ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

INVITATION TO BID NO. 2021C043

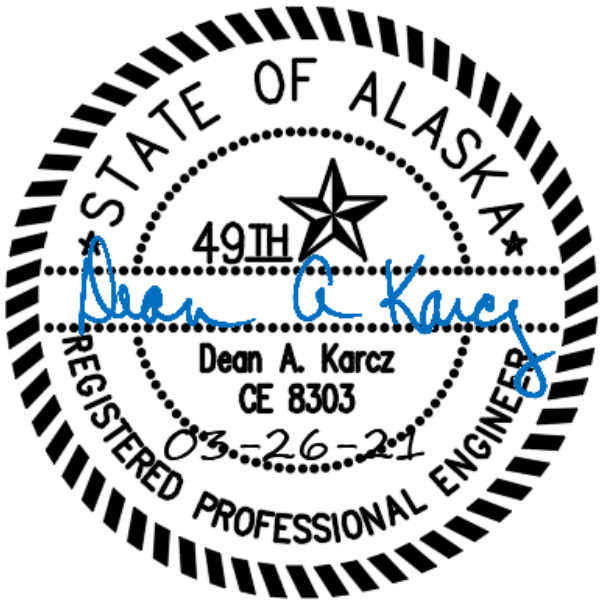
Municipality of Anchorage
Anchorage Water and Wastewater Utility
3000 Arctic Boulevard
Anchorage, AK 99503

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS



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

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

MASTER INDEX

The most current version of the Municipality of Anchorage Standard Specifications (M.A.S.S.) is provided on the Municipality website at

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

Notifications will be sent when updates are made to the document, but each user of M.A.S.S. is responsible to verify that they are using the most current version.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION I

INVITATION TO BID

MUNICIPALITY OF ANCHORAGE
PURCHASING DEPARTMENT

Invitation to Bid

No. 2021C043

Sealed bids will be received in accordance with the time schedule shown below by the Municipality of Anchorage at the Purchasing Department, 632 W. 6th Ave., Suite 520, Anchorage, Alaska 99501 for:

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

The Work that is presented in the Bid Proposal for this Contract consists of the Contractor to furnish ten (10) pressure reducing valve (PRV) bodies and associated appurtenances; furnishing five (5) PRV Rebuild Kits, Chemical Pump and associated Skid for ten (10) wells, Chemical Analyzer and associated Skid for ten (10) wells, two (2) gate valves, Remove and / or relocate existing Scada and Electrical Controls, Construction of a new PRV Blow Off Discharge Piping and Outfall, as well as, to furnish and install all identified components for the upgrading of the Chlorine Analyzers within Well Houses as set forth in the Plans and these Specifications.

ESTIMATED CONSTRUCTION COST: **Between: $1,000,001 - $3,000,000**

Site Visit:	**N/A**
Pre-Bid Conference:	**N/A**
Questions Due:	**12:00 P.M. Local Time, October 19, 2022**
Bid Opening:	**2:00 P.M. Local Time, November 3, 2022**

All Pre-Bid Conferences and/or Bid Openings may be attended in person or via conference call at this number (907) 343-6089. You may call in five (5) minutes before any scheduled conference. EMAILED BIDS WILL NOT BE ACCEPTED.

ALL QUESTIONS SHALL BE SUBMITTED PRIOR TO THE QUESTION DUE DATE THIS WILL BE THE FINAL OPPORTUNITY TO ASK QUESTIONS OR REQUEST CLARIFICATIONS.

Requests for interpretation or clarification of the bidding Documents shall be made in writing to the Purchasing Office (wwpur@muni.org). Please reference the Invitation to Bid Number & Project Title. Do not contact the specified department directly.

To maintain the project schedule, Interpretations, corrections, or changes to the Bidding Documents shall be made by Addendum and shall not be binding unless included in the Addendum. It is your responsibility to periodically check the website for addenda.

Municipality of Anchorage
ITB: 2021C043

At the above indicated time, the bids will be opened publicly and read. Bids must be received by the! Purchasing Officer prior to the time fixed for opening of the bids to be considered. Time of receipt! will be as determined by the time stamp in the Purchasing Office, Suite 520.

The Municipality of Anchorage reserves the right to reject any and all bids and to waive any! informalities in the bids. No bidder may withdraw his bid after the hour set for the opening of bids or! before the award of contract unless said award is delayed for a period exceeding sixty (60) days! from the time of the opening.

The Municipality shall not be responsible for bid preparation costs, nor for costs, including attorney! fees, associated with any (administrative, judicial or otherwise) challenge to the determination of the! lowest responsive and responsible bidder and/or award of contract, and/or rejection of bids. By! submitting a bid, each bidder agrees to be bound in this respect and waives all claims to such costs! and fees.

Contracts shall be awarded by written notice issued by the Purchasing Officer to the lowest! responsive and responsible bidder; however, preference will be given to local bidders in compliance! with Anchorage Municipal Code Section 7.20.040.

The Municipality of Anchorage assumes no responsibility for any interpretations or presentations! made by any of its officers or agents unless such interpretations or presentations are made by written! addendum to this Invitation to Bid.

Bonding Requirements are per MASS/MASS B or as per special provisions

THE MUNICIPALITY OF ANCHORAGE IS AN "EQUAL OPPORTUNITY EMPLOYER"

PUBLISH ONE TIME

Date: October 10, 2022

Senior Buyer Assigned to this Project:
Melanie A Clark ☐

Chris Hunter
_____
Chris Hunter
Deputy Purchasing Officer

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION II

SPECIAL PROVISIONS

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

INDEX TO THE SPECIAL PROVISIONS

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

GENERAL PROVISIONS

GENERAL STATEMENT AND EXTENT OF WORK

All proposed Work for the Anchorage Well House Chlorine Analyzer Improvements Project includes various well houses located in Anchorage, Alaska, and as shown on the Drawings. The Work included in this Contract consists of furnishing all labor, equipment, materials, supervision, and other facilities necessary to complete the Work set forth in the Plans, and Specifications, and terms of the Contract successfully.

The Work that is presented in the Bid Proposal for this Contract consists of the Contractor to furnish ten (10) pressure reducing valve (PRV) bodies and associated appurtenances; furnishing five (5) PRV Rebuild Kits, Chemical Pump and associated Skid for ten (10) wells, Chemical Analyzer and associated Skid for ten (10) wells, two (2) gate valves, Remove and / or relocate existing Scada and Electrical Controls, Construction of a new PRV Blow Off Discharge Piping and Outfall, as well as, to furnish and install all identified components for the upgrading of the Chlorine Analyzers within Well Houses as set forth in the Plans and these Specifications.

It shall be the responsibility of the bidder to prepare the bid so that all materials and working arrangements harmoniously conform to the intent of the Contract Specifications and Special Provisions.

Below are the schedules of Work that are presented in the Bid Proposal of this Contract:

SCHEDULE	DESCRIPTION
A. Well 04	Base Bid
B. Well 07	Base Bid
C. Well 09	Base Bid
D. Well 10	Base Bid
E. Well 11	Base Bid
F. Well 12	Base Bid
G. Well 13	Base Bid
H. Well 25	Base Bid
I. Well 29	Base Bid
J. Well 31	Base Bid

SPECIFICATIONS, CODES, ORDINANCES, AND STANDARDS

The Contractor shall perform all construction in accordance with the Contract Documents, which include the **Municipality of Anchorage Standard Specifications**, (hereinafter referred to as M.A.S.S.), as herein revised and supplemented. These specifications are available for download on the Municipality of Anchorage website, at the following link:

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

The AWWU Design and Construction Practices Manual (DCPM) is available for download on the AWWU website at the following link:

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

All Work under this Contract shall comply with the latest edition of all applicable codes, ordinances, standards, and all associated addenda.

CHANGES TO THE MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS (MASS)

The following enumerated provisions of MASS are amended as hereinafter stated.

DIVISION 10 STANDARD GENERAL PROVISIONS

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 3.4 Action on Bids

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

Unless otherwise specified in the Invitation to Bid, Notice of Award or rejection shall be given within ninety (90) days of Bid opening.

Article 3.6 Execution of Contract

Delete the fifth paragraph and replace with the following:

This project is partially funded through future appropriations. The bid proposal for this project contains multiple schedules. The contract will be awarded for the total of all schedules as described in Article 3.4. A separate Purchase Order will be generated for each schedule to the extent of available funding at the time of the Contract Date. Notice-to-Proceed for applicable schedules will be issued following execution of the select Purchase Orders. Bid Schedule items are Capital Project items with a portion of funding contingent upon assembly approval in 2024.

Add the following sixth paragraph:

Notice-to-Proceed for each schedule shall be issued within ten (10) working days after the date reflected on the respective Purchase Order. The effective date of the Notice to Proceed shall be within fifteen (15) working days of the date reflected on the Purchase Order. The Engineer or his authorized representative, the Engineer's address, and the completion date shall be designated in the Notice-to-Proceed.

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.

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. Other items indicated on the Drawings or in these Specifications, but not specifically listed as a bid item in these Contract Documents.

14. Installation of flexible delineators at the end of culverts, ends of retaining walls, field inlets, and other locations that may be hazardous or should be delineated for snow removal operations as determined by the Engineer.
15. Survey measurement is incidental to the contract and no separate payment will be made.

Article 4.12 Public Convenience and Access

Delete the second sentence of the first paragraph and replace with the following:
Without prior approval of the Engineer, entrances or driveways of all kinds shall not be blocked for more than eight (8) hours.

Article 4.13 Traffic Control Plan

Replace the paragraphs five (5) and six (6) with the following:
The Contractor is responsible for obtaining all road closure permits and for complying with all requirements of those permits. Full payment for project traffic control shall be made through bid item entitled "Traffic Maintenance." No other separate payment shall be made.

Add the following paragraph to the end of the Article:
The Contractor shall prepare and submit six (6) copies of an acceptable Traffic Control Plan (TCP) to be employed during construction. The TCP shall be delivered to the Engineer within ten (10) working days of the effective date of the Notice-To-Proceed or five (5) working days before the commencement of Work, whichever is the earlier date. The Engineer will review and accept or reject the plan within five (5) working days of submission. Successive submittals will also be reviewed within five (5) working days. The review by the Engineer is separate from any other agency review.

Article 4.17 Utilities

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.

Replace the list of Utility Companies in Article 2.7 E with the following:

Alaska Communication Systems (ACS) North ANC – Francisco Martin, 564-1785 or 231-7369

Alaska Communication Systems (ACS) South ANC – Duilio Guerrero, 564-1522

Anchorage Water & Wastewater Utility (AWWU) – Shawn Dooley, 564-2786

AT&T – Mike Barsalou, 264-7325

Chugach Electric Association (CEA) – Mike Miller, 762-4490

ENSTAR Natural Gas – Stan Staples, 334-7777

GCI – Mark Cypher, 868-1476

Municipal Street and Storm Drain Maintenance – Eric Hodgson, 343-8100

Municipal Street Light Maintenance – Eric Hodgson, 343-8100

Municipal Traffic Signals Section – Levi Piehl, 343-8355

Solid Waste Services (SWS) – Evalu Filitaula, 343-6258 or 317-6863

Alaska Waste – Josh James, 688-4446

C. Gas

Add the following paragraphs:
The Contractor shall download and follow the most current construction guidelines published by ENSTAR. Those guidelines can be downloaded from:

https://www.enstarnaturalgas.com/safety-education/natural-gas-safety/safety-for-excavators-contractors/

Click on the link in the last sentence of the first paragraph.

The Final Rule from the PHMSA website can be obtained from:

http://www.phmsa.dot.gov/nprm-anprm/PHMSA-2009-0192

Click on the "Excavation Damage 80 FR 43836 Final Rule" link on the right hand side.

D. Electrical and Telecommunications

Add the following paragraphs:
The Contractor shall download and follow the most current construction guidelines published by Chugach Electric Association. Those guidelines can be downloaded from:

http://www.chugachelectric.com/media-room/publications-request

Click on the link titled "Electrical Facility Clearance Requirements".

Add the following new Article:
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.

SECTION 10.05 CONTROL OF WORK

Article 5.3 Construction Progress Schedule and Schedule of Values

Add the following paragraphs after the second paragraph:
The Contractor shall also deliver, at the same time as the Construction Progress Schedule, in a form satisfactory to the Engineer, a Schedule of Values detailing the costs

of providing all labor, equipment, supplies, transportation, handling, and disposal in connection with the removal of system plant infrastructure as listed in the table below.

Plant system category	Plant system subcategory
Water source supply	• Structures and improvements • Collecting and impound reservoirs • Wells and springs • Supply mains (size)
Water treatment plant	• Structures and improvements • Water treatment equipment
General plant	• Structures and improvements

Work items not listed in a subcategory shall be incidental to the subcategory item.

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

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 5.5 Shop Drawings

Add the following sentence to the end of the last paragraph:
Reference Section 013300 – Submittals Procedures of the Technical Specifications for additional requirements.

Article 5.6 Product Data

Add the following sentence to the end of the last paragraph:
Reference Section 013300 – Submittals Procedures of the Technical Specifications for additional requirements.

Article 5.7 Materials

Add the following sentence to the end of the last paragraph:
Reference Section 016000 – Product Requirements of the Technical Specifications for additional requirements.

Article 5.22 Time for Completion of Work

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

The Project shall be completed within the following number of calendar days after the Notice-to-Proceed is issued:

Basic Bid:	One Hundred Twenty (120) calendar days
With Additive Alternate 1:	One Hundred Thirty (130) calendar days

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.

Article 5.31 Winter Suspension

C. Suitable Conditions for Winter Maintenance

Add the following paragraph:

8. Contractor shall install temporary flexible delineators at the end of culverts, end of retaining walls, field inlets, and other locations as determined by the Engineer.

Add the following new Article:

Article 5.34 Work Plan

Contractor shall submit an overall project Work Plan for approval by the Engineer within 7 days after signature of the Contract. The Contractor will also be required to submit a detailed Work Plan for each individual Schedule prior to commencement of Work on any given Schedule. The Work Plans shall address and consider the following:

1. Schedule
2. Minimize disruption of vehicular parking for local residents.
3. The Contractor shall verify pipe locations, measurements, deflections, as well as any potential conflicts, and shall provide to the Engineer a detailed pipe installation and connection plan for each schedule prior to beginning work on that schedule unless otherwise approved by the Engineer.
4. The Contractor shall only be allowed to work on one schedule at a time. Each schedule shall be completed before proceeding with another unless otherwise approved in writing by the Engineer.
5. The Contractor shall coordinate with AWWU for well shutdown times and lengths prior to commencing work on any schedule.

Contractor shall coordinate the Work Plans for each Schedule. Work shall not proceed until the Engineer has approved, in writing, the Work Plan(s). No separate payment shall be made for the Work described in this Article and all Work required for providing approved Work Plans is incidental to the Contract.

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 6.6 Permits

Add the following sentence to the end of the sixth paragraph:
The Contractor shall identify the “Anchorage Water and Wastewater Utility” as the applicant on any permit application forms.

Article 6.8 Safety

Add the following paragraphs at the end of this Article:
The Governor’s emergency declaration and mandates relating to COVID-19 expired on February 14, 2021. However, contractors are encouraged to review COVID-19 Response and Recovery Health Advisories that can be accessed at:

https://covid19.alaska.gov/health-advisories/

The Municipality of Anchorage emergency orders currently in effect can be accessed at:

https://covid-response-moa-muniorg.hub.arcgis.com/pages/emergency-orders

Contractors will still be required to meet any applicable local ordinances or requirements currently in effect, and comply with any future federal, state or local declarations or mandates that might be adopted while work on the project is ongoing.

Consistent with this Section, the Contractor will be responsible for paying all costs and expenses incurred to comply with any COVID-19 Health Mandates or Health Advisories in effect during times when the Contractor is performing project-related work activities. The Contractor will additionally be responsible for preparing any general or site-specific mitigation and response plans required for its forces, along with any associated schedule delays or impacts.

Article 6.9 Insurance

Remove and replace the fifth sentence of the first paragraph with the following:
The insurance company must provide written notification to the MOA contract administrator of any material change, cancellation, or non-renewal of the insurance policies. If the insurer does not notify the MOA in these circumstances, it will be the contractor’s responsibility to make that notification.

SECTION 10.07 MEASUREMENT AND PAYMENT

Article 7.5 Progress Payments

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 at substantial completion: Submit an application for payment following issuance of substantial completion.

   a. Progress Redlines shall be submitted with each application for payment.

   b. This application shall reflect certificates of partial substantial completion issued previously for Owner occupancy of designated portions of the work

   c. 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.

Delete numbers six through eight to the list of Withholdings, the fourth paragraph and replace with the following:

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.

9. Liquidated damages;

10. Claims by Subcontractors, suppliers, laborers, or the Alaska Department of Labor;

11. If the Contractor or his/her Subcontractor fails to file reports with the Municipality of Anchorage Office of Equal Opportunity as required by AMCR 7.50.004, AMCR 7.50.005, and by 7.60.004 in a timely manner, monies shall be withheld in the amount of ten percent (10%) of the amount due the Contractor until such time as the reports have been properly filed.

11. Upon receipt of progress billings by Subcontractors, and review and validation by the prime Contractor of satisfactory performance by its Subcontractors, the prime Contractor shall make payment for such work no more than 30 days from the prime Contractor’s receipt of payment for said work from the Owner.

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 of cost to the Contractor. The amount of withholding for items seven (7) through twelve (12) 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 State of Alaska funds this Contract (in part); therefore, the provisions of Alaska Statute 36, Section 36.90, and Article 3 entitled "Public Construction Contract Payment" apply.

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 punch list(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. 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 IV of the Contract Documents.

DIVISION 20 EARTHWORK

SECTION 20.13 TRENCH EXCAVATION AND BACKFILL

Article 13.3 Construction

E. Locator Tape

Delete the fourth (4th) paragraph and replace with the following:
The Contractor shall install the Warning Tape at least twenty-four (24) inches but no more than thirty-six (36) inches above the crown of the pipe.

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 streetlights.

It is the Contractor's responsibility to furnish, install, and maintain wood sheeting, steel sheet piling, shoring, planking, and bracing, whether or not indicated on the Drawings, to prevent earth movement which could damage, but not limited to, adjacent structures and/or property, landscaping, obstruct surface drainage channels or waterways, or otherwise impair or delay the work or endanger human life.

Where the centerline of any excavation is within 10 feet of any structure (including but not limited to buildings and retaining walls) in any direction, or the excavation will impact the pressure prism of the adjacent structure foundation, the Contractor shall provide shoring to protect the foundations of the structure.

Where connections of new water lines to existing water lines are located within 8 feet of the face of the structure, or the excavation will impact the pressure prism of the adjacent structure foundation, provide shoring parallel to the face of the structure over the entire width of the excavation.

Contractor shall be responsible to repair or replace any portion of any, but not limited to, structures and/or property, landscaping, surface drainage channels or waterways damaged during construction.

A. Measurement to Quantify Structure Settlement

Prior to beginning excavation, the Contractor shall obtain horizontal and elevation survey data for all structural foundation corners for structures within 10 feet of excavation. Structural corners shall include all buildings and retaining walls. The Contractor shall also survey an intermediary point when the structure length or the building wall length exceeds 50 feet. The Contractor shall set PK nails (or approved equal) into the structure to conduct the survey. The Contractor shall provide the Engineer with 24 hours of written notice prior to conducting the survey. The Contractor

shall remove targets and restore building surface upon written directive from the Engineer.

Repeat measurements before final completion but after substantial completion. Measurements to be on project horizontal and vertical datum, accuracy 0.01 feet (1/8-inch). Provide daily measurements if signs of settlement are identified.

Submit measurements in table form with point designations, initial locations, subsequent measured locations, dates of each measurement, and differential from original measurement. All survey and submittals shall meet the requirements of Section 65.01 and Section 65.02.

Article 30.3 Construction

Add the following sentence to the end of the second paragraph:
No bracing requiring driven or vibratory installation methods shall be used on this Project.

Add the following to the end of the Article:
Shoring within the building foundation pressure prism will remain in place to a level one (1) foot above pressure prism. Shoring above this level may be cut off and removed. Do not cut off or remove more shoring than can be completely backfilled within same workday. Bracing may be removed when bracing is not deemed necessary for shoring stability. Ensure bracing removal allows for compaction of soils around bracing. Do not use portable trench to shore building foundations.

The shoring shall be sufficient to avoid impacting areas or facilities outside of the existing ROW, PUEs or TCPs. Methods and materials used to shore or brace utilities shall be reviewed and approved by the affected utility company before it is submitted to the Engineer for approval.

The Contractor shall prepare and submit to the Engineer for approval a Shoring Plan. The Shoring Plan shall be submitted a minimum of three (3) days prior to work involving shoring. The Shoring Plan shall detail the methods and materials to be used for trench shoring as well as utility pole shoring, if necessary. The Plan shall be prepared by and sealed by a Professional Engineer registered in the State of Alaska.

When, in the opinion of the Engineer or affected utility company, shoring is inadequate, improper, or conditions exist such that damage may occur, the Contractor shall be notified in writing by the Engineer. Such notification shall be accompanied by a statement of corrective action. If the Contractor fails to promptly comply with such instruction, the Engineer may suspend any or all Work on the project until satisfactory, corrective action is taken. Notification or lack of notification shall in no way relieve the Contractor of the responsibilities established in Section 10.04 Subsection 4.17 Utilities.

Article 30.5 Basis of Payment

Delete the text of this Article and replace with the following:
No separate payment will be made for Work in this Section. Any single technique or combination of techniques used for Shoring, Sheeting, and Bracing; Shoring and sheeting in the Trench; and Portable Steel Shield will be considered incidental to the items in the Bid Proposal.

Add the following new Article:

SECTION 20.31 OUTFALL STRUCTURE

Article 31.1 General

The work under this section includes the performance of all work required for the construction of the Outfall Structure shown on the drawings.

Article 31.2 Material

Ditch lining shall be Riprap Class I per MASS Section 20.24.

Geotextile shall be the type shown on the drawings and as specified in MASS Section 20.25.

Article 31.3 Construction

Stake the location of the Outfall Structure and obtain the approval of the engineer prior to disturbing the existing vegetation Notify the engineer that the staking is ready for review a minimum of 72 hours in advance of the scheduled start of the work.

Excavation shall be completed and approved by the Engineer before placing the geotextile. The area to be occupied by the Outfall Structure shall be free of brush, trees, stumps, and other objectionable material and shall be dressed to a reasonably smooth surface.

The geotextile shall be spread uniformly on the prepared base to the length and width shown on the drawings.

Riprap shall be placed per MASS Section 20.24. Extend riprap as necessary to overlap adjacent intact vegetation such that no disturbed soil is exposed.

Marker posts shall meet the requirements of durable plastic material meeting the dimensions 2.5 inch by 6 foot and color blue. Resistant to ultraviolet light, ozone, and hydrocarbon damage and remain flexible at a temperature of minus 40 F. Provide posts with reflectors that are capable of self-erecting and remaining serviceable after 5 head-on impacts at 55 mph and 10 impacts at 35 mph with an automobile at an air temperature of plus 40 F. The marker posts shall be rectangular in cross section with reinforcing ribs capable of a minimum bending radius of 9 inches.

Marker posts shall be installed on the approach side of the flared end section, and as directed by the Engineer. Forty-two inches of post shall remain above the ground after driving.

Article 31.4 Measurement

The Outfall Structure shall be measured as a complete unit accepted in place. Unusable excavation, grading, geotextile, riprap, marker post and surface restoration are incidental to this pay item.

Article 31.5 Basis of Payment

ITEM	UNIT
Outfall Structure	Each

DIVISION 55 STORM DRAIN SYSTEMS

SECTION 55.05 MANHOLES AND CATCH BASIN MANHOLES

Article 5.3 Construction

Storm Drain Manholes and Catch Basin Manholes

Delete the last sentence of the first paragraph and replace with the following:
In the invert of manholes, Contractor shall slope the bottom of the manhole to the outlet pipe such that no water will stand in the bottom of the structure.

Add the following to the end of subsection A:
Provide two Manhole frames but only one cover. For the other cover see Section 60.10 “Air Gap” of these special provisions.

DIVISION 60 WATER SYSTEMS

SECTION 60.01 GENERAL

Article 1.2 Applicable Standards

Add the following items to the list of standards:

ANSI/AWWA C550-17	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
ASTM F441-15	Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

SECTION 60.02 FURNISH AND INSTALL PIPE

Article 2.1 General

Delete the first sentence of the first paragraph and replace with the following:
The work under this Section consists of performing all Work required for, completion of a pre-construction (and post-construction) survey, furnishing and installing an operational pipping system, and landscaping in a workman like manner meeting applicable standards.

