforts in selecting a replacement subcontractor.
- The prime contractor must employ the Six Good Faith Efforts even if the prime has achieved its Fair Share Objectives.
- Recipients who reported quarterly under the old MBE/WBE program will report semi-annually. [Note – this has been recently updated to now only require annual reporting.]
- MBE's and WBE's can no longer self-certify. They must be certified by EPA, Small Business Administration (SBA), Department of Transportation (DOT) or by state, local, Tribal or private entities whose certification criteria match EPA's. (MBEs and WBEs must be certified in order to be counted toward a recipient's MBE/WBE accomplishments.) The new requirements affect all financial assistance agreements entered into from the effective date of the rule (May 25, 2008). The new DBE rule won't affect those financial assistance agreements entered into before May 25, 2008; those will still operate under the old MBE/WBE program requirements.

SUMMARY OF GOALS

Stated simply, in meeting DBE goals under this program, the prime contractor must either 1) achieve the goal of contracting to Minority or Women-Owned Enterprises (MBE/WBE), or 2) follow the proper procedures in thoroughly documenting good faith efforts to achieve MBE/WBE goal participation. A prime contractor who is an MBE/WBE firm can also be counted towards the goal. (see attached current participation goals for the Department)

REQUIREMENTS

A. Definitions

- Disadvantaged Business Enterprise – Per EPA requirements for projects funded under the Alaska Drinking Water Fund and Alaska Clean Water Fund loan programs, Disadvantage Business Enterprises only include entities owned and/or controlled by socially and economically disadvantaged individuals (as described in 42 USC 7601 and 42 USC 4370d) – which includes Women's Business Enterprises (WBE) and Minority Business Enterprises (MBE). (for more information go to: <http://www.epa.gov/osbp/grants.htm>)
- Minority Business Enterprise or Women Owned Business Enterprise – means a small business concern which is owned and controlled by one or more minorities or women. Owned and controlled means a business:
 1. Which is at least 51 percent owned by one or more minorities or women, or in the case of a publicly owned business, at least 51% of the stock is owned by one or more minorities or women;

2. Whose management and daily business operations are controlled by one or more such individuals.

- Socially Disadvantaged Individual – means a person who is a citizen or lawful permanent resident of the United States and who is:
 - Black;
 - Hispanic;
 - Portuguese;
 - Asian American;
 - American Indian and Alaskan Native; and
 - Members of other groups, or other individuals, found to be economically and socially disadvantaged by the United States Small Business Administration under section 8(a) of the federal Small Business Act.
- Economically Disadvantaged Individual – those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital or credit opportunities, as compared to others in the same business area who are not socially disadvantaged.

B. Implementation for DBE Procurement

As part of ADEC’s capitalization grants for both the ADWF and ACWF loan programs, the programs have an overall Fair Share (or utilization goal) objective of 3.26% for MBE entities and 1.48% for WBE entities for construction only (effective October 1, 2019 – September 30, 2022). The loan recipient, engineering firm responsible for construction phase services, and prime contractor are required to adopt this same fair objective. The fair share objective is not a quota, EPA cannot penalize ADEC, the loan recipient, engineering firm, of the prime contractor for not meeting MBE or WBE participation objectives.

The prime contractor and consulting engineer responsible for construction phase services are required to make the good faith efforts and apply necessary administrative requirements. If the good faith efforts are not made when subcontracts are considered for the prime construction contract or for engineering construction phase services, the ability of ADEC to fund the project, or portion thereof, may be jeopardized.

C. How to Count DBE (MBE/WBE) Goals

The proposed MBE/WBE firms to be used must be declared by the Bidder before contract award. The MBE/WBE may act as a prime contractor, subcontractor, joint venture partner, or supplier. To be counted toward a goal, the MBE/WBE must perform a commercially useful function. To calculate the minimum dollar value for MBE/WBE participation, multiply the total estimated contract price (including additives or alternates, if any) by the goal percentage.

D. How to Obtain DBE (MBE/WBE) Participation

Prior to the scheduled pre-bid conference, solicit MBE/WBE participation to meet the goal. By contract award, the Bidder must either meet the goal or have made good faith efforts to do so. Good faith efforts include, but are not limited to the following:

1. Including qualified small, minority and women's business enterprises on solicitation lists.
2. Assuring that small, minority and women's businesses are solicited. If the MBE/WBE is only certified as a DBE, such as through the Alaska Department of Transportation, and the bidder has exhausted all efforts to determine the subcontractor MBE/WBE status, the bidder may document either category of certification to meet goal objectives.
3. Dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority and women's businesses.
4. Establish delivery schedules, where requirements of the work permit, which will encourage participation by small, minority and women's businesses.
5. Using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce, as appropriate.
6. If the prime contractor or proposer awards subcontracts/procurements, require the subcontractor to take the affirmative steps 1 through 5 above.

E. How to Credit DBE (MBE/WBE) Participation

If the Bidder's firm is a qualified Minority or Women-Owned Business Enterprise, credit will be given for the portion of the contract for which the Bidder performs a commercially useful function, and for that portion that is subcontracted to other MBE/WBE firms. For example, a MBE/WBE prime contractor proposes to perform 60% of a project quoted at \$500,000, and subcontracts 20% to a majority firm and the remaining 20% to another MBE/WBE. This means the credited MBE/WBE participation will be 80% for the project (60% + 20%) or \$400,000.

F. The DBE (MBE/WBE) Reporting Package

To meet the MBE/WBE reporting requirements of the program, the following forms need to be submitted during the course of bidding, contract award, and administration of this project:

1. COMPLIANCE STATEMENT - acknowledges the MBE/WBE requirement by the bidder. It must be provided with the bid.
2. REPORT OF PARTICIPATION – documents the level of anticipated MBE/WBE participation. It is submitted after bid opening, but before contract award.
3. CONTACT DOCUMENTATION – documents the efforts taken to attain the MBE/WBE goals and it, or other documentation should be submitted with the Report of Participation if the bidder did not meet the established goal.
4. CONTRACT & PROCUREMENT ANNUAL REPORT – documents the actual MBE/WBE contracts executed by the Prime Contractor and submitted to the Community. In the first week of October each year (reporting period, Oct – Sep), the Community will submit a listing of the executed contracts (for the previous reporting period) through

ADEC's State Revolving Fund Program online reporting form "SRF loan – MBE/WBE Utilization Form" under the OASys "Reports" tab at the following link:

<https://dec.alaska.gov/Applications/Water/OASys/ValidationInfo.aspx>

G. Create and Maintain a Bidders List

Any entity that receives an ACWF or ADWF SRF loan is required to create and maintain a bidders list if the loan recipient is subject to, or chooses to follow, competitive bidding requirements. **The list must include all firms that bid or quote on prime contracts, or bid or quote subcontracts, including both MBE/WBEs and non-MBE/WBEs** and must be maintained until the end of the project.

H. DBE Anti-Discrimination Contract Clause

Under 40 CFR part 33, Appendix A, the following statement must be included in **every contract** issued by an ACWF/ADWF borrower to a prime contractor. The statement cannot be changed, modified, or altered in any way.

"The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies."

**STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

**EQUAL EMPLOYMENT OPPORTUNITY
STATEMENT OF ACKNOWLEDGEMENT**

This statement of acknowledgement is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b)(1)) and must be completed by each Bidder and proposed Subcontractor participating in this contract.

PLEASE CHECK THE APPROPRIATE BOXES

THE Bidder proposed Subcontractor hereby **CERTIFIES:**

PART A. Bidders and proposed subcontractors with 50 or more employees and a federal contract amounting to \$50,000 or more are required to submit one federal Standard Report Form 100 during each year the two conditions (50 employees and a \$50,000 federal contract) exist.

The company named below (Part C) is exempt from the requirements of submitting the Standard Report Form 100 this year.

NO (go to PART B) YES (go to PART C)

PART B. The company named below (Part C) has submitted the Standard Report Form 100 this year, or intends to at this time.

NO YES

NOTE: Bidders and proposed Subcontractors who file Standard Report Form 100 may also be required to file Form CC-257 Monthly Employment Utilization Report if the project has significant financial impact on a community, or the bidder/subcontractor has signed an agreement to do so. At a minimum, the bidder/subcontractor is required to maintain records which reflect the reporting requirements of CC-257. Standard Report Form 100 and instructions may be obtained by writing to:

EEO-1 Joint Reporting Committee
P.O. Box 19100
Washington, DC 20036-9100
Telephone (866) 286-6440
Email: el.techassistance@eoc.gov

PART C.

Signature of Authorized Representative of Company

Date

Name of Company

(_____)_____
Telephone No.

Address of Company

Zip Code

Project Name

Contract Number

- Joint Reporting Committee
- Equal Employment Opportunity Commission
 - Office of Federal Contract Compliance Programs (Labor)

EQUAL EMPLOYMENT OPPORTUNITY

EMPLOYER INFORMATION REPORT EEO-1

Standard Form 100
REV. 01/2006

O.M.B. No. 3045-0007
EXPIRES 01/2009
100-214

Section A—TYPE OF REPORT

Refer to instructions for number and types of reports to be filed.

1. Indicate by marking in the appropriate box the type of reporting unit for which this copy of the form is submitted (MARK ONLY ONE BOX).

(1) Single-establishment Employer Report

Multi-establishment Employer:

(2) Consolidated Report (Required)

(3) Headquarters Unit Report (Required)

(4) Individual Establishment Report (submit one for each establishment with 50 or more employees)

(5) Special Report

2. Total number of reports being filed by this Company (Answer on Consolidated Report only) _____

Section B—COMPANY IDENTIFICATION (To be answered by all employers)

1. Parent Company

OFFICE
USE
ONLY

a. Name of parent company (owns or controls establishment in item 2) omit if same as label

a.

Address (Number and street)

b.

City or town

State

ZIP code

c.

2. Establishment for which this report is filed. (Omit if same as label)

a. Name of establishment

d.

Address (Number and street)

City or Town

County

State

ZIP code

e.

b. Employer identification No. (IRS 9-DIGIT TAX NUMBER)

f.

c. Was an EEO-1 report filed for this establishment last year? Yes No

Section C—EMPLOYERS WHO ARE REQUIRED TO FILE (To be answered by all employers)

Yes No 1. Does the entire company have at least 100 employees in the payroll period for which you are reporting?

Yes No 2. Is your company affiliated through common ownership and/or centralized management with other entities in an enterprise with a total employment of 100 or more?

Yes No 3. Does the company or any of its establishments (a) have 50 or more employees AND (b) is not exempt as provided by 41 CFR 60-1.5, AND either (1) is a prime government contractor or first-tier subcontractor, and has a contract, subcontract, or purchase order amounting to \$50,000 or more, or (2) serves as a depository of Government funds in any amount or is a financial institution which is an issuing and paying agent for U.S. Savings Bonds and Savings Notes?

If the response to question C-3 is yes, please enter your Dun and Bradstreet identification number (if you have one):

NOTE: If the answer is yes to questions 1, 2, or 3, complete the entire form, otherwise skip to Section G.

Section D-EMPLOYMENT DATA

Employment at this establishment - Report all permanent full- and part-time employees including apprentices and on-the-job trainees unless specifically excluded as set forth in the instructions. Enter the appropriate figures on all lines and in all columns. Blank spaces will be considered as zeros.

Job Categories	Number of Employees (Report employees in only one category)														
	Race/Ethnicity														
	Hispanic or Latino		Not-Hispanic or Latino												Total Col A - N
	Male	Female	Male						Female						
White			Black or African American	Native Hawaiian or Other Pacific Islander	Asian	American Indian or Alaska Native	Two or more races	White	Black or African American	Native Hawaiian or Other Pacific Islander	Asian	American Indian or Alaska Native	Two or more races		
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
Executive/Senior Level Officials and Managers 1.1															
First/Mid-Level Officials and Managers 1.2															
Professionals 2															
Technicians 3															
Sales Workers 4															
Administrative Support Workers 5															
Craft Workers 6															
Operatives 7															
Laborers and Helpers 8															
Service Workers 9															
TOTAL 10															
PREVIOUS YEAR TOTAL 11															

1. Date(s) of payroll period used: _____ (Omit on the Consolidated Report.)

Section E - ESTABLISHMENT INFORMATION (Omit on the Consolidated Report.)

1. What is the major activity of this establishment? (Be specific, i.e., manufacturing steel castings, retail grocer, wholesale plumbing supplies, title insurance, etc. Include the specific type of product or type of service provided, as well as the principal business or industrial activity.)

Section F - REMARKS

Use this item to give any identification data appearing on the last EEO-1 report which differs from that given above, explain major changes in composition of reporting units and other pertinent information.

Section G - CERTIFICATION

Check 1 All reports are accurate and were prepared in accordance with the instructions. (Check on Consolidated Report only.)
 one 2 This report is accurate and was prepared in accordance with the instructions.

Name of Certifying Official	Title	Signature	Date
Name of person to contact regarding this report	Title	Address (Number and Street)	
City and State	Zip Code	Telephone No. (including Area Code and Extension)	Email Address

All reports and information obtained from individual reports will be kept confidential as required by Section 709(e) of Title VII. WILLFULLY FALSE STATEMENTS ON THIS REPORT ARE PUNISHABLE BY LAW, U.S. CODE, TITLE 18, SECTION 1001

**STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

**DISADVANTAGE BUSINESS ENTERPRISES
(MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES)
COMPLIANCE STATEMENT**

To be eligible for award of this contract, the bidder/proposer must execute and submit, as part of his or her bid proposal, this statement relating to Disadvantage Business Enterprises (Minority and Woman-Owned Business Enterprises). This statement shall be deemed a material factor in the City's evaluation of this bid proposal. Failure to complete and submit this statement, or the inclusion of a false statement, shall render the bid proposal non-responsive.

The _____ (Company Name) acknowledges that Minority/Woman-Owned Business Enterprises (MBE/WBE) goal of 4.74% participation (with a good faith effort of 3.26% MBE and 1.48% WBE, Effective October 1, 2019 thru September 30, 2022) has been established for this contract, and hereby assures that it will meet the goal or provide documentation to show that the mandatory good faith efforts have been made.

The undersigned certifies that this bidder/proposer is aware of and will comply with MBE/WBE goals of this project and all applicable federal and state statutes and regulations concerning Disadvantage Business Enterprises (Minority and Woman-owned Business Enterprises).

We certify that should we be declared successful bidder/best proposer we shall submit such data as required for award of the contract within the time limits set forth in the contract specifications unless otherwise specified. In addition, we acknowledge that Minority/Woman-Owned Business Enterprises Contract and Procurement Reports will be submitted to the City for each half year of active construction.

We understand that if we are the successful bidder/best proposer and we fail to meet the MBE and/or WBE goals, or fail to demonstrate that we have made the required good faith effort the City can render the bid proposal non-responsive.

Company Name _____ RFP/Contract _____

Authorized Signature _____

Title _____

**STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

**DISADVANTAGE BUSINESS ENTERPRISES
(MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES)
REPORT OF PARTICIPATION**

Project Name _____ RFP/Contract No. _____

Company Name _____ Prepared By _____

The successful bidder/proposer must complete and submit this form after bid time, but prior to contract award. Please list below the name and address of each DBE (MBE/ WBE) subcontractor who will perform work under this contract, along with the contracted amount that will be applicable to the goal. Indicate whether the firm is MBE or WBE, and include your own firm if MBE/WBE eligible. A proposal submitted without adequate MBE/WBE participation or showing of good faith efforts to achieve such participation can render the bid proposal non-responsive. One copy of each executed MBE/WBE subcontract must be provided to the City by the successful prime contractor. Any changes to the list below must have prior approval by the City. Please note, if the MBE/WBE is only certified as a DBE, such as through the Alaska Department of Transportation, and the bidder has exhausted all efforts to determine the subcontractor MBE/WBE status, the bidder may document either category of certification to meet goal objectives.

Firm Name	AK Contractor's License No.	Contact Name & Phone No.	Type of Work	Contract Amount	MBE/WBE
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____
_____	_____	_____	_____	\$ _____	_____

Contract(s) Total: \$ _____ MBE/WBE Goal: _____ % Achieved: _____ % = \$ _____

Authorized Representative's Signature _____ Date _____

**STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DISADVANTAGE BUSINESS ENTERPRISES
(MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES)
CONTACT DOCUMENTATION**

Project Name _____ **RFP/Contract No.** _____

Company Name _____ **Authorized Signature/Title** _____

This form is provided for your convenience to document your efforts in meeting DBE (MBE/WBE) utilization goals. You may use additional sheets if needed. If you do not meet the MBE/WBE goal, you may return this form, or other supporting documentation (explanations, advertising notices, solicitations, etc.) with your MBE/WBE Report of Participation.

Firm _____ **MBE** _____ **WBE** _____
Address _____

Type of Work _____ **Bid Amount \$** _____
Dates of Contact _____
Method of Contact _____
Contact's Name _____
Results of Contact _____
If rejected, why _____

Firm _____ **MBE** _____ **WBE** _____
Address _____

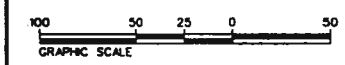
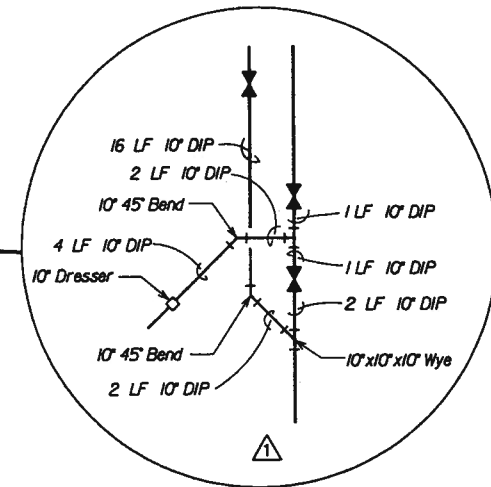
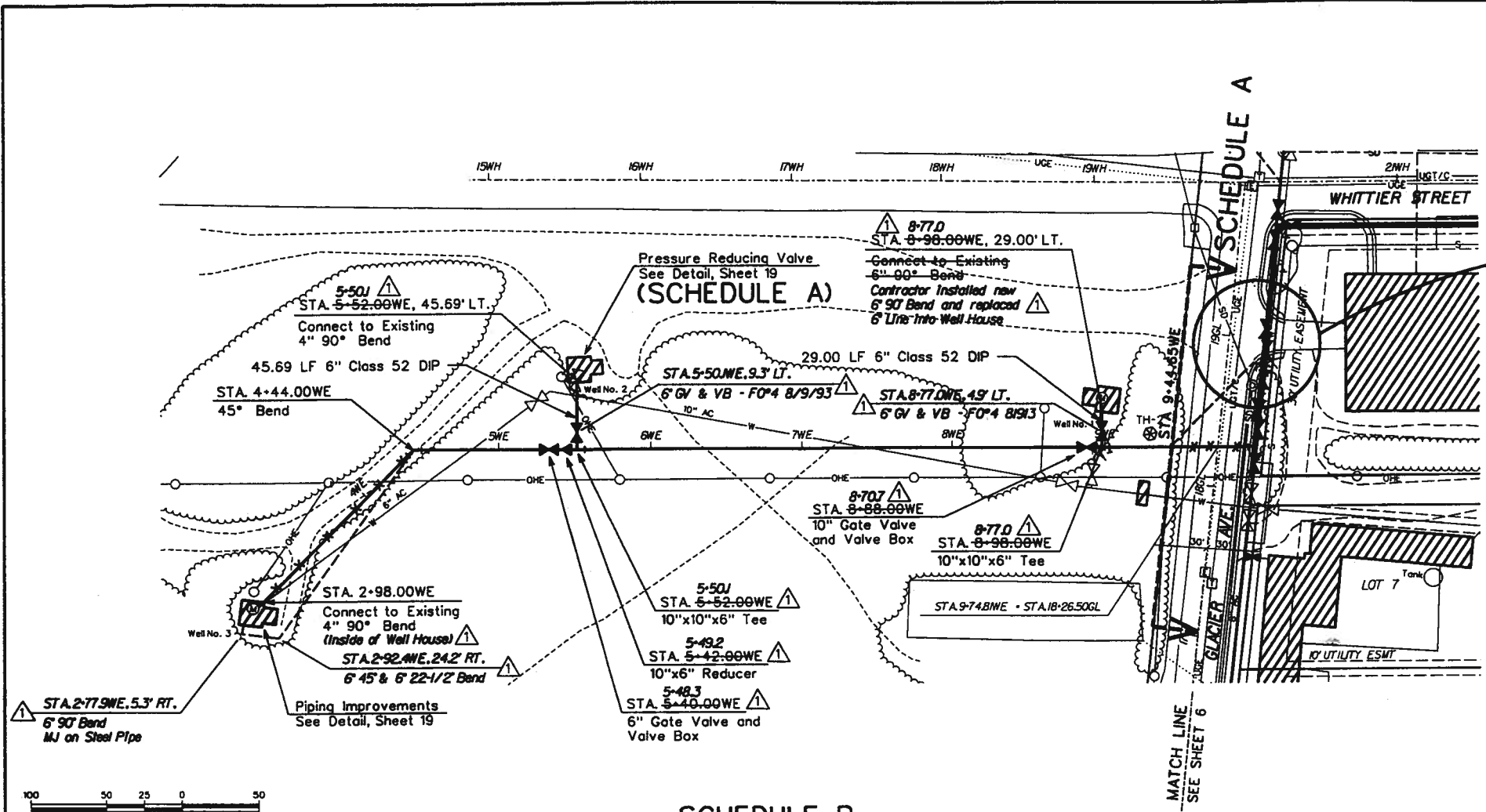
Type of Work _____ **Bid Amount \$** _____
Dates of Contact _____
Method of Contact _____
Contact's Name _____
Results of Contact _____
If rejected, why _____

