



# **Boniface Substation Getaways- 512 Feeder Replacement**

**W.O. E2020057**

**Project Book**

**BID PACKAGE FOR:**  
**BONIFACE SUBSTATION GETAWAYS - 512 FEEDER REPLACEMENT**  
**W.O. E2020057**  
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**BONIFACE SUBSTATION 12.47kV GETAWAYS  
 BID SCHEDULE  
 W.O. E2020057**

BID UNIT	DESCRIPTION	TAKEOFF QTY.	UNIT	UNIT LABOR	UNIT MATERIAL	UNIT LABOR & MATERIAL	EXTENDED COST
<b>Total Group J:</b>							
<b>GROUP K: CONDUIT AND CABLE</b>							
K1	CONDUIT, 6" HDPE	1	lot				
K2	CABLE, FEEDER 512 12.47 kV GETAWAY	1	lot				
*K3	MANHOUR	40	ea.				
<b>Total Group K:</b>							
<b>GROUP I: RETIREMENT</b>							
I-K2	RETIREMENT, EXISTING FEEDER 512 12.47 kV GETAWAY	1	lot				
<b>Total Group I:</b>							

\* Note: This unit will be applied only if required and authorized by Chugach Electric. Unit quantity of this Bid Unit may be increased, decreased, and/or deleted from the Contract without adjustments to the unit price.

**BONIFACE SUBSTATION 12.47kV GETAWAYS  
BID SCHEDULE SUMMARY  
W.O. E2020057**

**NEW CONSTRUCTION**

GROUP K: CONDUIT AND CABLE

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**TOTAL NEW CONSTRUCTION**

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**RETIREMENT**

GROUP I: RETIREMENT

\_\_\_\_\_

**TOTAL RETIREMENT**

=====

**TOTAL BID**

=====

**BONIFACE SUBSTATION 12.47KV GETAWAYS  
 BID UNIT DESCRIPTIONS  
 W.O. E2020057**

BID UNIT	DESCRIPTION
NOTES	GENERAL NOTES APPLICABLE TO ALL BID UNITS
	1. Cost for loading, transporting to construction site, and offloading of Chugach furnished material is incidental to the cost of the affected Bid Unit. No additional compensation will be paid for loading, transporting to construction site, and offloading of Chugach furnished material. Reference List Of Owner Furnished Material for materials furnished by Chugach and Bid Units affected by the material.
	2. Chugach will only furnish materials identified on the List Of Owner Furnished Material. All other materials required to complete the Work are to be furnished by the Contractor.
	3. Cost of dewatering is incidental to cost of affected Bid Unit. No additional compensation will be paid for dewatering.
	4. Cost of surveying is incidental to cost of affected Bid Unit. No additional compensation will be paid for surveying or surveying related expenses.
	5. Cost of landscaping and excavations including but not limited to those excavations provided for general excavation of the conduits, etc. shall include removal, from site, of excess excavated materials. Cost of this work is incidental to the cost of the Contract. No additional compensation shall be paid for removal of excess or unusable excavation.
K1	CONDUIT, 6" HDPE - This unit includes installing all 6" HDPE conduits as shown on drawings. The unit includes furnishing and installing all couplings, fittings, conduit placards, bending, trenching, trench backfill, and compaction and testing, including hand digging where indicated on the drawings and specifications. This unit includes providing and installing conduit sealing bushings for spare conduits, providing and installing pull ropes in all conduits, installing cable locator disks, and locating and splicing conduit to existing substation conduits as shown on the drawings. This unit includes all miscellaneous labor and material for a complete conduit system.
K2	CABLE, FEEDER 512 12.47 kV GETAWAY - This unit includes installation of all new Chugach furnished AL JCN 12.47 kV EPR cable for the Feeder 512 3-phase circuit as shown on drawings. This unit includes providing and installing terminations, splices, cable support bushings, brackets, ground connections, filler compounds, fasteners, conduit fittings, pulling of cables, cable tags at both ends of individual cables, line jumpers, line terminals, line support hardware, and phasing of circuit. The unit includes terminations, testing, and all miscellaneous labor and materials to provide a complete 12.47 kV cable installation.
*K3	MANHOUR - This unit includes all labor and miscellaneous support tools required to perform one hour of Chugach-directed work.
I-K2	RETIREMENT, EXISTING FEEDER 512 12.47 kV GETAWAY - This unit includes all labor, equipment, and material necessary for the removal and disposing of all 12.47 kV getaway conductor, terminations, filler compounds, fasteners, and miscellaneous materials necessary for complete removal of the existing 12.47kV feeder getaway conductors as indicated on the drawings.