Article 2.2 Submittals

Add the following to the list of Submittal requirements:

- Static Mixer

Article 2.3 Materials

A. Ductile Iron Pipe

Add the following after the first paragraph:

A spool shall be a section of ductile iron pipe with flanged ends to match the lengths as shown on the drawings and verified in the field. If any deflections exist then the spool shall be made to span the length and deflection required. Unless otherwise directed in the drawings. The spool shall be painted in accordance with the Technical Specifications.

I. Fittings and Gaskets

Delete the first two sentences of the fifth paragraph and add the following:
Fittings with nuts and bolts are to utilize stainless steel nuts and bolts. Anti-seize lubrication is to be used on the nuts and bolts.

Add the following to the end of the fifth paragraph:
Only lubricants with NSF 61 certification shall be used as approved by the Engineer.

Add the following Sub-Article:
P. Static Mixer

Static mixer shall be the Sulzer CompaX™ as manufactured by Sulzer Chemtech Ltd. or an approved equal. Each mixer shall be a ring-style constructed of polytetrafluoroethylene (PTFE) with an installation length of less than 1.0 pipe diameters.

Engineering Data forms in the Technical Specifications have been provided for the design of the static mixer. The Contractor shall submit these forms to Sulzer or other approved manufacturer as required to complete the design and shop drawings from the manufacturer.

Included in the submittal requirements shall be shop drawings from the manufacturer for each static mixer.

Add the following Sub-Article:
Q. Seed

Seed shall be certified and shall be furnished in standard containers with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within a 9 month period prior of application. This statement shall include name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished and, in case of a mixture, the proportions of each kind of seed. Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable.

In Schedule B: Revegetation / No-Mow Seed Mix, replace application rate with:

Application Rate: 8 lbs. / 1,000 s.f.

a. Fertilizer

Add the following:

For projects using HGM and FGM, fertilizer shall be organic based.

b. Mulch

Replace with the following:

Mulch shall be biotic-active hydraulic growth medium (HGM) such as ‘Verdyol Biotic Black Earth’, or an approved equal. Any approved equal must include the following material composition and meet the following laboratory analysis requirements:

Material Composition:

40% by volume of thermally and mechanically processed straw and flexible flax fibers

57% by volume of professional grade sphagnum peat moss

1.26% by volume other valuable trace minerals, sugars, starches, proteins, fiber and 16 amino acids including folic acid, Vitamin A, and triaconnatol growth stimulants/regulators

1% by volume mycorrhizae

Laboratory Analysis:

Total Organic Matter Content = >95%

Carbon: Nitrogen Ratio = 31:1

Moisture Content = 44.5% +/- 5%

pH = 5.5 (Saturated Media Extract Method)

Erosion Control

Erosion Control shall be a flexible, fully biodegradable growth medium (FGM) composed of 100% recycled and thermally refined wood fibers, crimped interlocking man-made biodegradable fibers, micro-pore granules, naturally derived cross linked biopolymers and water absorbents, such as ‘Flexterra HP-FGM”, or an approved equal. The HP-FGM is phytosanitized, free from plastic netting and requires no curing period. Any approved equal must meet the following material composition:

Material Composition:

80% Thermally Processed Wood Fiber

10% Crosslinked Biopolymers and Water Absorbents

5% Crimped, Man-made Biodegradable Interlocking Fibers

5% Micro-Pore Granules

Article 2.4 Construction

Add the following to the end of the first paragraph:
The water interruptions should only occur following written approval provided by the Owner. The Contractor shall be responsible for minimizing the interruptions to the water service throughout the project and adhering to any limitations and schedules as provided by the Owner.

Delete the first sentence of the seventh paragraph and add the following:
Where the supply of water of a Utility Company customer is interrupted in excess of six (6) hours, the Contractor shall furnish and install a temporary water system, unless an alternative arrangement has been made with the affected property owners or residents.

Add the following to the end of the seventh paragraph:
When authorized by the Engineer, water services may be shut-off between the hours of 8:00 a.m. and 5:00 p.m. At no time shall disruptions to areas larger than one block be permitted. The Contractor will not be permitted to begin additional excavation on another block until work on a previous block has received written notification of substantial completion for the pipe, water services, hydrants, and the trench excavation and backfill from the Engineer.

Replace subsection K with the following paragraph:
Detectable underground warning tape is required for installation of all pipe types. The warning tape must be continuously laid with the pipe and be at least eighteen inches (18”) and no more than twenty-four inches (24”) above the pipe.

Add the following Sub-Article:
P. Pre-Construction Survey

Contractor shall conduct a pre-construction [and post-construction] survey consisting of topo, profiles and cross sections at a spacing specified herein to include the existing pipe centerline, 20’ left and right of pipe centerline, floor drain outfall, building corners, perimeter fence, property corners and lines as described as: …, etc. in accordance with MASS Division 65.

Within 5 calendar days from the date of the Notice to Proceed, the Contractor shall submit the survey notes and plotted plan and profile (and cross sections) drawings to the Engineer (and data as specified in Section 65.02, Article 2.13). Plan and profile (and cross sections) drawings shall be submitted on 50-scale plan sheets in standard municipal format in conformance with AWWU Design and Construction Practices Manual and MASS, and shall be stamped by a registered Professional Land Surveyor or Civil Engineer licensed in the State of Alaska. The pre- and post-construction surveys will document that the new grades will closely align with the pre-construction and that there will be no significant deviations unless approved by the Engineer.

This Work shall include surveying the location, size or type, of all existing utilities.

Payment for conducting the pre-construction (and post-construction) profile and cross section surveys, plotting the plan and profile (and cross section) drawings, and providing the drawings in AutoCAD or equal format as specified in Article 2.13, and submitting them for approval shall be considered incidental to the bid item “Furnish and Install Pipe” and no separate payment shall be made.

Add the following Sub-Article:
Q. Seed

The area where the hydraulic growth medium (HGM) is to be sprayed should be inspected to evaluate the need of tillage operations before application. If tillage is required, the soil should be loosened to a minimum depth of 6 inches before the application commences. Tillage of the HGM into the subsoil is strictly not recommended as the HGM needs to be near the surface to be effective.

As a quality assurance method, an area should be measured and staked to match the tank capacity of the hydroseeder equipment. The hydroseeder operator must completely empty the hydroseeder tank in the delineated area. This warrants the soil equivalent dose is applied according to specification and homogeneously distributed. Prior to the application, the soil must be inspected to evaluate the need for tillage (as described above). It is ideal to spray the material over a roughened area that allows the organic matrix or soil equivalent to stick on the soil. To ensure even coverage, the topsoil equivalent shall be sprayed in two directions. Avoid overspray onto roads, sidewalks, trails, boulders, plantings, and other improvements. All new plantings must be protected from overspray. Do not spray on days of severe rains.

Erosion Control

Application rates for ‘Flexterra’ and ‘Verdyol Biotic Black Earth’ (or approved equals) as recommended by the manufacturer.

Article 2.5 Flushing and Testing

Add the following to the end of the first paragraph:
If the new pipe is for discharge/blow-off purposes only and NOT being used to convey finished water for human consumption, then flushing and testing will not be required.

Article 2.6 Measurement

Add the following at the end of the Article:
Measurement for furnishing and installing Well House Pipe will be by Lump Sum as shown on the Drawings. All work required to furnish and install ductile iron pipe, joints, fittings, static mixers, pipe supports, ball valves, and all other associated hardware with those items is considered incidental to the Furnish and Install Well House Pipe item.

Article 2.7 Basis of Payment

Add the following incidental items:

- Pre-Construction Survey
- Furnish and Install Pipe Bedding
- Demolish and Disposal of existing water system
- Furnish and Placement of Topsoil and Seeding
- Couplings
- Existing pipe removal
- Furnishing and installing insulation as required

Add the following:
Connection to Existing Water Systems (Mains) will be considered incidental to the Contract.

Add the following pay item:

Item	Unit
Furnish and Install Pipe (Well No. #)	Lump Sum

SECTION 60.03 FURNISH AND INSTALL VALVES

Article 3.1 General

Replace with the following:
The Work under this Section consists of the performance of all Work required for furnishing and installing valves, pipe, fitting, bends, adapters, valve boxes , marker posts, anodes, thrust restraint systems, pressure reducing valves, control valves, trim, and accessories. The Contractor shall install piping systems as specified within these Contract Documents, the manufacturer’s recommendations, the American Water Works Association (AWWA) standards, the Utility Company’s most current edition of the Design

and Construction Practices Manual (DCPM), per the Engineer's written directives and in conformity with the plans.

Article 3.2 Submittals

Add the following to the list of submittals:

- Pressure Reducing Valves
- Pipe
- Fittings
- Tracer and continuity wire
- Polyethylene baggies and sheeting

Add the following at the end of the Article:
All submittals shall conform to the requirements listed in Technical Specification 40.05.06.37.

Article 3.3 Material

Add the following sentence:
Ductile Iron Pipe, Fittings, Gaskets, Thrust Restraint Systems, Thaw and Continuity Wire, Warning Tape, and Polyethylene Encasement shall be provided as specified in Section 60.02 Furnish and Install Pipe.

Replace the first paragraph under subsection C. with the following:
Pressure reducing valves and any ancillary equipment are to be supplied as identified in Technical Specification 40.05.06.37.

Article 3.4 Measurement

Replace the first paragraph with the following:
Furnishing and installing valves will be measured as a complete assembly designated by type and size inclusive of all parts required to provide a functioning valve assembly as identified in the plans and Contract Documents including but not limited to valve, valve connection components, bottom section, riser, top section, dust pan, lid, markers, elevation adjustments, pipe, bends, fittings, adaptors, anodes, continuity wire, warning tape, thrust restraint systems, construction survey, surface restoration, and corrosion/intrusion/frost protection per these specifications, Section 60.02 specifications, special provisions, standard details and Drawings.

Add the following after the first paragraph:
Furnishing and installing Valve Bodies and Ancillary Equipment will be measured as a whole and paid for as a Lump Sum per Well House for the material and work described in Technical Specification 40.05.06.37, this section, and as shown on the plans.

Furnishing and installing anodes is incidental and no separate payment will be made.

Removal and replacement of pipe, construction survey, and installation of thrust blocks are incidental to Furnish and Install Gate Valve and no separate payment will be made.

Add the following to the list of incidental items:

- Pipe

- Fittings
- Bends
- Adaptors
- Anodes
- Thrust Restraint Systems
- Construction Survey
- Traffic Control

Article 3.5 Basis of Payment

Add the following pay item:

Item	Unit
Furnish and Install Valve Bodies and Ancillary Equipment (Well No. #)	Lump Sum

SECTION 60.07 TEMPORARY WATER SYSTEMS

Article 7.1 General

Add the following after the first sentence of the first paragraph of the Temporary Water Plan subparagraph:
The plan shall be delivered to the Engineer within ten working days of the effective date of the Notice-To-Proceed or five working days before the commencement of Work, whichever is the earlier date.

NEW SECTION 60.09 CHEMICAL ANALYZER

Article 9.1 General

The work of this Section includes removing the existing chemical analyzer system and installing a new chemical analyzer system as shown on the Drawings. The chemical analyzer system consists of the analyzer, metering pump, mounting skids, and all pipes, valves and connections associated with delivering chemical treatment to the water main. The Contractor shall furnish and install a new chemical analyzer, metering pump, pump skid, piping, and pipe protectors as shown on the Drawings, as well as procuring a representative from the skid manufacturer for initial startup of the chemical analyzer system.

Article 9.2 Submittals

Complete submittal requirements in accordance with Division 10 of MASS and these special provisions. Items requiring submittals for the chemical analyzer should include, but not be limited to the following information:

- Chemical Analyzer Skid
    - o Controller

  - Sensors
  - Piping
  - Valves and connections
- Pump Skid
  - Multi-diaphragm pump
  - Gauges
  - Piping
  - Valves & Ports
- Chlorinated Polyvinylchloride Pipe (CPVC)
- Stainless Steel Tubing

Article 9.3 Material

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

A. General: All piping, valves, fittings and appurtenances in contact with potable water shall be NSF-approved. Contractor shall provide manufacturer's certification prior to installation.

B. Chemical Analyzer Panel: Shall consist of a controller, sensors, pressure regulating valve, needle valve, and an inlet and outlet connector.

   a. The sensors shall be capable of measuring free chlorine, temperature, and pH as made by Prominent or approved equal.

   b. The Controller shall be a Rosemount model 56-03-24-HT or approved equal, and the Chemical Analyzer Panel shall be constructed as shown in the drawings and by Rosemount or approved equal. The Chemical Analyzer Panel shall be capable of mounting to the wall with the use of uni-strut near the locations shown on the plans so that the center of the display on the Controller is at eye-level (between 4.5 and 5.5 feet) as measured from the floor directly in front of the Controller.

   c. All piping and fittings shall be CPVC socket weld with Viton Seals and be the sizes shown on the plans. The inlet, outlet, and sample ports shall be preceded by a CPVC vented bleach ball valve.

C. Pump Skid: Shall be mounted on a ½" thick blue polypropylene backboard and consist of ½" CPVC tubing, ½" Y-Strainer, ½" Pressure reducing valve, pressure gauge with diaphragm seal, Pulsation Damper, Back Pressure valve, true union ball valves (TUBV), and an inlet, outlet and flush/sample point. The Pump Skid shall be a TMG Services Skid capable of mounting a Blue-White Chem-Pro MD-3 Multi-Diaphragm Metering Pump or approved equal.

   a. The skid shall be capable of mounting to the wall with the use of uni-strut near the locations shown on the plans so that the base of the pump is between 1.5 and 2.0 feet as measured from the floor.

   b. The parts required for the skid shall be the following or approved equal:

i. Pump: Blue-White MD3 (P/N MD-3244XVX)

ii. Pressure Relief Valve: Griffco M-Series (P/N BPM050CP-S)

iii. Back Pressure Valve: Griffco M-Series (P/N BPM050CP-S)

iv. Pulsation Dampener: Blacoh (P/N RC-10X-V50-SW)

v. Pressure Gauge & Diaphragm Seal: Blacoh (P/N CPVC-0200-SB01-V50-SW)

vi. Site Flow Indicator: Blue-White (P/N FL-100-8SV)

vii. True Union Ball Valve: Georg Fischer Type 546 Vented Ball (P/N 163 546 342)

D. Pump: Shall be a Blue-White Chem-Pro MD-3 Multi-Diaphragm Metering pump or approved equal.

E. Pipe, Fittings, Fasteners and Gaskets: Shall conform to the requirements of Section 60.02 of MASS and these special provisions.

a. All fasteners shall be 316 stainless steel and be assembled using anti-seize compounds.

b. All pipe shall be ½" diameter Chlorinated Polyvinylchloride Pipe (CPVC) unless otherwise approved.

c. All tubing shall be ¼" diameter Stainless Steel (SS) Tubing unless otherwise approved or noted on the plans.

F. Uni-Strut: Uni-Strut shall be vinyl glass unless otherwise approved or noted on the plans.

G. Pipe Protectors: Pipe protectors Safeguard Technology Pipe & Cable Covers, or approved equal, with coarse (Industrial) grade grit coating, safety yellow main color, black edge color, and standard sizes to be verified in the field by the contractor.

Article 9.4 Construction

Construction of the chemical analyzer will include demolition of the existing chemical analyzer system and installation of a new chemical analyzer as shown on the drawings.

The Contractor is to remove all associated hardware and components to include the analyzer, controller, piping, gauges, valves, pump, skid and uni-strut as shown on the Drawings.

The location of the new chemical analyzer panel and pump skid shall be verified and approved by the Owner prior to installation. The Contractor shall mount the panel and skid at the approved location using uni-strut channels and other hardware as required to complete the install as shown in the Drawings. All parts are to be installed per manufacturers recommendations.

Pipe protectors are to be mechanically fastened to the floor per manufacturers recommendations using 316 stainless steel fasteners.

Article 9.5 Measurement

All related work under this section to include work required to remove and dispose of existing equipment, furnish, install and connect to the system the and as shown in the plans shall be measured as Lump Sum for the specified well, complete, in place, tested, functional and accepted.

Article 9.6 Basis of Payment

Payment for this Work shall be in accordance with Section 60.01 – General, Article 1.5 – Payment – General, of this Division and shall include full payment for all Work described in Section 60.09 and the Drawings.

Payment shall be made on the following unit:

Description	Unit
Furnish and Install Chemical Analyzer (Well No. #)	Lump Sum

NEW SECTION 60.10 AIR GAP

Article 10.01 General

The Work under this Section consists of the performance of all Work required for the construction of an exterior air gap for the discharge of municipal wells.

Article 10.02 Material

Stainless Steel screening is to be T-304 Stainless Steel expanded sheet. The metal is to be #9 with ¾" openings.

The aluminum pipe is to be 8 inch diameter 6061-T6 Schedule 40 pipe.

Mounting hardware is to be 316 stainless steel.

Concrete is to conform to Division 30 of MASS.

Fill and backfill to conform to Division 20 of MASS.

Article 10.03 Construction

The air gap is to consist of stainless steel screening mechanically attached to the manhole frame for a Type II manhole with two hole reducing slab on one end and mechanically attached to an aluminum pipe on the other end. The stainless steel screen shall be fabricated to fit the manhole frame without any significant gaps and should fit the aluminum pipe snugly so as not to cause deformation in the pipe when attached together.

The air gap is to be attached to the manhole and centered around the 6" DIP coming from Well No. 04 and as shown in the drawings.

There is to be a splash pad centered around the opening in the Type II manhole that drains to the opening as shown in the drawings.

Article 10.04 Measurement

The Air Gap is to be measured as a unit completed in place. The Type II manhole and manhole frames are measured under Section 55.05 Manholes and Catch Basin Manholes and no separate measurement will be made.

Article 10.05 Basis of Payment

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

Payment for air gap includes but is not limited to; all mounting hardware, concrete slab and associated excavation, rebar reinforcement, furnish fill and backfill, grading, compacting, associated labor, stainless steel screen, and aluminum pipe.

Payment shall be made under the following unit:

ITEM	UNIT
Air Gap	Each

DIVISION 70 MISCELLANEOUS

SECTION 70.01 GENERAL

Add the following new Article:

Article 1.3 Utility Facilities

Prior to commencing any Work covered under this division or impacting utility facilities, the Contractor shall contact the Utility and obtain any permits, approvals, or other conditions as required by the Utility to complete any Work on or in the vicinity of their facilities.

END OF SPECIAL PROVISIONS

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION III

TECHNICAL SPECIFICATIONS

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

INDEX TO TECHNICAL SPECIFICATIONS

INDEX TO AWWU FURNISHED TEMPLATES FOR SELECT CSI SPECIFICATIONS

CSI Section	Water Specifications	CSI Section	
	Painting and Coating		09.90.00
15015	Piping and Tubing Systems	22.11.19	40.05.13
	Valve Bodies and Ancillary Equipment	40 05 06.37	
15204	Ball Valves	40.05.23.19	
16485	Local Control Stations and Miscellaneous Electrical Devices	25.14.05	
	Monitoring Transducers	25 36 16	
	Electrical Tests	26 01 26	
16050	Electrical Work, General	26.05.00	
16120	Wires and Cables	26.05.19	
	Grounding	26.05.26	
16110	Electrical Raceways Systems	26.05.33	
16140	Wiring Devices	26.27.26	
17100	Process Control and Instrumentation Systems	40.90.00	
	Process Analyzer Systems	40 91 16.05	
17510	PAC-Based Control Systems Hardware	40.95.00	
17114	Control Panels	40.95.13	

SECTION 09 90 00 – PAINTING AND COATING

PART 1 - GENERAL

1.1 THE REQUIREMENT

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. Any paint that comes into contact with potable water shall be NSF approved.

1.2 SUBMITTALS

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

1. Materials list naming each product to be used identified by manufacturer and type number.
2. Volatile organic compound (VOC) level (gm/l) and manufacturer's certification of compliance with applicable air quality limits for each coating.
3. Manufacturer's application recommendations for each product submitted.
4. Contractor shall submit on the AWWU Blue color, if the manufacturer is unable to match AWWU Blue 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.
5. The Owner shall select colors from the submittal information presented.

1.3 DEFINITION

A. 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

A. 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

A. 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 - PRODUCTS

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 Sherwin Williams 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

A. 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 paint shall be AWWU Blue unless directed otherwise by the engineer. 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

A. 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. The following index lists the various painting and coating systems by generic type:

Paint Coatings System Index

System ID.	Prime Coat	Finish Coats
A.	Macropoxy Epoxy (2 coat at 5-10 mils DFT)	
B.	Amine Cured Epoxy (1 coat at 3-5 mils DFT)	Amine Cured Epoxy (2 coats at 3-5 mils DFT each)

B. 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.
2. Generic Type(s): Macropoxy 646, Fast Cure Epoxy
3. Surface Preparation: SSPC SP-1.
4. 2 Coats Macropoxy 646, 5.0 – 10.0 Mils
5. Total System: 10 – 20 mils total dry film thickness (DFT).

C. System B – Buried Ferrous Metal:

1. Schedule/Service: Buried metal, such as valves, flanges, bolts, nuts, structural steel, fittings and metal piping in vaults.
2. Generic Type(s): Amine Cured Epoxy, minimum 83% volume solids.
3. Surface Preparation: SSPC-SP-10 (Near White Blast Cleaning).
4. Prime Coat: Ameron Amercoat 395FD, 3-5 DFT.
5. Finish Coats: 2 coats Ameron Amercoat 395FD, 3-5 DFT each coat.
6. Total System: 9-15 mils total dry film thickness (DFT).

PART 3 - EXECUTION

3.1 GENERAL

A. During scheduled coating periods, daily whether 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 sanded lightly 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.

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.

B. 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.

C. 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.

D. 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.

E. 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.

F. Field blast cleaning for all surfaces shall be dry method unless otherwise directed.

G. 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.

H. 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.

I. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paints are not exposed to abrasion from blast cleaning.

J. 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.

K. 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.

L. All welds shall be cleaned with a suitable chemical compatible with the specified coating materials.

M. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.4 of this specification section.

N. 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.

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

6. 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.

7. Provide fans, heating devices, 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.

8. 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 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

A. 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

A. 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

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

1. Exposed non-galvanized ferrous metal surfaces.

2. Buried 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 09 90 00

SECTION 22 11 19 – PIPING AND TUBING SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all exposed piping and tubing as shown and specified, complete, including stainless steel 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 MASS Section 10.05 Article 5.6.

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 A 312 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 shall 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 22 11 19

SECTION 40 05 06.37 - VALVE BODIES AND ANCILLIARY EQUIPMENT

PART 1 – GENERAL

1.1 WORK INCLUDED

A. This specification includes the requirements for the labor, materials, equipment, and services necessary for procurement, handling, and delivery of valve bodies, and ancillary trim equipment conforming to the standards dictated by this specification;

1.2 SUMMARY

A. The CONTRACTOR shall furnish valve bodies and trim appurtenances in accordance with the Contract Documents.

1.3 SUBMITTALS

A. **SUMMARY**

1. General: Wherever submittals are required hereunder, all such submittals by the CONTRACTOR shall be submitted to the Engineer.
2. Detailed submittals are required for all products even if submittals are not specifically requested in this Section, or any other specification section.
3. Submittals shall contain, at minimum, the following information:
    a. Data sheets indicating valve name, size, weight, fully open CV factor, pressure rating, chart of percent full CV versus percent open, headloss versus flow rate for valve fully open, and all other pertinent data such as; Valve coating systems.
    b. Torque requirements valve opening, closing and during travel.
4. Scheduling: Submittals shall be submitted sufficiently in advance of the time when the represented product is needed to allow reviews, as specified, ordering, fabrication, and furnishing the product such that the Substantial Completion and Contract Completion Dates are not delayed.

B. **OPERATION AND MAINTENANCE MANUALS**

1. General: The CONTRACTOR shall submit technical operation and maintenance information for each item of mechanical, electrical and instrumentation equipment in an organized manner in the Technical

Manual. It shall be written by the Manufacturer of the equipment or supplier of the system, and shall be written so that it can be used and understood by the Owner's operation and maintenance staff.