Firm _____ **MBE** _____ **WBE** _____
Address _____

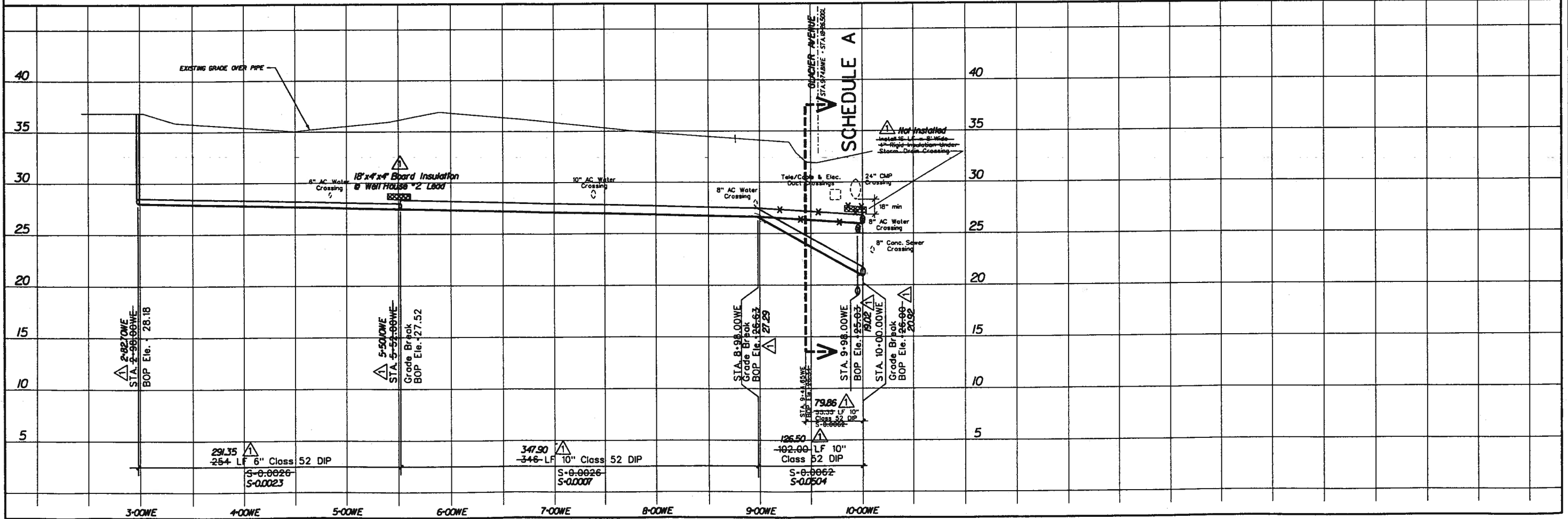
Type of Work _____ **Bid Amount \$** _____
Dates of Contact _____
Method of Contact _____
Contact's Name _____
Results of Contact _____
If rejected, why _____

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

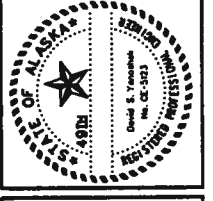
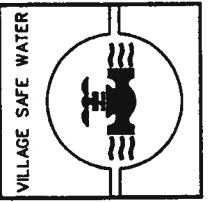
SECTION IX
RECORD DRAWINGS



SCHEDULE B



RECORD DRAWING CERTIFICATE
 THESE DRAWINGS REFLECT RECORDED INFORMATION OBTAINED DURING CONSTRUCTION. INFORMATION PROVIDED HEREIN IS ACCURATE TO THE BEST OF MY KNOWLEDGE.
 STATE OF ALABAMA
 REGISTERED PROFESSIONAL ENGINEER
 No. 15183
 Date: 11/18/93
 NAME: _____ DATE: _____



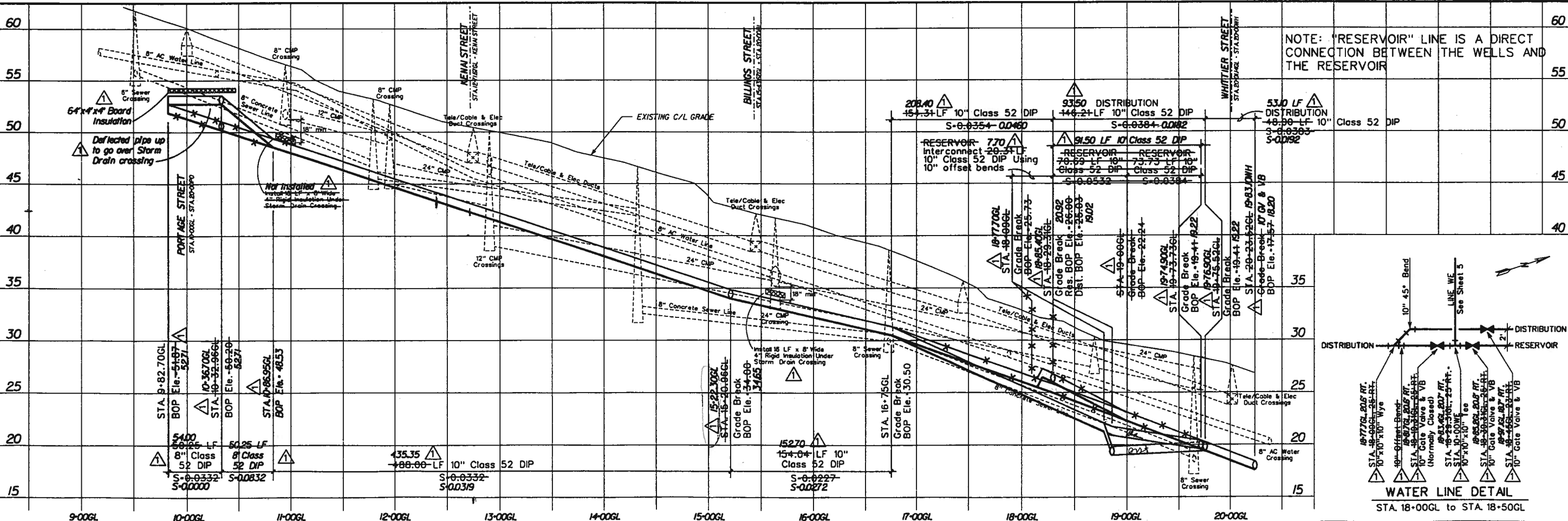
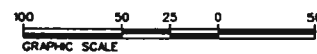
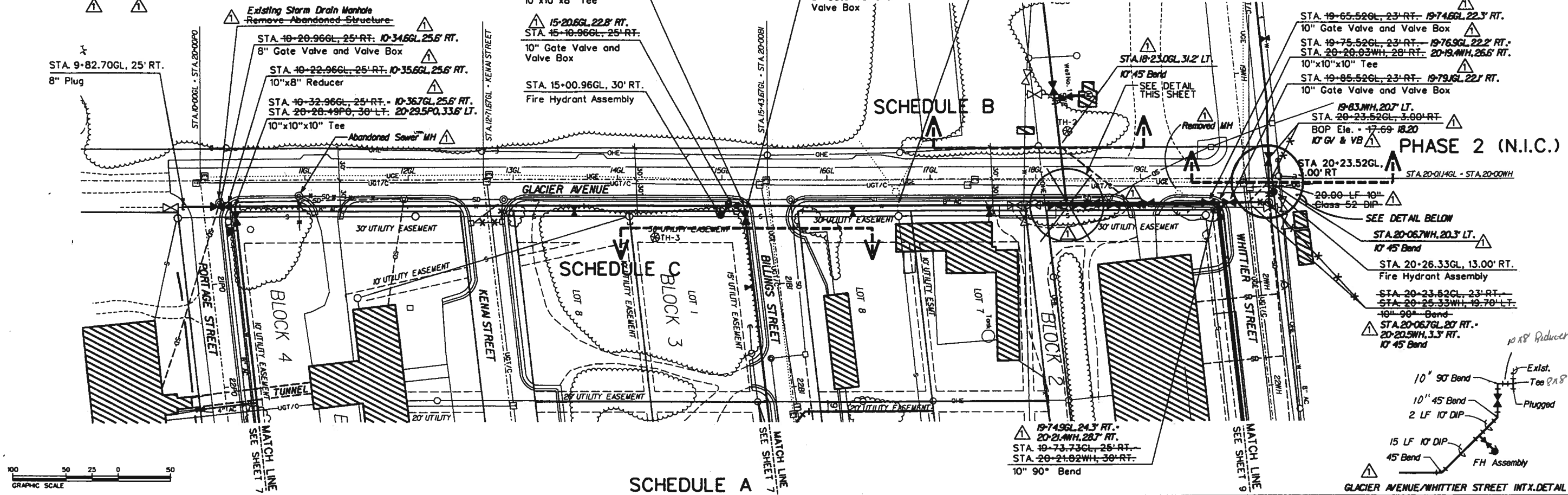
SR
 engineering group
 3800 ARCTIC BLVD. SUITE 203
 MOBILE, ALABAMA 36688
 PHONE: (907) 542-3332
 FAX: (907) 541-2373

WHITTIER IMPROVEMENTS
 PHASE 1
 WATER WELLS
 STA 2-98WE - STA 10-00WE

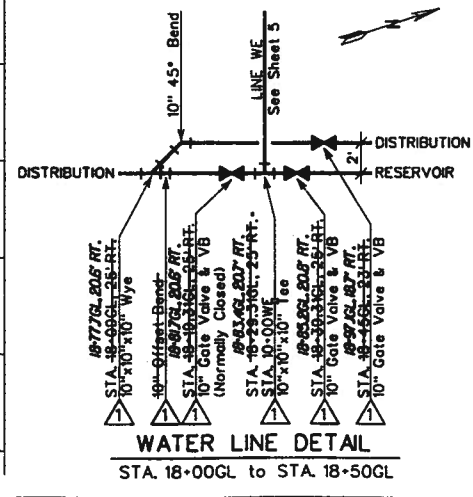
REVISION	BY	DATE
ISSUED FOR BID	D.Y.	11/18/93
PHASE 1 AS-BUILT	D.Y.	10/21/93

Project No. 9089
 Date APRIL 1993
 Designed D.Y.
 Drawn B.P./P.B.
 Approved W.V.H.

WATER SERVICE SCHEDULE						
LOT	BLOCK	STATION	OFFSET	SIZE	LENGTH	COMMENTS
8	3	13+58GL	R	?	5'	N.I.C.
8	2	16+25GL	R	?	5'	N.I.C.
7	2	17+63GL	29.2' RT.	1"	5'	Whittier Self Storage



NOTE: "RESERVOIR" LINE IS A DIRECT CONNECTION BETWEEN THE WELLS AND THE RESERVOIR



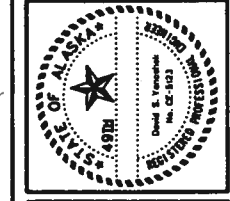
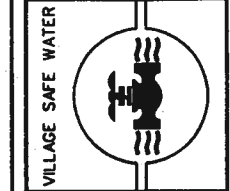
RECORD DRAWING CERTIFICATE

THESE DRAWINGS REFLECT RECORDED INFORMATION OBTAINED DURING CONSTRUCTION. INFORMATION PROVIDED HEREIN IS ACCURATE TO THE BEST OF MY KNOWLEDGE.

STATE OF ALASKA REGISTERED PROFESSIONAL ENGINEER

David S. Yessink
No. CE-3333
Exp. 12/31/2010

NAME: _____ DATE: _____



BER

engineering group

3000 ARCTIC BLVD, SUITE 203
ANCHORAGE, ALASKA 99503
PHONE: (907) 582-3232
FAX: (907) 582-3232

WHITTIER WATER IMPROVEMENTS
PHASE 1
GLACIER AVENUE
STA 9+82GL - STA 20+27GL

REVISION	BY DATE	BY DATE
1	PHASE 1-05-BAL-15	D.Y.

Project No. 9069
Date: APRIL 1993
Designed: D.Y.
Drawn: B.P./P.B.
Approved: W.V.H.

Sheet No. 6 of 20

CITY OF WHITTIER, ALASKA

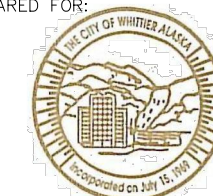
RE-POWER WELL HOUSES #1, 2 & 3

SEPTEMBER 2016

SCHEDULE OF DRAWINGS	
GENERAL	
G1	COVER
ELECTRICAL	
E1	ELECTRICAL LEGEND, ABBREVIATIONS, LUMINAIRE SCHEDULE & SCOPE OF WORK
E2	ELECTRICAL SPECIFICATIONS
E3	ELECTRICAL DEMOLITION PLAN
E4	ELECTRICAL SITE PLAN
E5	POWERONE-LINE & PANEL SCHEDULES



PREPARED FOR:



CITY OF WHITTIER




















PREPARED BY:



3940 ARCTIC BLVD. SUITE 300
ANCHORAGE, ALASKA 99503
PHONE: (907) 562-3252
FAX: (907) 561-2273

File: j:\basdata\20402.00 Whittier Re-Power Well Houses\00 CADD\01 Working Set\03 Electrical\20402.00 ELECTRICAL LEGEND & SPECS.dwg PLOT DATE: 9/16/2016 1:24 AM

LEGEND

-  BUS
-  EXPOSED CONDUIT
-  CONDUIT/CABLE RUN UNDERGROUND OR IN CONCRETE
-  HOMERUN TO PANEL "X", CIRCUITS NO. Y AND Z
CONDUIT RUNS NOT DEFINED ARE 1/2" C with 3#12.
-  GROUND
-  CONDUIT RUN - CHANGE IN ELEVATION
-  GROUND ROD
-  SPECIAL RECEPTACLE / PLUG
-  TRANSFORMER
-  MOTOR, HP AS SHOWN, THREE PHASE
-  MANUAL TRANSFER SWITCH
-  PANELBOARD
-  DISCONNECT SWITCH
-  KILOWATT-HOUR METER WITH CT
-  MOLDED CASE CIRCUIT BREAKER, X = AMPERE RATING, Y = NO. OF POLES
THERMAL/MAGNETIC UON
-  JUNCTION BOX OR FITTING
-  FUSE, X=SIZE IN AMPS
-  SHEET NOTE "X"
-  REDUCED VOLTAGE STARTER

ABBREVIATIONS

- A AMPERE
- AFF ABOVE FINISH FLOOR
- AHU AIR HANDLING UNIT
- AIC AMPERES INTERRUPTING CAPACITY
- ATS AUTOMATIC TRANSFER SWITCH
- AVEC ARCTIC VILLAGE ELECTRIC COMPANY
- BGP BOILER CONTROL PANEL
- bccu BARE COPPER
- BLDG BUILDING
- C CONDUCTOR
- C CONDUIT
- CIRC CIRCULATION
- CP CONTROL PANEL
- CP CIRCULATION PUMP
- CT CURRENT TRANSFORMER
- DHW DOMESTIC HOT WATER
- DWG DRAWING
- EA EACH
- EF EXHAUST FAN
- ENT ELECTRICAL NON-METALLIC TUBING
- EOL END OF LINE RESISTOR
- FACP FIRE ALARM CONTROL PANEL
- FC FOOT CANDLE
- FMC FLEXIBLE METAL CONDUIT
- FVNR FULL VOLTAGE NON-REVERSING, THERMAL MAGNETIC OCP
- G GROUND CONDUCTOR
- GFI GROUND FAULT INTERRUPTING
- GP GLYCOL PUMP
- H HOT CONDUCTOR
- HBP HIGH BOOST PUMP
- HE HEAT EXCHANGER
- HOA HAND OFF AUTO
- HP HORSEPOWER
- HPS HIGH PRESSURE SODIUM
- KVA KILO-VOLT-AMPERES
- KW KILOWATT
- LCP LOCAL CONTROL PANEL
- LTFCM LIQUID TIGHT FLEXIBLE METAL CONDUIT
- LTFCN LIQUID TIGHT FLEXIBLE NON-METALLIC CONDUIT
- LTG LIGHTING
- MCC MOTOR CONTROL CENTER
- MCM THOUSAND CIRCULAR MILLS
- MCP MAGNETIC ONLY CIRCUIT PROTECTOR
- MDP MAIN DISTRIBUTION PANEL
- MV MOTORIZED VALVE
- N NEUTRAL CONDUCTOR
- NEMA NATIONAL ELECTRICAL MANUFACTURES ASSOCIATION
- NMC NON METALLIC CABLE
- OCP OVERCURRENT PROTECTION
- P POLE
- RCP RECEPTACLE
- RM ROOM
- RMC RIGID METAL CONDUIT, GALVANIZED
- SL SWITCH LEG
- SP SEWAGE PUMP
- TBD TO BE DETERMINED
- TWSH TWISTED/SHIELDED
- TYP TYPICAL
- U/G UNDERGROUND
- UON UNLESS OTHERWISE NOTED
- V VOLTS
- VAC VACANCY
- VFD VARIABLE FREQUENCY DRIVE
- WP WEATHER PROOF
- WTP WATER TREATMENT PLANT
- XFMR TRANSFORMER

GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE INSTALLED IN ACCORDANCE WITH LATEST LEGALLY ADOPTED VERSION OF THE NATIONAL ELECTRICAL CODE AND THE LATEST EDITION OF THE MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS (MASS).
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO BEGINNING CONSTRUCTION.
3. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL BURIED UTILITIES, AND SHALL CALL FOR UTILITY LOCATES A MINIMUM OF TWO (2) DAYS PRIOR TO DIGGING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ANY UTILITY DAMAGED DURING THE COURSE OF CONSTRUCTION
4. THE CONTRACTOR SHALL RESTORE PROPERTY DISTURBED BY CONTRACT ACTIVITY TO THE PRE-CONSTRUCTION CONDITION. SUCH WORK IS INCIDENTAL TO THIS CONTRACT AND SHALL INCLUDE BUT NOT BE LIMITED TO PAVEMENTS, PAVEMENT STRIPING, CONCRETE SLABS, FENCES, MAILBOXES, SIGNS, CURBS, GUTTERS, SEEDED AREAS, AND DRAINAGE SWALES, ETC.
5. ALL ITEMS CALLED OUT ON THE PLANS TO BE CONSTRUCTED SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
6. THE LOCATION OF EXISTING FEATURES AND UTILITIES ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY UTILITY LOCATIONS IN THE FIELD AS NECESSARY. THE HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES ENCOUNTERED IN THE FIELD SHALL BE RECORDED ON THE CONTRACTOR'S RECORD DRAWINGS.

SCOPE OF WORK SUMMARY

WORK IS TO INCLUDE BUT NOT LIMITED TO THE FOLLOWING:

PROVIDE NEW 400A, 480/277V SERVICE WITH MANUAL TRANSFER SWITCH AND MDP.