\* Note: This unit will be applied only if required and authorized by Chugach Electric. Unit quantity of this Bid Unit may be increased, decreased, and/or deleted from the Contract without adjustments to the unit price.

**BONIFACE SUBSTATION 12.47kV GETAWAYS  
LIST OF OWNER FURNISHED MATERIAL  
CHUGACH W.O. E2020057**

Item	Bid Unit	Description	CEA ID	Manufacturer	Unit	Quantity	Price (ea/ft)	Total Cost	Delivered to Site By
1	K2	Wire, CU, SDB #4/0 STR (19 STR.)	378	N/A	LF	15	\$ 3.63	\$ 54.45	Contractor
2	K2	Lug, Compression, AL, 2H, for 750 MCM	1515	N/A	EA	3	\$ 31.97	\$ 95.91	Contractor
3	K2	Lug, Compression, AL, 2H, for #4/0 ACSR	1513	N/A	EA	1	\$ 3.87	\$ 3.87	Contractor
4	K2	Cable, AL, JCN, 15KV, 750 MCM, EPR	346	N/A	LF	1905	\$ 7.37	\$ 14,039.85	Contractor
5	K2	Kit, Primary Termination, 15KV, for 750 MCM JCN	4773	N/A	EA	3	\$ 125.00	\$ 375.00	Contractor
6	K1	Conduit, HDPE, 6"	11888	N/A	LF	1525	\$ 9.30	\$ 14,182.50	Contractor
7	K1	Conduit, Fiberglass Elbow, 30 Degree, 6", 60" RADIUS	15050	N/A	EA	2	\$ 200.59	\$ 401.18	Contractor
8	K1	Conduit, Fiberglass Elbow, 90 Degree, 6", 48" RADIUS	4172	N/A	EA	1	\$ 450.00	\$ 450.00	Contractor
		<b>TOTAL OWNER FURNISHED MATERIAL</b>						<b>\$ 29,602.76</b>	

**SPECIAL PROVISIONS**

**FOR**

**Boniface Substation 12.47kV Getaways**

**W.O. E2020057**

**May 23, 2023**

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May 23, 2023

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Boniface Substation Getaways  
512 Feeder Relocation  
W.O. E2020057

## SPECIAL PROVISIONS

These Special Provisions supplement the provisions of the Chugach Electric Association, Inc.'s (Chugach's) 2022-2023 Outside Electrical Line Construction Contract (OELCC) and the Technical Specifications.

### SECTION 1

#### SUMMARY OF WORK

##### 1.1 SECTION INCLUDES

- A. Description of project
- B. Contractor use of premises
- C. Permits and Licenses
- D. Supplementary Instructions to Bidders

##### 1.2 DESCRIPTION OF THE PROJECT

This Project includes the construction of three new 12.47 getaway conduits from the substation fence to Patterson Street, and replacement of the feeder getaway conductors for one feeder of the Boniface Substation (BFSS), located at 4200 Patterson Street, behind the Chugach Square shopping center, in Anchorage, Alaska.

#### **Boniface Substation 12.47kV Getaway Relocation Construction**

The Project consists of replacing one 3-phase 12.47 kV underground getaway circuit (BFSS 512) that currently runs between the substation and riser pole 0232 on Patterson Street; the existing getaway is installed in conduit within the substation to approximately 5' outside the fence; the feeder is direct buried between the substation conduit and the riser pole. This Project consists of installing conduit in the open trench (dug under W.O.E1813854) for the feeder 512 getaway circuit, splicing to the existing getaway conduit near the substation fence, and extending that conduit into SC 1139 (installed under W.O.E1813854). Spare conduits for feeders 212 and 612 will also be installed from the substation fence to the edge of the Patterson Street right-of-way with locate disks for future use.