2. Legibility: Pages of the Technical Manual consisting of catalogs and catalog cuts shall be the Manufacturer's original printed material. Other CONTRACTOR submitted data shall be high quality and legible. Illegible copies of CONTRACTOR data and copies of catalogs or photographs will not be acceptable.
3. Subdivisions of Manual: The Technical Manual shall be subdivided first, by Specification Section number; second, by equipment item; and last, by "Part." "Parts" shall conform to the following (as applicable):
    a. Part 1 - Preventive Maintenance Procedures:
        i. Procedures: Preventive maintenance procedures shall include all Manufacturer-recommended procedures to be performed on a periodic basis, both by removing and replacing the equipment or component, and by leaving the equipment in-place.
        ii. Schedules: Recommended frequency of preventive maintenance procedures shall be included. Lubrication schedules, including lubricant SAE grade, type, and temperature ranges, shall be covered.
    b. Part 2 - Complete Parts List:
        i. Complete Parts List: A complete parts list shall be furnished, including a generic description and Manufacturer's name and identification number for each part. Names, addresses, and telephone numbers of a national and a local supplier and parts warehouse shall be included.
        ii. Drawings: Cross-sectional or exploded view drawings shall accompany the parts list.
    c. Part 3 - Shop Drawings:
        i. Drawings: This part shall include approved shop or fabrication drawings, complete with dimensions.
    d. Part 4 - Safety:
        i. Procedures: This part describes the safety precautions to be taken when operating and maintaining the equipment or working near it.
    e. Part 5 - Documentation:

i. All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.

f. Part 6 - Table of Contents:

i. Each volume of the Technical Manuals shall contain a Table of Contents covering all Volumes of the Technical Manual, together with a listing of Manufacturers and names, addresses and current phone numbers of the Manufacturers' local representatives and suppliers of each product which the Technical Manual covers.

4. Number and Packaging: The CONTRACTOR shall furnish to the Engineer seven identical Technical Manuals. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring, loose-leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. Drawings shall be reduced to 8-1/2" x 11", punched and bound into the volume or folded as appropriate, inserted into an envelope, punched and bound into the volume. A fly leaf describing the Part No. and the contents shall be used to separate the Parts described herein. The cover shall identify each volume with the typed or printed title, "Technical Manual, Volume No. _____", the project title, and the equipment for which the volume is intended. A Table of Contents indicating all equipment in the Manuals shall be prepared.
5. Schedule: Technical Manuals shall be submitted in final form to the Engineer at the same time that the equipment from this contract is delivered. All discrepancies found by the Engineer in the Technical Manuals shall be corrected by the CONTRACTOR prior to acceptance of the Work.

1.4 NSF 61 AND LEAD FREE REQUIREMENTS

A. All valves in contact with the potable water supply shall be NSF 61 and Lead Free certified.

B. The CONTRACTOR shall provide the certification documents.

1.4 WARRANTY

A. The valve shall be under warranty for a period of 3 years from the date of shipment to be free of defects in materials and workmanship.

PART 2 – PRODUCTS

2.1 VALVE CHARACTERISTICS

A. Function: Pressure reducing valves shall maintain a constant metered rate of flow and / or reduce a higher upstream pressure to an electronically or mechanically pre-set, lower, constant pressure, regardless of fluctuations in the upstream pressure. A normally open / energized closed solenoid valve shall keep the pressure reducing valve fully closed when the solenoid is energized.

B. Operation: The valve shall be a hydraulically operated, adjustable pilot-controlled, diaphragm type globe valve or right angle pattern valve as indicated.

2.3 VALVE CONSTRUCTION

A. Valve Body:
1. The valve body and flanges shall be pressure rated in accordance with the design pressure, as indicated in the contract documents.
2. The valve body shall be of ductile iron to ASTM A 536 - Ductile Iron Castings
3. Flanged ends shall be 150 lb ends to ANSI/ASME B 16.42 - Ductile Iron Pipe Flanges and Flanged Fittings.
4. Flanged ends shall be flat-faced and flange drilling shall be in accordance with ANSI B16.1 Class 125.
5. The valve cover shall be flanged and be the same material as the body. All necessary repairs shall be possible without removing the valve from the pipeline.

B. Valve Trim:
1. The valve stems with position indication, springs, body seat rings, and all bolts, nuts, and washers shall be of Type 302, 303, or 316 stainless steel. The valve stems shall have metallic top and bottom guides; the stem may be unthreaded without disassembling the cover.. All rubber parts shall be of Buna-N. The diaphragms shall be of Nylon-reinforced Buna-N, supported firmly between body and valve cover.

C. Valve Controls:
1. Control valves shall be provided independent of the valve body. Control valves include: Y-pattern strainer, flow restrictors, adjustable opening and closing flow controls, mechanically adjusted pressure reducing pilot, downstream pressure surge pilot, upstream pressure sustaining pilot, upstream pressure surge relief pilot, The controls shall be capable of achieving all of the functions indicated.

D. Factory Tests:

1. All valves shall be factory tested with a hydrostatic test and a functional test and a test certificate shall be submitted to the ENGINEER prior to delivery of the valve.

E. Valve Body Parameters as follows:

Valve Number	Size (in)	Pattern Type
V-1	10	Globe
V-2	10	Globe
V-3	10	Globe
V-4	10	Globe
V-5	10	Globe
V-6	8	Globe
V-7	6	Globe
V-8	6	Globe
V-9	6	Angle
V-10	6	Angle
V-11	6	Angle

F. Manufacturer or approved equal:

1. Cla-Val Company

a) **V-1, V-2, V-3, V-4, V-5**
Globe Valve

10” 316 Stainless Steel body, stainless steel trim, Dura-Kleen® Stem, ANSI Class 150.

Cla-Val Model No. 100-46 with Options KD.

b) **V-6**
Globe Valve

8" 316 Stainless Steel body, stainless steel trim, Dura-Kleen® Stem, ANSI Class 150.

Cla-Val Model No. 100-46 with Options KD.

c) **V-7**
Globe Valve

6" 316 Stainless Steel body, stainless steel trim, Dura-Kleen® Stem, ANSI Class 150.

Cla-Val Model No. 100-46 with Options KD.

d) **V-8**

Globe Valve

6" Ductile iron body, stainless steel trim, epoxy lined and coated, Dura-Kleen® Stem, 150# flanged ends.

Cla-Val Model No. 100-02 with Options KC, KD.

e) **V-9, V-10, V-11**

Angle Valve

6" Ductile iron body, stainless steel trim, epoxy lined and coated, Dura-Kleen® Stem, 150# flanged ends.

Cla-Val Model No. 100-02 with Options KC, KD.

Epoxy Coating:

1. The coating shall be an NSF 61 Listed and FDA approved, fusion bonded epoxy coating for use with cast iron, ductile iron or steel valves, as furnished and installed by Cla-Val or equal. The coating shall be applied in accordance with AWWA coating specification C116-03.

Dura-Kleen® Stem

1. The stem shall be designed to allow all valve sizes to operate freely conditions where water supplies containing dissolved minerals create deposits that build-up and hamper valve operations

G. Rebuild Kits

1. Manufacturer or approved equal: Cla-Val Company.

Model / Part No.	Type	Size (in)	Qty
98179-03K	Valve Repair Kit, 100-01	12	1
98179-02B	Valve Repair Kit, 100-01	10	1
91699-13C	Valve Repair Kit, 100-02	6	2
209574-63H	Valve Repair Kit, 100-02	3	1

H. Controls and Accessories

1. Manufacturer or approved equal: Cla-Val Company.

Model	Type	Size (in)	Qty
17642-01J	Stainless Steel Flow Check Valve	3/8	32
97015-02J	Flow Control (Opening & Closing)	3/8	40
71945-09B	Manual Pressure Control Valve (CRD)	-	11
208404-06F	Manual Pressure Surge Control Valve (CRL)	-	9
X58C-97870-03E	Restriction Fitting	3/8	11
27487J	X105 Position Indication & Limit Switch Valve	-	20

2. Manufacturer or approved equal: ASCO.

Model	Type	Size (in)	Qty
	4-Way Solenoid Valve	1/2	9
L82106G030	Normally Open 2-way Solenoid	1/2	11

3. Manufacturer or approved equal: Bradford.

Model	Type	Size (in)	Qty
SSBV38	Isolation (Ball) Valve	3/8	131

4. Manufacturer or approved equal: Singer.

Model	Type	Size (in)	Qty
J0097A	Strainer with Sensor Port	3/8	11

PART 3 – EXECUTION

3.01 PRODUCT HANDLING

A. The Contractor shall deliver the Controls and Accessories as identified in Part 2.3.G, and Part 2.3.H of this this SECTION to the Owner. The Owner shall install the Controls and Accessories following the written notification from the Contractor that the Valve Bodies have been installed and all adjacent work is completed.

3.02 INSTALLATION

A. General

1. Equipment Locations: The location of equipment as shown on the plans is approximate. The exact locations of the Valve bodies shall be field verified.

B. Valve Rehabilitation

1. Valves identified on the plans to be “rebuilt” or “refurbished” shall have new controls and accessories furnished by the Contractor and installed by the Owner.

C. Valve Body Installation

1. Valves identified on the plans as “New” shall be furnished and the valve bodies installed by the Contractor. The Contractor shall furnish the trim and accessories to the Owner for installation.

END OF SECTION 40 05 06.37

SECTION 40 05 23.19 – BALL VALVES

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide ball valves and appurtenances, complete and operable, in accordance with the Contract Documents. Gate or plug valves will not be accepted as an alternative.

1.2 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall furnish manufacturer's product data in accordance with MASS Section 10.05 Article 5.6.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL BALL VALVES

A. General: Stainless steel ball valves shall be provided on all instrument lines unless otherwise indicated, sized to match the adjacent pipe or tubing. Valves shall have lever actuators.

B. Construction: Stainless steel ball valves shall have bodies of 316 SS with tube fitting ends or screwed ends as required, with a pressure rating of 800 psig minimum.

C. Manufacturers: **Swagelok Series 40** or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Care shall be taken so that valves in small diameter lines are well supported at each end of the valve.

END OF SECTION 40 05 23.19

SECTION 25 14 05 – LOCAL CONTROL STATIONS AND MISCELLANEOUS ELECTRICAL DEVICES

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide complete local control stations, relays, detectors, solenoids and switches as indicated on the project drawings, control diagrams, herein, or in other Sections of the Specifications.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Local control panels shall comply with the requirements of NEC, NEMA, and shall be built to UL-508 standards, or equal as approved by the Municipality of Anchorage Building Department.

1.3 CONTRACTOR SUBMITTALS

A. Furnish Shop Drawings in accordance with MASS Section 10.05 Article 5.6, and 26 05 00 – Electrical Work, General.
   1. Include panel schematics and layout drawings, and catalog cuts of all control equipment including enclosures, relays, pilot devices, terminations, and wire troughs.

PART 2 - PRODUCTS

2.1 GENERAL

A. The CONTRACTOR shall provide the stations to satisfy the functional requirements in the relevant mechanical equipment and Instrumentation & Control specifications and the Electrical Schematics. Each station shall be fabricated with UL-labeled components. Stations not specifically indicated as being WORK of other Sections shall be provided under this Section. All stations shall be wired under this Section.

B. The controls shall be 120-volt maximum, preferably 24 VDC. Where the electrical power supply is 240-volt, single-phase or 480-volt, 3-phase, the station shall be provided with a fused control power transformer. Control conductors shall be provided in accordance with Section 26 05 00 – Electrical Work, General.

C. Each station shall be provided with identified terminal strips for the connection of external conductors. The CONTRACTOR shall provide sufficient terminal blocks to connect 25 percent additional conductors for future use. Termination points shall be identified in accordance with Shop Drawings. The stations shall be the source of power for all 24 VDC/120 VAC solenoid valves interconnected with the stations. All equipment associated with the stations shall be ready for service after connection of conductors to equipment, controls, and stations.

D. Wiring to door-mounted devices shall be extra flexible and anchored to doors using wire anchors cemented in place. Exposed terminals of door-mounted devices shall be guarded to prevent accidental personnel contact with energized terminals.

E. Enclosures
   1. In indoor rooms, enclosures shall be NEMA 12 steel enclosures painted with ANSI 61 exterior and white interior unless otherwise indicated.
   2. In outdoor areas and underground locations, enclosures shall be NEMA 4X stainless steel (prior to modifications) with brushed finish.
   3. All penetrations into NEMA 12 and NEMA 4X enclosures shall be bottom entry, unless approved by the Engineer. All enclosure penetrations shall utilize approved, listed fittings suitable to maintain the enclosure NEMA rating.
   4. Through the door disconnects are not permitted.
   5. Enclosures shall be freestanding, pedestal-mounted, or equipment skid-mounted, as indicated. Wall-mounted enclosures shall be installed on Unistrut construction channel. Internal control components shall be mounted on a removable mounting pan. Mounting pan shall be finished white.
   6. Enclosures shall have non-locking handles.

F. Disconnect Switches
   1. Heavy duty, non-fusible, single throw.
   2. Horsepower rated.
   3. UL listed.
   4. Padlockable in "Off" position and door interlock without having the operator mounted on the door.
   5. Enclosure per area classification in Section 26 05 00 – Electrical Work, General.
   6. 600-volt, 3-phase, 3-pole.
   7. Auxiliary control contact as applicable and as indicated.
   8. As manufactured by **G.E., Cutler-Hammer,** or **Square D**.

G. Identification of panel-mounted devices, conductors, and electrical components shall be in accordance with Section 26 05 00 – Electrical Work, General.

H. Panel-mounted devices shall be mounted a minimum of 3 feet above finished floor elevation.

2.2 STATION COMPONENTS

A. Pushbuttons, selector switches, and pilot lights shall be the heavy-duty, oil-tight type, sized to 30 mm. Miniature style devices are not acceptable. Devices shall be as manufactured by **Square D, G.E., Cutler-Hammer**, or equal. Switches shall be UL listed for use in existing motor starters, MCCs, or LCPs, as required.
   1. Lens colors shall be green for "run," "open," or "on;" red for "stopped," "closed," or "off;" and amber for alarm.
   2. Pilot lights shall be LED type.

B. Relays shall be 1, 2, or 3 PDT, as required, with 10-amp contacts, plug-in type utilizing rectangular blades and provided with sockets for screw-type termination and hold-down clips or DIN rail mounted. Relays shall be as manufactured by **Square D, Potter Brumfield**, or equal.

C. Magnetic starters shall be:
   1. NEMA rated. IEC or dual NEMA/IEC rated type are not acceptable.
   2. FVNR type unless indicated otherwise.
   3. Combination starters with magnetic only instantaneous trip circuit breakers such as **Cutler-Hammer "MCP," G.E., "Mag-Break,"** or equal.
   4. Control transformers shall be provided with primary and secondary fuses, 120-volt maximum control voltage.

D. Terminal strips shall be provided for all panels and shall be the flanged fork or ring lug type suitable for No. 12 AWG stranded wire minimum, or shall be DIN rail-mounted terminals, **Phoenix model KDKS**, or equal. Provide 25 percent spare terminals in each panel.

E. Time delay relays shall be combination on delay and off delay (selectable) with adjustable timing ranges. Provide socket with screw terminal connections and retaining strap. Time delay relays shall be Square D JCK70, or equal.

2.3 FACTORY TESTING

A. Each LCS shall be factory-assembled and tested for sequence of operation prior to delivery.

2.4 MISCELLANEOUS DEVICES

A. Valve Limit Switches: Valve off-seat limit switches shall be single-pole double-throw, **Cla-Val X105LCW**, or equal, compatible with the type of valve. Provide a complete assembly, including rising stem, bushing, mounting bracket, adjustable locking collar, and mechanical modifications required for installation. Provide limit switches as identified in equipment schedules included in project drawings. See project I&C detail drawing for typical limit switch raceway installation detail.

2.5 SOLENOID VALVES

A. Provide solenoid valves as identified in the equipment schedules in the project drawings. See project I&C detail drawing for typical solenoid raceway installation detail.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Stations shall be installed in accordance with in Section 26 05 00 – Electrical Work, General, and in accordance with the manufacturer's recommendations.

B. Stations shall be protected at the Site from loss, damage, and the effects of weather. Stations shall be stored in an indoor, dry location. Heating shall be provided in areas subject to corrosion and humidity.

C. Station interiors and exteriors shall be cleaned, and coatings shall be touched up to match original finish upon completion of the WORK.

D. Conduit, conductors, and terminations shall be installed in accordance with Section 26 05 00 – Electrical Work, General.

E. Solenoid valves shall be securely supported and connected to stainless steel tubing.
   1. Solenoid valves shall be independently supported using stainless steel hardware and shall not rely on process tubing for support. The CONTRACTOR shall submit support details to the ENGINEER for approval prior to installation.

3.2 FIELD TESTING

A. Each component shall be tested again for functional operation in the field after the connection of external conductors and prior to equipment startup.

B. Deficient stations shall be corrected, to the ENGINEER'S satisfaction, at the CONTRACTOR'S expense.

END OF SECTION 25 14 05

SECTION 25 36 16 – MONITORING TRANSDUCERS

PART 1 - GENERAL (NOT USED)

PART 2 - PRODUCTS

2.1 GENERAL

A. Signal Output: Outputs shall be current regulated 4-20 mA.

B. All instruments shall be NTRL-approved & installed in accordance with manufacturer's recommendations.

2.2 4-20 mA LOOP ISOLATOR SIGNAL CONDITIONER

A. The 4-20 mA signal conditioner transducer shall provide a 4-20 mA output, fully isolated from input, proportional to a 4-20 mA or 0-10 VDC input. Supply voltage shall be 24 VDC output loop power. The transducer shall provide accuracy of 0.2% of span with a 80 ms response time.

B. Manufacturer: **Allen-Bradley 931S-C1A2D-OP**, or approved equal.

C. Install signal conditioner transducers as shown on the panel wiring diagrams.

PART 3 - EXECUTION

3.1 GENERAL

A. All monitoring transducers shall be handled, installed, calibrated, loop-tested, precommissioned, and performance tested in accordance with the Manufacturer's installation instructions and Section 40 90 00 – Process Control and Instrumentation Systems.

END OF SECTION 25 36 16

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 26 01 26

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. 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.

D. 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)

Anchorage Electrical Code amendments to the NEC.

B. Electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL).

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.

1.4 PUBLIC UTILITIES REQUIREMENTS

A. The CONTRACTOR shall contact the serving utility and verify compliance with requirements before construction. The CONTRACTOR shall coordinate schedules and payments 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 verify with the utility the exact location of each service point and type of service, and shall pay all charges levied by the serving utilities as part of the WORK.

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 MASS Section 10.05 Article 5.6.

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. 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. 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.

E. Owner's Manuals: Complete information in accordance with MASS Section 10.04, Article 4.20 Operating and Maintenance Manuals.

F. 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 according to MASS Section 10.05 Article 5.6.

G. 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 AWWU plant supervisor and the ENGINEER. The CONTRACTOR shall remove the lock within 4 hours upon request of AWWU, 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.
   1. 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.
   2. The ENGINEER will coordinate with the CONTRACTOR to load and commission the PLC software after the CONTRACTOR makes the wiring modifications.
   3. 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 MASS Division 10.

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. MOA NEC Local Amendments: The CONTRACTOR shall comply with all requirements of the MOA NEC local amendments.
   1. The CONTRACTOR shall pay particular attention to the additional grounding requirements. In general, grounding conductors are not specifically called out on the drawings but are required for every raceway.

D. 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.

E. 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.

F. Incoming utility power equipment shall be provided in conformance with the utility's requirements.

G. 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 under MASS Section 10.05 Article 5.6.

C. Panels, raceways, and other equipment shall be anchored and supported for Seismic requirements of MOA Building Safety.

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 26 05 00

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 MASS Section 10.05 Article 5.6, 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 machine-printed heat-shrinkable wire markers at each end.

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 No.14 19-strand copper AWG.

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 and UL-listed. The CONTRACTOR shall install RJ-45 connectors as required.

F. DeviceNet Cable: Shall be 600-volt rated sunlight resistant, 65% braid coverage**,** UL Listed**, Allen-Bradley DeviceNet Trunk Cable, Type TC**, or equal.

2.3 CABLE TERMINATIONS

A. 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.

B. Pre-insulated fork tongue lugs shall be **Thomas & Betts, Burndy**, or equal.

C. 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.

D. Labels for coding low voltage 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 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.

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 120/240-volt system conductors shall be color-coded as follows:
      a. Line 1 - Black
      b. Line 2 - Red
      c. Neutral - White
   4. 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
   5. 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.

6. 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.
7. General purpose AC control cables shall be Red.
8. General purpose DC control cables shall be Blue.
9. Spare cable shall be terminated on terminal screws and shall be identified with a unique number as well as with destination.
10. 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 01300 – 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 megohmeter.
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 26 05 19

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 MASS Section 10.05 Article 5.6 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 loop 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.

B. B. 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

metallically 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.

C. Buried cable-to-cable and cable-to-ground rod connections shall be made using exothermic welds by **Cadweld, Enrico Products**, or equal.

D. 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.

E. Grounding clamps shall be used to bond each separately derived system to the grounding electrode conductors.

F. 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.

G. Ground clamps in concrete shall be rated for use with rebar and embedded in concrete.

H. 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 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 26 05 26

SECTION 26 05 33 – ELECTRICAL RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide electrical raceway systems, complete and in place, in accordance with the Contract Documents.

B. Local amendments to NEC require:
   1. The equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following:
      a. A copper, aluminum, or copper-clad aluminum conductor.
      b. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a bus bar of any shape.

1.2 DEFINITIONS

A. Raceway System – The raceway system consists of conduits, wireways, fittings, junction and pull boxes, supports, labels complete and ready for conductors.

PART 2 - PRODUCTS

2.1 GENERAL

A. Conduits, wireways, fittings, supports, labels, junction and pull boxes, and other indicated enclosures which are dedicated to the raceway system, shall comply with the requirements of this Section.

2.2 CONDUIT

A. Galvanized Rigid Steel Conduit (GRC)
   1. Rigid steel conduit shall be mild steel, hot-dip galvanized inside and out.
   2. Rigid steel conduit shall be manufactured in accordance with ANSI C80.1 - Rigid Steel Conduit, Zinc Coated, and UL-6.
   3. Manufacturers, or Equal
      a. **LTV Steel**;
      b. **Triangle**;
      c. **Wheatland Tube**.
   4. GRC shall be used in all locations except outdoor locations or NEMA-4X locations.

B. PVC-Coated Galvanized Rigid Steel Conduit (PVC-coated GRC)

1. The conduit, prior to PVC coating, shall meet the requirements for GRC conduit above.
2. A PVC coating shall be bonded to the outer surface of the galvanized conduit. The bond between the coating and the conduit surface shall be greater than the tensile strength of the coating.
3. PVC coating thickness shall be not less than 40 mils.
4. PVC-coated GRC shall be manufactured in accordance with the following standards:
   a. UL-6
   b. ANSI C80.1
   c. NEMA RN1 - PVC Externally Coated Galvanized Rigid Steel Conduit, Intermediate Metal Conduit, and where shown on the plans
5. Manufacturers, or Equal
   a. **Robroy**;
   b. **Ocal**.
6. PVC-coated GRC shall be used in all direct-bury installations, outdoor locations, below-ground facilities, NEMA 4X designated areas, and where shown on the drawings.

C. Liquidtight Flexible Conduit (LFMC)
1. Liquidtight flexible conduit (LFMC) shall be constructed of a flexible galvanized metal core with a sunlight-resistant thermoplastic outer jacket.
2. LFMC shall be manufactured in accordance with UL-360 - Steel Conduits, Liquid-Tight Flexible.
3. Manufacturers, or Equal
   a. **Anaconda, "Sealtite"**;
   b. **Electriflex, "Liquatite"**.

D. Electrical Metallic Tubing (EMT) or Intermediate conduit (IMC) will <u>not</u> be accepted.

2.3 FITTINGS AND BOXES

A. General:
1. Cast and malleable iron fittings for use with metallic conduit shall be the threaded type with 5 full threads.
2. Fittings and boxes shall have neoprene gaskets and non-magnetic stainless steel screws. All covers shall be attached by means of holes tapped into the body of the fitting. Covers for fittings attached by means of clips or clamps will not be acceptable.
3. Non-explosion-proof boxes larger than standard cast or malleable types shall be 304 stainless steel, NEMA 4X.
4. Boxes larger than standard cast or malleable types shall be 304 stainless steel, NEMA 4X.
5. In outdoor areas, raceways shall be terminated in raintight hubs as manufactured by **Myers, O.Z. Gedney**, or equal. In other than outdoor areas, sealed locknuts and bushings shall be used.

6. Fittings and boxes in hazardous locations shall be suitable for the Class and Division indicated or required by code.

B. Cast Aluminum Fittings and Boxes
   1. Cast aluminum boxes and fittings shall have less than 0.40 percent copper content.
   2. Manufacturers, or Equal
      a. **O.Z. Gedney**;
      b. **Appleton**;
      c. **Crouse-Hinds**.

C. Malleable Iron Fittings and Boxes
   1. Fittings and boxes for use with galvanized steel conduit shall be of malleable iron or gray-iron alloy with zinc plating.
   2. Manufacturers, or Equal
      a. **O.Z. Gedney**;
      b. **Crouse-Hinds**;
      c. **Appleton**.