INSTALL NEW FEEDERS TO WELL HOUSES #1, 2, & 3.

PROVIDE NEW 480V DISTRIBUTION WITHIN EACH WELL HOUSE AND OTHER WORK AS SHOWN.

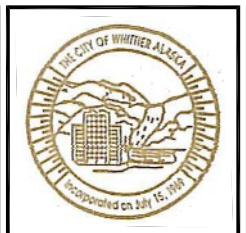
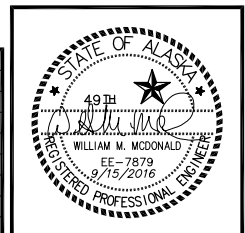
COORDINATE WITH CEA FOR INSTALLATION OF NEW SERVICE AND THE REMOVAL OF EXISTING OVERHEAD WELL HOUSE FEEDERS FROM CEA OWNED DISTRIBUTION POLES. ALL WIRING SHALL BE REMOVED UNDER THIS CONTRACT.

CALL BEFORE YOU DIG!!!		
Alaska Digline, Inc.		
Statewide	811	
Alaska Railroad	265-2520	
Military Fuel Lines	552-3760	
State Storm Drains	333-2411	



REVISION			
REV	DATE	DESCRIPTION	BY

REVISION			
REV	DATE	DESCRIPTION	BY



SCALE	HOR. N/A VER. N/A
DESIGNED BY	
DRAWN BY	
CHECKED BY	
APPROVED BY	

PROJECT NO:	CITY OF WHITTIER, ALASKA
	RE-POWER WELL HOUSES #1, 2 & 3
	ELECTRICAL LEGEND, ABBREVIATIONS, LUMINAIRE SCHEDULE & SCOPE OF WORK
STATUS: FINAL DESIGN	DATE: SEPTEMBER 2016

PROJECT NO.	20402
CITY GRID	
WATER GRID	
SEWER GRID	
SHEET	E1
OF	E5

ELECTRICAL SPECIFICATIONS

SCOPE OF WORK: Furnish and install all material and equipment as required for the installation as specified here and as shown on the drawings.

STANDARDS, CODES AND REGULATIONS: Contractor shall comply with the latest adopted edition of the National Electrical Code (NEC), International Building Code (IBC), and International Fire Code (IFC) including all state and local amendments to these codes.

DRAWINGS: The drawings are diagrammatic, not necessarily showing all offsets or exact locations of fixtures, equipment, etc., unless specifically dimensioned. Review the drawings and specifications for equipment furnished by other crafts but installed in accordance with this section. Bring questionable or obscure items, apparent conflicts between plans, specifications, governing codes and/or utilities regulations to the attention of the Engineer. Codes, ordinances, regulations, manufacturer's instructions or standards take precedence when they are more stringent or conflict with the drawings and specifications.

RECORD DRAWINGS: Mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all electrical work that will become permanently concealed. Show routing of work in permanently concealed blind spaces within buildings and structures. Show complete routing and sizing of any significant revisions to the systems shown.

WORKMANSHIP: Installation of all work shall be made so that its several component parts shall function as a workable system complete with all accessories necessary for its operation. All material and equipment shall be installed in accordance with the manufacturer's recommendations, instructions and/or installation drawings and in accordance with NECA standards. Materials and equipment shall be new and shall conform to applicable industry standards, NEMA standards and Underwriters Laboratories (U/L) standards.

OPERATION AND MAINTENANCE MANUALS: Provide operation and maintenance manuals for training of the owner's personnel. Describe in the manuals the procedures necessary to operate the system including start-up, operation, emergency operation and shutdown. Provide instructions and a schedule of preventive maintenance in tabular form for all routine cleaning, inspection and lubrication with recommended lubricants. Provide instructions for minor repair or adjustments required for preventive maintenance routines. Provide manufacturer's descriptive literature including approved shop drawings covering devices used in any contractor-provided equipment or systems with illustration, exploded views, etc. Provide a non-password protected PDF file of each manual in its entirety on a CD in addition to the required hard copies.

REFERENCE SYMBOLS: The Electrical "LEGEND" on the drawings is a standardized version, and all symbols shown may not be used. Use the "LEGEND" as a reference for the symbols used on the drawings.

IDENTIFICATION: Provide engraved three-layer laminated plastic nameplates with black letters on a white background to identify all electrical distribution and control equipment, loads served and as noted on the drawings. Letter heights shall be 1/8" for individual switches, motor starters and loads served and 1/4" on panelboards. Secure nameplates to equipment fronts using screws, rivets or adhesives.

CONDUITS: Mark all conduits entering or leaving panelboards/control panels with an indelible black marker with the circuit numbers of the circuits contained inside.

JUNCTION BOXES: Mark all circuit numbers of wiring on all junction boxes with sheet steel covers. Mark with indelible black marker. Mark all other special system junction boxes with sheet steel covers.

CONDUIT: In General, all INTERIOR wiring shall be installed EMT and pressed steel shall be permitted. Feeders 100A or over shall be run in rigid steel. All metallic fittings, connectors, boxes, etc., shall be approved for use as a grounding means. Utilize short extensions (36" maximum) of flexible, low temperature, liquidtight flexible metallic conduit for connection of all motors and other equipment subject to vibration and where conduits transition between structures or on risers from below grade. Paint all exposed raceways to match the surface to which it is attached or crosses. Otherwise paint industrial gray. Completely and thoroughly swab raceway system before installing conductors. An equipment ground wire is required in all conduits whether shown or not. EMT conduit fittings shall be compression type with insulated throats. Rigid steel penetrations shall be proved with grounding bushings.

CONDUCTORS: Conductors shall be copper, solid or stranded, with type XHHW-2, 90° insulation exterior above grade and type USE or UF below grade and THHN/THWN interior. Minimum branch circuit conductor size shall be #12 AWG. Minimum control circuit conductor size for field wiring shall be #14 AWG unless noted otherwise on drawings. Pull all conductors into the raceway at the same time. Use UL listed wire-pulling lubricant for pulling #4 AWG and larger wires. Color code conductors as follows: 240/120 volt systems: black (L1), white/gray (N) and green or bare (G). Use properly sized insulated spring wire connectors with plastic caps for all conductors #8 AWG and smaller. Terminate #6 AWG and larger conductors with crimp or compression type connectors installed with tool recommended by connection manufacturer and insulate with properly sized 600-volt rated heat shrink tubing.

CIRCUIT BREAKERS: Molded case circuit breakers shall be bolt-on with common trip handle for all poles. Thermal magnetic trip type unless specifically shown as magnetic only (MCP).

EQUIPMENT CONNECTIONS: Provide wiring and connection to equipment requiring electrical power but specified under other divisions of the specifications. Equipment shall include but is not limited to motors, pumps, dispensing equipment, etc. Review equipment submittal from the other trades prior to installation and electrical rough-in. Verify location, size, type of connections, and that equipment is ready for electrical connection. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with the manufacturer's instructions. Provide interconnecting wiring and disconnects where required.

DISCONNECT SWITCHES: Provide 600V and 250V heavy duty non-fusible quick-make, quick break, load interrupter, enclosed knife switches with externally operable handle interlocked to prevent opening front cover with switch in on position, handle lockable in off position. For motors under 1HP, specification grade snap switched rated for HP duty may be used. Where locking is required, provide suitable cover plate with locking feature.

EQUIPMENT MOUNTING: Provide all bracing as required to securely mount enclosures, fixtures and devices. Unless otherwise noted use galvanized hardware and galvanized formed steel components such as Unistrut or equal. When bolting to structure, verify that the original structural and performance (i.e. water tight) characteristics are maintained.

WIRING METHODS: Unless noted otherwise, enclosures, junction boxes and other equipment shall be installed in accordance with the following schedule:

- Exterior – Cast weatherproof device boxes with gasketed covers, RMC or LTFMC. NEMA 3R enclosure rating.
- Interior – Surface mounted EMT, LTFMC, Cast device boxes, NEMA 12 enclosure ratings.

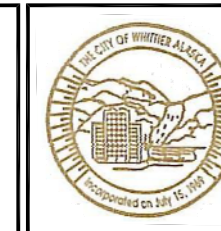
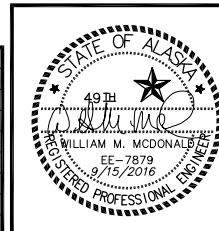
Below grade – Rigid Metal conduit buried 36". Underground junction boxes shall be rated for H2O as the route runs adjacent to an alleyway.

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REVISION			
REV	DATE	DESCRIPTION	BY

REVISION			
REV	DATE	DESCRIPTION	BY

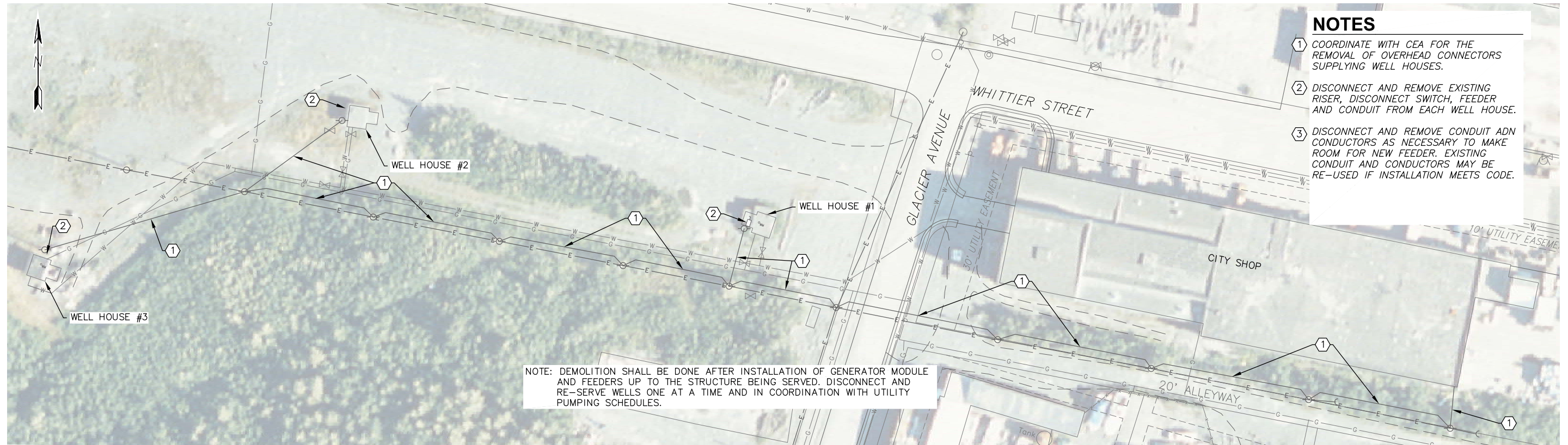


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DESIGNED BY	
DRAWN BY	
CHECKED BY	
APPROVED BY	

PROJECT NO:	CITY OF WHITTIER, ALASKA
RE-POWER WELL HOUSES #1, 2 & 3	
ELECTRICAL SPECIFICATIONS	
STATUS: FINAL DESIGN	DATE: SEPTEMBER 2016

PROJECT NO:	20402
CITY GRID	
WATER GRID	
SEWER GRID	
SHEET	E2
OF	E5

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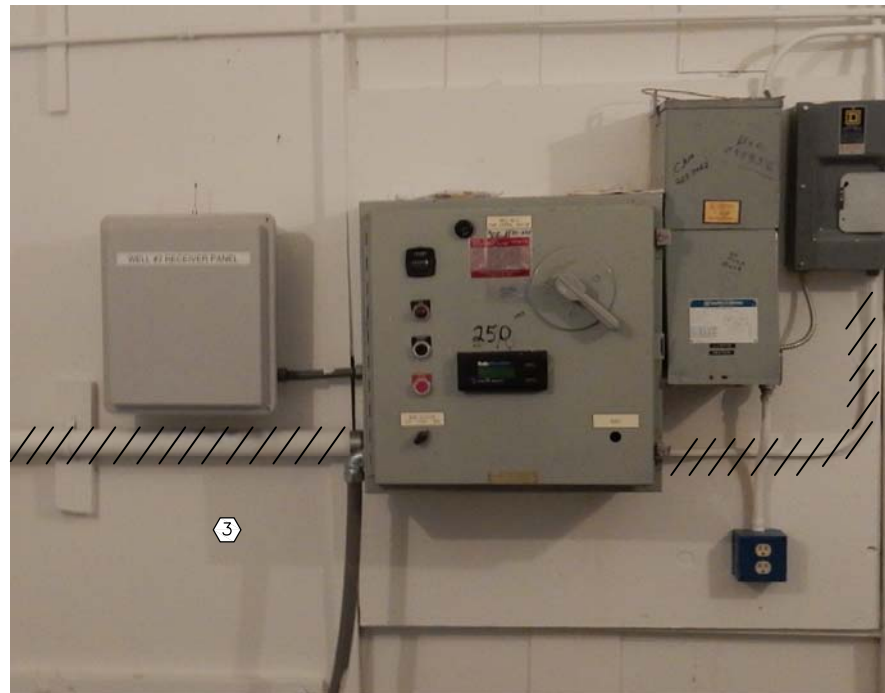


- NOTES**
- ① COORDINATE WITH CEA FOR THE REMOVAL OF OVERHEAD CONNECTORS SUPPLYING WELL HOUSES.
 - ② DISCONNECT AND REMOVE EXISTING RISER, DISCONNECT SWITCH, FEEDER AND CONDUIT FROM EACH WELL HOUSE.
 - ③ DISCONNECT AND REMOVE CONDUIT AND CONDUCTORS AS NECESSARY TO MAKE ROOM FOR NEW FEEDER. EXISTING CONDUIT AND CONDUCTORS MAY BE RE-USED IF INSTALLATION MEETS CODE.

NOTE: DEMOLITION SHALL BE DONE AFTER INSTALLATION OF GENERATOR MODULE AND FEEDERS UP TO THE STRUCTURE BEING SERVED. DISCONNECT AND RE-SERVE WELLS ONE AT A TIME AND IN COORDINATION WITH UTILITY PUMPING SCHEDULES.



② **WELL HOUSE #3**
Scale: 1/4"=1'



③ **WELL HOUSE #2**
Scale: GRAPHIC



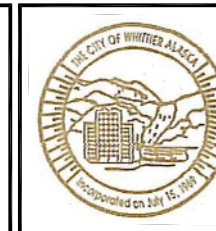
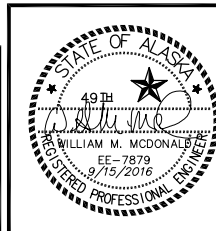
④ **WELL HOUSE #1**
Scale: GRAPHIC



GRAPHIC SCALE 40 0 40 80 120

REVISION			
REV	DATE	DESCRIPTION	BY

REVISION			
REV	DATE	DESCRIPTION	BY

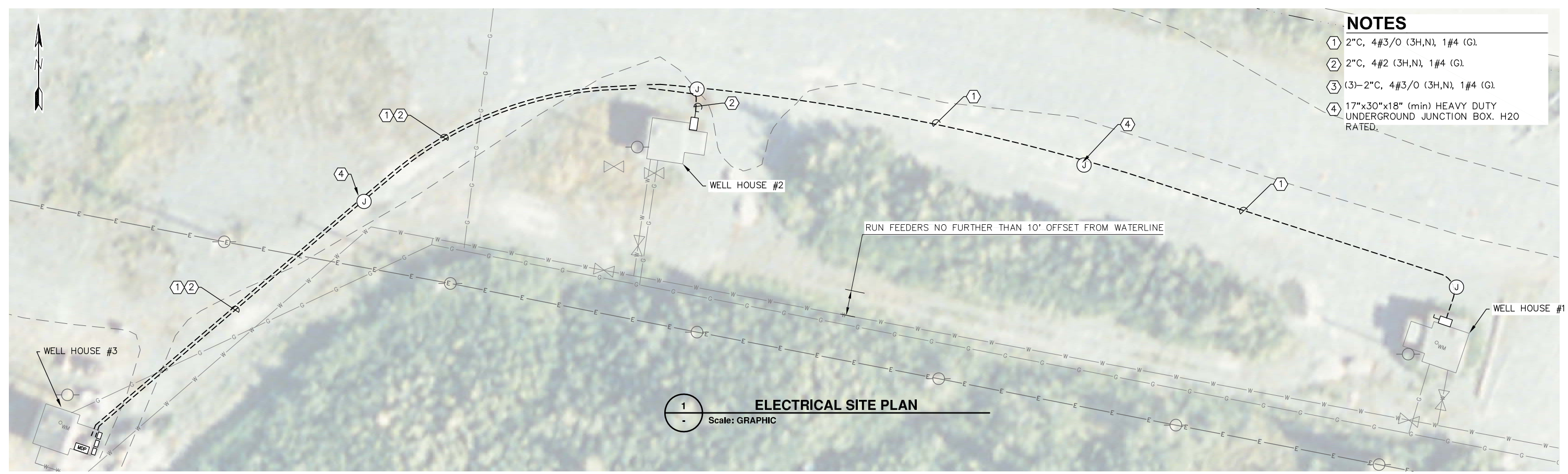


SCALE
HOR. 1" = 40'
VER. N/A
DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY

PROJECT NO:	CITY OF WHITTIER, ALASKA
RE-POWER WELL HOUSES #1, 2 & 3	
ELECTRICAL DEMOLITION PLAN	
STATUS: FINAL DESIGN	DATE: SEPTEMBER 2016

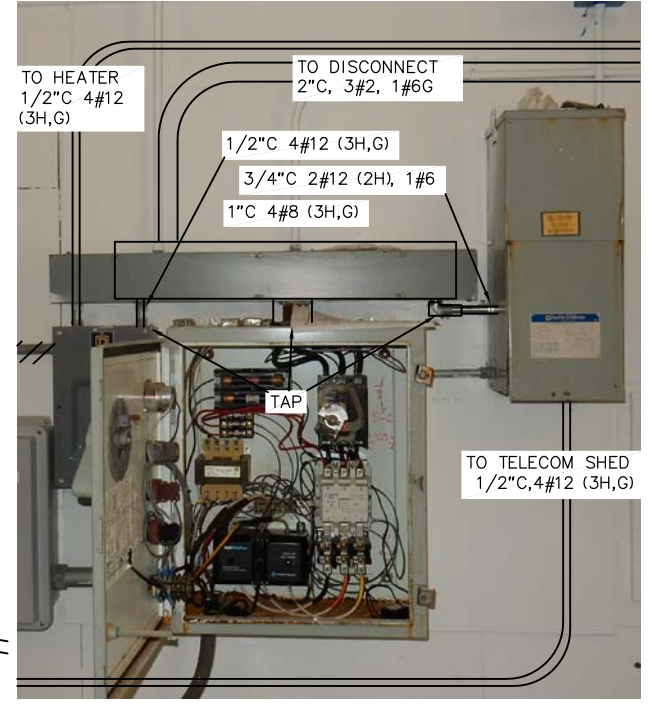
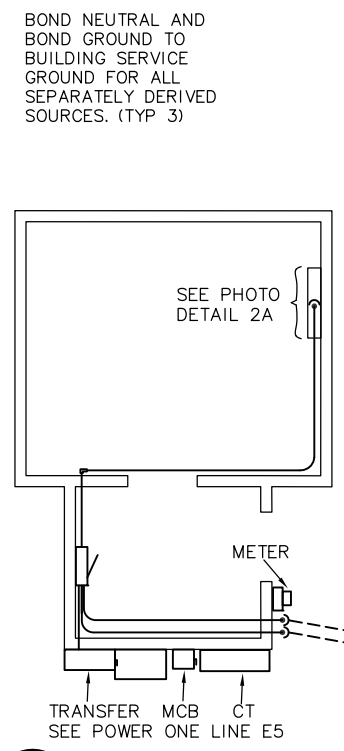
PROJECT NO.	20402
CITY GRID	
WATER GRID	
SEWER GRID	
SHEET	E3
OF	E5

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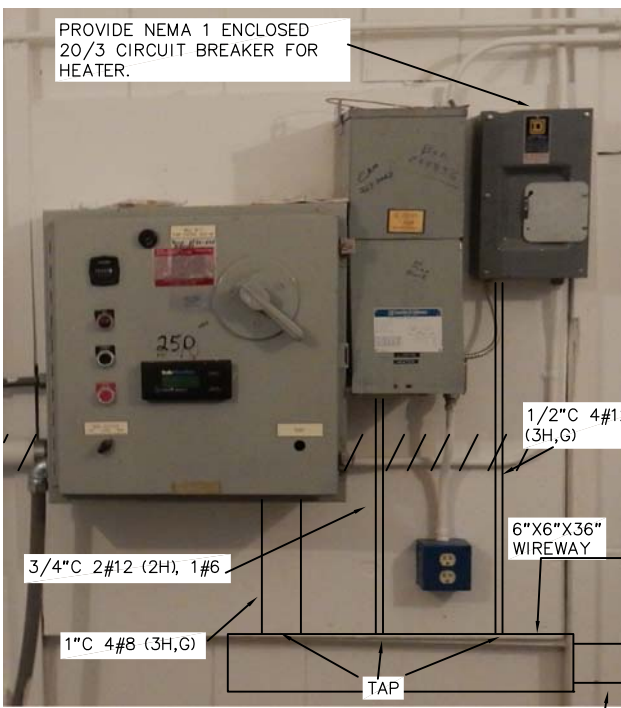
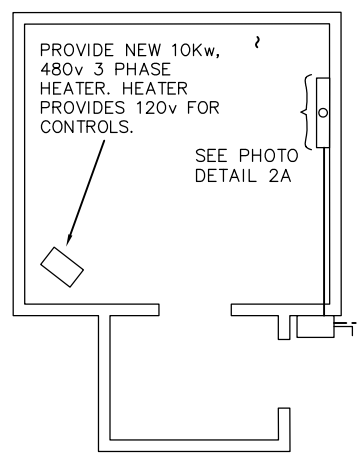


- NOTES**
- ① 2" C, 4#3/0 (3H,N), 1#4 (G).
 - ② 2" C, 4#2 (3H,N), 1#4 (G).
 - ③ (3)-2" C, 4#3/0 (3H,N), 1#4 (G).
 - ④ 17"x30"x18" (min) HEAVY DUTY UNDERGROUND JUNCTION BOX. H2O RATED.