In addition, the existing getaway 512 feeder circuit will be retired from the existing 12.47kV BFSS switchgear to where it transitions to direct buried cable; the 512 feeder circuit will be abandoned in place beyond that point. A new 12.47 kV getaway circuit will be installed from the 12.47 kV switchgear through the new conduit run to Switch Cabinet 1139 at Patterson Street.

Projects E1813854 and E2020057 will be Bid together. The distribution relocation contract (E1813854) for the Patterson Street relocation work includes an owner furnished Erosion and Sediment Control Plan, and a site specific SWPPP prepared by the distribution relocation contractor. Coordination between these two plans will be required.

Construction at BFSS will be performed at an energized site.

The Work includes a final, as-built planimetric survey of the 12.47 kV getaway circuits, completed by a Land Surveyor registered in the State of Alaska.

Construction of this Project includes testing and commissioning for the Contractor installed cables.

### 1.3 WORK

- A. The Work consists of all obligations, duties, and responsibilities necessary to the successful completion of the Contract assigned to or undertaken by the Contractor under the Contract Documents, including all labor, materials, equipment, and other incidental operations to provide a complete facility and the furnishing thereof.

### 1.4 CONTRACTOR USE OF PREMISES

- A. Limit the use of the premises to Work, storage of Project materials, and equipment and access.
- B. Coordinate use of premises under direction of Chugach.
- C. Assume full responsibility for protection and safekeeping of products under this Contract.
- D. Obtain and pay for use of additional storage and Work areas needed for operations under this Contract.
- E. No sanitary facilities or utilities are available at the site. Contractor shall furnish all temporary utilities and sanitary facilities at the site for construction purposes and comply with all local, state, and federal codes, regulations, and laws. No additional compensation will be made for costs associated with the forgoing.
- F. Install and maintain all temporary erosion and pollution control measures and other best management practices (BMPs) as required for the Project site.
- G. Install and maintain silt fence and other best management practices (BMPs) required in all areas affected by any construction activity. Cost of providing all measures required for temporary erosion and pollution control measures other than those specifically identified as

paid for in a specific Bid Unit are considered incidental to the cost of the affected unit. No additional compensation will be paid for temporary erosion and pollution control measures.

#### 1.5 PERMITS AND LICENSES

- A. Except as otherwise provided in the Contract Documents, the Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the Work.

#### 1.6 CONTAMINATED SOILS AND CONTRACTORS DISCHARGE RESPONSE PLAN

- A. There are no known areas of contaminated soil located within the project area. If contaminated soils are encountered, Contractor shall contact Chugach for further direction.

#### 1.7 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

##### A. Substitutions and Product Options:

1. At time of Bidding, unless otherwise specified in the Specifications, Bidder may, on an "approved equal" or substitution-basis, propose other equipment which he considers comparable with or superior to the specified items. In the absence of a listing of such equipment, it will be assumed that the Bidder intends to furnish the items as specified.
2. Bidder shall provide sufficient information and data necessary for a full evaluation of any equipment proposed on an "approved equal" or substitution-basis. At a minimum, information shall include complete description, physical dimensions, manufacturer's name and model number, price, time for delivery, and a specific listing of any characteristics which differ from those specified and could require engineering changes to equipment, buildings, structures, and services. Failure to supply adequate or accurate information may result in rejection of Bidder's proposal.
3. The determination of the suitability of "approved equals" or substitutions for the service intended, and final acceptance thereof, shall be by Chugach. The successful Bidder shall be liable for the cost of any subsequent engineering changes which are clearly attributable to negligence on the part of the Bidder to furnish proper information with his Bid.
4. If any revisions to Drawings or Specifications are required to conform equipment, materials, or work to national, state, and local laws, codes, ordinances, and regulations, Bidder shall give notice when submitting its Bid and include a statement listing the additions to or deductions from the Bid Price required by the revisions.
5. If Bidder fails to give notice, Bidder shall provide the equipment, materials, and Work as intended by the above without extra cost to Chugach.

- B. Surveys: All surveys shall be performed as specified in Section 3 of these Special Provisions.