D. PVC-Coated Fittings and Boxes
   1. Fittings and boxes for use with PVC-coated GRC shall be PVC-coated and shall be products of the same manufacturer as the conduit.
   2. Fittings used for LFMC and PVC-coated systems are to be PVC-coated.

E. Stainless Steel Boxes
   1. Stainless steel boxes shall be used with PVC-coated GRC raceway systems and where indicated on the Drawings.
   2. Stainless steel boxes shall be NEMA 4X, Type 304.
   3. Stainless steel shall be a minimum 14-gauge thickness, with a brushed finish.
   4. Doors shall have full-length stainless steel piano hinges. Non-hinged boxes are not acceptable.
   5. Manufacturers, or Equal
      a. **Hoffman**;
      b. **Rohn**;
      c. **Hammond**.

2.4 WIREWAYS

A. All wireways shall be painted ANSI 61 gray, galvanized 14-gauge steel with screw covers and a steel divider to separate the discrete signals from the analog signals. Wireways shall be **Hoffman**, or equal.

B. Wireway shall be NEMA 12 and used only in above ground indoor locations.

C. Wireway systems not shown on the plans shall be submitted for approval.

2.5 CABLE TRAYS

A. Cable trays are not to be used.

2.6 IDENTIFICATION TAPE

A. Continuous lengths of warning tapes shall be installed 12 inches above and parallel to all underground conduits. Tape shall be 6-inch-wide polyethylene film imprinted, "CAUTION – ELECTRIC UTILITIES BELOW." Tape shall be as manufactured by **Brady**, or equal.

2.7 EXPLOSION-PROOF BOXES

A. Explosion-proof boxes shall be used to house control stations, switches, any arc producing device, and terminal for splicing in hazardous locations. The boxes shall be made from copper-free aluminum with stainless steel hardware, have a hinged cover, and use O-ring gaskets for watertight integrity. The boxes shall be factory painted with epoxy gray paint. Boxes 12" x 12" and larger shall have (1) 2" hole and (2) 1.5" holes, and (2) 1" holes drilled, tapped, and plugged on the bottom of the box. The boxes shall be **Appleton Electric AJBEW**, or equal.

2.8 EXPLOSION-PROOF CONDUIT FITTINGS AND UNIONS

A. Explosion-proof conduit fittings and unions shall be made from zinc electroplated malleable iron. Fittings shall include gasketed water-tight connections, be UL-listed for use in Class 1 Division 1 areas. Fittings shall be **Appleton Electric**, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. All wiring shall be run in raceway unless indicated otherwise.

B. Raceways shall be installed between equipment 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 accomplished with tools designed for this purpose. Field bends are required on conduits up to 2". Factory elbows may be utilized on raceways over 2". All fittings and connections shall be made tight.

C. Separate raceway systems shall be provided for:
   1. Analog signals
   2. 24 VDC discrete signals and instrument power supply conductors
   3. 120 VAC and higher wiring

When non-loop powered instruments have only one raceway port, the CONTRACTOR may run both the analog and 24 VDC wiring in a short length of ½" LFMC to a splitter box where the wiring must then be separated into the required raceway system. The length of LFMC must be kept to the absolute minimum and must not exceed 3 feet unless written approval has been given by the ENGINEER.

D. Where raceway routings are indicated on plan views, follow those routings to the extent possible. See SECTION 26 05 00 – ELECTRICAL WORK, GENERAL Article 3.1 Para B for additional installation requirements.

E. Routings shall be adjusted to avoid obstructions. Coordinate between trades prior to installation of raceways. Lack of such coordination shall not be justification for extra compensation, and removal and re-installation to resolve conflicts shall be by the CONTRACTOR as part of the WORK.

F. Support rod attachment for ceiling-hung trapeze installations shall meet the seismic requirements.

G. Exposed raceways shall be installed parallel or perpendicular to structural beams.

H. Install expansion fittings with bonding jumpers wherever raceways cross building expansion joints.

I. Exposed raceways shall be installed at least 1/2-inch from walls or ceilings except that at locations above finished grade where damp conditions do not prevail, exposed raceways shall be installed 1/4-inch minimum from the face of walls or ceilings by the use of clamp backs or struts.

J. In underground facilities or NEMA 4X areas, all raceway penetrations in panels shall be bottom entry.

K. Wherever contact with concrete or dissimilar metals can produce galvanic corrosion of equipment, suitable insulating means shall be provided to prevent such corrosion.

L. To facilitate future expansion, boxes and fittings are to be installed when indicated on the drawings. Unused hubs are to be plugged with proprietary devices. Raceways that include future expansion provision are to be sized to accommodate any such specified wiring without exceeding the requirements of this specification.

M. The maximum allowable conduit fill for instrumentation and control wiring is given by the following table:

Conduit Diameter	No. of 14-Gauge Wires	No. of 18-Gauge TWS
3/4"	8	2
1"	16	4
1-1/4"	32	7
1-1/2"	48	10

2”	72	17

Note: No instrumentation or control wiring conduit is to be larger than 2 inches in diameter.

3.2 RACEWAYS

A. Exposed raceway systems shall be rigid galvanized steel except as follows, unless indicated otherwise:
   1. In outdoor areas, all underground vaults, and NEMA 4X areas, PVC-coated GRC shall be utilized.

B. Raceways concealed, buried, or encased in concrete, shall be PVC-coated GRC. Where conduit emerges from concrete encasement, a PVC-coated RGS elbow shall be utilized for transition from the concrete. Conduit shall emerge from the concrete perpendicular to the surface whenever possible.

C. Exposed conduit shall be 3/4-inch minimum trade size. Supports shall be installed at distances required by the NEC.

D. Conduit shall not be encased in the bottom floor slab below grade.

E. Concrete cover for conduit and fittings shall not be less than 1-1/2 inches for concrete exposed to earth or weather, or less than 3/4-inch for concrete not exposed to weather or in contact with the ground.

F. Raceways passing through a slab, wall, or beam shall not impair significantly the strength of the construction.

G. Raceways embedded within a slab, wall, or beam (other than those merely passing through) shall satisfy the following:
   1. Conduits with their fittings embedded within a column shall not displace more than 4 percent of the gross area of cross section.
   2. Conduits shall not be larger in outside dimension than one third the overall thickness of slab, wall, or beam in which embedded.
   3. Raceways shall not be spaced closer than 3 outside diameters on centers.

H. Raceways shall be placed so that cutting, bending, or displacing reinforcement from its proper location will not be required.

I. Threads shall be coated with a conductive lubricant before assembly.

J. Joints shall be tight, thoroughly grounded, secure, and free of obstructions in the pipe. Conduit shall be adequately reamed to prevent damage to the wires and cables inside. Strap wrenches and vises shall be used to install conduit to prevent wrench marks on conduit. Conduit with wrench marks shall be replaced.

K. Wherever raceways enter substructures below grade, the raceways shall be sloped to drain water away from the structure. Extreme care shall be taken to avoid pockets or depressions in raceways.

L. Connections to lay-in type grid lighting fixtures shall be made using LFMC not exceeding 4-feet in length. Connections to motors and other equipment subject to vibration shall be made with LFMC not exceeding 3-feet in length. Equipment subject to vibration that is normally provided with wiring leads shall be provided with a cast junction box for the make-up of connections. The junction box is to be independently supported and not left free to hang from the equipment.

M. Raceways passing through walls or floors shall have plastic sleeves. Core drilling shall be performed in accordance with Section 26 05 00.

N. Provide raceway seal fittings at the following locations:
   1. In hazardous classified locations, in strict accordance with the NEC.

O. Conduit, fittings, and boxes required in hazardous classified areas shall be suitably rated for the area and shall be provided in strict accordance with NEC requirements.

P. Empty raceways shall be tagged at both ends to indicate the final destination. Where it is not possible to tag the raceway, destination shall be identified by a durable marking on an adjacent surface. A pull-cord shall also be installed in each empty conduit. This shall apply to conduits in floors, panels, manholes, equipment, etc.

Q. Where an underground raceway enters a structure through a concrete roof or a membrane waterproofed wall or floor, core-drill the entrance and provide a Link-Seal, or equal, sealing device. The sealing device shall be utilized with rigid steel conduit.

R. Final connections to heaters, instruments, motors, limit switches, and any equipment subject to vibration shall be made with LFMC and approved fittings. Maximum length of LFMC shall be 3 feet.

S. Connections to solenoid valves, pilot actuators, and flood sensors shall be made with LFMC and approved fittings to a cast box with screw cover (GUA type), independently and securely supported. In no case is the device to support the cast box. See project I&C detail drawing for typical valve control raceway configuration.

3.3 CABLE TRAYS

A. Cable trays are not to be used.

END OF SECTION 26 05 33

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 MASS Section 10.05 Article 5.6.

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 26 27 26

SECTION 40 90 00 – PROCESS CONTROL AND INSTRUMENTATION SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all Process Control and Instrumentation Systems (PCIS), less programming, complete and operable, in accordance with the Contract Documents. All programming and configuration shall be done by the ENGINEER and OWNER.

B. The requirements of this Section apply to all components of the PCIS, unless indicated otherwise.

C. Responsibilities
   1. The CONTRACTOR, through the use of an Instrumentation Supplier, panel fabricator, and qualified electrical and mechanical installers, shall be responsible to the OWNER for the implementation of the PCIS and the integration of the PCIS with other required instrumentation and control devices.
   2. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that the Instrumentation Supplier be responsible to the CONTRACTOR for the integration of the PCIS with devices provided under other sections, with the objective of providing a completely integrated control system free of signal incompatibilities.
   3. As a minimum, the Instrumentation Supplier shall perform the following WORK:
      a. Implementation of the PCIS
         1) prepare analog hardware submittals
         2) prepare the test plan, the training plan, and the spare parts submittals
         3) procure hardware
         4) oversee and certify hardware installation
         5) oversee, document, and certify loop testing
         6) prepare Technical Manuals
         7) prepare edited set of record drawings
   4. Any Instrumentation Supplier responsibilities in addition to the list above are at the discretion of the CONTRACTOR and the Instrumentation Supplier. Additional requirements in this Section and throughout Division 40 which are stated to be the CONTRACTOR's responsibility may be performed by the Instrumentation Supplier if the CONTRACTOR and Instrumentation Supplier so agree.

D. Control System Panel Designer and Fabricator
   1. Control System Panel Designer and Fabricator (CSPDF): The control system panel, and all other panels that have PLC hardware or communication hardware within them, shall be fabricated by the CSPDF. The CSPDF shall perform the following work:
      a. Edit contract loop drawings and control panel designs to show any and all changes to the design.

b. Fabricate and Test the panel(s) at the factory.
c. Ship the panel with a copy of the marked up drawings.

2. CSPDF Qualifications: The CSPDF shall have the resources, space, and personnel needed to design and fabricate the panels. The CSPDF shall meet the following minimum qualifications:
   a. The CSPDF shall have been in the business of building panels and bonding the construction of these panels for at least 5 years. The bonding shall be under the name and ownership of the company fabricating the panels for this project.
   b. The CSPDF shall build the panels to UL standard 508A, shall be certified to build panels to UL standard 508A, and shall attach a UL label on all new panels, or the panel builder shall build to an equal standard, shall be certified to an equal standard, and shall attach a label to all new panels with a label that is acceptable to the Municipality of Anchorage Building Department.
   c. The CSPDF shall make all wiring changes to new and existing control panels. The changes shall be made to UL standard 508, or equal standard that is acceptable to the Municipality of Anchorage Building Department. The CSPDF shall provide a UL engineer, or equal testing lab engineer that is acceptable to the Municipality of Anchorage Building Department, to inspect the changes and certify that the panel meets the standard, or provide a list of deficiencies.
3. The CSPDF shall be experienced with building AWWU Systems. Acceptable OEM Manufacturers include:
   a. TecPRO, Anchorage, Alaska
   b. Dowland-Bach, Anchorage, Alaska
   c. Technical Systems Inc, (TSI), Lynnwood, Washington

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with MASS Section 10.05 Article 5.6 and the following:
   1. The CONTRACTOR shall coordinate the instrumentation work so that the complete instrumentation and control system will be provided and will be supported by accurate Shop Drawings and record drawings.
   2. Exchange of Technical Information: During the period of preparation of these submittals, the CONTRACTOR shall authorize a direct, informal liaison with the ENGINEER for exchange of technical information. As a result of this liaison, certain minor refinements and revisions in the systems as indicated may be authorized informally by the ENGINEER, but will not alter the scope of work or cause increase or decrease in the Contract Price. During this informal exchange, no oral statement by the ENGINEER shall be construed to give approval of any component or method, nor shall any statement be construed to grant exception to or variation from these Contract Documents.
   3. Symbology and Nomenclature: In these Contract Documents, all systems, all meters, all instruments, and all other elements are represented schematically, and are designated by symbology as derived from Instrument Society of America Standard ANSI/ISA S5.1 – Instrumentation Symbols and Identification. The nomenclature and numbers designated herein and on the Contract Drawings

shall be employed exclusively throughout Shop Drawings, and similar materials. No other symbols, designations, or nomenclature unique to the manufacturer's standard methods shall replace those prescribed above, used herein, or on the Contract Drawings.

B. Shop Drawings

1. General

a. Shop Drawings shall include the letterhead or title block of the Instrumentation Supplier. The title block shall include, as a minimum, the Instrumentation Supplier's registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing. The quantity of submittal sets shall be as indicated in MASS Section 10.05 Article 5.6.

b. Organization of the Shop Drawing submittals shall be compatible with eventual submittals for later inclusion in the Technical Manual.

c. Shop Drawing information shall be bound in standard size, three-ring, loose-leaf, vinyl plastic, hard cover binders suitable for bookshelf storage. One set of drawings for each facility is to be hung inside the SCADA panel. The drawings are to be enclosed in PVC pockets suitable for hanging from a 3-ring binder, two drawings per pocket. The ring binder is to be attached to the inside of the front panel door.

d. Interfaces between instruments, motor starters, control valves, variable speed drives, flow meters, chemical feeders and other equipment related to the PCIS shall be included in the Shop Drawing submittal.

2. Analog Hardware Submittal: The CONTRACTOR shall submit an analog hardware submittal as a complete bound package at one time within 60 calendar days after the commencement date stated in the Notice to Proceed, including:

a. A complete index which lists each device by tag number, type, and manufacturer. A separate technical brochure or bulletin shall be included with each instrument data sheet (original documents only – photocopies are not acceptable and will be rejected). The data sheets shall be indexed in the submittal by systems or loops, as a separate group for each system or loop. If, within a single system or loop, a single instrument is employed more than once, one data sheet with one brochure or bulletin may cover all identical uses of that instrument in that system. Each brochure or bulletin shall include a list of tag numbers for which it applies. System groups shall be separated by labeled tags.

b. Fully executed data sheets according to ISA-S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, for each component, together with a technical product brochure or bulletin. The technical product brochures shall be complete enough to verify conformance to all Contract Document requirements. The data sheets, as a minimum, shall show:

1) Component functional description used in the Contract Documents
2) Manufacturer's model number or other product designation
3) Project tag number used in the Contract Documents
4) Project system or loop of which the component is a part
5) Project location or assembly at which the component is to be installed

6) Input and output characteristics
7) Scale, range, units, and multiplier (if any)
8) Requirements for electric supply (if any)
9) Requirements for air supply (if any)
10) Materials of component parts to be in contact with or otherwise exposed to process media and corrosive ambient air
11) Special requirements or features

c. Priced list of all spare parts for all devices.

d. Instrument installation, mounting, and anchoring details shall be submitted in an electronic hard copy format. Each instrument shall have a dedicated 8-1/2-inch by 11-inch detail which only pertains to the specific instrument by tag number. Each detail shall be certified by the instrument manufacturer that the proposed installation is in accordance with the instrument manufacturer's recommendations and is fully warrantable. These certifications shall be embedded in the CAD files and also appear as a stamp on the hard copies. As a minimum, each detail shall have the following contents:
1) Show all necessary sections and elevation views required to define instrument location by referencing tank, building or equipment names and numbers, and geographical qualities such as north, south, east, west, basement, first floor.
2) Process line pipe or tank size, service and material.
3) Process tap elevation and location.
4) Upstream and downstream straight pipe lengths between instrument installation and pipe fittings and valves.
5) Routing of tubing and identification of supports.
6) Mounting brackets, stands, and anchoring devices.
7) Conduit entry size, number, location, and delineation between power and signal.
8) NEMA ratings of enclosures and all components.
9) Clearances required for instrument servicing.
10) List itemizing all manufacturer makes, model numbers, quantities, lengths required, and materials of each item required to support the implementation of the detail.

3. Test Procedure Submittals
a. The CONTRACTOR shall submit the proposed procedures to be followed during tests of the PCIS and its components.
b. Preliminary Submittal: Outlines of the specific proposed tests and examples of proposed forms and checklists.

4. The CONTRACTOR shall provide a submittal of the CSPDF’s certifications, P.E. licenses, and project history before submitting any Shop Drawings or commencing any work on the control panels.

C. Technical Manual
   1. General: Information in the Technical Manual shall be based upon the approved Shop Drawing submittals as modified for conditions encountered in the field during the WORK.
   2. The Technical Manual shall have the following organization for each process:
      a. Section C – Edited As-Built Drawings
      b. Section D – Instrument Summary
      c. Section E – Instrument Data Sheets
      d. Section G – Instrument Installation Details
      e. Section H – Test Results
   3. Signed results from Loop Testing and FAT test.
   4. Initially, two sets of draft Technical Manuals shall be submitted for review after return of favorably reviewed Shop Drawings and data required herein. Following the ENGINEER's review, one set will be returned to the CONTRACTOR with comments. The Manuals shall be revised and amended as required and the final Manuals shall be submitted 15 days prior to start-up of systems.
   5. The CONTRACTOR shall provide Instrument Equipment Summary Form 1302 CM 1207 for all instruments, PLC hardware, devices, control hardware, and miscellaneous equipment. The data shall be provided in electronic format, **Microsoft Excel**, or approved equal.

D. Record Drawings
   1. The CONTRACTOR shall keep current a set of complete loop and schematic diagrams which shall include all field and panel wiring, piping and tubing runs, routing, mounting details, point to point diagrams with cable, wire, tube and termination numbers. These drawings shall include all instruments and instrument elements. Two sets of drawings electronically formatted in AUTOCAD on CD-ROM and two hard copies shall be submitted after completion of all commissioning tasks. All such drawings shall be submitted for review prior to acceptance of the completed work by the OWNER.

1.3 WARRANTY

A. The warranty shall start from the date of final acceptance of the completed project, and shall extend for 1 year, in accordance with MASS Division 10.

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. 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 of MASS Section 10.05 Article 5.7. 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 in equipment specifications in Division 40.

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.
   3. PLC equipment cables, Control Area Networks shall be provided under Division 40.
   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 insure proper operation in accordance with the instrument loop diagrams or specification data sheets.

E. Analyzer Calibration: Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.

F. Calibration Sheets: Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit:
   1. Project name
   2. Loop number
   3. Tag number
   4. Manufacturer
   5. Model number
   6. Serial number
   7. Calibration range
   8. Calibration data: Input, output, and error at 20 percent, 60 percent and 100 percent of span
   9. Switch setting, contact action, and deadband for discrete elements
   10. Space for comments
   11. Space for sign-off by Instrumentation Supplier and date
   12. Test equipment used and associated serial numbers

G. Calibration Tags: A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the ENGINEER. The CONTRACTOR shall have the Instrumentation Supplier sign the tag when calibration is complete. The ENGINEER will sign the tag when the calibration and testing has been accepted.

3.4 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 insure 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 Instrumentation Supplier 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 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.

3.6 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

A. For the purpose of this Section, the following conditions, in addition to the requirements in MASS Division 10, shall be fulfilled before the WORK is considered substantially complete:
   1. Submittals have been completed and approved.
   2. The PCIS has been installed, calibrated, and loop tested.
   3. Spare parts and expendable supplies and test equipment have been delivered to the ENGINEER.
   4. The performance test has been successfully completed.
   5. Punch-list items have been corrected.
   6. Record drawings in both hard copy and electronic format have been submitted.
   7. Revisions to the Technical Manuals that may have resulted from the field tests have been made and reviewed.
   8. Debris associated with installation of instrumentation has been removed.
   9. Probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.
   10. Instrument Equipment Summary Forms 1302 CM-1207 have been accepted by the OWNER.

END OF SECTION 40 90 00

SECTION 40 91 16.05 – PROCESS ANALYZER SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. General: The CONTRACTOR shall provide process analyzer 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 instruments shall be FM-approved, or equal.

PART 2 - PRODUCTS

2.1 GENERAL

A. Power Input: Analyzers shall be the fully isolated 2-wire type, unless the type is not available, in which case the analyzer shall be the fully isolated four wire type with power supply of 115 volts plus and minus 10 percent, 60 Hz plus and minus 5 percent.

B. Signal Output: Outputs shall be current regulated 4-20 mA DC capable of driving 0 to 600 ohms.

C. Ambient Conditions: Analyzers shall be suitable for continuous automatic on-line analysis of the indicated parameter under the conditions indicated.
   1. Equipment shall operate satisfactorily in ambient temperatures between minus 20 degrees and plus 120 degrees, or shall be provided with isothermal enclosures so that accuracies will not exceed one percent of span.
   2. Process fluid temperatures will range between 40 and 100 degrees F, unless indicated otherwise.

D. Sample Flow: Samples shall not pass through housings containing electronics, unless indicated otherwise.

E. Local Indication: Each analyzer shall be provided with local indication scaled in process units.

F. Calibration: Each analyzer shall be fitted with calibration connections at the analyzer.

G. Single Manufacturer: All electrodes, fittings, and transmitters on analyzers measuring the same parameter shall be products of a single manufacturer.

H. All instruments shall be FM-approved, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Process analyzers shall be handled, installed, calibrated, loop-tested, precommissioned, and performance tested according to Section 40 90 00 – Process Control and Instrumentation Systems.

END OF SECTION 40 91 16.05

SECTION 40 95 00 – PAC-BASED CONTROL SYSTEMS HARDWARE

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR, through the use of the Instrumentation Supplier and qualified electrical installers, shall provide and install the PAC-based control system (PACS) hardware complete and operable, in accordance with the Contract Documents.

B. Instrumentation Supplier: It is the intent of these Specifications to have the Instrumentation Supplier be singularly responsible for selecting, and verifying correct operation of compatible hardware to provide a functional PACS and to provide future support of all PACS hardware.

C. Minimum Instrumentation Supplier Scope: The exact contractual relationship and scope definition shall be established exclusively between the CONTRACTOR and the Instrumentation Supplier. It is the intent of these Specifications that the Instrumentation Supplier, under the direction of the CONTRACTOR, shall assume full responsibility for the following, as a minimum:
   1. Procurement of all hardware required to conform to these Specifications.
   2. Design and submit PACS hardware, and spare parts submittals.
   3. Perform all required PACS hardware tests, adjustments, and calibrations.
   4. Furnish all required PACS tools, test equipment, spare parts, supplies, operations and maintenance manuals, and reproducible record drawings as specified herein.

1.2 SUBMITTALS

A. Shop Drawings: PACS hardware submittals shall be in accordance with the applicable requirements of Section 40.90.00 – Process Control and Instrumentation Systems. PACS submittals shall, however, be made separately from other process control and instrumentation system submittals.

B. Hardware Submittals: The PACS hardware submittal shall be a single submittal which includes at least the following:
   1. A complete index appearing in the front of each bound submittal volume. System groups shall be separated by labeled tags.
   2. Complete grounding requirements for the entire PACS, including any requirements for PACS communication networks and control room equipment.
   3. Data sheets shall be included for each PACS component together with a technical product brochure or bulletin. These data sheets shall show the component name as used within the Contract Documents, the manufacturer's model number or other identifying product designation, the project tag number, the project system of which it is a part, the Site to which it applies, the input and output characteristics, the requirements for electric power, the ambient operating condition requirements, and details on materials of construction.

4. Complete and detailed bills of materials: A bill of material list, including quantity, description, manufacturer, and part number, shall be submitted for each component of the PACS system. Bills of material shall include all items within an enclosure.

C. Owner's Manuals: General requirements for Owner's Manuals are as described in Section 40 90 00 – Process Control and Instrumentation Systems. The following items shall also be included in the PACS manual:
   1. Operation and maintenance manuals for both the PACS, and all other PACS hardware.

D. Factory Test Procedure: The Instrumentation Supplier shall prepare and submit a factory test procedure which incorporates test sequences, test forms, samples of database lists, a PACS testing block diagram, and an estimated test duration which comply with the requirements of the factory test specified herein.

1.3 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The CONTRACTOR/Instrumentation Supplier shall arrange for visits by, and services of, technical field representatives of the PAC manufacturer for installation certification, system testing, and start-up. These services shall be part of the WORK.