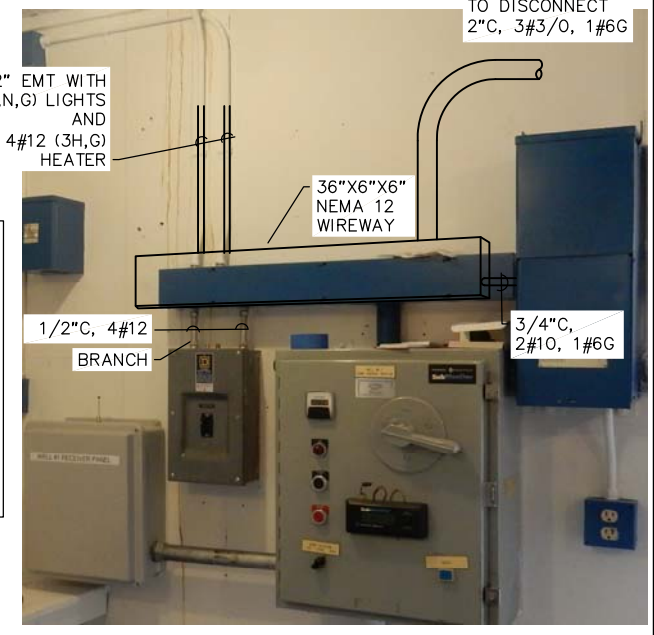
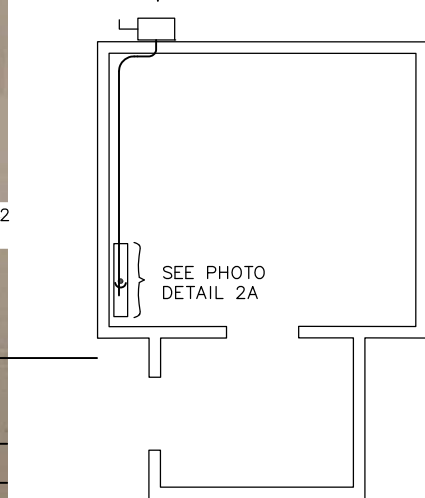
1 ELECTRICAL SITE PLAN
Scale: GRAPHIC



2A W#3 ELEVATION VIEW
Scale: NONE



3A W#2 ELEVATION VIEW
Scale: GRAPHIC



4A W#1 ELEVATION VIEW
Scale: GRAPHIC

2 WELL HOUSE #3
Scale: 1/4"=1'

3 WELL HOUSE #2
Scale: GRAPHIC

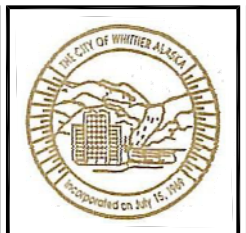
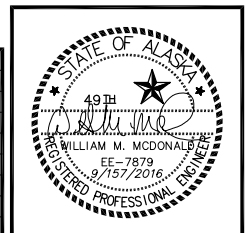
4 WELL HOUSE #1
Scale: GRAPHIC

GRAPHIC SCALE 20 0 20 40 60



REVISION			
REV	DATE	DESCRIPTION	BY

REVISION			
REV	DATE	DESCRIPTION	BY



SCALE
HOR. 1" = 20'
VER. N/A
DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY

PROJECT NO: CITY OF WHITTIER, ALASKA
RE-POWER WELL HOUSES #1, 2 & 3
ELECTRICAL SITE PLAN
STATUS: FINAL DESIGN
DATE: SEPTEMBER 2016

PROJECT NO: 20402
CITY GRID
WATER GRID
SEWER GRID
SHEET E4
OF E5

File: j:\basdata\20402.00 Whittier Re-Power Well Houses\00 CADD\01 Working Set\03 Electrical\20402.00 ELECTRICAL SITE PLAN.dwg PLOT DATE: 9/16/2016 11:19 AM

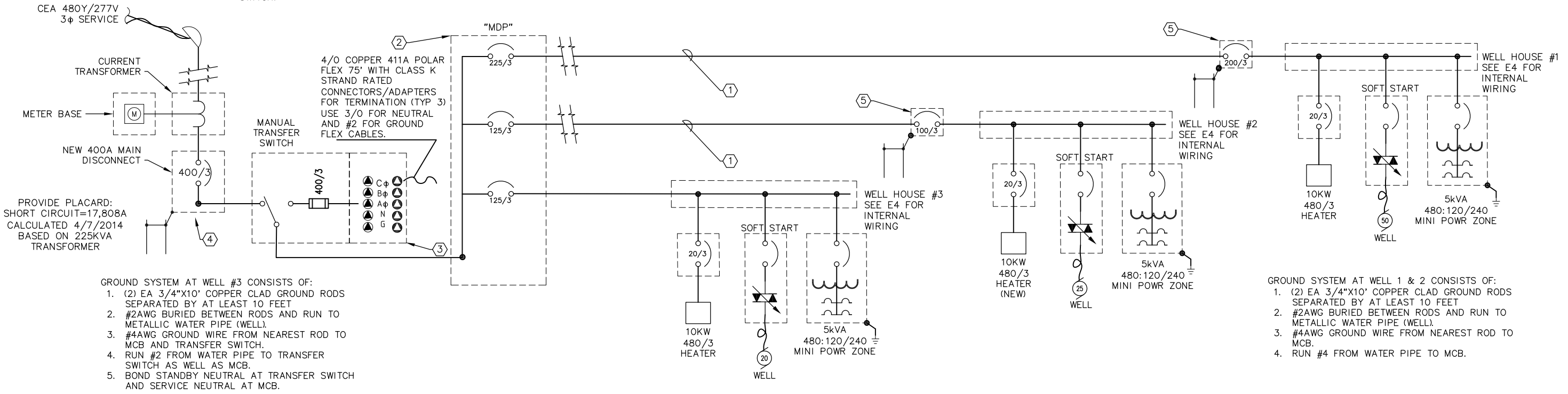
PANEL "MDP" SCHEDULE									
LOCATION: GENERATOR CONNEX			480Y/277V			3 PHASE 4 WIRE		22,000 AIC	
SERVED FROM: AUTOMATIC TRANSFER SWITCH			400A MLO					NEMA 3R	
POLE #	AMP TRIP	LOAD DESCRIPTION	POLE Kva	MLO A? B? C?	POLE Kva	LOAD DESCRIPTION	AMP TRIP	POLE #	
1			18.0	27.5				2	
3	225/3	WELL HOUSE #1	18.0		27.5	WELL HOUSE #2	125/3	4	
5			18.0					6	
7			9.5	9.5				8	
9	125/3	WELL HOUSE #3	9.5		9.5			10	
11			9.5					12	
13								14	
15					0.0			16	
17								18	
			37.0	37.0	37.0	Total kVA = 111.1 kVA			
			Total Amps @ 480V = 231.4 A						

NOTES

- ① SEE DRAWING E4 FOR CONDUCTOR/CONDUIT.
- ② 400A, 480Y277V, 3φ, NEMA 3R, 30 SPACE PANEL BOARD. SQUARE D OR APPROVED EQUAL.
- ③ 400A MANUAL TRANSFER SWITCH, NEMA 3R, POSILOK PLUGS FOR STANDBY CONNECTION.
- ④ 400A, 480V 3 POLE, SERVICE RELATED MAIN BREAKER IN NEMA 3R ENCLOSURE. PROVIDE SHORT CIRCUIT AND ARC FLASH PLACARD. FINAL DATA FOR PLACARD TO BE PROVIDED AFTER SERVICE IS INSTALLED.
- ⑤ WELL HOUSE MAIN DISCONNECT. NEMA 3R INCLOSED WITH S/N. NEUTRAL IS BONDED AT THIS LOCATION. SERVICE RATED BREAKER AMPACITY AS SHOWN.

PROVIDE CT ENCLOSURE AND METER BASE (1"RIGID CONNECTION) PER CEA SERVICE STANDARDS AND REQUIREMENTS.

PROVIDE 3"C RISER, (4) 500MCM XHHW-2, EXTEND TO CT BUSBAR AND THEN WITH ADDED #2 GROUND TO THE MCB AND ON TO THE TRANSFER SWITCH.

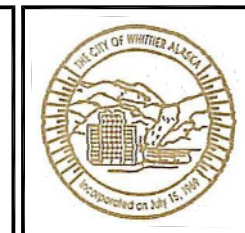
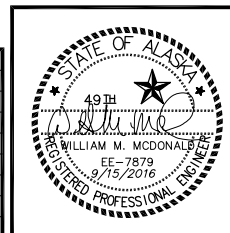


1 POWER ONE-LINE
Scale: NTS



REVISION			
REV	DATE	DESCRIPTION	BY

REVISION			
REV	DATE	DESCRIPTION	BY



SCALE	HOR. N/A VER. N/A
DESIGNED BY	
DRAWN BY	
CHECKED BY	
APPROVED BY	

PROJECT NO:	CITY OF WHITTIER, ALASKA
RE-POWER WELL HOUSES #1, 2 & 3	
POWER ONE-LINE & PANEL SCHEDULES	
STATUS: FINAL DESIGN	DATE: SEPTEMBER 2016

PROJECT NO.	20402
CITY GRID	
WATER GRID	
SEWER GRID	
SHEET	E5
OF	E5

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION X
SOIL BORING LOGS

Geotechnical Investigation

Whittier Well Field Design

Whittier, Alaska

November 2021



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Geotechnical Investigation Whittier Well Field Design Whittier, Alaska

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11.5.2021

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Senior Geotechnical Engineer

A handwritten signature in blue ink, appearing to read "Ali Sacks".

Ali Sacks, PE
Geotechnical Engineer

Table of Contents

1. Introduction and Project Description	4
2. Site Conditions	5
2.1 Historical Geotechnical Investigations.....	5
2.2 Historical Site Use	5
2.3 Contaminated Sites.....	5
3. Field Investigation	6
3.1 Test Pit Excavation	6
3.2 Sample Collection	6
3.3 Test Pit Completion.....	6
3.4 Groundwater.....	6
4. Laboratory Testing and Results	7
5. Site Conditions	8
5.1 Geology	8
5.2 Soil Lithology.....	8
5.3 Surface Water and Groundwater.....	8
5.4 Contaminated Soils	8
5.5 Seismic Considerations	8
6. Geotechnical Engineering Recommendations.....	10
6.1 Frost Depth and Frost Classification	10
6.2 Site Preparation	10
6.3 Excavations and Dewatering.....	10
6.4 Dust Control	11
6.5 Site Grading.....	11
6.6 Fill and Compaction	11
6.7 Reuse of Material.....	12
6.8 Shallow Foundation Recommendations	12
6.8.1 Bearing Capacity and Settlement.....	12
6.8.2 Lateral Load Resistance.....	13
6.8.3 Uplift Resistance	13
6.9 Stability Evaluation.....	13
6.9.1 Slope Instability.....	13
6.9.2 Loss of Bearing Capacity.....	14
6.9.3 Liquefaction and Lateral Spreading.....	14
6.10 Utility Recommendations	14
6.10.1 Pipe Bedding	14
6.10.2 Backfill.....	14
6.10.3 Settlements.....	15
7. Limitations and Closure	16
8. References	17

Tables

Table 3-1 – Test Pit Data Summary 6
Table 4-1 – Laboratory Analyses, Methods, and Sample Numbers 7
Table 5-1 – Seismic Design Parameters for Site Class D 9

Figures

- Figure 1 – Vicinity Map
- Figure 2 – Test Pit Locations

Appendices

- Appendix A – Test Pit Logs
- Appendix B – Laboratory Results

Acronyms and Abbreviations

ADEC	Alaska Department of Environmental Conservation
AEIC	Alaska Earthquake Information Center
AKRR	Alaska Railroad Corporation
ASTM	American Society for Testing and Materials
ATL	Alaska Testlab
BGS	below ground surface
CRW	CRW Engineering Group, LLC
CSP	Contaminated Sites Program
DCM	Design Criteria Manual
DNR	Department of Natural Resources
H	horizontal
LMA	Limited Mechanical Analysis
MASS	Municipality of Anchorage Standard Specifications
MOA	Municipality of Anchorage
M_w	earthquake moment magnitude
N/A	Not Applicable
NFS	non-frost susceptible
No.	number
pcf	pounds per cubic foot
PID	photoionization detector
psf	pounds per square foot
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
V	vertical
°	degree

1. Introduction and Project Description

CRW Engineering Group, LLC (CRW) is pleased to present this geotechnical data and design recommendations report to support the design of the proposed improvements to the Whittier City Well Field in Whittier, Alaska. A geotechnical investigation was conducted by CRW for the City of Whittier.

The scope of work included:

- Reviewing historical geotechnical data near the project area;
- Performing a geotechnical investigation which included three test pits;
- Making observations of groundwater during test pit excavation;
- Overseeing laboratory testing of recovered soil samples including moisture content, gradation, and Atterberg Limits;
- Analyzing field observations and testing results; and,
- Preparing the geotechnical report.

2. Site Conditions

The project is located in Whittier, Alaska, in the open space south of Whittier Street and west of Glacier Avenue (Figure 1). The site proposed for development is south of the existing well house and basketball court, and is currently minimally developed with a cleared gravel area that extends around all the existing water wells. The area to the south is wooded primarily with cottonwood trees. Parts of the area are used year-round to store cones and plowing equipment. The northwestern corner of this lot is used for snow storage in the winter, and was previously used by the City of Whittier for gravel stockpiling. The land is owned by the Alaska Railroad Corporation (AKRR) and leased to City of Whittier.

The City of Whittier is built on an alluvial fan created by Whittier Creek, which flows down from the mountains and out to Prince William Sound. Since development of Whittier began, Whittier Creek has been confined to flow along the western side of the valley.

2.1 Historical Geotechnical Investigations

Most of the available historical geotechnical data in Whittier is associated with industrial development near the waterfront, and limited historic geotechnical information was found for the project site. Anecdotal information from previous utility excavations on this site was provided by the City of Whittier.

2.2 Historical Site Use

Historical photos of the site were identified in order to determine the former uses of the site. Several exist in the Prince William Sound Museum in Whittier, and some are available online. Digitized plan drawings from development of Whittier in the mid-1950s were also provided by the City of Whittier.

All of these sources show minimal development on the site. In the 1940s, some ground disturbance is evident, but no structures are present.

2.3 Contaminated Sites

The Alaska Department of Environmental Conservation (ADEC) Contaminated Sites database was reviewed for potential contaminated sites near the project. In the ADEC database contaminated sites are designated Active, Cleanup Complete, and Cleanup Complete – Institutional Controls. No contaminated sites are documented in the ADEC Contaminated Sites Program (CSP) database within 500 feet of the test pits, and no field screening with a photoionization detector (PID) was planned.

3. Field Investigation

A geotechnical investigation was performed on May 25, 2021 to assess the project site's existing soil conditions. The investigation excavated and sampled three test pits (TP-01 through TP-03). Test pit locations were determined based on the conceptual site plan provided by the City of Whittier, and adjusted in the field as needed due to existing site conditions. Utilities were located by agency-designated locators, and several were identified and marked prior to excavations.

3.1 Test Pit Excavation

A Volvo EC160B excavator and operator were provided by the City of Whittier. CRW engineer Ali Sacks supervised the field investigation program. She logged the recovered soil samples and managed the field operations. Test pits were advanced to a maximum depth of 13 feet below ground surface (BGS). All test pits were excavated to refusal (TP-01) or to the maximum practical reach of the excavator (TP-02 and TP-03). Refusal was the result of increasing numbers of large boulders with depth. Table 3-1, below, summarizes test pit depths.

Table 3-1 – Test Pit Data Summary

Test Pit Designation	Total Depth (feet BGS)	Depth to Groundwater (feet BGS)
TP-01	12	Not observed
TP-02	12	11
TP-03	13	5

Test pit logs are presented in Appendix A.

3.2 Sample Collection

Soil samples were obtained by collecting soil from the excavator bucket. Samples were collected approximately every three feet, or at each observable change in soil characteristics. Soil characteristics, such as visual classification, consistency, moisture, and color were noted for each sample recovered. Samples were then individually sealed in double plastic bags and transported to Anchorage for additional testing. Field visual classifications were verified per laboratory testing. Classification was performed following the Unified Soils Classification System (USCS) according to ASTM D2487/D2488.

3.3 Test Pit Completion

All test pits were backfilled immediately upon completion of sampling, and the ground surface was graded level with the excavator bucket.

3.4 Groundwater

Groundwater was observed in two of the three test pits, with depths summarized in Table 3-1.

4. Laboratory Testing and Results

Soil laboratory tests to evaluate index properties of representative samples were performed by the Alaska Testlab (ATL) in their Anchorage, Alaska facility. The laboratory testing program consisted of soil index tests to determine the water content, grain-size distribution, limited mechanical analysis (LMA), and Atterberg Limits.

LMA consists of washing a sample over the No. 200 mesh sieve. The coarse fraction of the remaining soil is then dried and sieved through the No. 4 sieve to determine the sand and gravel content. The LMA is a means to determine the percentage of coarse and fine grains in a sample without having to perform full gradations.

The laboratory tests were performed in accordance with the test methods of ASTM International as listed in Table 4-1. Results of the laboratory testing are presented in Appendix B.

Table 4-1 – Laboratory Analyses, Methods, and Sample Numbers

Analysis	Method	Number of Samples
Moisture Content	ASTM D2216	13
Grain-size Distribution	ASTM D6913 ASTM D422	4
Limited Mechanical Analysis	ASTM D1140	9

5. Site Conditions

5.1 Geology

The City of Whittier is built on an alluvial fan formed by Whittier Creek and composed of silt, sand, gravel and boulders derived from the local bedrock of slate, argillite, and greywacke. Bedrock outcrops are visible on the steep slopes of the valley walls and mountain peaks. Along the edges of the valley, bedrock may be near the ground surface.

5.2 Soil Lithology

The soil at the project site consists predominately of gray sand, gravel, and boulders in varying proportions, and commonly including less than 10 percent fines, though in one test pit soil contained up to 26 percent fines. When particle shape was observable, all were subrounded to angular from sand up to boulder size, and frequently platy or flat.

Laboratory classifications indicated poorly-graded gravel with silt and sand, well- or poorly-graded sand with silt and gravel, silty gravel with sand, and silty sand. Fines were non-plastic or slightly plastic. The percentage of boulders and cobbles was generally about 5 to 15 percent and increased in percentage with depth.

Test pit TP-01 had the highest percentages of cobbles and boulders and the most pronounced increase in cobble and boulder content with depth, up to 30 percent by 12 feet where refusal was met. Boulders up to 2 feet were removed from test pits at this site. Based on a notable increase in the cobble and boulder content at approximately 6 feet BGS and the presence of a wood stave pipe (8-inch diameter) at 5 feet BGS in TP-01, it is likely that soil above 6 feet BGS was previously disturbed or imported from elsewhere in Whittier.

In TP-02, a thin buried organic layer (woody debris, roots, and some organic soil) at about 2 feet BGS may indicate a former ground surface with fill above. In test pits TP-02 and TP-03, undisturbed soils exhibit layering, including layers of poorly-graded sand and gravel with varying silt content.

5.3 Surface Water and Groundwater

At the time of the investigation, groundwater was deeper than 12 feet BGS in the vicinity of TP-01, and at 11 and 5 feet BGS in TP-02 and TP-03, respectively. As mentioned above, the occurrence of groundwater was associated with sandy layers in the subsurface. Groundwater was observed seeping from sandy layers in the subsurface. Seeps did not produce a large volume of water during the geotechnical investigation and are not considered representative of a groundwater table.

5.4 Contaminated Soils

No visual or olfactory evidence of contamination was observed in any test pit.

5.5 Seismic Considerations

The project site lies in a region of moderate to high seismicity, and is subjected to relatively large earthquakes and strong ground motion. The Alaska Earthquake Center (AEC) has documented several moment magnitude earthquakes larger than 7.0, including the November 2018 Anchorage earthquake. The site is bounded by the Denali Fault to the north and east, the Castle Mountain fault to the west-southwest, and the Alaska-Aleutian Megathrust Subduction zone to the south. The project site has three dominant seismic sources that present hazards. All information below comes from the AEC, the Alaska

Department of Natural Resources Division of Geological and Geophysical Surveys, and the United States Geological Survey (USGS) website (retrieved July/August 2020).

- The Denali Fault is a thrust and right-lateral strike-slip surface fault extending over 1,000 miles, located approximately 175 miles away from the project site at the nearest approach. The Denali Fault has a variable slip rate of greater than 0.2 inches/year on some segments. The central portion generated a moment magnitude earthquake of 7.9 on November 3, 2002.
- The Castle Mountain fault is a northeast-striking, active fault system located an estimated 60 miles from the project site. The fault is approximately 120 miles long and the western segment is considered active with Holocene fault scarps identified along this portion of the fault. The Castle Mountain fault has a maximum slip rate of 0.2 inches/year and an estimated maximum moment magnitude earthquake of 7.1.
- The toe of the Alaska-Aleutian Megathrust Subduction zone is approximately 150 miles from the project site. This plate boundary fault is the source of the 1964 Great Alaska Earthquake. A fault in the subducted Pacific slab was the source of the 2018 Anchorage Earthquake. The convergence and slip along the megathrust is estimated to be between 2.2 and 2.9 inches/year in a north-northwest direction.

Seismic design parameters were determined using the U.S. Seismic Design Maps online tool from the USGS (earthquake.usgs.gov/hazards/interactive/). Table 5-1 provides the seismic design parameters for the 2,475-year return period consistent with Section 1613 of the International Building Code (International Code Council, 2018) and Chapter 11 of the American Society of Civil Engineers (ASCE) ASCE 7-10 (2010). Based on observations of the soil type and in situ conditions, this site is presumed to be Site Class D by the procedure outlined in Chapter 20 of ASCE 7-10 (ASCE, 2010).

Table 5-1 – Seismic Design Parameters for Site Class D

Description	Value
Moment Magnitude, M_w	9.2
Return Period	2,475 years (2% in 50 years)
Peak Ground Acceleration (PGA_M)	0.507g
S_{D5} (0.2 second period acceleration)	1.00g
S_{D1} (1 second period acceleration)	0.734g

6. Geotechnical Engineering Recommendations

Based on our observations and results of laboratory testing, we have developed recommendations for:

- Site preparation and grading,
- Subgrade preparation and design recommendations for buried water lines and manifold building,
- Shallow foundation design for a partially-heated manifold building, and
- Dewatering for planned excavations.

The manifold building will have a heated portion housing pumps and water system controls, and an unheated portion housing an emergency backup generator.

6.1 Frost Depth and Frost Classification

Seasonal frost was not observed in the borings at the time of excavation. Permafrost was not encountered in any test pits and is not expected at the project site.

Typical design frost depths are estimated between 5 and 8 feet BGS in Whittier, Alaska and are common for relatively dry granular soils. It should be noted that seasonal fluctuations of snow cover, temperatures, infiltration/evaporation, groundwater table, and other climatic effects will have an impact on the design frost depth therefore any calculated value should only be considered a reasonably estimated design value as deeper frost penetrations are possible.

Based on the subsurface information obtained, the subgrade soils throughout the site are MOA frost classification F-3 to not frost susceptible (NFS).

6.2 Site Preparation

The proposed manifold building site and buried utility routes should be cleared of trees, stumps, topsoil, and any other deleterious material. A significant volume of cobbles and boulders, 8 inches and larger in diameter, are expected to be present in the upper 6 feet BGS and should be removed. The owner may dispose or stockpile the cobbles and boulders for re-use at his or her discretion. We recommend excavating down to a minimum of 3 feet BGS in the vicinity of the manifold building to ensure that all buried organic material is removed from beneath the foundation, regardless of the foundation depth.

6.3 Excavations and Dewatering

Temporary excavations into soil should be performed in accordance with OSHA or other agency guidelines and recommendations for trenching and slope angles based on soil type encountered. The contractor is responsible for trench stability, worker safety, and regulatory compliance as he will be present on a daily basis and can adjust efforts to obtain the needed stability.

Excavations above the water table may stand relatively steeply initially but fail suddenly without warning. As the in-situ soils dry, they will tend to ravel and slough to their natural angle of repose, which we estimate to be between 1.5 to 1.8H:1V (horizontal to vertical). Below the water table, or if surface water is allowed to enter the trench, in-situ soils may slough, soften, squeeze, slump over time or due to disturbance, to slopes of 2 to 2.5H:1V or flatter. As appropriate, trench shoring should be used by the contractor depending on depth and excavation limitations. Excavation and backfilling operations should be closely coordinated so that seepage and surface runoff is not allowed to collect and stand in open

excavations for long periods. We recommend the ground around any excavation be contoured to direct surface water away from the excavation and to minimize surface water or runoff entering the excavation.

We recommend foundation excavations extend laterally 3 feet beyond the perimeter of the proposed foundation in every direction and be backfilled and compacted with classified fill following the recommendations of this report.

Based on observations made at the time of the investigation, slow groundwater seeps may be encountered in excavations deeper than 5 feet BGS, which impact buried utilities. Groundwater may be shallower or seeps may produce more water across the site under other conditions, such as peak snowmelt or sustained heavy precipitation.

Dewatering is not anticipated to be required unless excavation activities are undertaken during the times of year when flooding is common, or unless surface runoff is allowed to enter excavations. If required, dewatering in the form of open pumping (i.e. ditches with sumps and pumps) is recommended. The contractor should anticipate the likelihood of flood or precipitation events and make sufficient preparations, including contouring the ground around excavations to divert surface runoff away from open excavations. If dewatering is required, permits from the Alaska Department of Natural Resources and potentially other local and state agencies will be necessary for construction dewatering.

6.4 Dust Control

Due to naturally occurring arsenic, silica, and other minerals common in the native rock and soils of the area, we recommend adhering to industry best practice for control of dust on and off the project site. This may include establishing dedicated entrance/exit routes, placing rumble racks or similar to shake loose dirt from vehicles leaving the jobsite, efficient staging of stockpiles, securely covering soil stockpiles subjected to windy conditions to prevent fugitive dust, maintaining moisture levels in soils during rehandling or compaction, and practicing good jobsite housekeeping.

6.5 Site Grading

Site grading will be required to manage surface runoff during construction. All trees and small brush should be removed prior to starting any earthwork. Surface organics should be removed prior to any fill placement. All earthworks should be performed in accordance with the project specifications and with local, state, and federal laws and regulations.

Final site grading plans should include ditches and swales designed to capture and divert water from the southeastern edge of the site and route it around planned structures and paved areas and into the City of Whittier's storm water management system. Parking areas should have positive gradients toward drainage structures and away from buildings. Site grading should be established to provide drainage of surface water and roof drainage away from proposed buildings.

6.6 Fill and Compaction

All classified fill material should be thawed, free from lumps, organics, debris, and other deleterious material and should be durable and sound. We recommend the classified fill be clean, well-graded sand and gravel and a non-frost classification (NFS). The gradation of the classified fill must be consistent with the Municipality of Anchorage (MOA) Standard Specification (MASS) for Select Material Type II-A.

All subgrade exposed at the bottoms of excavations should be scarified a minimum of 4 inches, moisture conditioned, and rolled smooth until subgrade achieves unyielding conditions under compaction equipment. Classified fill should be placed in loose lifts not exceeding 12 inches in thickness and adjusted

based on the contractor's equipment. Thinner lifts maybe required. A vibratory steel drum roller should be used to compact classified fill. Near new utilities or footings, however, lightweight or hand-operated compactors should be used to avoid damage to these elements.

No hauling or grading equipment should be used in lieu of appropriate compaction equipment. Any loosening of fill material by hauling or other equipment should be repaired and re-compacted. The number of passes required to meet the compaction requirement will depend on the size of compaction equipment used. Each layer should be compacted as recommended in the report and field verification of compaction requirements is recommended.

Foundation soils should be protected from freezing during construction. No frozen soil should be used as fill, nor should any fill be placed over frozen soil. Any frozen soil should be removed and replaced with appropriate fill prior to construction.

6.7 Reuse of Material

With the exception of the organic material encountered in TP-02, the majority of material encountered in the upper 5 feet at this site may be made acceptable for reuse in as a subgrade material once cobbles and boulders larger than 8 inches in diameter are removed.

When reusing material, consideration should be given to the ability to excavate, sort, and store reusable materials. This effort may be less efficient and cost more than complete removal and replacement with imported materials.

6.8 Shallow Foundation Recommendations

Shallow foundations are used to transfer building loads to the underlying soil. The soil type, consistency/density, compressibility, heave/swell/collapse potential, groundwater table, and depth to and type of bedrock are all considered in the type of foundation recommended for the proposed infrastructure.

The soils encountered at the project site are conducive to shallow foundations, including spread footings, continuous footings, and mat foundations. We recommended the use of spread or continuous footings to carry the expected building loads.

6.8.1 Bearing Capacity and Settlement

The design of shallow foundations must consider the bearing capacity of the underlying soil, as well as the potential for settlement and the effects of seasonal frost action. In general, foundation designs should be consistent with the current editions of the International Building Code with any local amendments or requirements.

Perimeter continuous footings and interior spread footings should bear on a minimum of 6 inches of compacted, classified fill prepared in accordance with our recommendations. If our recommendations are followed, the footings may be designed according to the following criteria.

- Maximum Allowable Bearing Pressure (includes a factor of safety of 2.5)
 - Isolated Footings (Dead and Normal Live): 3,500 psf
 - Continuous Footings (Dead and Normal Live): 3,000 psf
 - Transient Loads (Wind and Seismic): Increase static by 33 percent

These recommendations apply to footings that are isolated, not eccentrically loaded, and with a minimum width of 1.5 feet and a maximum width of 8.0 feet. The effective bearing area of eccentrically loaded footings will be less than the actual footing dimensions, and may vary depending on anticipated design loads and eccentricity. These values do not apply to footings on a slope. Additional bearing capacities can be recommended for larger footings or footings on slopes.

- Depth of Embedment
 - Perimeter Footings (warm footings): 46 inches, minimum
 - Perimeter Footings (cold footings): 60 inches, minimum
 - Interior Footings (warm footings): 18 inches, minimum
 - Interior Footings (cold footings): 60 inches, minimum

The depth should be measured from adjacent grade to bottom of footing.

- Settlement (Elastic)
 - Total Settlement <1.0 inch
 - Differential Settlement <0.5 inch

6.8.2 Lateral Load Resistance

Lateral loads on footings will be resisted by passive earth pressures developed against the footing block and frictional resistance against the base of the footing. We recommend a passive resistance (equivalent fluid pressure) of 220 psf/foot (PCF). This equivalent fluid pressure includes a factor of safety of 2.0. A friction coefficient of 0.50 is recommended to be used for resistance of footings to lateral sliding, assuming the concrete footing is cast directly against sand and gravel.

6.8.3 Uplift Resistance

Uplift loads may occur in some foundation elements due to overturning moments resulting from wind and seismic forces. The proposed pavilion is a type of structure frequently subjected to uplift loads from wind. Uplift loads may be resisted by the weight of the footing and soil within the limits of a truncated pyramid above the top of the footing. The shape of the truncated pyramid will vary with material type and density. For the native sand and gravel soils near the surface at the site, the pyramid should be defined by a 20-degree angle from a vertical line extending upward and away from the top of the footing.

6.9 Stability Evaluation

6.9.1 Slope Instability

No significant slopes are likely for the project considering the relatively flat terrain. By inspection, global instability is deemed of no concern.

If slopes are required, we recommend slopes be no steeper than 2H:1V (horizontal to vertical) assuming the slopes are constructed from granular native fill and compacted following our construction recommendations. A more detailed stability analysis should be performed if poorer quality fill material is used or steeper slopes are required.

Engineered slopes at the recommended 2H:1V (horizontal to vertical) will perform well though some minor sloughing and rills will likely occur over time due to runoff/infiltration under static conditions. During strong ground motions, some displacements are expected with the primary effect anticipated to

be rotational failures of the slope edges. More detailed seismic slope stability analyses can be performed on request.

6.9.2 Loss of Bearing Capacity

Assuming the footings are not bearing on deleterious material, an inspection of in situ soil condition and soil type suggest that the risk of loss of bearing capacity in the top 20 feet of the soil during a seismic event is low.

6.9.3 Liquefaction and Lateral Spreading

Test pits are inadequate to evaluate liquefaction and lateral spreading therefore the potential for these ground failure phenomena is unknown.

6.10 Utility Recommendations

All excavations for utilities should follow proper local, state, and federal requirements, including OSHA. The contractor is responsible for trench stability, worker safety, and regulatory compliance.

Based on the past performance of buried utilities at the site and the low volume of water observed in seeps shallower than 8 feet BGS, we do not anticipate any special accommodations for groundwater will be required for the proposed new waterlines.

Buried utilities which are susceptible to damage from freezing need to be frost-protected by sufficient amounts of backfill, insulation, or active freeze protection like heat tape. Some combination of these methods could also be used.

If rigid foam insulation is desired, the required frost depth can be decreased. The decrease in depth can be approximated by decreasing 1 foot of depth for every 1 inch of insulation that is placed over the pipe. That is, if 4 inches of insulation is considered then the frost depth can be reduced by 4 feet. Further recommendations on the insulation, lateral extents, and minimum cover can be provided on request.

6.10.1 Pipe Bedding

Pipe bedding is important to maintaining a functioning utility and is highly dependent on the quality of the soil under and along the sides of the pipe. Areas near the pipe that require bedding should be cleared of organic material, boulders, cobbles and uneven surfaces. The in-situ soils should be proof-rolled to create a firm and unyielding surface. The bedding material around the pipe should be consistent with the manufacturer's recommendations or the governing utility entities requirements.

Bedding material should be compacted to at least 95 percent of the Modified Proctor (ASTM D1557) maximum dry density or per manufacturer recommendations or governing utility entity requirements to support and hold the pipe firmly in place.

6.10.2 Backfill

The bulk of the material encountered in the test pits was gravel and sand. The native soils from the trench excavations may be used as backfill. The backfill material should be placed in loose lifts no thicker than 12-inches and compacted to at least 90 percent of its Modified Proctor maximum dry density. Some processing of the native material, including the removal of clasts larger than 3 inches, may be required to achieve this level of compaction based on the natural moisture content of the native soils.

6.10.3 Settlements

The magnitude of settlements that will develop around new utilities is dependent on the applied loads, the gradation properties of the bedding and backfill material, and the care with which the bedding and fills are placed and compacted.

Surface settlements should be relatively minor (less than 2 inches) provided our excavation and backfill recommendations are followed. However, if compaction criteria are relaxed or not verified during construction, significant settlement may occur at the ground surface over time. This could impact existing drainage conditions in the vicinity resulting in unwanted water conditions. The amount of settlement will depend on the materials used and the degree of compaction that was achieved.

7. Limitations and Closure

The information submitted in this report is based on our interpretation of data from a field geotechnical investigation performed for this project. The conclusions contained in this report are based on site conditions as they were observed on the dates indicated. It is presumed that the investigation is representative of the subsurface conditions throughout the site. Effort was made to obtain information representative of existing conditions at the site. If, however, subsurface conditions are found to differ, we should be notified immediately to review these recommendations in light of additional information.

If there is substantial lapse of time between the submittal of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we recommend that this report be reviewed to determine the applicability of the conclusions considering the changed conditions and time lapse. Unanticipated soil conditions are commonly encountered and cannot fully be determined by collecting discrete samples or advancing borings or excavations. The client and contractor should be aware of this risk and account for contingency accordingly.

Samples will be retained by CRW for six months following the date on which the final report is issued. Other arrangements may be made at the client's request.

This report was prepared by CRW for use on this project only, and may not be used in any manner that would constitute a detriment to CRW. CRW is not responsible for conclusions, opinions, or recommendations made by others based on data presented in this report.

8. References

Alaska Department of Natural Resources Division of Geological and Geophysical Surveys. Retrieved August 2020: <https://dggs.alaska.gov/hazards/earthquakes.html>.

Alaska Earthquake Center. Retrieved July 2020: <http://earthquake.alaska.edu/>.

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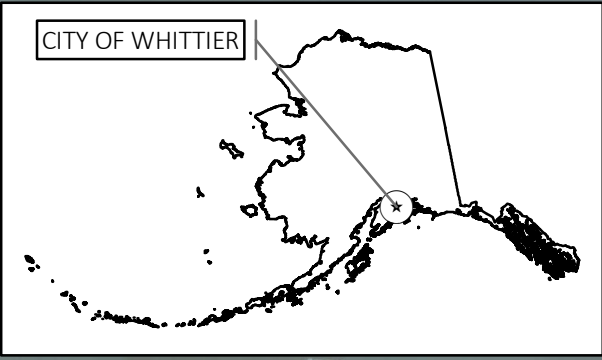
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Municipality of Anchorage Project Management and Engineering. 2015. Municipality of Anchorage Standard Specifications.

United States Geological Survey (USGS) Quaternary Fault and Fold Database. Retrieved July 2020: <https://www.usgs.gov/natural-hazards/earthquake-hazards/hazards>.

USGS website. Retrieved August 2020: <https://www.usgs.gov/news/2018-anchorage-earthquake>.

Figures



LEGEND

★ Project Location



File Path: I:\JobsData\20403.14 Whittier Well Field Design\00 CADD 2019\04 GIS\IR_F1_SSV.mxd

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VICINITY MAP
GEOTECHNICAL INVESTIGATION
WHITTIER WELL FIELD DESIGN
WHITTIER, ALASKA

Project:	20403.14
Drawn By:	AFS
Scale:	Not to Scale
Date:	11/5/2021
Figure:	1

LEGEND

● Test Pit Locations



File Path: I:\JobsData\20403.14 Whittier Well Field Design\00 CADD 2019\04 GIS\IR_F2_THLocations.mxd

0 25 50 100 150 200 250 Feet

Imagery dated 2016, acquired by NGS.