1.4 STORAGE AND HANDLING

A. All equipment and materials delivered to the Site shall be stored in a location that shall not interfere with the operations of the OWNER's personnel or interfere with construction. Storage and handling shall be performed in a manner that shall afford maximum protection to the equipment and materials. It is the CONTRACTOR's responsibility to assure proper handling and on-site storage.

1.5 SPECIAL WARRANTY REQUIREMENTS

A. Equipment and materials selected by the CONTRACTOR that do not achieve design requirements after installation shall be replaced or modified by the Instrumentation Supplier to attain compliance. The cost for doing so shall be the CONTRACTOR's responsibility. Following replacement or modification, the CONTRACTOR shall retest the system and perform any additional procedures needed to place the complete PACS in satisfactory operation and attain design compliance approval from the ENGINEER.

B. The CONTRACTOR warrants/guarantees the satisfactory performance of the equipment and materials under operating conditions for a period of 1 year after the date of final acceptance of the entire PACS. In the event that tests and inspections disclose latent defects or failure to meet the specified requirements, the Instrumentation Supplier, upon notification by the OWNER, shall proceed at once to correct or repair any such defects or non-conformance or to furnish, at the delivery point named in the Contract Documents, such new equipment or parts as may be necessary for conformity to the requirements, and shall receive no additional

compensation therefore. In case of any required repairs or other corrective or remedial work covered under warranty, the warranties on all such corrections, repairs, new equipment, or parts shall be extended for an additional 24 months from the date of final acceptance, or 12 months from the date of completion of any such corrections, repairs, new equipment, or parts, whichever date is later. If the OWNER performs repair, the CONTRACTOR shall reimburse the OWNER for all costs incurred in the removal of the defective material and installation of the replacement.

PART 2 - PRODUCTS

2.1 GENERAL

A. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to this Section.

B. All materials and all PACS equipment furnished under this Contract shall be new, free from defects, of first quality, and produced by manufacturers regularly engaged in the manufacture of these products.

C. Hardware Commonality: Where there is more than one item of similar equipment being furnished all such similar equipment shall be the product of a singular manufacturer.

2.2 PACS ENCLOSURES

A. Each PAC and its corresponding I/O modules, power supply module(s), communication interface device(s), peripheral equipment, and radio communications shall be mounted inside suitable enclosures. All I/O wiring from the field to the I/O modules shall be terminated on terminal blocks in the enclosure.

2.3 PROGRAMMABLE AUTOMATION CONTROLLER (PAC)

A. General: Each PAC shall be of solid-state design. All central processor (CPU) operating logic shall be contained on plug-in modules for quick replacement. Chassis-wired logic is not acceptable. The controller shall be capable of operating in a hostile industrial environment and designed to provide high reliability specifically in this process application. The internal wiring of the controller is to be fixed, with the logic functions it must perform in a given application to be programmed into its memory. The controller shall be supplied with the CPU, input/output scanner, inputs, outputs, memory, power supply, and all power and interface cables necessary to function as a complete and operable PAC system.

B. Design: Each PAC shall have all of the facilities required to implement the control schemes and database indicated. PACS shall have the following functions and features:

1. Modular, field-expandable design allowing the system to be tailored to this process control application. The capability shall exist to allow for expansion of the system by the addition of hardware and/or user software.

2. The processor plus input and output circuitry shall be of a modular design with interchangeability provided for all similar modules. Modules are defined herein as devices that plug together to form an interlocking modular chassis. The design must prohibit upside-down insertion of the modules.
3. The PAC shall have downward compatibility whereby all new module designs can be interchanged with all similar modules in an effort to reduce obsolescence.
4. All hardware shall operate at an ambient temperature of 0 to 60 degrees C (32 to 140 degrees F), with an ambient temperature rating for storage of - 40 to + 85 degrees C (- 40 to + 185 degrees F), and shall function continuously in the relative humidity range of 5 percent to 95 percent with no condensation. The PAC system shall be designed and tested to operate in the high electrical noise environment of an industrial plant.
5. The PAC shall provide a means for mounting the chassis in a standard cabinet.

C. Central Processors: The CPU shall contain all the relays, timers, counters, number storage registers, shift registers, sequencer, arithmetic capability, and comparators necessary to perform the indicated control functions. It shall be capable of interfacing sufficient discrete inputs, analog inputs, discrete outputs, and analog outputs as shown on the drawings. The Processor shall be an **Allen Bradley CompactLogix 1769-L33ER**, as shown on the Drawing, no exceptions, to match AWWU equipment at other AWWU facilities. The CPU shall be supplied with a 1GB **SecureDigital card Allen-Bradley 1784-SD1**, or equal. The PACS shall have the following features and capabilities:
   1. All PACS shall be provided to support and implement closed loop floating and PID control which is directly integrated into the PAC's control program.
   2. The CPU shall be a self-contained unit, and shall provide control program execution and support remote or local programming. This device shall also supply I/O scanning and inter-processor and peripheral communication functions.
   3. The operating system shall be contained in removable programmable devices which allow for easy field replacement.
   4. The CPU within the system shall perform internal diagnostic checking and give visual indication to the user by illuminating a "green" indicator when no fault is detected and a "red" indicator when a fault is detected.
   5. Non-volatile memory shall store the operating system information to protect against loss in the case of power loss or system shut-down. Only at the time of a hardware change shall this configuration status be altered or re-entered.
   6. The PAC shall have the ability to fit into Rockwell’s Factory Talk Directory’s Security Application and participate in the Rockwell Asset Center Disaster Recovery Program.

D. Program Creation and Storage (Memory)
   1. The program storage medium shall be of a static RAM type.
   2. The PAC system shall be capable of addressing up to 2MB, where each word is comprised of 8 data bits.
   3. Memory capacity shall be configurable to allow for the most economical match to the intended application. It shall be possible to upgrade to a processor with a larger memory size simply by saving a program, replacing the processor, and downloading the program to the new system without having to make any program changes.

4. Memory shall be capable of retaining all stored program data through a continuous power outage for 4 months under worst case conditions. A low battery condition must be detectable in ladder logic, but shall not automatically generate a major fault.
5. All user memory in the processor not used for program storage shall be allocatable from main memory for the purpose of data storage. The PAC system shall be capable of storing the following data types:
    a. External Output Status
    b. External Input Status
    c. Timer Values
    d. Counter Values
    e. Signed Integer Numbers (16-bit)
    f. Floating Point Numbers
    g. Decimal Numbers
    h. Binary Numbers
    i. BCD Numbers
    j. Direct and Indexed Addressing
    k. Internal Processor Status Information
    l. ASCII Character Data
    m. ASCII String Data
    n. Block Transfer Control Structures
    o. Floating Point PID Control Structures
    p. File Instruction Control Structures
    q. Message Control Structures
6. Control logic programs shall have immediate access to the sub-elements of control structures by address and sub-element mnemonic, such as timer accumulator value, timer done bit, or PID Process Variable value.
7. Each unit shall be supplied with memory to implement the indicated control functions. The memory shall be programmed in a multi-mode configuration with multiple series or parallel contacts, counters, timers, and arithmetic functions.

E. Programming Techniques: The ENGINEER and OWNER shall program the PACS.

F. Ethernet Interface and Network
1. The PAC system shall offer industry standard Ethernet TCP/IP communication capabilities. The controller shall be able to connect to industry standard 100baseT media types by implementing a standard RJ-45 transceiver port that can connect to different transceivers. There shall be a CIP protocol layer that uses TCP/IP as the transport mechanism to deliver packets of data to other PACS that use the same protocol. This protocol handles the addressing and transfer of all the specific data file types in the PAC to allow for peer-to-peer messaging.
    a. Token passing system.
    b. Peer-to-peer communication.
    c. Message error checking.
    d. Retries of unacknowledged messages.

e. Diagnostic checks on other stations.
f. Interface to more than one network.
g. A user-oriented command language for manipulation of data structures of variable size and organization, such as setting or resetting bits, word and file transfers in a peer processor.
h. The ability to perform PAC memory uploads and downloads.
i. The ability to communicate with all other models of PAC manufactured by said manufacturer.
j. The ability to monitor the status of any processor remotely via the network.
k. The ability to automatically broadcast data to (and receive data from) all compatible stations on the link. Once configured, this operation shall be continuous without operator intervention.
l. A gateway interface to the Ethernet TCP/IP network for connectivity to host computers as well as other PACS that have direct Ethernet connectivity

2. The PAC system shall allow industry standard repeaters, bridges, routers, and gateways on the network in order to access other PACS and host computers. The controller shall be able to name a specific gateway/router IP address in order to direct data to other networks.
3. On-line programming and upload/downloads of control programs shall be able to occur over the Ethernet network.

G. PAC Power Supply
1. The PAC shall operate in compliance with an electrical service of 24 VDC. The power supply shall be mounted in the PAC housing and be sized to power all modules mounted in that housing and an "average module load" for any empty housing slots plus 25 percent above that total. Power supply shall be by the same manufacturer as the PAC and shall be of the same product line. A single main power supply shall have the capability of supplying power to the CPU and local input/output modules. Auxiliary power supplies shall provide power to remotely located racks.
2. The power supply shall be **Allen-Bradley 1769-PB4**, no exceptions to the model shown on the Drawings.

H. PAC Input/Output (I/O) Modules
1. I/O Modules General: All I/O housings and modules shall be suitable for hostile industrial environments. All I/O modules shall be isolated and conform to IEEE Surge Withstand Standards and NEMA Noise Immunity Standards. The I/Os shall be 4-20 mA DC for all analog inputs and outputs and shall be 24 VDC for discrete inputs and dry relay contacts for safe discrete outputs. Each PAC I/O location shall contain the I/O module quantity and type as shown on the Drawings.
2. Discrete Input Modules with Diagnostics: Defined as contact closure inputs from devices external to the programmable controller module. Individual inputs shall be optically isolated from low energy common mode transients to 1500 volts peak from users wiring or other I/O modules. Input modules shall be **Allen-Bradley 1769-IQ16** or **1756-IB16**, unless noted on the Drawings.
a. DC input for devices that operate at 5 to 30 VDC.

3. Discrete Output Modules with Electronic Fuse: Defined as contact closure outputs for ON/OFF operation of devices external to the programmable controller module. The output modules shall be optically isolated from inductively-generated, normal mode and low energy, common mode transients to 1500 volts peak. Discrete output contacts shall be provided with interposing relays in the control panel. Output modules shall be **Allen-Bradley 1769-OB16** or **1756-OB16**, unless noted on the Drawings.
   a. DC output for devices that operate at 10 to 30 VDC.
4. Analog Input Modules: Defined as 4 to 20 mA DC signals, where an analog to digital conversion is performed with 14-bit precision and the digital result is entered into the processor. The analog to digital conversion shall be updated with each scan of the processor. Input modules shall be source or sink to handle 2-wire or 4-wire transmitters, respectively. Input modules shall be **Allen-Bradley 1769-IF4** or **1756-IF16**, unless noted on the Drawings.
5. Analog Output Modules: Defined as 4 to 20 mA DC output signals where each output circuit performs a digital to analog conversion minimum of 12-bit precision with each scan of the processor. Each analog output module shall have two isolated output points which shall be rated for loads of up to 1200 ohms. The CONTRACTOR shall provide current loop isolators as required to break ground loops. Output modules shall be **Allen-Bradley 1769-OF2** or **1756-OF8**, unless noted on the Drawings.
6. DeviceNet Scanner Module: Any PAC location which requires communication to remote devices via DeviceNET shall be supplied with a DeviceNET scanner module in PAC Rack 00, located in the slot position next to the PAC. The DeviceNET module shall be **Allen-Bradley model 1769-SDN**.
7. DeviceNet Adapter Module: Any remote I/O location which requires communication to a PAC via DeviceNet shall be supplied with a DeviceNet adapter module, **Allen-Bradley model 1769-ADN**.

I. PAC Rack Configuration: The PAC, power supply, and I/O modules shall be mounted in the Rack configurations show on the drawings. Space is to be provided for future expansion of the racks in keeping with Allen-Bradley guidelines.

2.4 NETWORK HARDWARE

A. All unshielded twisted pair cabling shall be rated EIA/TIA 568 category 6 for plenum space.

B. DeviceNet Hardware
   1. Trunk Line Drop Connection: **Allen-Bradley T-Port tap**, or **DeviceNet Plug with lock 1787 Plug 10R**.
   2. Power Tap: **Allen-Bradley PowerTap**.
   3. Terminating Resistors: **Allen-Bradley 1485A Series**.

C. EtherNet / IP Distributed I/O Module: Allows CompactLogix user to re-use existing 1769 I/O. **Allen-Bradley-AENTR I/O Module.**

D. EtherNet Tap Module: **Allen-Bradley 1783-ETAP**.

2.5 SPARE PARTS

A. Provide spare parts as identified on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The CONTRACTOR shall utilize qualified personnel to accomplish, or supervise the physical installation of all elements, components, accessories, or assemblies that it provides. The CONTRACTOR shall employ installers who are skilled and experienced in the installation and connection of all elements, components, accessories, and assemblies it provides.

B. All components of the PACS, including all communication cabling, shall be the installation responsibility of the CONTRACTOR unless specifically noted otherwise. The installation of the communication network shall be the complete installation responsibility of the CONTRACTOR, including all cables, connectors, transceivers, antennas, and any required electrical grounds. Grounding shall be shown on submittal drawings. After installation of the PACS is completed, the installation shall be inspected jointly by the CONTRACTOR and the Equipment Manufacturer's representatives. Any problems shall be corrected, and when both are satisfied with the installation, a written certification of the installation shall be delivered to the ENGINEER. The certification shall state that all PAC communication and I/O modules, modems, system grounds, communication network, and all other components of the PACS System have been inspected and are installed in accordance with the Manufacturer's guidelines.

C. All DeviceNet cabling shall be done in accordance with Allen-Bradley DeviceNet Planning and Installation Manual.
   1. Maximum length of DeviceNet drop lines shall not exceed 20 feet.
   2. Terminating resistors shall be installed at each end of the trunk line.
   3. Where a DeviceNet MCC is installed, DeviceNet power connection shall be made with a PowerTap in a separate enclosure. In facilities with no DeviceNet MCC, DeviceNet power connection shall be made from SCADA panel fuse directly to the DeviceNet scanner module.

3.2 FACTORY TEST

A. General: Prior to shipment of the PACS from the factory, but after the procurement, assembly, and configuration of all components, the CONTRACTOR shall conduct a factory test on the panel fabricator shop floor. This test shall be witnessed by a representative of the OWNER and the ENGINEER of record, at the place of fabrication. No PACS shall be shipped without the ENGINEER’s written approval of the factory test. The factory test is intended to be a complete PACS. The factory test

shall demonstrate the functionality and performance of specified features of the PAC. The test shall include verification of all radios, PACS, and remote I/O system I/O points. Each point shall be checked from the terminal strip to register in the PAC processor. A complete system checklist shall be available during the test for recording results of selected points. **A minimum of ten (10) working days** notification shall be provided to the ENGINEER prior to testing.

B. Test Setup: The complete PACS system as shown on the drawings shall be assembled and interconnected on the CONTRACTOR's factory floor. The system shall include communication cable segments for the LANs, an Ethernet switch provided by the CONTRACTOR, and the radios to simulate as closely as possible the eventual Site installation. The PACS and communication devices shall be loaded with their applicable software packages. PAC input and output modules shall be installed in their assigned housings and wired to field termination points in the enclosures. The CONTRACTOR shall have a complete, up-to-date set of wiring drawings and a PAC register list for the test point, for review throughout the test.

C. The CONTRACTOR shall schedule the factory test after receiving approval of the factory test procedures submittal. One test shall be conducted for the complete system. A minimum of five 8-hour days will be budgeted for the test. The CONTRACTOR shall provide a qualified technician to assist with testing for the entire duration of the factory test.

D. Test Procedure: The factory test shall be conducted in accordance with the previously submitted and approved test procedures. The test procedures shall include written descriptions of how individual tests shall be performed and shall incorporate testing the following features as a minimum. All testing shall be completed in one continuous factory test which shall extend over 5 continuous days.
   1. Power Failure: External power to enclosures and/or workstations shall be turned off and back on in order to test the operation of the DC battery back-up system.
   2. The panel fabricator shall provide one technician for the 5 days of the test to assist the ENGINEER in testing the panel.

E. Test Report: The CONTRACTOR shall record the results of all factory testing on preapproved test forms which the OWNER's and ENGINEER's representatives shall sign. A copy of the completed test forms and a report certifying the results shall be provided to the ENGINEER within 10 days of completing the test.

F. Rework and Retest: If the PACS does not operate as required, the CONTRACTOR shall make whatever corrections are necessary, and the failed part of the tests shall be repeated. If, in the opinion of ENGINEER's representative, the changes made by the CONTRACTOR for such a correction are sufficient in kind or scope to effect parts of system operation already tested, then the effected parts shall be retested also. If a reliable determination of the effect of changes made by the CONTRACTOR cannot be made, then the ENGINEER's representative may require that all operations be retested. The CONTRACTOR shall bear all of its own costs for the factory test, including any required retesting.

G. All of the travel and per diem costs for factory testing and retesting shall be borne by the CONTRACTOR.

1. For factories within a 50-mile radius of the project site, no travel or per diem costs will be charged by the OWNER's representative and ENGINEER of record.
2. For factories outside of a 50-mile radius of the project site, the CONTRACTOR shall pay air travel costs, vehicle rental costs, lodging, and meals, for two people for the duration of each visit required to witness the factory tests. The vehicle rental, lodging, and meal allowance shall be $225 per person per day.

3.3 CALIBRATION, TESTING, AND INSTALLATION

A. Calibration: All analog inputs and outputs of the PAC shall have their calibration checked at a minimum of two points to verify consistency with the balance of the analog loop. This calibration check shall be done in conjunction with the analog loop tests in Section 40 90 00 – Process Control and Instrumentation Systems. Operator Interfaces and PAC registers shall both be verified for correctness.

B. The CONTRACTOR shall submit to the ENGINEER a system testing completion report when each process system and all aspects of the configuration software have been successfully tested as described herein. The report shall note any problems encountered and what action was required to correct them. It shall include a clear and unequivocal statement that the process systems have been thoroughly tested and are complete and functional in accordance with all Specification requirements.

END OF SECTION 40 95 00

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 SCADA 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 UL 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. Panels equipped with Intrinsically Safe controls shall also bear UL 913 label in addition to the UL 508.

F. SCADA enclosures and power panel enclosures shall be built to NEC standards for enclosures.

1.2 REFERENCE DOCUMENTS

A. UL 508A – 2001 Standard for Industrial Control Panels`

B. UL 913 -2000 Standard for Safety of Intrinsically Safe Apparatus and Associated Apparatus for use in Class I, II and III, Division 1 Hazardous Locations.

C. NFPA 79 – Electrical Standard for Industrial Machinery

D. NFPA 70 – Article 409

1.3 SUBMITTALS

A. General: Submittals shall be furnished in accordance with MASS Section 10.05 Article 5.6.

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.

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 24 VDC. Control conductors shall be provided in accordance with the indicated requirements.

D. The control panel shall be the source of power for any 120 VAC solenoid valves interconnected with the control panel. 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 unless otherwise noted on the drawings.
   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 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. Discrete outputs from the control panels shall be provided by electrically isolated contacts rated for 2 amps at 24 VDC or 5 amps at 120 VAC.

I. All control panel mounted devices shall be provided as shown on the Drawings.

J. 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. Insulation.
8. Open bottom with 2” flange for pad mounting.
9. Provision for mounting fluorescent lights.
10. 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. Each panel shall be provided with a switched light fixture, as shown on the Drawings. The fixture shall include a 120-volt receptacle and door switch.
6. 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.
7. 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 between the PLC I/O card and 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. DeviceNet cable shall be as per Allen-Bradley requirements, and terminated per Allen-Bradley requirements.
   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) 120 VAC Foreign Power - Yellow 16 AWG minimum
      6) 120 VAC Foreign Neutral - Yellow 16 AWG minimum
      7) DC Positive - Blue 16 AWG minimum
      8) DC Negative - White/Blue 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.

8. 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. DIN rail mounted relays shall be **Allen-Bradley 700-HK36A24-3-4** with **700-HN121** base or equal.

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 in addition to a 2-wire terminal with a fused circuit and a feed through circuit. Fused Terminals for the discrete input points shall be 2-wire terminal with a fused circuit and a feed through circuit. Provide a one-quarter of an ampere rapid blow 250-volt fuse for all analog circuits and all discrete input circuits. The analog terminals shall be **Allen-Bradley 1492-JD3FB with 1492-JDG3FB**, and the discrete input terminal shall be **Allen-Bradley 1492-JD3FB or approved equal**. Provide end barriers and end anchors for terminal trips as recommended by the manufacturer.

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. Miscellaneous Parts:
   1. Each panel 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.

N. Labor and Workmanship: Panels shall be fabricated, piped, and wired by fully qualified workmen who are properly trained, experienced, and supervised.

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. Other information and labels as required by UL508A.

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 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: All wires shall be run in plastic wireways except (1) field wiring, (2) wiring between mating blocks in adjacent sections, (3) wiring from components on a swing out panel to components on a part of the fixed structure, and (4) wiring to panel mounted components. 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 tied with nylon wire ties and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.

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 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 wireways 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. 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.
   3. 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.

END OF SECTION 40 95 13

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION IV

SUBMITTAL LIST AND STANDARD FORMS

Submittal List

Submittal Transmittal

Certificate of Compliance

Design Clarification & Verification Request

Deviation Request

Substitution Request

Subcontractor & Supplier List

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SUBMITTAL LIST

Job #: 00011(WTR) Contractor: _____

Submittal No.	Description	Submittal Schedule
10.03.2	Bid Submittals	Prior to the time of opening specified in the Invitation to Bid and the exact date and time of receipt of Bids shall be recorded.
10.04.9	Waste disposal on private property	Prior to construction.
10.04.13	Traffic Control Plan (TCP)	Within ten (10) days of NTP, or five (5) days before commencement of work, whichever is earlier.
10.04.15	Storm Water Pollution Prevention Plan (SWPPP)	No less than twelve (12) days prior to the beginning of excavation or within 10 days of NTP, whichever comes first.
10.04.19	Record Documents	Within thirty (30) days after Substantial Completion or prior to Final Acceptance of the project, whichever is earlier.
10.04.22	24-Hour Emergency Contact Number*	Prior to commencement of work * Found in Construction Specifications
10.05.3	Construction Progress Schedule	Within ten (10) days of the effective Notice to Proceed, and prior to the commencement of Work.
10.05.3	Critical Path Method (CPM) Schedule	No later than twenty-one (21) days from the effective date of the Notice to Proceed and at least monthly thereafter.
10.05.4	Unusual Working Hours	At least forty-eight (48) hours advance notice.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

10.05.5	Shop Drawings	Within reason and in such sequence as to cause no delay in the Work or in the work of the Owner or any other contractor.
10.05.6	Product Data	Within reason and in such sequence as to cause no delay in the Work or in the work of the Owner or any other contractor.
10.05.7	Materials Substitutions	Within ten (10) calendar days of the effective date of the Notice-to-Proceed (or such time as may be approved in writing by the Engineer.)
10.05.10	Subcontractor List	Within ten (10) days after the effective date of the Notice-To-Proceed, and prior to the commencement of the Work.
10.05.18	Changed Conditions	No later than two (2) working days, and before such conditions are disturbed.
10.05.20	Change Order Proposal	Prior to payment of changed Work
10.05.21	Claims for Additional Compensation	Initial Notification - Immediately.
10.05.26	Pre-Final Inspection Notification	After completion of Work After code compliance inspections
10.05.29	Termination of Work for Owners Convenience	Immediately after receiving a Notice of Termination.
10.05.34	Work Plan	Prior to beginning construction.
10.06.9	Insurance	Prior to execution of the Contract.
10.07.4	Change Order Proposal/ Negotiated Changes	Prior to payment of the changed Work.
10.07.5	Application for Partial Payment	

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

10.07.7	Final Payment	Upon completion of the Work and issuance of a certificate of completion by the Engineer, and prior to acceptance of the work.
20.02.3.A	Hazardous Material Control Plan (HMCP), Spill Prevention, Control, and Countermeasure Plan (SPCC)	7 days prior to commencement of excavation work
20.02.3.B	Storm Water Pollution Prevention Plans (SWPPP)	No less than twelve (10) days prior to the beginning of excavation or within 10 days of NTP, which ever comes first.
20.12.3	Construction Dewatering Plan	No less than seven (7) days prior to the beginning of dewatering activities.
20.30.3	Excavation, Shoring, and Temporary Material Storage Plan	Submitted three (3) days prior to the beginning of work involving shoring. Submitted ten (10) days prior to construction or within 10 days of NTP, which ever comes first.
30.01.7	Ready-Mixed Concrete	Prior to unloading the concrete mix at the construction site.
40.06.2.A	Asphalt Concrete Pavement	Prior to paving.
40.07.3.E	Job-Mix	Fifteen (15) days prior to paving.
40.07.5	Paving Plan	Minimum of five (5) days prior to commencement of paving.
60.02.3.A	Written Notice of mainline flow interruptions.	Minimum of seventy-two (72) hour and a maximum of one-hundred forty-four (144) hours in advance of interruption.
60.02.4	Flushing and Testing Schedule and Procedure	Forty-eight (48) hours prior to flushing, testing.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

60.08.1	Temporary Water Systems Plan	Ten (10) working days of the effective date of the Notice-to-Proceed (NTP) or five (5) days before the commencement of Work, whichever is earlier.
65.02.14	As-built Surveys and Record Drawings	Upon completion of construction activity.
70.12.1	Traffic Control Plan (TCP)	Prior to commencement of the project.
75.04.2	Seed Certification	Ten (10) days prior to application.

NOTE: The above list of submittals is not all-inclusive. In addition to the above, the Contractor is required to comply with all submittal requirements as required or identified in the plans, Special Provisions, MASS, or as directed by the Engineer. (See Division 10, Section 10.04, Article 4.3.)

SUBMITTAL TRANSMITTAL

PROJECT: _____ SUBMITTAL NO.: _____

CONTRACTOR: _____ CONTRACT NO.: _____

ORIGINATOR: _____ SPEC. SECTION: _____

DATE SUBMITTED: _____ DRAWING NO.: _____ SHEET _____ OF _____

TO: ANCHORAGE WATER & WASTEWATER UTILITY
Engineering Division
3000 Arctic Boulevard

ATTN: _____

ITEM: _____

SUPPLIER/CONTRACTOR:

☐ Original Submittal ☐ 3rd

☐ 2nd ☐ 4th

ID. NO.	DETAILED DESCRIPTION (Provide Itemized List of Contents of this Submittal)	REVIEW ACTION: COPIES SENT	NO EXCEPTION TAKEN (A)	MAKE CORRECTIONS AS NOTED (B)	AMEND AND RESUBMIT (C)	REJECTED RESUBMIT (D)	COPIES RETURNED	NOTES ATTACHED

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				

AWWU SUBMITTAL REVIEW ACTION

PROJECT _____ SUBMITTAL NO. _____

CONTRACTOR _____ CONTRACT NO. _____

ORIGINATOR _____ SPEC. SECTION _____

DATE SUBMITTED _____ DRAWING NO. _____ SHEET _____ OF _____

A-NO EXCEPTION TAKEN
B-MAKE CORRECTIONS AS NOTED
C-AMEND AND RESUBMIT
D-REJECTED RESUBMIT

REVIEW ACTION	ID. NO.	COMMENT:

ENGINEER: _____ DATE: _____

CERTIFICATE OF COMPLIANCE

Project Name: _____ Contract No. C-_____

I (WE) CERTIFY THAT ALL WORK HAS BEEN PERFORMED AND MATERIALS SUPPLIED IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS AND CONTRACT DOCUMENTS FOR THE ABOVE WORK, AND THAT:

A. Not less that the prevailing rates of wages as ascertained by the governing body of the contracting agency has been paid to laborers, workmen, and mechanics employed on this work;

B. There have been no unauthorized substitutions of subcontractors; nor have any subcontracts been entered into without the names of the subcontractors having been submitted to the Engineer prior to the start of such subcontracted work;

C. No subcontract was assigned or transferred or performed by any subcontractor other than the original subcontractor, without prior notice having been submitted to the Engineer together with the names of all subcontractors;

D. All claims for material and labor and other services performed in connection with these specifications have been paid;

E. All monies due the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund, the State Tax Commission, hospital associations and/or other have been paid.

_____
(Company Name)

_____ _____
(Contractor's Signature) (Date)

STATE OF ALASKA)
)ss.
THIRD JUDICIAL DISTRICT)

The foregoing instrument was acknowledged before me this _____ day of _____, 20 ___, by _____ to be the _____ of the company.

_____
Notary Public
My commission expires: _____

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** _____

☐ _____

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 ☐ **YES** ☐ **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**

☐ **Disapproved**

BY _____
(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**
Signature: _____	☐ **Accepted**
Firm: _____	☐ **Accepted as Noted**
_____	☐ **Not Accepted**
Date: _____	☐ **Received too Late**
Telephone: _____	
	By: _____
Attachments:	**Title:** _____
_____	**Date:** _____
_____	**Remarks:** _____

ANCHORAGE WATER AND WASTEWATER UTILITY

Subcontractor/Supplier List

Project Name:

Project Number:

List all suppliers, subcontractors, their mailing addresses and a summary of the extent and character of the work to be performed by each:

Supplier/Subcontractor	Address	Extent/Character of Work

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION V

CONTRACT AND BID DOCUMENTS

Contract

Bid Bond

Performance & Payment Bond

Certificate of Insurance

Bidder's Checklist & Responsible Bidder Questionnaires

C O N T R A C T

Invitation to Bid No. **2022C**_____

Contract No. **C-2022**_____

NAME AND ADDRESS OF CONTRACTOR:

_____

_____

_____

Check appropriate box:

☒ **Incorporated in the State of**

MUNICIPALITY OF ANCHORAGE, acting through _____ (hereinafter the Owner).

Contract for _____

BID SCHEDULES	**ITEMS**	**PLAN SHEET FILE NUMBERS**	**AMOUNT**

$ _____

Total Amount : $ _____

THIS CONTRACT, entered into by the MUNICIPALITY OF ANCHORAGE, ALASKA, acting through 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. This CONTRACT consisting of 4 pages.

II. The Bid Proposal Section ___ consisting of ____ pages numbered as ____, **as contained in ITB 2022C_____.**

III. The Contract Performance and Payment Bond _____.

IV. The Contractor's Certificate of Insurance Dated _____.

V. Municipality of Anchorage Standard Specifications dated 2015 (MASS) Incorporated by Reference, **as contained in ITB 2022C_____.**

VI. Specifications consisting of the following:

Supplemental Provisions Section _____ consisting of _____ pages, with attachments Exhibit A through F, **as contained in ITB 2022C_____.**

VII. Equal Opportunity Special Provisions and Forms Section _____ consisting of _____ pages, **as contained in ITB 2022C_____.**

VIII. Disadvantaged/Women-Owned Business Enterprise (DBE/WBE) Specification Section _____ consisting of _____ pages, **as contained in ITB 2022C_____.**

IX. The Laborers' and Mechanics' Minimum Rates of Pay dated September 1, 2015 Section _____ consisting of _____ pages, **as contained in ITB 2022C_____.**

X. Submittal List Section _____ consisting of _____ page, **as contained in ITB 2022C_____.**

XI. The Drawings consisting of _____ sheets numbered _____, **as contained in ITB 2022C_____.**

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

MUNICIPALITY OF ANCHORAGE, ALASKA

BY _____
Signature

Purchasing Officer or designee
Title

Date of Signature and Contract Date:

_____

VENDOR _____

BY _____
Signature

_____
Printed Name

_____
Title

_____
Date of Signature

CONTRACT AND PERFORMANCE AND PAYMENT BOND SIGNATURE INSTRUCTIONS

1. The full name and business of the Contractor shall be inserted on Page 1 of the Contract and on the Performance and Payment Bond, hereinafter the Bond.
2. Two copies of the Contract and the Bond shall be manually signed by the Contractor. If the Contractor is a partnership or joint venture, all partners or joint ventures shall sign the Contract and the Bond except that one partner or one joint venturer may sign for the partnership or joint venture when all other partners or joint venturers have executed a Power-of-Attorney authorizing one partner or joint venturer to sign. The Power-of-Attorney shall accompany the executed contract and the Bond.
3. If the Contractor is a corporation, the President of the corporation shall execute the Contract and the Bond unless a Power-of-Attorney or corporate resolution shall accompany the executed Contract and Bond.
4. The Bond shall be returned to the Purchasing Division undated. The Contract Date shall be inserted on the Contract when the Municipality signs the Contract and the Bond shall be dated the same as the Contract Date.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we, _____ 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 MUNICIPALITY OF ANCHORAGE, 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, executors, administrators, successors, and assigns, jointly and severally, firmly by the presents.

WHEREAS, the said Principle is herewith submitting its proposal for _____ _____.

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 to the Obligee the amount stated above.

Signed, sealed, and delivered _____, 20_____.

WITNESS AS TO PRINCIPAL:

_____ _____
Contractor Name

_____
Contractor Signature

(AFFIX CORPORATE SEAL) _____
Corporate Surety

_____

_____
Surety Business Address

BY: _____
(Attorney-In-Fact)

(AFFIX SURETY SEAL)

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 MUNICIPALITY OF ANCHORAGE, as Obligee, in the full and just sum of _____ ($ _____) Dollars, lawful money of the UNITED STATES, for the payment which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, 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 _____ date of _____ 20 _____, with the Obligee for the construction of _____

_____

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 material in the prosecution of the work provided for in said contract, during the original term of said contract and any extensions of modifications thereof that may be granted by the Municipality, 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 use and benefit of all persons who may perform any work or labor or furnish any material in the execution of said Contract and may be sued on thereby in the name of said Obligee.

This 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.

Whenever Principal shall be, and declared by Obligee to be in default under the Contract the Obligee having performed Obligee's obligations thereunder, the Surety may promptly remedy the default or shall promptly:

1. Complete the Contract in accordance with its terms and conditions, or
2. Obtain a bid or bids for submission to Obligee for completing the Contract in accordance with its terms and conditions and upon determination by Surety of the lowest responsible bidder, or, if the Obligee elects, upon determination by Obligee and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Obligee and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price but not exceeding, including other costs and damages for which the Surety may be liable hereunder the amount set forth in the first paragraph hereof. The term "balance of the contract price" as used in this paragraph, shall mean the total amount payable by Obligee to Principal under the Contract and any amendments thereto, less the amount properly paid by Obligee to Principal.

IN TESTIMONY WHEREOF, the parties hereunto have caused the execution hereof in _____ _____ original counterparts as of the _____ day of _____, 20_____.

WITNESS AS TO PRINCIPAL:

_____ _____

Principal Name

_____

Principal Signature

(AFFIX CORPORATE SEAL) _____

Corporate Surety

_____

_____

Surety Business Address

(AFFIX SURETY SEAL) BY: _____

(Attorney-In-Fact)

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	NAIC #
INSURED	INSURER A :	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$
	☐ COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
	☐ CLAIMS-MADE ☐ OCCUR						MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
							GENERAL AGGREGATE	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$
	☐ POLICY ☐ PRO-JECT ☐ LOC							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	☐ HIRED AUTOS ☐ NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
	☐ **UMBRELLA LIAB** ☐ OCCUR						EACH OCCURRENCE	$
	☐ **EXCESS LIAB** ☐ CLAIMS-MADE						AGGREGATE	$
	☐ DED ☐ RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						☐ WC STATU-TORY LIMITS ☐ OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ **(Mandatory in NH)**	N / A					E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

ADDITIONAL INSURED:

1. ADDITIONAL INSURANCE: The Municipality of Anchorage is an additional insured on all policies, and shall contain a WAIVER OF SUBROGATION against the Municipality except Professional Liability and Worker's Compensation.
2. CANCELLATION: "Should any of the above described policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the Policy Provisions."

CERTIFICATE HOLDER

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Municipality of Anchorage
ITB: 2021C043

BIDDER'S CHECKLIST

INSTRUCTION TO BIDDER

I. GENERAL:

Bidders are advised that notwithstanding any instructions or implications elsewhere in this Invitation to Bid only the documents shown and detailed on this sheet need be submitted with and made part of their bid. Other documents may be required to be submitted after bid time, but prior to award. Bidders are hereby advised that failure to submit the documents shown and detailed on this sheet shall be justification for rendering the bid nonresponsive. Evaluation of bids for responsiveness shall be accomplished in accordance with Anchorage Municipal Code, Title 7.

II. REQUIRED DOCUMENTS FOR BID

NOTE: "Only the following listed items as marked with an "X" are required to be completely filled out and submitted with the bid."

__X__ Bid Proposal consisting of 13 pages numbered BP-1 of 3 through BP-13 of 13. Bid Proposal Page **BP-2 of 13 must** be manually signed.

__X__ Erasures or other changes made to the Bid Proposal Sheet must be initialed by the person signing the bid.

__X__ Bid Bond, certified check, cashier's check, money order or cash shall be submitted with the bid in the amount indicated.

__X__ All Addenda issued shall be acknowledged in the space provided on the Bid Proposal sheet or by manually signing the Addenda sheet and submitting it prior to the bid opening in accordance with Anchorage Municipal Code 7.20.020C.

III. REQUIRED DOCUMENTS AFTER BID OPENING

The following documents are required within **five (5)** working days of notification by the Purchasing Office. Failure, in whole or in part, to submit the documents required below shall be grounds to determine the Bidder as non-responsible.

__X__ In accordance with AO No. 2019-130 (S), Anchorage Municipal Code 7.20.030 and 7.20.070, Contractor Questionnaire consisting of three (3) Pages, Prime Contractor Form Filled out by Prime Contractor **and** all known subcontractors. **Please review AO NO. 2019-130 (S), AMC 7.20.030 and 7.20.070, and the attached Contractor Questionnaire before submitting a bid.**

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION VI

BID PROPOSAL

BID PROPOSAL
(CERTIFICATION)

TO: MUNICIPALITY OF ANCHORAGE _____, 2022
PURCHASING DEPARTMENT
632 W. 6TH AVENUE, SUITE 520
ANCHORAGE, ALASKA 99501

SUBJECT: Invitation to Bid No. 2021C043

PROJECT TITLE: ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Pursuant to and in compliance with subject Invitation to Bid, and other bid documents relating thereto, the bidder hereby proposes to furnish all labor and materials and to perform all work for the construction of the above referenced project in strict accordance with the bid documents at the prices established in the Bid Proposal, page **BP- 1 of 13 through BP- 13 of 13** submitted herewith.

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

LUMP SUM; ONE JOB **$_____**

The bidder acknowledges receipt of the following addenda:

Addenda No._____ Addenda No. _____
Addenda No._____ Addenda No. _____
Addenda No._____ Addenda No. _____

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, ( ) an LLC, ( ) a partnership, ( ) a nonprofit organization, or ( ) a joint venture. If a partnership or joint venture, identify all parties on a separate page.

Is this project Federally Funded?
Yes ☐
No ☐

_____
Company Name

BID PROPOSAL
(CERTIFICATION)
Continued

SUBJECT: Invitation to Bid No. 2021C043

PROJECT TITLE: ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Date	Alaska Contractor's License Number
Company Name (Printed)	Employer's Tax Identification Number
Authorized Representative Signature	Printed Name & Title
Company **Mailing** Address	Company Phone Number
City, State, Zip Code	Company Fax Number
Company **Physical** Address (if different from mailing address)	Company Email Address
City, State, Zip Code	

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

	BID
SCHEDULE A: WELL 04	$ -
SCHEDULE B: WELL 07	$ -
SCHEDULE C: WELL 09	$ -
SCHEDULE D: WELL 10	$ -
SCHEDULE E: WELL 11	$ -
SCHEDULE F: WELL 12	$ -
SCHEDULE G: WELL 13	$ -
SCHEDULE H: WELL 25	$ -
SCHEDULE I: WELL 29	$ -
SCHEDULE J: WELL 31	$ -
TOTAL AMOUNT BID	**$ -**

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE A: WELL 04

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
A-1	20.02	Storm Water Pollution Prevention Plan (Type 2) per LS	1		$ -
A-2	20.04	Clearing and Grubbing per LS	1		$ -
A-3	20.31	Outfall Structure per EA	1		$ -
A-4	55.05	Construct (Type II, 6' Dia.) Manhole per EA	1		$ -
A-5	60.02	Furnish and Install Pipe (Well No. 4) per LS	1		$ -
A-6	60.02	Furnish and Install (12" DI) Pipe per LF	125		$ -
A-7	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 4) per LS	1		$ -
A-8	60.08	Decommission Pipeline in Place (6") per LF	110		$ -
A-9	60.09	Furnish and install Chemical Analyzer (Well No. 4) per LS	1		$ -
A-10	60.10	Air Gap per EA	1		$ -
A-11	26.05.00	Electrical Labor and Materials per LS	1		$ -
A-12	40.90.13	Signal Conditioner Panel per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE B: WELL 07

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
B-1	60.02	Furnish and Install Pipe (Well No. 7) per LS	1		$ -
B-2	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 7) per LS	1		$ -
B-3	60.09	Furnish and install Chemical Analyzer (Well No. 7) per LS	1		$ -
B-4	26.05.00	Electrical Labor and Materials per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE C: WELL 09

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
C-1	60.02	Furnish and Install Pipe (Well No. 9) per LS	1		$ -
C-2	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 9) per LS	1		$ -
C-3	60.09	Furnish and install Chemical Analyzer (Well No. 9) per LS	1		$ -
C-4	26.05.00	Electrical Labor and Materials per LS	1		$ -
C-5	40.90.13	Signal Conditioner Panel per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE D: WELL 10

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
D-1	60.02	Furnish and Install Pipe (Well No. 10) per LS	1		$ -
D-2	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 10) per LS	1		$ -
D-3	60.09	Furnish and install Chemical Analyzer (Well No. 10) per LS	1		$ -
D-4	26.05.00	Electrical Labor and Materials per LS	1		$ -
D-5	40.90.13	Remote I/O Panel per LS	1		$ -
D-6	40.90.13	DC Power Distribution Panel per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE E: WELL 11

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
E-1	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 11) per LS	1		$ -
E-2	60.09	Furnish and install Chemical Analyzer (Well No. 11) per LS	1		$ -
E-3	26.05.00	Electrical Labor and Materials per LS	1		$ -
E-4	40.90.13	Remote I/O Panel per LS	1		$ -
E-5	40.90.13	DC Power Distribution Panel per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE F: WELL 12

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
F-1	60.02	Furnish and Install Pipe (Well No. 12) per LS	1		$ -
F-2	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 12) per LS	1		$ -
F-3	60.09	Furnish and install Chemical Analyzer (Well No. 12) per LS	1		$ -
F-4	26.05.00	Electrical Labor and Materials per LS	1		$ -
F-5	40.90.13	Signal Conditioner Panel per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE G: WELL 13

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
G-1	60.02	Furnish and Install Pipe (Well No. 13) per LS	1		$ -
G-2	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 13) per LS	1		$ -
G-3	60.03	Furnish and Install (12") Gate Valve per EA	1		$ -
G-4	60.09	Furnish and install Chemical Analyzer (Well No. 13) per LS	1		$ -
G-5	26.05. 00	Electrical Labor and Materials per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE H: WELL 25

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
H-1	60.09	Furnish and install Chemical Analyzer (Well No. 25) per LS	1		$ -
H-2	26.05. 00	Electrical Labor and Materials per LS	1		$ -
H-3	40.90. 13	Signal Conditioner Panel per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE I: WELL 29

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
I-1	60.02	Furnish and Install Pipe (Well No. 29) per LS	1		$ -
I-2	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 29) per LS	1		$ -
I-3	60.03	Furnish and Install (10") Gate Valve per EA	1		$ -
I-4	60.09	Furnish and install Chemical Analyzer (Well No. 29) per LS	1		$ -
I-5	26.05.00	Electrical Labor and Materials per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

MUNICIPALITY OF ANCHORAGE
Anchorage Water and Wastewater Utility
Anchorage Well House Chlorine Analyzer Improvements
AWWU Project No. WW00011

Bid Proposal

SCHEDULE J: WELL 31

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
J-1	60.02	Furnish and Install Pipe (Well No. 31) per LS	1		$ -
J-2	60.03	Furnish and Install Valve Bodies and Ancillary Equipment (Well No. 31) per LS	1		$ -
J-3	60.09	Furnish and install Chemical Analyzer (Well No. 31) per LS	1		$ -
J-4	26.05.00	Electrical Labor and Materials per LS	1		$ -

Total $ -

CONTRACTOR: _____ **DATE:** _____

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION VII

OTHER UTILITY REQUIREMENTS

CHUGACH
POWERING ALASKA'S FUTURE

April 2014

ELECTRICAL FACILITY CLEARANCE REQUIREMENTS

Enclosed is a copy of the Chugach Electric Association, Inc. (Chugach) Electrical Facility Clearance Requirements policy. Periodically, copies of the policy are mailed out to various companies and agencies whose activities may bring their personnel in close proximity to 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, we are concerned with preventing possible damage to our electrical facilities and disruption of electrical service to our customers. Please note that the Electrical Facility Clearance Requirements publication is now on Chugach's web site at: www.chugachelectric.com. Click on the "Customer Service" tab and go to either "For your Home" or "For Your Business", click on "Electrical Facility Clearance Requirements" (April 2014).

For your additional information, Alaska State Statute ("Article 6. Locating Underground Facilities") 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 general 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 with us, either during the design phase of a project or prior to the start of actual construction, can help eliminate or minimize conflicts. If you have questions please contact the Line Operations Division at 762-7655 and your call will be directed to the appropriate department for assistance.

Sincerely,

William J. Bernier
Director, Substations and Line Operations
Enclosures

cc: Statewide Bonding Companies; State of Alaska OSHA Inspector; State of Alaska Electrical Inspector; Alaska General Contractors

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 • info@chugachelectric.com

Issued April 2014

CHUGACH ELECTRIC ASSOCIATION, INC.

ELECTRICAL FACILITY 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 cable, poles, padmounted equipment, etc., is based upon the following considerations:

- The potential for serious injury and resulting liability is extremely high when dealing with voltages as high as 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 over-stressed insulation will almost always result in premature failure of the cable. The highest risk to personnel is a failure while the cable is being handled during excavation or construction. Undetected construction damage may result in a subsequent cable failure with consumer outages for periods of up to 48 hours during winter conditions.

- The stability of overhead pole lines or padmounted equipment is jeopardized with improper excavation and backfill. This may expose the public, as well as maintenance or construction personnel, to high voltages and create consumer power outages.

The above concerns can be minimized or eliminated 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.

NESC, Section 2, *Definitions of Special Terms* 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 1926.550 (a) (15) addresses crane operations near electrical lines. For lines rated over 50 kilovolts (kV), minimum clearance between the lines and any part of the crane or load must be 10 feet plus 0.4 inch for each 1 kV over 50 kV -- or twice the length of the line insulator, but never less than 10 feet.

CHUGACH SYSTEM VOLTAGES	
Normal Voltage (Phase-to-Phase)	**Minimum Clearance Required**
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 (a) (15) (iv) requires a "Safety Observer" during crane operations if the equipment is operating where it is difficult for the operator to maintain the desired 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 overhead 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; 1926.550; and 1926.651 regulate activities relative to job site electrical facilities.

Again, 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.

Issued April 2014

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 located in 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 762-7659 or 762-7669, 48 hours in advance, to notify the Line Construction and Maintenance Department of the planned work and be in compliance with OSHA 29CFR1926 (a) (15), and AS 18.60.670. If equipment, tools, machinery, or material must work in proximity closer than the minimum clearances outlined in OSHA 29CFR1926 (a) (15), and AS 18.60.670, the requirements of AS 18.60.680 shall be complied with before work can proceed. All necessary arrangements to be made 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 underground facilities are to be made through the Alaska Digline at 811. In addition, prior to excavating, Chugach shall be contacted a minimum of two (2) business days in advance. Contact the Line Operations Division at 762-7655 and your call will be directed to the appropriate department for assistance.

Locate surface markings are only reasonably accurate to +/- two (2) feet. As a general rule, Chugach requires hand-digging within two (2) feet of locate marks but in some cases may require three (3) or four (4) feet, depending on the actual 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 cross beam in such a manner that the outer cable jacket and/or conduit shall not be damaged in any way. The cable support work and excavation within the three (3) foot radius (see Section H-1) shall be done 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 direct buried 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 Line Operations Division at 762-7655 and your call will be directed to the appropriate department for assistance. Requests must be made three (3) working days in advance of the outage date requested. After hours, contact Chugach's Power Control Center at 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 it determines it 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, it will advise the construction contractor that it will pass these costs to the construction contractor.

4. In all cases, a final minimum burial depth of 40 to 60 inches (depending on the operating voltage) for high-voltage (above 1000 volts) primary cable/conduit and 30 inches for secondary low-voltage cable/conduit shall be maintained. If, however, existing Federal, State, or Municipal permit conditions require depths in excess of the 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 SUR2-3 through 6 (supplied upon request).

5. Projects which increase the final grade over Chugach underground distribution cable that are direct buried shall require relocation if the final depth of burial exceeds 60" from the proposed final grade. Where the distribution cables are in conduit a review and written approval by Chugach are required for proposed grade increases resulting in a depth of burial above 60".