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TEST PIT LOCATIONS
GEOTECHNICAL INVESTIGATION
WHITTIER WELL FIELD DESIGN
WHITTIER, ALASKA

Project:	20403.14
Drawn By:	AFS
Scale:	Graphical Scale
Date:	11/5/2021
Figure:	2

Appendix A

Test Pit Logs

Included in this section:

- 1) Test Pit Log Legend
- 2) Test Pit Logs (TP-01 through 03)

FILE NAME: M:\Engineering_References\Tech_Geotechnical\Report_Template\Borehole_Log_Legend\Geotech_RAP_debris_added.dwg

UNIFIED SOIL CLASSIFICATION (ASTM D 2487)

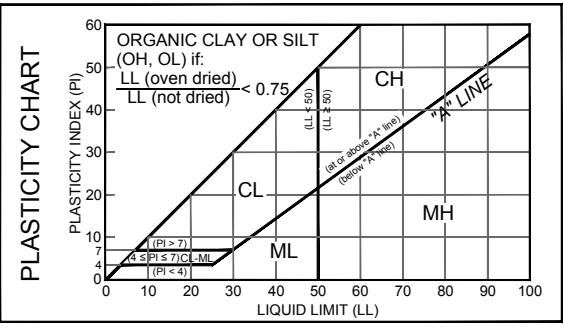
GROUP SYMBOL	SOIL GROUP NAMES & LEGEND	
GW	WELL-GRADED GRAVEL	if soil contains $\geq 15\%$ sand, add "with sand"
GP	POORLY GRADED GRAVEL	
GM	SILTY GRAVEL	
GC	CLAYEY GRAVEL	
SW	WELL-GRADED SAND	if soil contains $\geq 15\%$ gravel, add "with gravel"
SP	POORLY GRADED SAND	
SM	SILTY SAND	
SC	CLAYEY SAND	
CL	LEAN CLAY	if soil contains coarse-grained soil from 15% to 29%, add "with sand" or "with gravel" for whichever type is prominent, or for $\geq 30\%$, add "sandy" or "gravelly"
ML	SILT	
OL	ORGANIC CLAY OR SILT	
CH	FAT CLAY	
MH	ELASTIC SILT	
OH	ORGANIC CLAY OR SILT	
PT	PEAT	

Gravels or sands with 5% to 12% fines require dual symbols (GW-GM, GW-GC, GP-GM, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC) and add "with clay" or "with silt" to group name. If fines classify as CL-ML for GM or SM, use dual symbol GC-GM or SC-SM.

Optional Abbreviations: Lower case "s" after USCS group symbol denotes either "sandy" or "with sand" and "g" denotes either "gravelly" or "with gravel."

COMPONENT DEFINITIONS BY GRADATION

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 IN.
COBBLES	3 IN. TO 12 IN.
GRAVEL	3 IN. TO NO. 4 (4.76 mm)
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 (4.76 mm)
SAND	NO. 4 (4.76 mm) TO NO. 200 (0.074 mm)
COARSE SAND	NO. 4 (4.76 mm) TO NO. 10 (2.0 mm)
MEDIUM SAND	NO. 10 (2.0 mm) TO NO. 40 (0.42 mm)
FINE SAND	NO. 40 (0.42 mm) TO NO. 200 (0.074 mm)
SILT AND CLAY	SMALLER THAN NO. 200 (0.074 mm)
SILT	0.074 mm TO 0.005 mm
CLAY	LESS THAN 0.005 mm



OTHER SYMBOLS

SYMBOL	NAMES & LEGEND	
BLDR	COBBLES AND BOULDERS	overlay
FILL	GRANULAR FILL	main-made or placed
WD	WOODY DEBRIS	
RAP	RECLAIMED ASPHALT PAVEMENT	

RELATIVE DENSITY / CONSISTENCY ESTIMATE USING STANDARD PENETRATION TEST (SPT) VALUES (FROM TERZAGHI & PECK 1996)

COHESIONLESS SOILS ^(a)		COHESIVE SOILS ^(b)	
RELATIVE DENSITY	N ₆₀ (BLOWS/FOOT) ^(c)	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TSF) ^(d)
VERY LOOSE	0 - 4	VERY SOFT	0 - 0.25
LOOSE	4 - 10	SOFT	0.25 - 0.50
MED DENSE	10 - 30	MEDIUM	0.50 - 1.0
DENSE	30 - 50	STIFF	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	2.0 - 4.0
		HARD	OVER 4.0

- (a) Soils consisting of gravel, sand and silt, either separately or in combination possessing no characteristics of plasticity, and exhibiting drained behavior.
- (b) Soils possessing the characteristics of plasticity, and exhibiting undrained behavior.
- (c) Refer to ASTM D 1586-99 for a definition of N.
- (d) Undrained shear strength, s_u = 1/2 unconfined compression strength, U_c. Note that Torvane measures s_u and Pocket Penetrometer measures U_c.

SAMPLER ABBREVIATIONS

SS	SPT Sampler (2 in. OD, 140 lb hammer)	C	Core (Rock)
SSO	Oversize Spit Spoon (2.5 in. OD, 140 lb typ.)	TW	Thin Wall (Shelby Tube)
HD	Heavy Duty Split Spoon (3 in. OD, 300/340 lb typ.)	MS	Modified Shelby
BD	Bulk Drive (4 in. OD, 300/340 lb hammer typ.)	GP	Geoprobe
CA	Continuous Core (Soil in Hollow-Stem Auger)	AR	Air Rotary Cuttings
G	Grab Sample from surface / testpit	AG	Auger Cuttings

CRITERIA FOR DESCRIBING MOISTURE CONDITION (ASTM D 2488)

DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

DESCRIPTIVE TERMINOLOGY FOR PERCENTAGES (ASTM D 2488)

DESCRIPTIVE TERMS	RANGE OF PROPORTION
TRACE	0 - 5%
FEW	5 - 10%
LITTLE	10 - 25%
SOME	30 - 45%
MOSTLY	50 - 100%

LABORATORY TEST ABBREVIATIONS

AL	Atterberg Limit	PI	Plastic Index	TS	Thaw Consolidation
Consol	Consolidation	PID	Photoionization Detector	TV	Torvane
LMA	Limited Mechanical Analysis	Proc	Proctor	TXCD	Consolidated Drained Triaxial
MA	Sieve and Hydrometer Analysis	PP	Pocket Penetrometer	TXCU	Consolidated Undrained Triaxial
MC	Moisture Content	P200	Percent Fines (Silt & Clay)	TXUU	Unconsolidated Undrained Triaxial
NP	Non-plastic	SA	Sieve Analysis	VS	Vane Shear
OLI	Organic Loss on Ignition	SpG	Specific Gravity	Ω	Soil Resistivity



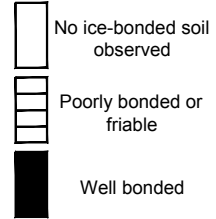
LEGEND: FIELD AND LABORATORY TEST ABBREVIATIONS

FILE NAME: M:\Engineering_References\Tech_Geotechnical\CRW_Geotechnical_Report_Template\Borehole_Log_Legend\Geotech_RAP_debris_added.dwg

FROZEN SOIL CLASSIFICATION (ASTM D 4083)

1. DESCRIBE SOIL INDEPENDENT OF FROZEN STATE	CLASSIFY SOIL BY THE UNIFIED SOIL CLASSIFICATION SYSTEM				
	MAJOR GROUP		SUBGROUP		
2. MODIFY SOIL DESCRIPTION BY DESCRIPTION OF FROZEN SOIL	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION	
	Segregated ice not visible by eye	N	Poorly bonded or friable	N _f	
			Well bonded	No excess ice	Nbn
				Excess ice	Nbe
	Segregated ice visible by eye (ice less than 25 mm thick)	V	Individual ice crystals or inclusions	V _x	
			Ice coatings on particles	V _c	
			Random or irregularly oriented ice formations	V _r	
			Stratified or distinctly oriented ice formations	V _s	
			Uniformly distributed ice	V _u	
	3. MODIFY SOIL DESCRIPTION BY DESCRIPTION OF SUBSTANTIAL ICE STRATA	Ice greater than 25 mm thick	ICE	Ice with soil inclusions	ICE+soil type
Ice without soil inclusions				ICE	

ICE BONDING SYMBOLS



DEFINITIONS

Candled Ice is ice which has rotted or otherwise formed into long columnar crystals, very loosely bonded together.

Clear Ice is transparent and contains only a moderate number of air bubbles.

Cloudy Ice is translucent, but essentially sound and non-pervious.

Friable denotes a condition in which material is easily broken up under light to moderate pressure.

Granular Ice is composed of coarse, more or less equidimensional, ice crystals weakly bonded together.

FROST DESIGN SOIL CLASSIFICATION⁽¹⁾

FROST GROUP ⁽²⁾	GENERAL SOIL TYPE	% FINER THAN 0.02 mm BY WEIGHT	TYPICAL USCS SOIL CLASS
NFS ⁽³⁾	(a) Gravels Crushed stone Crushed rock	0 - 1.5	GW, GP
	(b) Sands	0 - 3	SW, SP
PFS ⁽⁴⁾ [MOA NFS] [FAA NFS] [MOA F2] [FAA FG-2]	(a) Gravels Crushed stone Crushed rock	1.5 - 3	GW, GP
	(b) Sands	3 - 10	SW, SP
S1 [MOA F1] [FAA FG-1]	Gravelly soils	3 - 6	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
S1 [MOA F2] [FAA FG-2]	Sandy soils	3 - 6	SW, SP, SW-SM, SP-SM, SW-SC, SP-SC
F1 ⁽⁵⁾ [FAA FG-1]	Gravelly soils	6 - 10	GM, GC, GM-GC, GW-GM, GP-GM, GW-GC, GP-GC
F2 ⁽⁵⁾ [FAA FG-2]	(a) Gravelly soils	10 - 20	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
	(b) Sands	6 - 15	SM, SW-SM, SP-SM, SC, SW-SC, SP-SC, SM-SC
F3 ⁽⁵⁾ [FAA FG-2] [For Clays, FAA FG-3]	(a) Gravelly soils	10 - 20	GM, GC, GM-GC
	(b) Sands, except very fine silty sands	6 - 15	SM, SC, SM-SC
	(c) Clays, PI > 12	--	CL, CH
F4 ⁽⁵⁾ [FAA FG-4]	(a) Silts	--	ML, MH, ML-CL
	(b) Very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI < 12	--	CL, ML-CL
	(d) Varved clays or other fine-grained banded sediments	--	CL or CH layered with ML, MH, ML-CL, SM, SC, or SM-SC

Ice Coatings on particles are discernible layers of ice found on or below the larger soil particles in a frozen soil mass. They are sometimes associated with hoarfrost crystals, which have grown into voids produced by the freezing action.

Ice Crystal is a very small individual ice particle visible in the face of a soil mass. Crystals may be present alone or in a combination with other ice formations.

Ice Lenses are lenticular ice formations in soil occurring essentially parallel to each other, generally normal to the direction of heat loss and commonly in repeated layers.

Ice Segregation is the growth of ice as distinct lenses, layers, veins and masses in soils, commonly but not always oriented normal to direction of heat loss.

Massive Ice is a large mass of ice, typically nearly pure and relatively homogeneous.

Poorly-Bonded signifies that the soil particles are weakly held together by the ice and that the frozen soil consequently has poor resistance to chipping or breaking.

Porous Ice contains numerous void, usually interconnected and usually resulting from melting of air bubbles or along crystal interfaces from presence of salt or other materials in the water, or from the freezing of saturated snow. Though porous, the mass retains its structural unity.

Thaw-Stable frozen soils do not, on thawing, show loss of strength below normal, long-time thawed values nor produce detrimental settlement.

Thaw-Unstable frozen soils show on thawing, significant loss of strength below normal, long-time thawed values and/or significant settlement, as a direct result of the melting of the excess ice in the soil.

Well-Bonded signifies that the soil particles are strongly held together by the ice and that the frozen soil possesses relatively high resistance to chipping or breaking.

(1) From the U.S. Army Corps of Engineers (USACE), EM 1110-3-138, "Pavement Criteria for Seasonal Frost Conditions", April 1984
 (2) USACE frost groups directly correspond to frost groups in Municipality of Anchorage (MOA) Design Criteria Manual (DCM). Federal Aviation Administration (FAA) frost groups come from Table 2-2 in Section 2.7 of Advisory Circular (AC) 150/5320-6F, Airport Pavement Design and Evaluation.
 (3) Non-frost susceptible
 (4) Possibly frost susceptible, requires lab test for void ratio to determine frost design classification.
 (5) Consistent with MOA Definition.



LEGEND: FROZEN SOIL CLASSIFICATION



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TEST PIT TP-01

PAGE 1 OF 1

CLIENT City of Whittier
PROJECT NUMBER 20403.14
DATE STARTED 5/25/21 **COMPLETED** 5/25/21
EXCAVATION CONTRACTOR City of Whittier
EXCAVATION METHOD Volvo EC160B
LOGGED BY AFS **CHECKED BY** SMH
NOTES Two feet of snow on the ground at this location.

PROJECT NAME Whittier Well Field Design
PROJECT LOCATION Whittier, Alaska
GROUND ELEVATION
GROUND WATER LEVELS:
AT TIME OF EXCAVATION --- No groundwater observed.
AT END OF EXCAVATION ---
AFTER EXCAVATION ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲								
											10	20	30	40					
0.0	ORG		ORGANIC MAT, (ORG) Moss, grass, roots, and organic soil at surface. Upper foot of soil may have been frozen.																
2.5	SP-SM		POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) 44% gravel, 49% sand, 7% fines Gray, moist, no odor. Angular to subrounded platy or elongate gravel, cobbles, and boulders, up to 1.5 feet diameter. 5% cobbles and boulders. Frost class F-2 (estimated). Buried wood debris at approximately 2 feet BGS.	SG 1							LMA								
5.0	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) 53% gravel, 40% sand, 7% fines Gray, moist, no odor. A distinct lenticular body of gravel and sand. Subrounded to rounded elongate gravel, cobbles, and boulders up to 1.5 feet. 10% boulders and cobbles. Frost class F-1 (estimated). Wood-stave pipe observed approximately 5 feet BGS. 8-inch diameter, wire-wrapped, apparently oriented SE-NW. No odor or sheen associated with pipe, no liquid contained within it.	G S2					0		LMA								
7.5	GM		SILTY GRAVEL WITH SAND, (GM) 46% gravel, 44% sand, 12% fines Gray, moist, no odor. Angular to subrounded platy or elongate gravel, cobbles, and boulders up to 1.5 feet diameter. 15% cobbles and boulders. Frost class F-3 (hydrometer).	G S3							MA								
10.0	GP		POORLY GRADED GRAVEL WITH SAND, (GP) 56% gravel, 40% sand, 4% fines Gray, moist, no odor. Angular to subrounded platy or elongate gravel, cobbles, and boulders up to 1.5 feet diameter. 30% cobbles and boulders.	G S4							LMA								

Bottom of test pit at 12.0 feet.

Notes:
 Backfilled with spoils. Operator suggests that transition to more bouldery soils at approximately 5-6 feet BGS may correspond to the bottom of placed fill in this area, based on previous experience in Whittier. Presence of wood debris and wood stave pipe supports this interpretation.

CRW MOA LOG - CRW_DATATEMPLATE_20190115.GDT - 11/5/21 13:12 - 20403.14 WHITTIERWELLFIELD.GPJ



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TEST PIT TP-02

PAGE 1 OF 1

CLIENT City of Whittier

PROJECT NAME Whittier Well Field Design

PROJECT NUMBER 20403.14

PROJECT LOCATION Whittier, Alaska

DATE STARTED 5/25/21 COMPLETED 5/25/21

GROUND ELEVATION _____

EXCAVATION CONTRACTOR City of Whittier

GROUND WATER LEVELS:

EXCAVATION METHOD Volvo EC160B

▽ AT TIME OF EXCAVATION 11.00 ft Seep from sandy layer.

LOGGED BY AFS CHECKED BY SMH

AT END OF EXCAVATION ---

NOTES _____

AFTER EXCAVATION ---

CRW MOA LOG - CRW_DATATEMPLATE_20190115.GDT - 11/5/21 13:12 - 20403.14 - WHITTIERWELLFIELD.GPJ

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲			
											10	20	30	40
0.0											PL	MC	LL	
	GP		POORLY GRADED GRAVEL WITH SAND, (GP) 60% gravel, 35% sand, 5% fines Gray, moist, no odor. Subangular to subrounded platy or elongate gravel, cobbles, and boulders, up to 1.25 feet diameter. 10% cobbles and boulders. Frost class NFS (estimated).											
2.5	ORG		ORGANIC SOIL, (ORG) Organic layer including organic soil and plant fiber. Not sphagnum peat. May have been original ground surface in this area.											
	GP		POORLY GRADED GRAVEL WITH SAND, (GP) 59% gravel, 39% sand, 2% fines Gray, moist, no odor. Subangular to subrounded platy or elongate gravel, cobbles, and boulders, up to 1.25 feet diameter. 10% cobbles and boulders. Frost class NFS (estimated).	G S1						LMA				
5.0	SP-SM		POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) 47% gravel, 47% sand, 6% fines Gray, moist, no odor. Subangular to subrounded platy or elongate gravel and cobbles. 5% cobbles. Frost class F-2 (estimated).	G S2					0	LMA				
7.5	SM		SILTY SAND, (SM) 1% gravel, 73% sand, 26% fines Gray, moist, no odor. Lenticular body of silty sand, fine to coarse sand. No cobble or boulders. Frost class F-3 (estimated).	G S4						SA				
10.0	GM		SILTY GRAVEL WITH SAND, (GM) 47% gravel, 30% sand, 23% fines Gray, moist, no odor. Subangular to subrounded platy or elongate gravel and cobbles. Sandier layers throughout, some containing groundwater. 5% cobbles. Frost class F-2 (hydrometer).	G S3						MA				

Bottom of test pit at 12.0 feet.

Notes:
 Backfilled with spoils.



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TEST PIT TP-03

PAGE 1 OF 1

CLIENT City of Whittier
PROJECT NUMBER 20403.14
DATE STARTED 5/25/21 **COMPLETED** 5/25/21
EXCAVATION CONTRACTOR City of Whittier
EXCAVATION METHOD Volvo EC160B
LOGGED BY AFS **CHECKED BY** SMH
NOTES

PROJECT NAME Whittier Well Field Design
PROJECT LOCATION Whittier, Alaska
GROUND ELEVATION
GROUND WATER LEVELS:
 ▽ **AT TIME OF EXCAVATION** 5.00 ft Seep from sandy layer.
AT END OF EXCAVATION ---
AFTER EXCAVATION ---

CRW MOA LOG - CRW DATATEMPLATE 20190115.GDT - 11/5/21 13:12 - 20403.14 WHITTIERWELLFIELD.GPJ

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲			
											10	20	30	40
0.0											PL	MC	LL	
2.5	GP		POORLY GRADED GRAVEL, (GP) 67% gravel, 32% sand, 1% fines Gray, moist, no odor. Subrounded to angular sand, gravel, and cobbles. 10% cobbles. Frost class NFS (estimated).	G S1						LMA	○			
5.0	SP		POORLY GRADED SAND, (SP) 3% gravel, 93% sand, 4% fines Gray, moist to wet, no odor. No cobbles or boulders. Water seeps from this interval. Frost class NFS (estimated).	G S2					0	SA	○			
7.5	SP		POORLY GRADED SAND WITH GRAVEL, (SP) 43% gravel, 55% sand, 2% fines Gray, moist to wet, no odor. Subangular to subrounded platy or elongate sand, gravel, cobbles, and boulders up to 1.25 feet. 10-15% cobbles and boulders. Frost class NFS (estimated).	G S3						LMA	○			
10.0	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) 50% gravel, 45% sand, 5% fines Gray, moist to wet, no odor. Subangular to subrounded platy or elongate sand, gravel, cobbles, and boulders up to 1.25 feet. 10-15% cobbles and boulders. Frost class NFS (estimated).	G S4						LMA	○			
12.5	GP		POORLY GRADED GRAVEL WITH SAND, (GP) 49% gravel, 47% sand, 4% fines Gray, moist to wet, no odor. Subangular to subrounded platy or elongate sand, gravel, cobbles, and boulders up to 2 feet. 10-15% cobbles and boulders. Frost class NFS (estimated).	G S5						LMA	○			

Bottom of test pit at 13.0 feet.

Notes:
 Backfilled with spoils.