6. Projects which propose to modify the grade over Chugach underground transmission cables (voltages above 25kV) require review and written approval by Chugach.

7. In addition to the foregoing, excavations near transmission underground cable/conduit will require the following:

   a) Excavation Adjacent to Transmission Voltage Level Power Lines: Chugach will require its Locate Contractor to notify excavators when a locate request includes the locating of cables that exceed 25kV distribution voltages.

      When excavation is planned that will come within close proximity (ten (10) feet), expose, parallel or undermine sections of Chugach's transmission underground cables (voltages above 25kV), special precaution and safety consideration must be taken. These cables operate at voltages between 34,000 volts and 230,000 volts phase-to-phase, provide power to tens of thousands of Chugach customers and require extraordinary protection. The following guidelines shall apply:

      Chugach Operations Department shall be contacted at (907) 762-7655 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 transmission cable. 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 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.

Because of the high voltage, excavations within ten (10) feet of a transmission cable can expose unqualified workers to extremely unsafe conditions. Prior planning by the excavator with coordination through Chugach and Chugach approval of construction activity within ten (10) feet of transmission cable is required.

Chugach shall approve, in advance, any plan for directional drilling, boring, pile driving or other type of "trenchless" construction in the vicinity of its transmission cables prior to any construction activity.

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 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 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 shoring plan is required for all excavations where more than one pole is subject to an open excavation. Pole shoring shall conform to Chugach specifications XP-X/Y (steel pile shoring) or XM40/XM40A (wood pole shoring) as approved by Chugach for the specific excavation. Specifications will be supplied upon request. All work for installing the piles must be performed within the OSHA guidelines. Shoring by other methods requires prior approval by Chugach on a case-by-case basis. Street light 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.

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 done 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 the Line Operations Division at 762-7655 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, 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 done by a backhoe, scraper, grader, auger, or other piece of equipment.

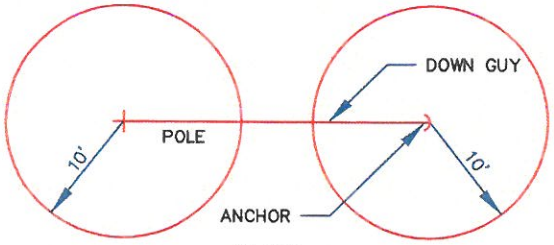
4. Cables are defined as insulated cable whether buried directly or in conduit. The guidelines for cables also include 600-Volt pedestals and other small electrical apparatus associated with cable but not included under pads or vaults.

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 or with an air-knife tool (compressed air jet).

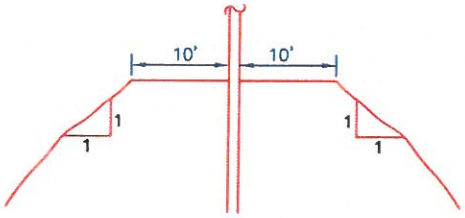


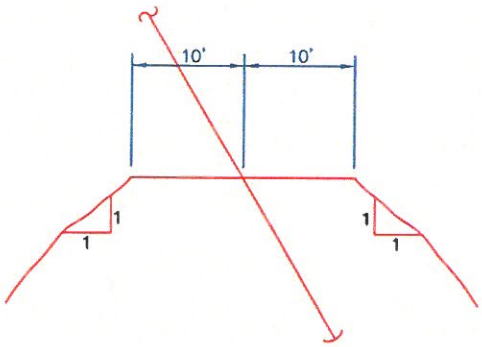
PLAN

(RADIUS OF UNDISTURBED SOIL)

NOTE:

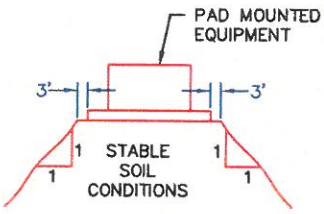
FOR VERY UNSTABLE SOIL CONTACT CHUGACH ELECTRIC.





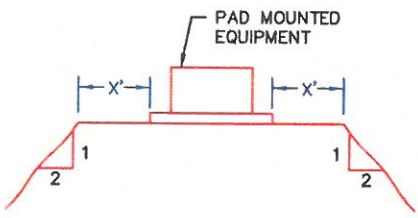
PROFILE

POLES/GUYS



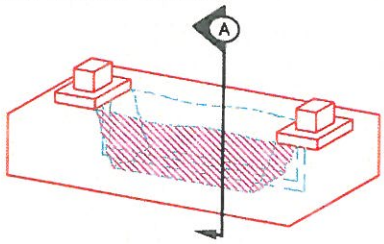
DURING CONSTRUCTION

SUPPLEMENTAL SUPPORT REQUIRED FOR EXCAVATIONS WITHIN 5' OF PADMOUNTED EQUIPMENT LOCATED ON UNSTABLE SOIL CONTACT CHUGACH ELECTRIC

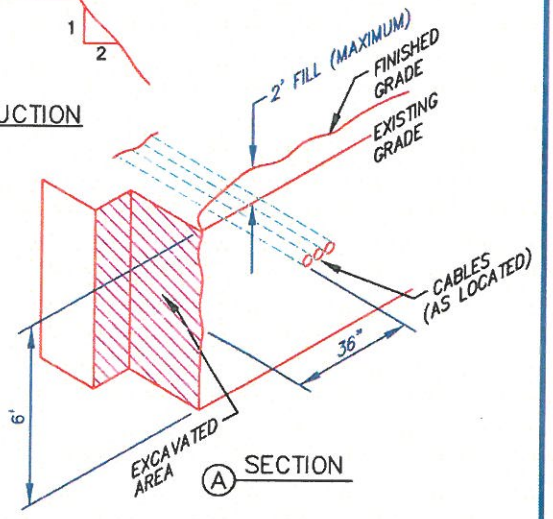


AFTER CONSTRUCTION

X': 10' ON DOOR/ACCESS SIDES. 4' ON OTHER SIDES.



PARALLEL EXCAVATION



STRUCTURES/CABLES

REV. NO.: 3 DATE: 1/28/98

Standards Engineer:

Mgr., Dist. Engineering:

Mgr., Const. & Maint.:

Dir., T&D Services Div.:

Chugach Electric Association, Inc.

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.

Safety Requirements For Excavation Adjacent To Natural Gas Pipelines

ENSTAR Natural Gas Company / Alaska Pipeline Company

Safety

ENSTAR Natural Gas Company provides natural gas service through 3,200 miles of gas mains to over 133,000 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).

As an operator of a natural gas system, ENSTAR is required by the DOT regulations to:

1. Deliver gas safely and reliably to customers.
2. Provide training and written instruction for employees.
3. Establish written procedures to minimize hazards resulting from gas pipeline emergencies.
4. Keep records of inspections and testing.
5. Test employees in safety-sensitive positions for prohibited drugs and alcohol.

Pipeline Reliability

Safety is and always will be unequivocally the number one priority for the natural gas industry. The industry spends billions of dollars each year to ensure the safety and reliability of the natural gas infrastructure. Natural gas utilities are subject not only to their own stringent internal controls, but also must meet rigorous federal and state oversight. Inspections are performed regularly by PHMSA regulators to ensure that compliance is being met.

Historically, excavation damage is the leading cause of most serious pipeline failures. Over 50% of the 312 damages to ENSTAR's pipelines last year were done by excavators that failed to obtain locates. Call before you dig, it's free and it's the law. Calling for locates is now as simple as dialing **811**. Dialing **811** anywhere in the United States connects you with the Locate Call Center for that area. 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.

Pressure Classification

Natural gas is a potentially dangerous, compressible gas. Gas pipelines with the highest pressure contain the highest stored potential energy and present the greatest risk. Caution is always warranted when working around natural gas facilities. **Extreme caution must be exercised whenever transmission pipelines are encountered. Contact ENSTAR Engineering Dept., (907) 264-3740 for specific instructions before working within 10 feet of any transmission pipeline.**

Pressure Classification	Pressure Rating Range	Pipeline Material
Transmission Pressure	Greater than 60 psig	Steel
Distribution Pressure	60 psig or less	Polyethylene, Steel, Copper

Recognizing ENSTAR's Pipelines

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 4" to 20" in diameter. They are typically coated with a protective coating. There is no single color but yellow and black are the predominant color while some are green or brown.

Typical ENSTAR Pipeline Marker

Distribution pipelines are steel, copper or polyethylene with locate wire. These pipelines range in size from ½" 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. They are typically steel or polyethylene and range in size from 2" to 12" in diameter.

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 ½" to 1" 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.

Excavation Requirements for Natural Gas Pipelines

1 **Line Locating is a Free Service:** To request a locate, dial **811** the new Nationally recognized One-Call number and you will be connected to Alaska Digline Inc. Call at least two but not more than 15 working days before the date scheduled for beginning the excavation. Hand digging is advised when excavating within 2 feet of a marked facility. After ENSTAR has field marked with yellow paint, or flagged the location of an underground facility, the excavator is responsible for maintaining the markings. **Failure to call is a violation of state statutes and could result in fines well in excess of the cost of the damage.**

2 **Support for Steel Line 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 needed bracing. 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) 264-3740 for further information. Extra care must be taken when geotextile fabric and/or rigid insulation are used. In addition to continuous support under the pipeline, compacted fill material shall be placed between the geotextile fabric/rigid insulation and the pipeline. 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.

3 **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 8 clearance)

4 **Excavation Parallel to Pipeline:** 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.** Contact ENSTAR Engineering at 264-3740 for additional information.

5 **Blasting:** All blasting that is to be done within 500' of any Company Facility, shall be reviewed by an ENSTAR engineer, with the person performing the blasting and appropriate measures, (i.e. require minimum distance from facilities, minimize blasting charge intensity, etc.) shall be taken to protect the integrity of the Company's Facilities. A leak survey shall be performed after any blasting activity, which is within 500' of any Company Facility. The leak survey zone shall include all Company Facilities within 500' radius of the blasting.

6 **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.

7 **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 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.**

8 **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) 264-3740**.** 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.

9 **Inspection:** All excavations in the immediate vicinity of ENSTAR Natural Gas facilities (including backfill, compaction, temporary support, and shoring), is subject to prior approval and inspection by ENSTAR personnel. Transmission pipeline inspections are provided whenever an excavator is working within ten feet of a transmission pipeline. If it has been determined that there was excavation either by hand or machinery within 5 ft. of ENSTAR Natural Gas Distribution mains or 10ft. from ENSTAR Natural Gas Transmission mains 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.

Pipeline Components

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) 264-3740, 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 inspect each possible locate wire damage before it is reburied.**

Service Line Excess Flow Valves

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 February 12, 2010, all gas companies nationwide were required to install an EFV in any newly installed service line that serves one single family dwelling.

ENSTAR will not be installing EFVs on service lines that branch to multiple buildings, multi-family, commercial or industrial structures. ENSTAR will not be installing EFVs on the existing 100,000 service line currently in use.

What does this mean to you as an Excavator?

Should you dig into 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 277-5551.

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 Damage a Gas Line or Smell Gas

If you damage a pipeline facility, call ENSTAR's 24-hour dispatch number at 277-5551. Call ENSTAR any time a gas line is broken, scraped, pulled, cut or otherwise damaged. **If the damage results in a release of natural gas and there is a danger to life or property, you should call the local Fire Department or 911.** Eliminate all ignition sources and evacuate the area of the damage. Wait for an ENSTAR employee to shut off the flow of gas and make repairs.

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 277-5551 and an ENSTAR Representative will investigate for possible underground leakage.

Qualified Personnel Requirements

Only qualified individuals meeting all applicable requirements may perform work on ENSTAR Natural Gas Company facilities. At a minimum, such individuals must comply with applicable federal, state and local regulation, statutes, and ordinances.

For further information about ENSTAR, visit our web site @ www.enstarnaturalgas.com

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION VIII

MINIMUM RATES OF PAY

State of Alaska Wage Rate

Laborers' & Mechanics' Minimum Rates of Pay

Title 36. Public Contracts AS 36.05 & AS 36.10 Wage & Hour Administration Pamphlet No. 600 (Pamphlet 600) is hereby incorporated in its entirety. Pamphlet 600 is available for free download at http://labor.state.ak.us/lss/pamp600.htm.

The Municipality of Anchorage will include a paper copy of the wage rates in the signed Contract.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION IX

AWWU DISADVANTAGED BUSINESS ENTERPRISE PROGRAM (MBE/WBE)

(NOT USED)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION X

EEO CONTRACT COMPLIANCE SPECIFICATIONS

EEO Special Provisions

EQUAL EMPLOYMENT OPPORTUNITY SPECIAL PROVISIONS

CONTRACT COMPLIANCE SPECIFICATIONS

Every municipal contract shall include language substantially the same as the following: The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, ancestry, age, sex, sexual orientation, gender identity, marital status, or physical or mental disability. The contract will comply with all laws concerning the prohibition of discrimination including, but not limited to, Title 5 and Title 7 of the Anchorage Municipal Code.

Every municipal contract shall state, in all solicitations or advertisements for employees to work under the contract, that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, ancestry, age, sex, sexual orientation, gender identity, marital status, or physical or mental disability.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION XI

RECORD DRAWINGS

(UNDER SEPERATE COVER)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION XII

SOIL BORING LOGS

(NOT USED)

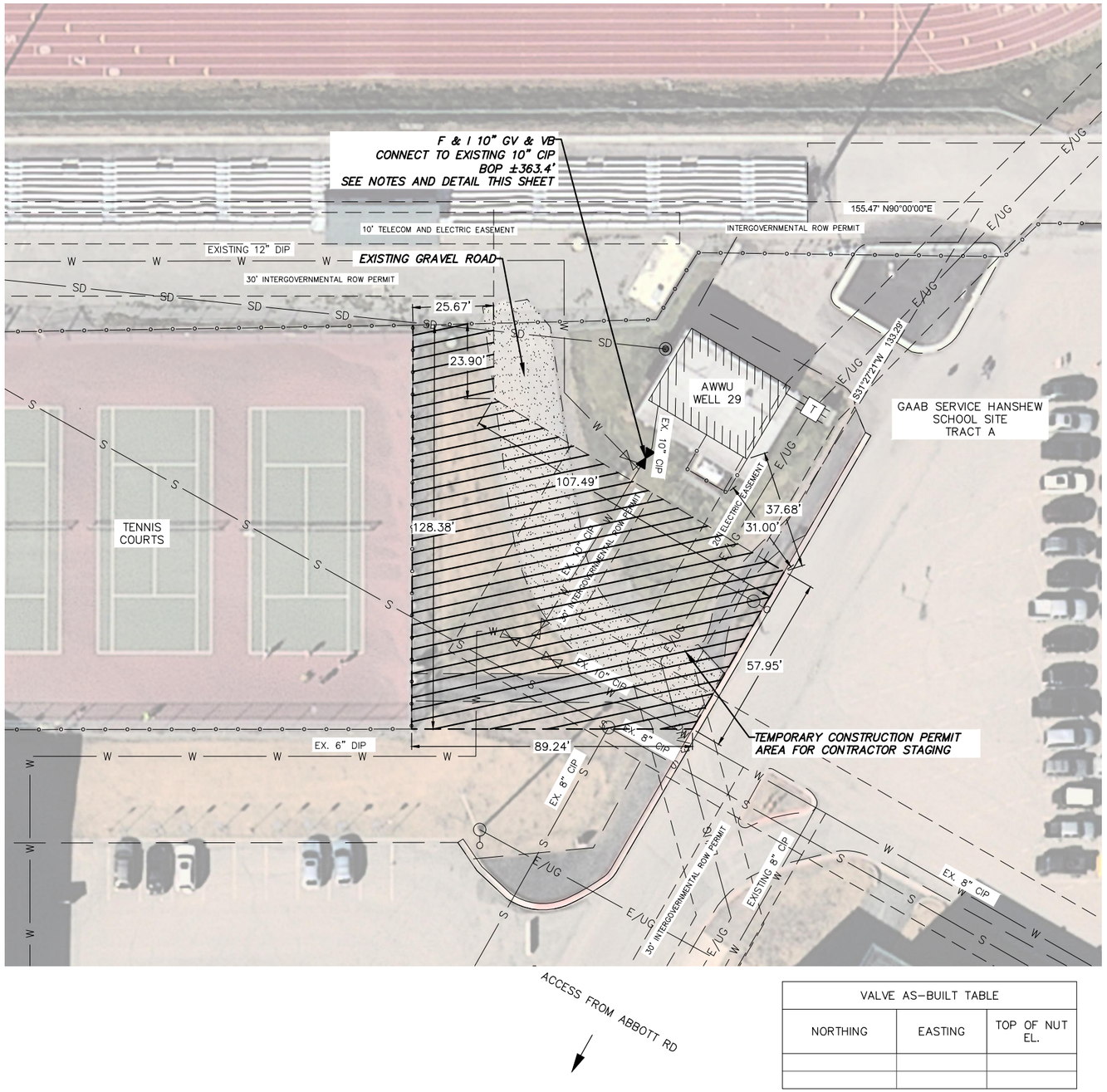
Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

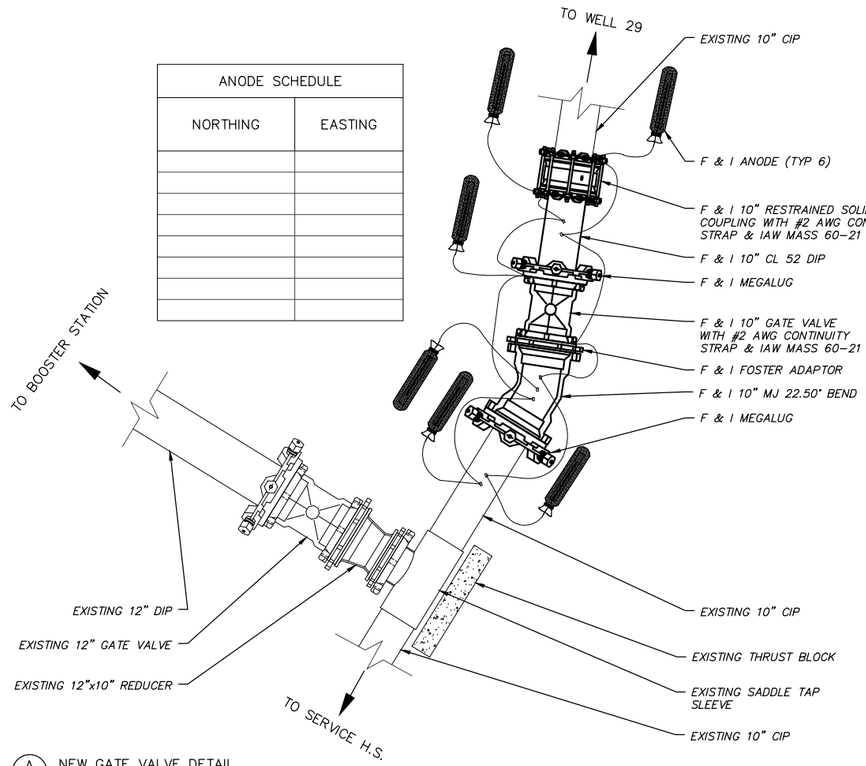
SECTION XIII

TEMPORARY CONSTRUCTION PERMITS AND EASEMENTS



VALVE AS-BUILT TABLE		
NORTHING	EASTING	TOP OF NUT EL.

ANODE SCHEDULE	
NORTHING	EASTING



A NEW GATE VALVE DETAIL

NOT TO SCALE

CONSTRUCTION NOTES

1. CONTRACTOR SHALL OBTAIN TYPE 1 SWPPP.
2. CONTRACTOR TO F&I A 10" GV & VB. REMOVE NECESSARY 10" CIP AND EXISTING 22.50° BEND TO ACCOMMODATE VALVE INSTALLATION. USE MEGALUG MECHANICAL JOINT RESTRAINT OR APPROVED EQUAL FOR VALVE AND NEW DIP REPLACEMENT.
3. ALL JOINTS MUST BE RESTRAINED.
4. FURNISH AND INSTALL ANODES AND BONDING AS SHOWN IN DETAIL A IN ACCORDANCE WITH MASS 60-04 AND 60-20. NO EXOTHERMIC WELD CONNECTIONS WILL BE ALLOWED ON THE VALVE. CONTRACTOR SHALL USE AN 1/8" THICK 316 STAINLESS STEEL FLAT BAR CONNECTOR PLATE WITH A WIRE RING CONNECTOR IN ACCORDANCE WITH MASS 60-21.
5. THE VALVE BOX SHALL BE BROUGHT TO FINISHED GRADE IN ACCORDANCE MASS 60-08. CONTRACTOR SHALL PLACE A VALVE BOX MARKER ON THE BUILDING WITH DISTANCE TO VALVE AS DIRECTED BY THE ENGINEER. MARKER IS INCIDENTAL TO THE CONTRACT AND NO SEPARATE PAYMENT WILL BE MADE.
6. CONTRACTOR SHALL BACKFILL EXCAVATION WITH NATIVE MATERIAL AS DIRECTED BY THE ENGINEER.
7. CONTRACTOR SHALL RESTORE SITE TO PRE-CONSTRUCTION CONDITIONS. RESTORATION IS INCIDENTAL TO THE CONTRACT AND NO SEPARATE PAYMENT WILL BE MADE. RESTORE GRAVEL DRIVEWAYS WITH 2" OF LEVELING COURSE AND GRASSY AREAS WITH 4" OF TOPSIL AND SCHEDULE A SEED. SEE G12 FOR TYPICAL TRENCH DETAIL.
8. CONTRACTOR SHALL MINIMIZE EXCAVATION BY USE OF EXCAVATION SHIELDS. USE OF EXCAVATION SHIELDS IS INCIDENTAL TO THE CONTRACT AND NO SEPARATE PAYMENT WILL BE MADE. SEE G12 FOR TYPICAL TRENCH DETAIL.
9. CONTRACTOR SHALL COORDINATE WITH OWNER TO PERFORM TEST SHUTDOWN PRIOR TO THE BEGINNING OF CONSTRUCTION.
10. LOCATIONS OF UTILITIES ARE BASED ON AVAILABLE RECORD DRAWING INFORMATION. CONTRACTOR IS RESPONSIBLE TO VERIFY DEPTH AND LOCATION OF EXISTING WATER MAIN AND BURIED UTILITIES.
11. CONTRACTOR SHALL LIMIT DISTURBANCE AND STAGING TO TEMPORARY CONSTRUCTION PERMIT AREAS AND INTERGOVERNMENTAL ROW PERMIT AREAS.
12. CONTRACTOR SHALL COORDINATE WORK WITH ANCHORAGE SCHOOL DISTRICT PRIOR TO BEGINNING. CONTACT PERSON FOR ANCHORAGE SCHOOL DISTRICT IS DANA MENENDEZ (907) 348-5206.

AWWU PLAN SET NO. 11018

2021/03/23 10:32 AM By: Kevin Garcia Z:\WW-17_(Task 4 CA-01)\dwg Active\WW00011WTR_WELL-29.dwg

VERIFY SCALE THIS BAR REPRESENTS ONE INCH ON ORIGINAL DRAWING. 0 — 1" IF BAR IS NOT ONE INCH, ADJUST DRAWING SCALE ACCORDINGLY.

DATA	DRAWN BY	CHECKED BY
	KMG	DAK
TOPOGRAPHY		
PROFILE		
SANITARY SEWER		
STORM SEWER		

DATA	DRAWN BY	CHECKED BY
TELEPHONE		
ELECTRIC		
CABLE TV		
TRAFFIC SIGNAL		
DESIGN	KMG	DAK
QUANTITIES	KMG	DAK
MUN. FINAL CHECK		

PLAN CHECK

REV	DATE	DESCRIPTION	BY

REVISIONS

RECORD DRAWING Note: To be filled out on original drawings upon project completion.

1. DATA PROVIDED BY: _____
   This shall serve to certify that these Record Drawings are a true and accurate representation of the project as constructed.
   CONTRACTOR: _____
   BY: _____ TITLE: _____
   DATE: _____
2. DATA TRANSFERRED BY: _____
   COMPANY: _____
   DATE: _____
3. Based on periodic field observations by the Engineer (or an individual under his/her direct supervision), the Contractor-provided data appears to represent the project as constructed.
   DATA TRANSFER CHECKED BY: _____
   COMPANY: _____
   BY: _____ TITLE: _____
   DATE: _____

REUSE OF DOCUMENTS

THIS DOCUMENT AND THE IDEAS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF AWWU AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF AWWU.