Appendix B

Laboratory Results

Included in this section:

- 1) Laboratory Results from Alaska Testlab



Material Test Report

Report No: ASM:21-0876
Issue No: 1

Client: CRW Engineering Group, LLC
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 Anchorage, AK 99503

CC:

Project: Whittier - 20403.14

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

Reviewed By: Oscar Lage
 Title: Laboratory Supervisor
 Date: 6/4/2021

Sample Details

Sample ID	21-0876-S01	21-0876-S02	21-0876-S03	21-0876-S04
Client Sample ID	TP-01 Sample 1	TP-01 Sample 2	TP-01 Sample 3	TP-01 Sample 4
Date Sampled				

Particle Size Distribution

Method:	Sieve Size	% Passing	Limits
ASTM D 422	3in (75.0mm)	100	
Description:	2in (50.0mm)	100	
Analysis of Particle Size	1½in (37.5mm)	100	
Distribution in Soils. Sieving for	1in (25.0mm)	92	
Particles >75µm, Hydrometer	¾in (19.0mm)	85	
Drying by:	½in (12.5mm)	77	
	3/8in (9.5mm)	70	
Washed:	No.4 (4.75mm)	54	
Sample Washed	No.10 (2.0mm)	36	
	No.20 (850µm)	28	
	No.40 (425µm)	21	
	No.60 (250µm)	17	
	No.100	14	
	No.200 (75µm)	12	
	Finer No.200	12.1	

Other Test Results

Description	Method	Results				Limits
Water Content (%)	ASTM D 2216	9.6	9.5	10.2	8.5	
Method		B	B	B	B	
Tested By		Quinton Goodman	Quinton Goodman	Quinton Goodman	Quinton Goodman	
Percent Gravel	LMA (Internal Method)	44	53		56	
Percent Sand		49	40		40	
Percent Fines (Silt/Clay)		7	7		4	
Group Symbol		SP-SM	GP-GM		GP	
Group Symbol	ASTM D 2487			GM		
Group Name				Silty gravel with sand		
Dispersion device	ASTM D 422			Dispersant by hand		
Dispersion time (min)						
Shape						
Hardness						

Comments

N/A



Material Test Report

Report No: ASM:21-0879
Issue No: 1

Client: CRW Engineering Group, LLC
 3940 Arctic Blvd., Ste. 300
 Anchorage, AK 99503

CC:

Project: Whittier - 20403.14

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

Reviewed By: Oscar Lage
 Title: Laboratory Supervisor
 Date: 6/4/2021

Sample Details

Sample ID	21-0879-S01	21-0879-S02	21-0879-S03	21-0879-S04
Client Sample ID	TP-02 Sample 1	TP-02 Sample 2	TP-02 Sample 3	TP-02 Sample 4
Date Sampled				

Particle Size Distribution

Method:	Sieve Size	% Passing		Limits
ASTM D 422	3in (75.0mm)	100	100	
Description:	2in (50.0mm)	89	100	
Analysis of Particle Size	1½in (37.5mm)	78	100	
Distribution in Soils. Sieving for	1in (25.0mm)	69	100	
Particles >75µm, Hydrometer	¾in (19.0mm)	65	100	
Drying by:	½in (12.5mm)	61	100	
	3/8in (9.5mm)	59	100	
Washed:	No.4 (4.75mm)	53	99	
Sample Washed	No.10 (2.0mm)	44	97	
	No.20 (850µm)	37	88	
	No.40 (425µm)	32	81	
	No.60 (250µm)	29	73	
	No.100	26	53	
	No.200 (75µm)	23	26	
	Finer No.200	23.0	25.8	

Other Test Results

Description	Method	Results				Limits
Water Content (%)	ASTM D 2216	6.0	11.1	15.8	25.4	
Method		B	B	B	B	
Tested By		Quinton Goodman	Quinton Goodman	Quinton Goodman	Quinton Goodman	
Percent Gravel	LMA (Internal Method)	59	47			
Percent Sand		39	47			
Percent Fines (Silt/Clay)		2	6			
Group Symbol		GP	SP-SM			
Group Symbol	ASTM D 2487			GM	SM	
Group Name				Silty gravel with sand	Silty sand	
Dispersion device	ASTM D 422			Dispersant by hand		
Dispersion time (min)						
Shape						
Hardness						
Method	ASTM D 6913					
Sample Obtained While				Oven-Dried		
Group Name				Silty sand		
Group Symbol				SM		
Composite Sieving Used				No		
Dispersion Method				Dispersant by hand		
Prior Testing						

Comments

N/A



Material Test Report

Report No: ASM:21-0880
Issue No: 1

Client: CRW Engineering Group, LLC
 3940 Arctic Blvd., Ste. 300
 Anchorage, AK 99503

CC:

Project: Whittier - 20403.14

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

Reviewed By: Oscar Lage
 Title: Laboratory Supervisor
 Date: 6/4/2021

Sample Details

Sample ID	21-0880-S01	21-0880-S02	21-0880-S03	21-0880-S04	21-0880-S05
Client Sample ID	TP-03 Sample 1	TP-03 Sample 2	TP-03 Sample 3	TP-03 Sample 4	TP-03 Sample 5
Date Sampled					

Particle Size Distribution

Method:	Sieve Size	% Passing	Limits
ASTM D 6913	75.0mm	100	
Description:	50.0mm	100	
Particle size distribution (gradation) of soils using sieve analysis.	37.5mm	100	
	25.0mm	100	
	19.0mm	100	
	12.5mm	100	
Drying by:	9.5mm	99	
Washed: Sample Washed	4.75mm	97	
	2.0mm	92	
	850µm	76	
	425µm	48	
	250µm	21	
	150µm	10	
	75µm	4	
	Finer 75µm	3.8	

Other Test Results

Description	Method	Results					Limits
Water Content (%)	ASTM D 2216	3.8	17.7	6.3	12.6	7.7	
Method		B	B	B	B	B	
Tested By		Quinton Goodman	Quinton Goodman	Quinton Goodman	Quinton Goodman	Quinton Goodman	
Percent Gravel	LMA (Internal Method)	67		43	50	49	
Percent Sand		32		55	45	47	
Percent Fines (Silt/Clay)		1		2	5	4	
Group Symbol		GP		SP	GP-GM	GP	
Group Symbol	ASTM D 2487		SP				
Group Name			Poorly graded sand				
Method	ASTM D 6913						
Sample Obtained While			Oven-Dried				
Group Name			Poorly graded sand				
Group Symbol			SP				
Composite Sieving Used			No				
Dispersion Method			Dispersant by hand				
Prior Testing							

Comments

N/A



Material Test Report

Report No: MAT:21-0876-S03
Issue No: 1

Client: CRW Engineering Group, LLC
 3940 Arctic Blvd., Ste. 300
 Anchorage, AK 99503

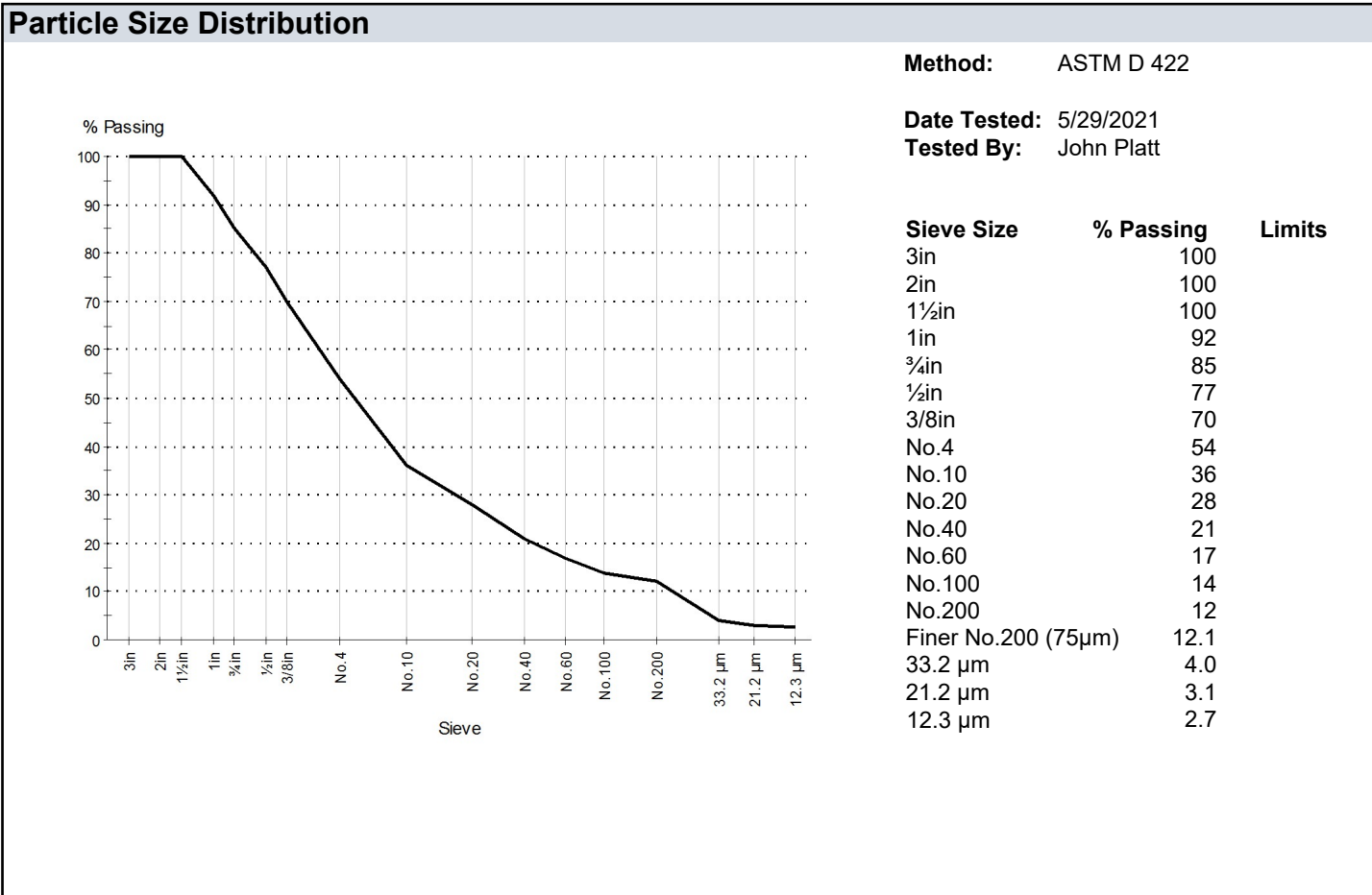
CC:

Project: Whittier - 20403.14

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

Reviewed By: Oscar Lage
 Title: Laboratory Supervisor
 Date: 6/4/2021

Sample Details		Other Test Results			
Sample ID	21-0876-S03	Description	Method	Result	Limits
Client Sample ID	TP-01 Sample 3	Water Content (%)	ASTM D 2216	10.2	
Specification	Sieve	Method		B	
		Tested By	Quinton Goodman		
		Date Tested	6/3/2021		
		Group Symbol	ASTM D 2487	GM	
		Group Name	Silty gravel with sand		
			ASTM D 422		
		Dispersion device	Dispersion by hand		
		Dispersion time (min)			
		Shape			
		Hardness			



Comments
 N/A



Material Test Report

Report No: MAT:21-0879-S03
Issue No: 1

Client: CRW Engineering Group, LLC
 3940 Arctic Blvd., Ste. 300
 Anchorage, AK 99503

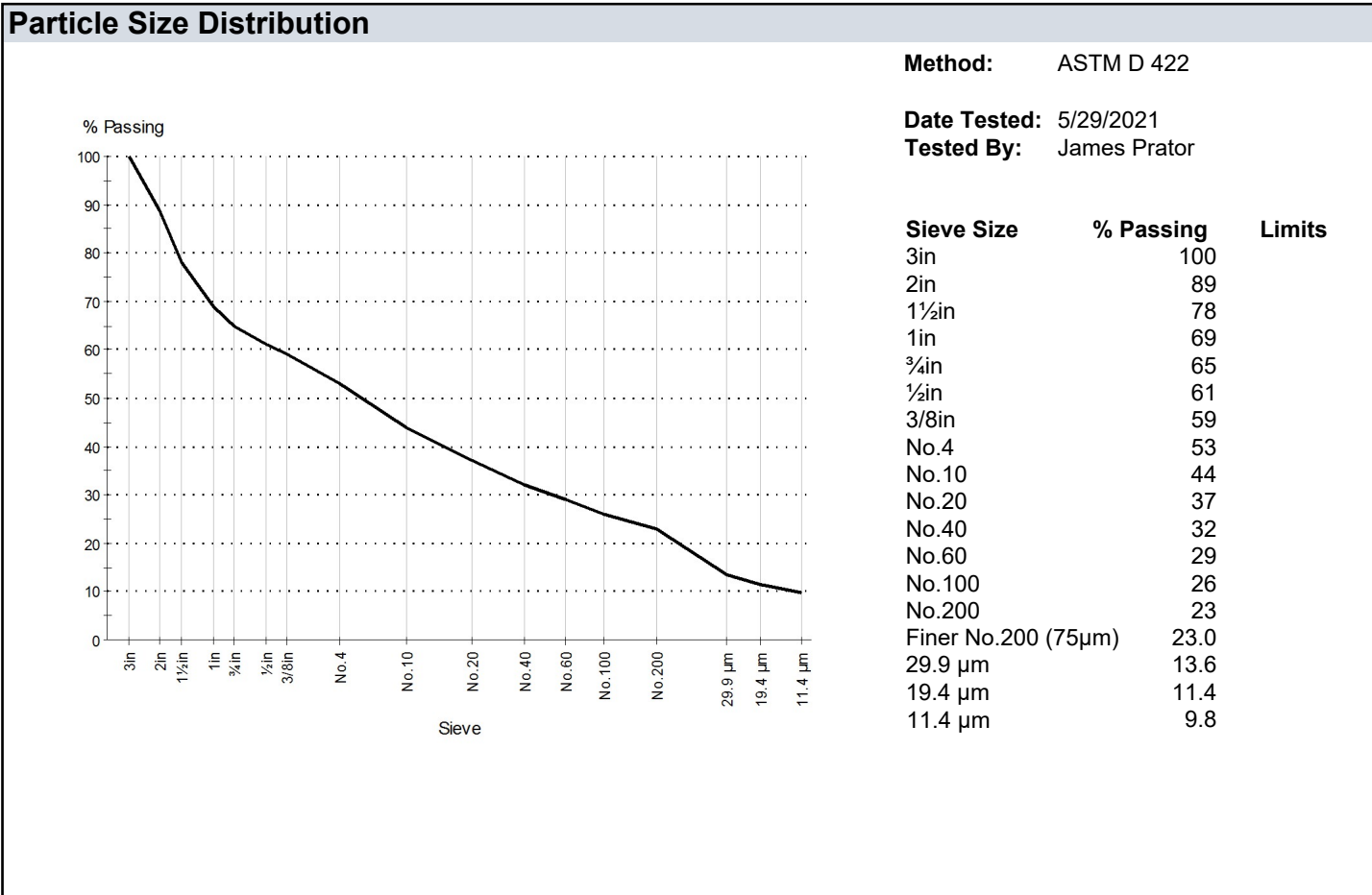
CC:

Project: Whittier - 20403.14

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

Reviewed By: Oscar Lage
 Title: Laboratory Supervisor
 Date: 6/4/2021

Sample Details		Other Test Results			
Sample ID	21-0879-S03	Description	Method	Result	Limits
Client Sample ID	TP-02 Sample 3	Water Content (%)	ASTM D 2216	15.8	
Specification	Sieve	Method		B	
		Tested By	Quinton Goodman		
		Date Tested	5/28/2021		
		Group Symbol	ASTM D 2487	GM	
		Group Name	Silty gravel with sand		
			ASTM D 422		
		Dispersion device	Dispersant by hand		
		Dispersion time (min)			
		Shape			
		Hardness			



Comments
 N/A



Material Test Report

Report No: MAT:21-0879-S04
Issue No: 1

Client: CRW Engineering Group, LLC
 3940 Arctic Blvd., Ste. 300
 Anchorage, AK 99503

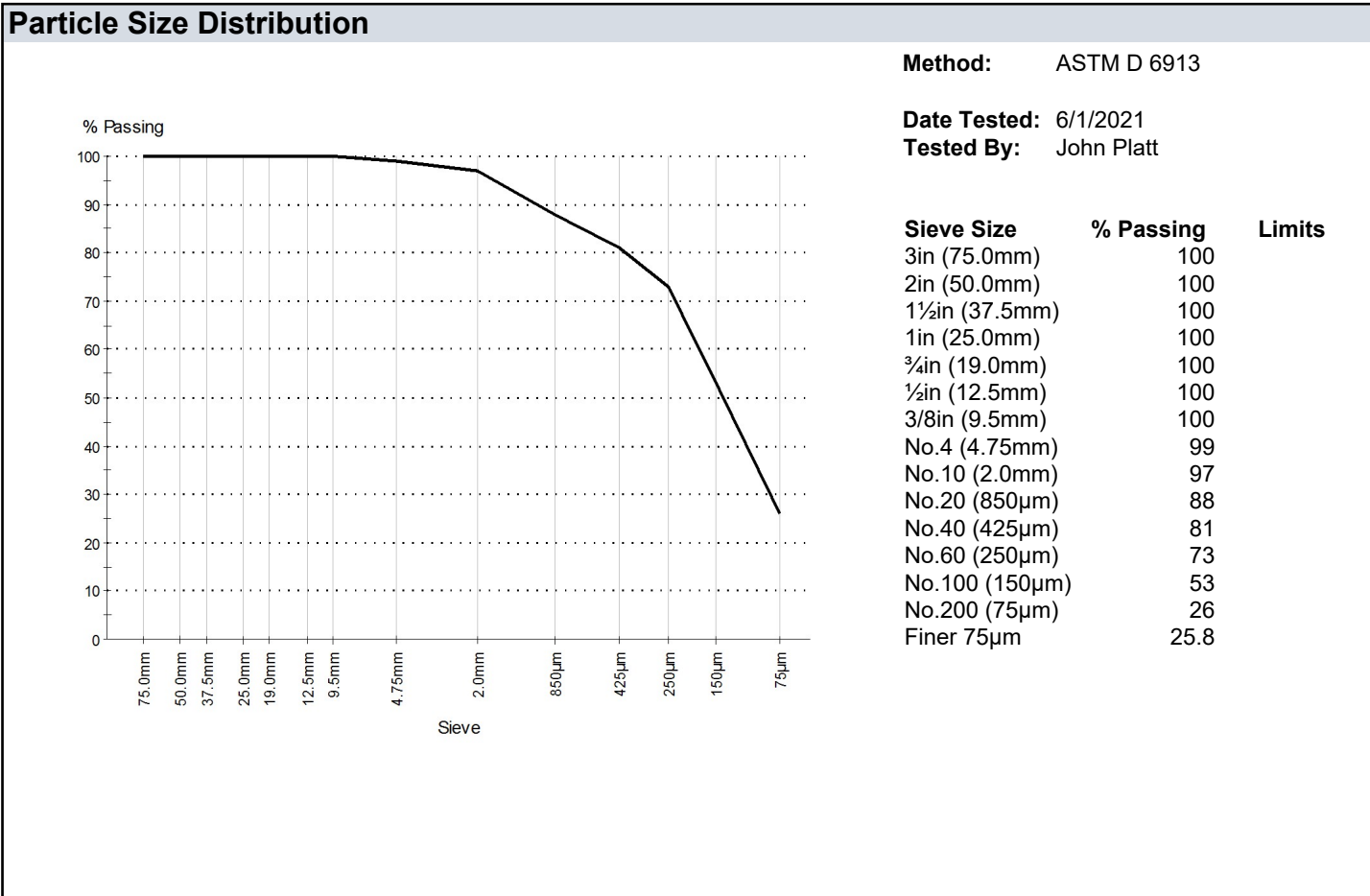
CC:

Project: Whittier - 20403.14

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

Reviewed By: Oscar Lage
 Title: Laboratory Supervisor
 Date: 6/4/2021

Sample Details		Other Test Results			
Sample ID	21-0879-S04	Description	Method	Result	Limits
Client Sample ID	TP-02 Sample 4	Water Content (%)	ASTM D 2216	25.4	
Specification	Sieve	Method		B	
		Tested By	Quinton Goodman		
		Date Tested	5/28/2021		
		Method	ASTM D 6913		
		Sample Obtained While	Oven-Dried		
		Group Name	Silty sand		
		Group Symbol	SM		
		Composite Sieving Used	No		
		Dispersion Method	Dispersant by hand		
		Prior Testing			