PROFESSIONAL & TECHNICAL SERVICES, INC.
CONSULTING • ENGINEERING • SURVEYING
912 EAST 15TH AVE, SUITE 200
ANCHORAGE, ALASKA 99501
PHONE: (907) 561-6237
FAX: (907) 563-3813
LICENSE# AECO924

CONSULTANT

STATE OF ALASKA 49TH
Dean A. Karcz
CE 8303
05-23-21
REGISTERED PROFESSIONAL ENGINEER

SEAL

MUNICIPALITY OF ANCHORAGE
WATER & WASTEWATER UTILITY

ANCHORAGE WELL HOUSE
CHLORINE ANALYZER IMPROVEMENTS

WELL 29
WELL HOUSE SITE PLAN

HORZ SCALE: NTS VERT SCALE: NTS	DATE: 03/2021	GRID: SW2337	SHEET 29-3 of 29-8
PROJ. ID.: WW00011(WTR)			

An area of land, described as follows:

Using Plat number 99-120 as a reference. Beginning at a point along the westerly boundary of said Tract A, which is common to the southeast corner of Abbott Road Subdivision, Tract B, and the northeast corner of Abbott Road Subdivision, Tract C.

Thence: N00°09’47”W a distance of 823.80 feet, along a line concurrent with the westerly boundary of said Tract A to the northwestern corner of said Tract A.

Thence: S41°58’37”E a distance of 562.99 feet to the northwest corner of an existing intergovernmental permit corner.

Thence: S00°00’08”E along the westerly boundary of an existing intergovernmental right of way permit area a distance of 38.62 feet to the true point of beginning.

Thence: S00°00’08”E along the westerly boundary of an existing intergovernmental right of way permit area a distance of 23.90 feet to a point.

Thence: S59°13’02”E along the southwesterly boundary of an existing intergovernmental right of way permit area a distance of 107.49 feet to a point.

Thence: S90°14’58”W a distance of 57.95 feet to a point.

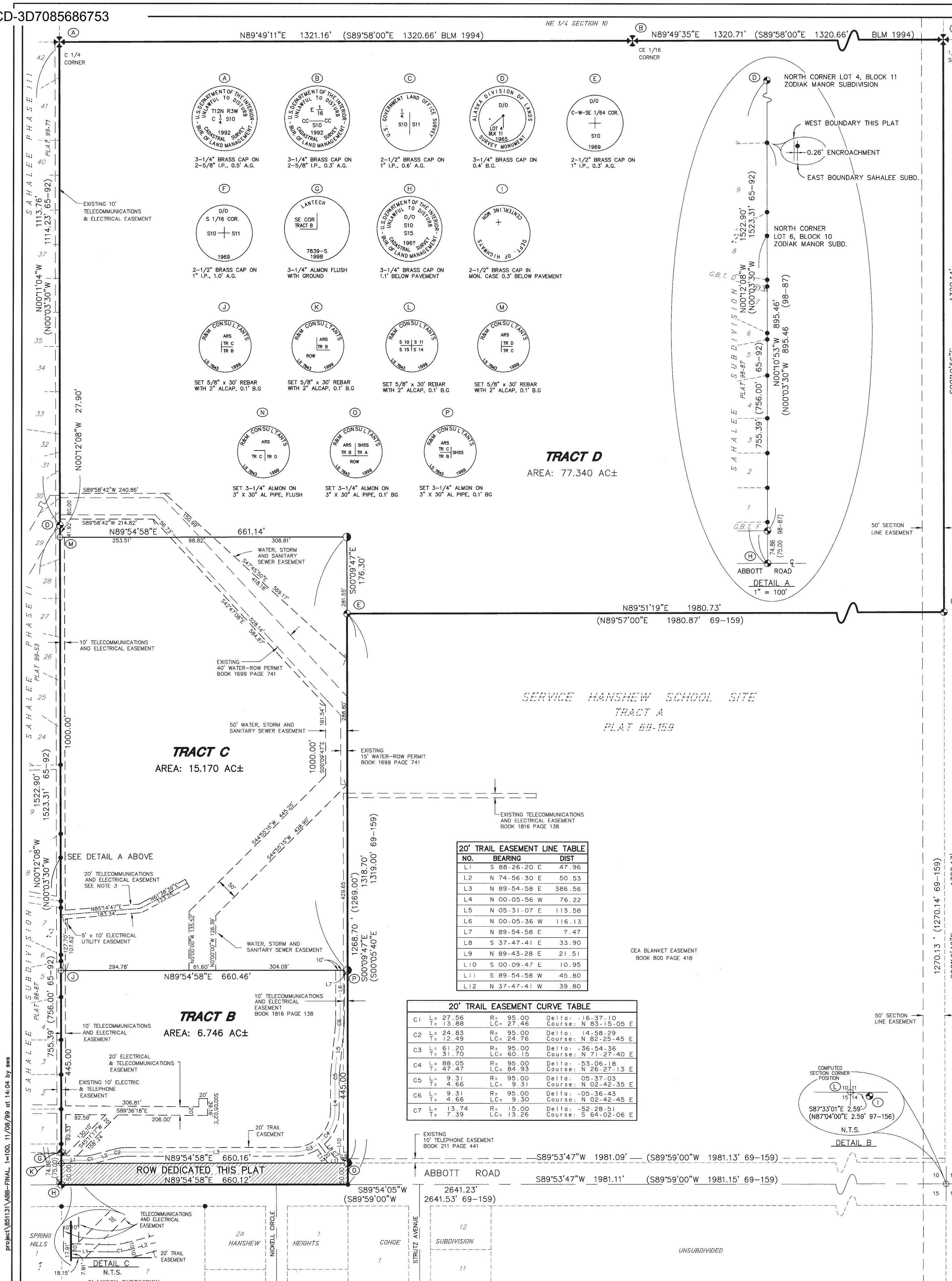
Thence: N90°00’00”W a distance of 89.24’ feet to a point.

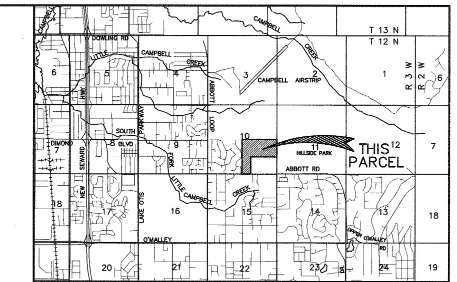
Thence: N00°11’20”E a distance of 128.38’ feet to a point.

Thence: N88°40’39”E a distance of 26.67 feet to the true point of beginning. Contains 9,761 square feet more or less.

This temporary construction permit overlaps an existing 30 foot wide intergovernmental right of way permit.

DocuSign Envelope ID: 36FBE93F-2757-472F-84CD-3D7085686753





20' TRAIL EASEMENT LINE TABLE		
NO.	BEARING	DIST
L1	S 88-26-20 E	47.96
L2	N 74-56-30 E	50.53
L3	N 89-54-58 E	386.56
L4	N 00-05-56 W	76.22
L5	N 05-31-07 E	113.58
L6	N 00-05-36 W	116.13
L7	N 89-54-58 E	7.47
L8	S 37-47-41 E	33.90
L9	N 89-43-28 E	21.51
L10	S 00-09-47 E	10.95
L11	S 89-54-58 W	45.80
L12	N 37-47-41 W	39.80

20' TRAIL EASEMENT CURVE TABLE			
C1	L= 27.56 T= 13.88	R= 95.00 LC= 27.46	Delta: -16-37-10 Course: N 83-15-05 E
C2	L= 24.83 T= 12.49	R= 95.00 LC= 24.76	Delta: 14-58-29 Course: N 82-25-45 E
C3	L= 61.20 T= 31.70	R= 95.00 LC= 60.15	Delta: -36-54-36 Course: N 71-27-40 E
C4	L= 88.05 T= 47.47	R= 95.00 LC= 84.93	Delta: -53-06-18 Course: N 26-27-13 E
C5	L= 9.31 T= 4.66	R= 95.00 LC= 9.31	Delta: 05-37-03 Course: N 02-42-35 E
C6	L= 9.31 T= 4.66	R= 95.00 LC= 9.30	Delta: -05-36-43 Course: N 02-42-45 E
C7	L= 13.74 T= 7.39	R= 15.00 LC= 13.26	Delta: -52-28-51 Course: S 64-02-06 E

LEGEND

- Found 3 1/4" brass cap monument
- Found 1 1/2" brass cap monument
- Found rebar with yellow plastic cap
- Set 3 1/4"" alum. cap with magnet on 2-1/2" x 30" aluminum pipe,
- Set 2" aluminum cap on 5/8" x 30" rebar
- ( ) – Record dimension as noted

NOTES

1. Direct access to Abbott Road is limited to the shared access between Tract B, Tract C and Tract A, Service Hanshew School Site per Plat 69-159.
2. Landscaping and retention of existing natural vegetation shall be in conformance with the Municipality of Anchorage Urban Design Commission approved site and landscaping plan along the boundaries of Tract B and shall be installed and maintained by the property owner.
3. The telecommunications and electrical easement will terminate on the east side at the face of the constructed building on Tract C and will not encroach into the building structure.
4. All easements which are referenced by book and page number are not dedicated by this plat.
5. The bearings shown are Alaska Coordinate System of 1983, Zone 4 grid bearings based on GPS observations and ties to NGS Control Stations "Talkeetna CORS L1 Phase Center" Epoch 1997 and "Kenai 1 CORS L1 Phase Center" Epoch 1997 using Trimble 4800 Dual Frequency Receivers. The distances shown are ground distances reduced to horizontal in U.S. Survey Feet.

CERTIFICATE OF OWNERSHIP AND DEDICATION

I (we), hereby certify that I (we) hold the herein specified property interest in the property described hereon. I (we) hereby dedicate to the Municipality of Anchorage all areas depicted for use as public utility easements, streets, alleys, thoroughfares, parks, and other public areas shown hereon. There shall be reserved adjacent to the dedicated streets shown hereon a slope reservation easement sufficient to contain cut and fill slopes of 1.5 feet horizontal for each 1 foot vertical (1.5 to 1) of cut or fill for the purpose of providing and maintaining the lateral support of the constructed streets. There is reserved to the grantors, their heirs, successors and assigns, the right to use such areas at any time upon providing and maintaining other adequate lateral support, as approved by the Municipality.

I (we) hereby agree to this plat, and to any restriction or covenant appearing hereon and any such restriction or covenant shall be binding and enforceable against present and successive owners of this subdivided property.

~~Rick Mystrom, Mayor~~ GEORGE J. VAKALIS MUNICIPAL MANAGER
Municipality of Anchorage
PO Box 196650
Anchorage, Alaska 99519-6650

NOTARY ACKNOWLEDGEMENT

Subscribed and sworn before me this 7th day of December 1999.

Notary Public — My Commission Expires 5/02/01

, ED CONYERS
Anchorage School District
4600 Debarr Avenue
P.O. Box 196614
Anchorage, Alaska 99519-6614

NOTARY ACKNOWLEDGEMENT

Subscribed and sworn before me this 17 day of Nov. 1999.

Notary Public — My Commission Expires 9-5-2003

ACCEPTANCE OF DEDICATION

The Municipality of Anchorage hereby accepts for public uses and for public purposes the real property dedicated on this plat including but not limited to the easements, rights-of-way, alleys, roadways, thoroughfares and parks shown hereon.

Dated at Anchorge, Alaska this 1st day of Dec. 1999.

Attest:

Municipal Clerk Deputy for — Mayor of Anchorage

APPROVALS

Platting Officer — Date 12-7-99

Municipal Surveyor — Date 11/19/99

TAX CERTIFICATION

All real property taxes levied by the Municipality of Anchorage on the area shown on this plat have been paid in full, and if approval is sought between January 1 and the tax due date, there is on deposit with the chief fiscal officer an amount sufficient to pay estimated real property tax for the current year.

Authorized Official — Date 11-23-99

PLAT APPROVAL

Plat approved by the Municipal Platting Authority on the 6th day of December 1999.

Authorized Official — Date 12/6/99

SURVEYOR'S CERTIFICATE

I, Lendle C. Story, professional land surveyor, do herby certify that the plat of Tract B, Tract C and Tract D Abbott Road Subdivision is a true and correct representation of lands actually surveyed and that the distances and bearings are shown correctly and that all permanent exterior control monuments, all other monuments, and lot corners have been set and staked.

Lendle C. Story, LS-7843 — Date 11-12-99

STATE OF ALASKA — 49th — Lendle C. Story — LS 7843 — 11-12-99 — Registered Professional Land Surveyor

99-120 20CCX2

RECORDED – FILE
ANCHORAGE REC. DIST.
DATE 12-7-99
TIME 2:16 PM
REQUESTED BY MOA
ADDRESS

PLAT OF

TRACT B, TRACT C AND TRACT D ABBOTT ROAD SUBDIVISION

A SUBDIVISION OF THE SE 1/4, SEC. 10, T.12N., R.3W., S.M., AK EXCEPTING THEREFROM TRACT A, SERVICE HANSHEW SCHOOL SITE, PLAT 69-159, ANCHORAGE RECORDING DISTRICT

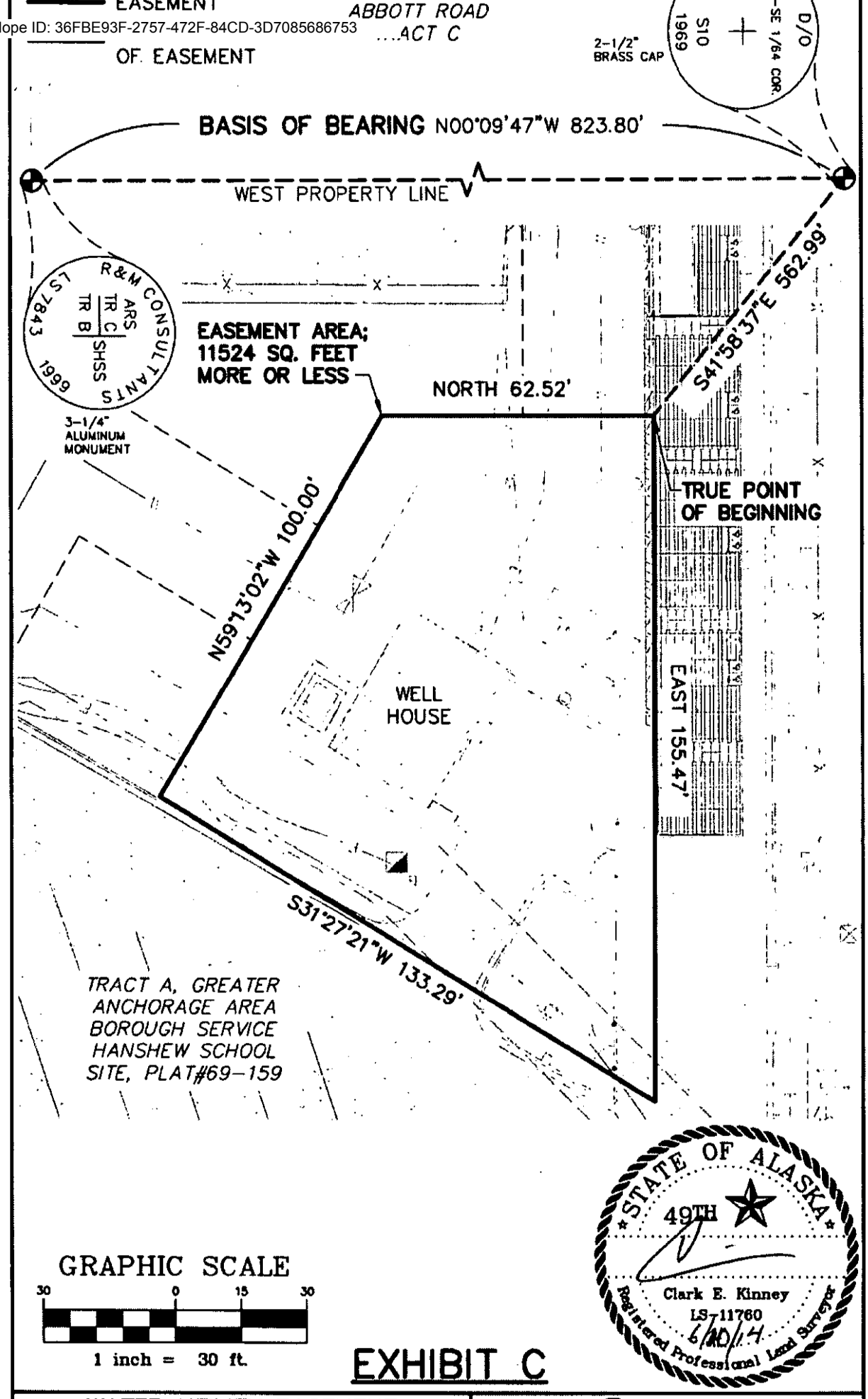
CONTAINING 100.01 ACRES MORE OR LESS

R&M CONSULTANTS, INC.
9101 Vanguard Drive, Anchorage, Alaska 99507

DRAWN: NFD/ss	SCALE: 1"=100'	PROJECT: 851131	GRID: 2337
CHECKED: LCS	FIELD BK: 5-374	DATE: 11/9/99	SHEET: 1 OF 1

Case No. S-10404

99-120



STATE OF ALASKA
49TH
Clark E. Kinney
LS-11760
6/20/14
Registered Professional Land Surveyor

GRAPHIC SCALE

30 0 15 30

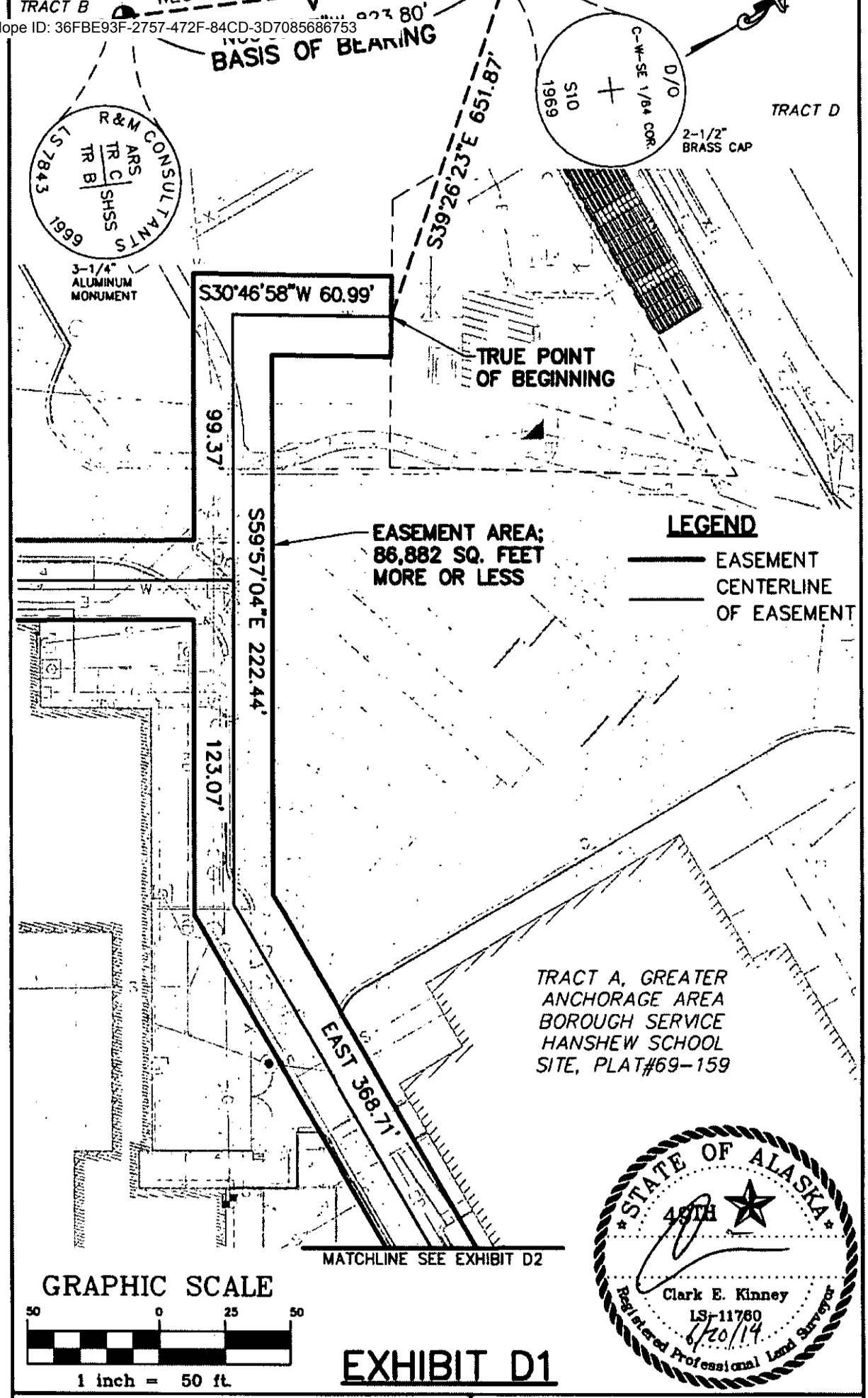
1 inch = 30 ft.

EXHIBIT C

WATER UTILITY EASEMENT

TRACT A, GREATER ANCHORAGE AREA BOROUGH SERVICE HANSHEW SCHOOL SITE, PLAT#69-159, SEC. 10, T2N, R3W, S.M.

RPKA



GRAPHIC SCALE

50 0 25 50

1 inch = 50 ft.

STATE OF ALASKA
49TH
Clark E. Kinney
LS-11760
6/20/14
Registered Professional Land Surveyor

EXHIBIT D1

WATER UTILITY EASEMENT

TRACT A, GREATER ANCHORAGE AREA BOROUGH SERVICE HANSHEW SCHOOL SITE, PLAT#69-159, SEC. 10, T2N, R3W, S.M.

RPKA

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION XIV

PERMITS

(NOT USED)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION XV

TRAFFIC CONTROL PLANS

(NOT USED)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION XVI

ANNOTATED SITE PHOTOGRAPHS

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS
WELL 04

Photo 4-1: View of both existing PRVs from Generator Room

Photo 4-2: View of both existing PRVs from Well Head

Photo 4-3: View of Chlorine Analyzer room from Well Room

Photo 4-4: View of existing chemical feed pump

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 4-5: 6” CIP Discharge Line and 1-1/4” PVC Cooling line (North Side of Well House)

Photo 4-6: 6” CIP Discharge Line and 1-1/4” PVC Cooling line

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

WELL 07

Photo 7-1: View of existing Chemical Analyzer system

Photo 7-2: Existing PRVs

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 7-3: Existing PRVs

Photo 7-4: Existing PRVs

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Well 09

Photo 9-1: Existing Piping

Photo 9-2: Existing Piping

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 9-3: Existing Chemical Analyzer

Photo 9-4: Existing Chemical Feed Pump and Skid

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Well 10

Photo 10-1: Existing Chemical Analyzer and Chemical Feed Skid

Photo 10-2: Existing Piping and Chemical feed Pump

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 10-3: Existing Chemical Feed pump

Photo 10-4: Chemical Storage Room that shares wall with Chemical Analyzer

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS

ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Well 11

Photo 11-1: Existing Piping

Photo 11-2: Existing Chemical Feed Pump

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 11-3: Existing PRVs

Photo 11-4: Existing Chemical Analyzer and Skid

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Well 12

Photo 12-1: Existing Skid

Photo 12-2: Existing Piping

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 12-3: Existing PRVs and Chemical Analyzer

Photo 12-4: Existing Chemical Feed Pump and Skid

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Well 13

Photo 13-1: Existing PRVs

Photo 13-2: Existing Chemical Feed Pump and Skid

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 13-3: Existing Blow-Off PRV

Photo 13-4: Existing Skid and Chemical Analyzer

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Well 25

Photo 25-1: Existing Chemical Feed Pump and Skid

Photo 25-2: Existing Chlorine Analyzer

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 25-3: Existing Mixer, Chlorine Analyzer, Flow Meter, and Pump Skid

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Well 29

Photo 29-1: Existing Piping, Chemical Analyzer, and Chemical Feed Pump and Skid

Photo 29-2: Existing PRV

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 29-3: Existing Blow-Off PRV

Photo 29-4: Existing Chemical Feed Pump and Skid

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Well 31

Photo 31-1: Existing Blow-Off PRV

Photo 31-2: Existing Chemical Feed Pump and Chlorine Analyzer

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

Photo 31-3: Existing PRV

Photo 31-4: Existing Chemical Feed Pump, Skid, and Chlorine Analyzer.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION XVII

HAZARDOUS MATERIALS SURVEY REPORT

(NOT USED)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION XVIII

MAXIMO ASSET REPORTS

(NOT USED)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 WATER IMPROVEMENTS
ANCHORAGE WELL HOUSE CHLORINE ANALYZER IMPROVEMENTS

SECTION XIX

DRAWINGS (UNDER SEPARATE COVER)