Comments
 N/A



Material Test Report

Report No: MAT:21-0880-S02
Issue No: 1

Client: CRW Engineering Group, LLC
 3940 Arctic Blvd., Ste. 300
 Anchorage, AK 99503

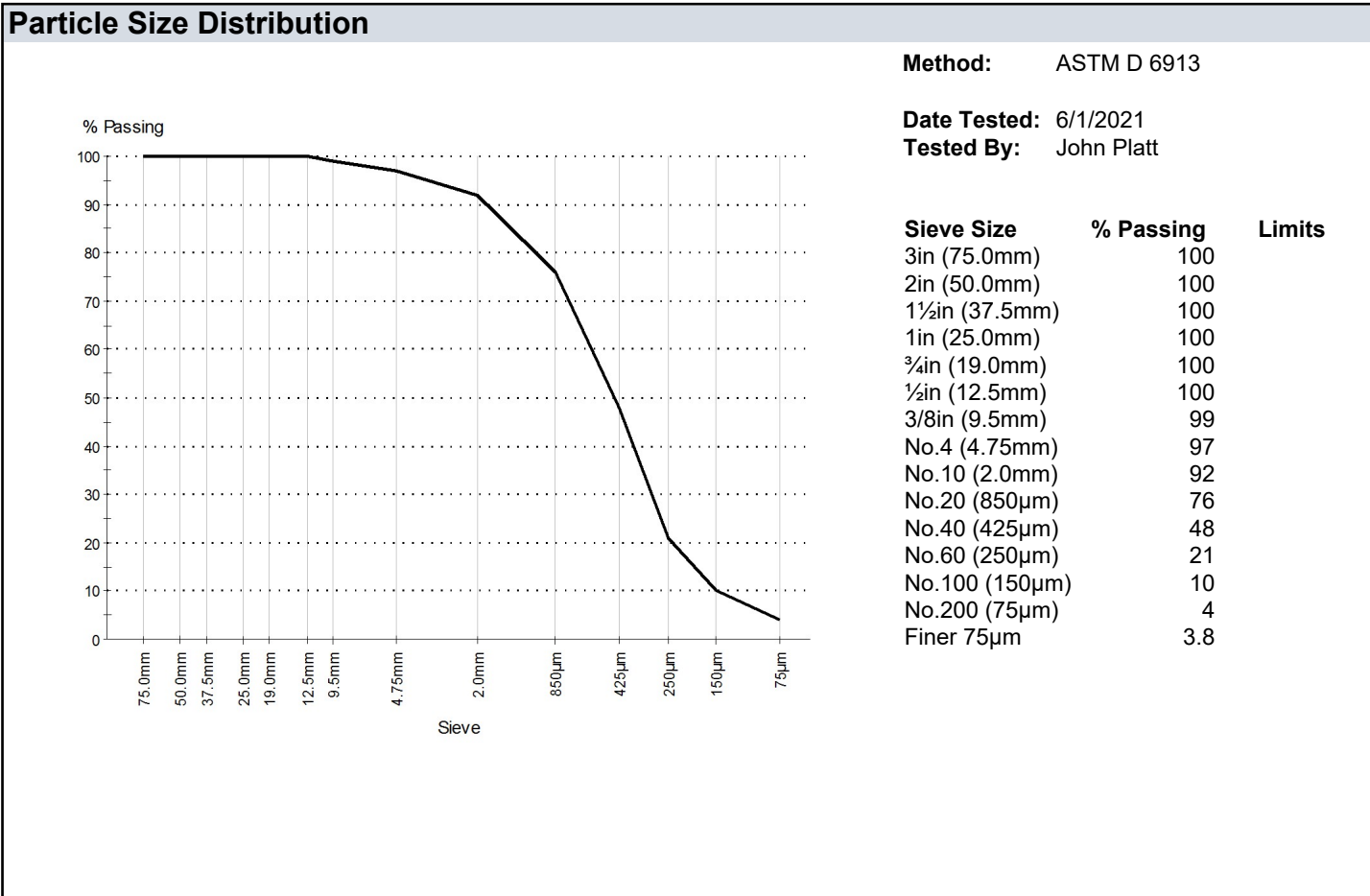
Project: Whittier - 20403.14

CC:

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

Reviewed By: Oscar Lage
 Title: Laboratory Supervisor
 Date: 6/4/2021

Sample Details		Other Test Results			
Sample ID	21-0880-S02	Description	Method	Result	Limits
Client Sample ID	TP-03 Sample 2	Water Content (%)	ASTM D 2216	17.7	
Specification	Sieve	Method		B	
		Tested By	Quinton Goodman		
		Date Tested	5/28/2021		
		Method	ASTM D 6913		
		Sample Obtained While	Oven-Dried		
		Group Name	Poorly graded sand		
		Group Symbol	SP		
		Composite Sieving Used	No		
		Dispersion Method	Dispersant by hand		
		Prior Testing			



Comments
 N/A

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION XI

PERMITS

State of Alaska DEC Conditional Construction Approval
State of Alaska DPS State Fire Marshal Plan Approval



September 6, 2022

Mr. Scott Korbe
City of Whittier
PO Box 608
Whittier, AK 99693

RE: City of Whittier Community Water System – Public Water System ID# 211952
Whittier Well Field Upgrade
Conditional Construction Approval
Conditional Approval of Separation Distance Waiver Request (Project ID# 18299)

Dear Mr. Korbe:

On August 4, 2022, this office received a request for approval to construct modifications to the drinking water system serving the City of Whittier. We have reviewed the request, which includes engineering plans and specifications and additional information received on August 30, 2022. Based on this review, we grant conditional construction and separation distance waiver approvals as detailed below. This letter and the enclosed "Construction and Operation Certificate" are the written approval required by State of Alaska Drinking Water Regulations, 18 AAC 80.200(b). Use the noted public water system identification (PWSID#) and project (Project ID#) numbers to identify this project.

This approval is for the design detailed in the noted engineering plans, subject to compliance with the following conditions. Approval of changes is required prior to implementation.

Please review and familiarize yourself with the conditions before beginning construction. Interim and Final Approvals to Operate may be withheld until all conditions are met. You are required to obtain approval from this office before serving water

Project-specific Conditions of Construction Approval

1. The water system modifications are designed to provide water from two new wells (Wells A and B), and has the capacity to provide for 750 gpm from Well A, and 500 gpm from Well B. These wells will replace Wells #2 and #3, which can produce on average 220 gpm and 250 gpm, respectively. Sheet I102 provides the control sequence for the wells. To briefly summarize, Well A and B will be in a lead/lag configuration (with the ability to switch which well will be the lead well), with the lag pump to turn on if the lead pump has been running alone for 5 hours. Because water levels in the wells were tidally influenced, Sheet I102 and I611 provides limiting conditions and monitoring requirements to ensure there is no saltwater intrusion. This approval is limited to the construction of the items listed below and monitoring requirements listed in the design documents.

SYSTEM MODIFICATION SUMMARY

CLASSIFICATION	Community	PWSID# 211952	
WELL A	Onsite Well (GW)	Total depth: 101 ft. Static Water: 27 ft. bgs Yield: 775 GPM	Location: Latitude: +60.774056 Longitude: -148.68975
WELL B	Onsite Well (GW)	Total depth: 99 ft. Static Water: 27 ft bgs Yield: 565 gpm	Location: Latitude: +60.773987 Longitude: -148.68805
WELL PUMPS A & B	Goulds VIS-BATM 9RCLC	750 gpm at 290 ft. TDH	
WATER LINE	Approximately 190 LF of 10" DIP – manifold piping to existing system	Approximately 101 LF of 8" DIP CL52 – Well A to manifold building	Approximately 226 LF of 8" DIP CL52 – Well B to manifold building
APPURTENANCES	Two 6" ABB flow meters (for each well)		

1. Sample results for Nitrate, Nitrite, Total Coliform, inorganic chemicals, volatile organic chemicals, and secondary contaminants as listed in 40 CFR 141 and 143.3 will need to be submitted from each new well before operational approval is issued.
2. Submit well decommissioning form (attached) to this office and DNR for abandoned Wells No. 2 and No. 3.

GENERAL CONDITIONS OF APPROVAL	
Separation Distance Requirements	<p>A minimum separation distance of 200 feet must be maintained between drinking water sources and potential sources of contamination. The department has the authority to require greater distances when warranted.</p> <p>A minimum separation distance of 10 feet must be maintained between all drinking water lines and wastewater sewer lines and appurtenances (including sewer manholes), as measured from the closest edges of each component.</p> <p>A minimum separation distance of 10 feet must be maintained between all drinking water lines and wastewater treatment and disposal system components, as measured from the closest edges of each component.</p> <p>If these distances cannot be met, approval of separation distance waivers must be requested and granted prior to construction.</p>
Water Main Crossings	Crossings of water and sewer mains (sanitary or storm water) must meet the requirements of Drinking Water Regulations, 18AAC80.020(f) unless a separation distance waiver has been granted for this project. Record drawings submitted with the request for Final Approval to Operate must include details adequate to confirm that the prescriptive requirements have been met during construction.
Contamination Encountered During Construction	During construction, if contaminated soil or groundwater is encountered, contact DEC to assure that concerns related to the drinking water system improvements and Spill Prevention and Response requirements are properly addressed.
Changes to Approved Plans	Deviations from approved plans which affect capacity, flow, operation, major design of units, materials of major system components, or separation distances, must be approved in writing by this office prior to their implementation.

Flushing, Pressure Testing, and Disinfection	Following construction, the system shall be flushed, pressure tested and disinfected in accordance with standards approved by this office.
Chlorinated Discharges	Water containing chlorine used during the disinfection or pressure testing processes requires proper management. This includes chlorine neutralization or disposal in an appropriate wastewater treatment and disposal system. This water must be managed to avoid adverse effects on groundwater, surface water or the environment.
2-Year Approval Duration and Extensions	This approval is valid for two years from the date of this letter. If the applicant fails to construct, install, alter, renovate, or improve the water system within two years, the approval is void and the plans and information required under 18 AAC 80.210(a) must be resubmitted for Department review and approval. If during the two-year period, the site conditions, plans, and information, and requirements of this chapter do not change, and if the applicant pays the fee required by 18 AAC 80.1910(b)(12), the Department may grant the applicant an extension.
Other Required Authorizations	This approval is also contingent upon your receipt of any other state, federal or local authorizations which are required for your project.

TO REQUEST INTERIM APPROVAL TO OPERATE

Upon completion of construction and <i>prior to serving water</i> , the project engineer must certify the following information in the request for Interim Approval to Operate:	
Construction	Construction has been completed under the direction of a registered engineer in accordance with the DEC approved plans. Any deviations from the original plans approved for construction have been submitted to and approved by DEC.
Materials	Only materials approved by the department for installation in this system were used in the construction and only NSF/ANSI 60 listed chemicals are provided for water treatment.
Flushing, Pressure Testing and Disinfection	The system was successfully flushed, pressure tested, and disinfected in accordance using department approved methods.
Disinfection Verification Coliform Sampling	The system was properly disinfected and verified to be free of Coliform bacteria in accordance with applicable AWWA standards or methods approved by the department prior to construction. This project requires a minimum of 4 satisfactory analytical results as follows: <ul style="list-style-type: none"> • One set of 2 samples taken in accordance with one of these options: Option A: Take one set, wait 16 hours, and take the second set; or Option B: Wait 16 hours after filling line, take one set, flush the line for 15 minutes and take the second set; • The set should be taken at the end of the newly constructed water transmission main. • Two additional samples are required from each well after disinfection. Submit copies of the satisfactory results with the request for Interim Approval to Operate.
O & M Manual	An Operations & Maintenance manual has been provided to the water system operators.
	All applicable minimum separation distance requirements have been met

Separation Distances	during construction. For conditional waiver approvals of separation distance requirements, provide confirmation that all conditions were met.
Conditions	All conditions of construction approval have been met.

TO REQUEST FINAL APPROVAL TO OPERATE	
At least 30 days prior to the expiration of the Interim Approval to Operate, submit the following information in the request for Final Approval to Operate:	
Record Drawings	Record drawings, sealed, signed and dated by a registered engineer. The record drawings must confirm that the system meets the requirements of 18AAC80 and provides public health protection. The record drawings must include: <ul style="list-style-type: none"> • clear delineations of any changes or deviations from the previously submitted and approved plans; • details verifying compliance with minimum separation distance requirements; and • construction details for all water and sewer main crossings.
Operator	The Drinking Water Regulations, 18 AAC 80.007, require that this system be actively supervised as described in the Operator Certification Regulations, 18 AAC 74, by operators who are certified in accordance with AS 46.30 and 18 AAC 74. Additional information regarding Operator Certification is available at: http://dec.alaska.gov/water/operator-certification.aspx
Outstanding Conditions	Verification and applicable documentation demonstrating that all conditions contained in this Conditional Approval to Construct have been met.

Waiver Approval

On August 30, 2022, this office received engineering plan submittals supporting a request for a waiver of the minimum separation distance required under Drinking Water Regulations, 18 AAC 80.020. We have completed a review and find that the submitted information, justification, and endorsement of the project engineer adequately supports a reduction of the required minimum separation distance. Lesser separation distances as detailed below are approved as requested.

SEPARATION DISTANCE WAIVER APPROVAL CRITERIA:	
The department grants conditional approval of the following waivers of the minimum separation distance requirements of the State of Alaska Drinking Water Regulations, 18AAC80.	
Compliance with the conditions under which the waivers are granted may require the use of specific materials, construction quality assurance, inspection and testing, as recommended by the project engineer in justifying the waiver request.	
WAIVER	REQUIRED MITIGATING MEASURES AND APPROVAL CRITERIA
Well A approximately 70 LF from Manifold Building floor drains, and 95 feet from dry well.	Floor drains and the connected dry well are intended to only capture water leaks from potable water equipment and the facility dehumidifier, or snow tracked in during winter. The building will have signage that no chemical storage is allowed. Sheet C204 shows the dry well will be covered and buried. A generator is proposed to be installed in the building with a 265-gallon fuel tank. The fuel tank has secondary containment, and the facility has a leak sensor with alarm.

Based on the engineer's request, the waiver is approved.
--

Approval Limitations

This waiver is valid only for the proposed use and the systems described in the waiver request dated August 30, 2022, on file in this office. This waiver is valid as long as the drinking water contaminant concentrations do not exceed the maximum contaminant levels (MCLs) established in 18 AAC 80.300.

The Department's construction approval does not guarantee correctness of the functional design or waive the owner's responsibility for compliance with applicable regulations. This approval does not imply the granting of additional authorizations, nor obligate any federal, state, or local regulatory body to grant required authorizations. This is not an approval of omissions or oversights by this office or noncompliance with any applicable regulation.

Informal Reviews and Adjudicatory Hearings

A person authorized under a provision of 18 AAC 15 may request an informal review of a contested decision by the Division Director in accordance with 18 AAC 15.185 and/or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. See DEC's "Appeal a DEC Decision" web page <https://dec.alaska.gov/commish/review-guidance/> for access to the required forms and guidance on the appeal process. Please provide a courtesy copy of the adjudicatory hearing request in an electronic format to the parties required to be served under 18 AAC 15.200.

Requests must be submitted no later than the deadline specified in 18 AAC 15.

If you have any questions, please feel free to contact me at 907-262-3400.

Sincerely:



Charity Bare, PE
DEC Engineer

Enclosure: Construction and Operation Certificate

cc: Pete Bellezza, P.E., CRW Engineering Group, LLC (via email)
Jessica Cahill, Roy Robertson, DEC Drinking Water Program (via email)
DEC Operator Training and Certification Program (via email: dec.opcert@alaska.gov)



STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CONSTRUCTION AND OPERATION CERTIFICATE
FOR
PUBLIC WATER SYSTEMS



A. APPROVAL TO CONSTRUCT –

Plans for the construction or modification of Whittier Well Field Upgrade drinking water system, (PWSID# 211952, Project ID# 18299), a Community Water System, located in Whittier, Alaska, submitted in accordance with Drinking Water Regulations, 18 AAC 80.200 by Pete Bellezza, PE / Scott Korbe, Whittier Director of Public Works have been reviewed and are

approved as submitted conditionally approved (see attached conditions)

Charity Bare
(Reviewing Engineer)

EII
(Title)

9/6/22
(Date of Approval)

If applicant fails to construct, alter, install, or modify the system within two years of the date of approval to construct, approval is void, and plans must be resubmitted for Department review and approval.

B. APPROVED CHANGE ORDERS

Change (contract order number or descriptive reference):

(Reviewing Engineer) _____
(Title) _____
(Date of Approval)

Change (contract order number or descriptive reference):

(Reviewing Engineer) _____
(Title) _____
(Date of Approval)

C. INTERIM APPROVAL TO OPERATE

This section must be completed and signed by the Department before any water is made available for public use.

The construction of the above-referenced water system was completed and approved for operation on __/__/__. The system is hereby granted **INTERIM APPROVAL TO OPERATE for 90 days** following the interim approval date. It is illegal to operate a public water system beyond 90 days without **FINAL APPROVAL TO OPERATE** from the Department.

(Reviewing Engineer) _____
(Title) _____
(Date of Approval)

D. FINAL APPROVAL TO OPERATE

Record drawings and other documents submitted to the Department, or an inspection by the Department, has confirmed that the above-referenced water system was constructed in substantial conformance with the approved plans. The system is hereby granted **FINAL APPROVAL TO OPERATE**.

(Reviewing Engineer) _____
(Title) _____
(Date of Approval)



THE STATE
of **ALASKA**
GOVERNOR MIKE DUNLEAVY

Department of Public Safety

DIVISION OF FIRE AND LIFE SAFETY
Plan Review Bureau - Anchorage

5700 East Tudor Road
Anchorage, Alaska 99507-1225
Main: 907.269.2004
Fax: 907.269.0098

September 26, 2022

Pete Bellezza
CRW Engineering Group, LLC
3940 Arctic Blvd.
Anchorage, AK 99503

SUBJECT: Well Field Manifold Building - Full Plan Review
CITY: Whittier
PLAN REVIEW: 2022Anch1549
TYPE OF CONSTRUCTION: VB
OCCUPANCY: F-1
2012 INTERNATIONAL BUILDING AND FIRE CODE

Dear Pete Bellezza:

Plans for the subject facility have been reviewed by this office for conformity with the State Fire Safety Regulations and are hereby approved as submitted. Enclosed is a certificate of approval that must be posted on the premises until completion of the above facility. You are prohibited to occupy this building until construction is completed as approved. Any changes to the approved plans must be submitted to this office for review and approval.

Approval of submitted plans is not approval of omissions or oversights by this office or noncompliance with any applicable regulations of the Municipal Government. The plans have not been reviewed for compliance with the federal Americans with Disabilities Act or structural requirements.

It must be understood that the inclusion of and compliance with State Fire Safety Regulations does not preclude the necessity of compliance with the requirements of local codes and ordinances.

If we can be of further assistance in this matter, please feel free to contact us at the address above.

Sincerely,

A handwritten signature in black ink, appearing to read "Jarrett Zuspan".

Jarrett Zuspan
Plans Examiner 1

Enclosure: Approval Certificate

State of Alaska
Office of the State Fire Marshal
Plan Review

This is to certify that the plans for this building were reviewed by the *State Fire Marshal* on September 26, 2022 for conformance with AS 18.70.010 -- 100; 13 AAC 50.027.

This certificate shall be posted in a conspicuous place on the premises named Well Field Manifold Building and shall remain posted until construction is completed.

NOTICE: Any changes or modifications to the approved plans **must** be resubmitted for review by the *State Fire Marshal*.

Plan Review #: 2022Anch1549

By: 

Jarrett Zuspan
Plans Examiner 1

Authority: AS 18.70.080

Form: 12-741

(6/01)

Full Plan Review

CITY OF WHITTIER, ALASKA
WHITTIER WELL FIELD UPGRADE

SECTION XII
DRAWINGS (UNDER SEPARATE COVER)