END OF SECTION

May 23,2023

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Boniface Substation Getaways  
512 Feeder Relocation  
W.O. E2020057

## SECTION 2

### MEASUREMENT AND PAYMENT

#### 2.1 SECTION INCLUDES

- A. Measurement Methods
- B. Lump-Sum Measurement

#### 2.2 MEASUREMENT METHODS

- A. Measurement methods specified in the Bid Schedule of the Contract shall govern if they differ from methods specified in this Section.
- B. The Contractor shall compute all quantities and submit calculations for approval by Chugach. Where necessary, such computations shall be based upon surveys performed by the Contractor as specified by the Special Provisions in Section 3.3 Field Engineering.
- C. Payment will be full compensation for furnishing all labor, materials, tools, equipment, transportation, services, and incidentals, as specified and for performing all work necessary for completing the erection or installation of the item or work classification.
- D. Full compensation for all expense involved in conforming to the requirements for measuring materials shall be considered as included in the prices paid for the materials being measured, and no additional compensation will be made therefore.
- E. All costs in connection with the Work specified herein will be considered to be included with the related item of Work in the Bid Schedule, or incidental to the Project.

#### 2.3 LUMP-SUM MEASUREMENT

- A. Lump-sum measurement shall be for the entire item, unit of Work, structure, or combination thereof, as listed in the Bid Schedule.
- B. If the Contractor requests progress payments for lump-sum items or amounts in the Bid Schedule, such progress payments shall only be allowed if approved by Chugach in writing. Progress payments will be made in accordance with a well-balanced, detailed program of payment- apportioning, prepared by the Contractor and submitted to Chugach for approval.
- C. Such program for each applicable lump-sum item shall show estimated quantities and unit prices therefore as allocated by the Contractor to the different features of the Work and major subdivisions thereof. The summation of extensions of quantities and unit prices and related costs shall total, in each case, the exact amount to be paid under the lump-sum Contract Price for the item.

- D. Such programs will be used for computing progress payments as provided herein, but will not be used to determine the amount of the final payment for the Work of this Contract. Final payment will be based on actual percentage of Work completed by the Contractor.

END OF SECTION

## SECTION 3

### COORDINATION AND FIELD ENGINEERING

#### 3.1 SECTION INCLUDES

- A. Coordination
- B. Field Engineering
- C. Project Documents

#### 3.2 COORDINATION

- A. Contractor shall coordinate scheduling, submittals, and Work of the various activities with Chugach to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Work within Boniface Substation will be on and near energized switchgear and equipment. Outages noted below will be permitted and coordinated with Chugach's Power Control Center and scheduled through Chugach's Project Engineer in accordance with the Chugach Outage Request procedures. Outages shall occur in the sequence listed below unless Contractor receives written authorization from Chugach to change the outage sequence.
  - 1. An outage will be permitted on the 12.47 kV feeder circuit BFSS 512, on an individual basis, to perform the Work defined in this Project.
- C. All outage requests must be submitted to Chugach's Power Control Center seven calendar days prior to outage. Outages will be granted based on system constraints.
- D. All work within Boniface Substation shall be coordinated with Chugach's Power Control Center and Chugach's Project Engineer.
- E. Chugach's system operation may require other crafts to perform work at or near this Project in the station. Contractor shall coordinate activities with Chugach's site representative to avoid delays and interference.
- F. Contractor is responsible for coordinating with other entities for locates.

#### 3.3 FIELD ENGINEERING

- A. The Contractor shall use a Land Surveyor registered in the State of Alaska to do survey work which includes establishing elevations, lines, and levels, utilizing recognized engineering survey practices.
- B. The Contractor shall locate and protect survey control and reference points.

- C. All survey work shall be performed under the supervision of a Land Surveyor registered in the State of Alaska and acceptable to Chugach.
- D. Activities of the Surveyor are to be restricted to within the Chugach property boundary or public right-of-way. Obtain written permission for ingress or egress to Chugach property or public right-of-way where access to Chugach property or public right-of-way is across private property. Obtain written permission for use of private property by the Surveyor for parking or other work performed by the Surveyor that is not completely within the Chugach property or public right-of-way. Permission must be granted in a written agreement between the property owner and the Surveyor. Chugach Electric Association, Inc. shall be held harmless from any act of the Surveyor.
- E. Copies of all field notes produced by the Surveyor shall be provided to Chugach.
- F. An as-built survey of the substation getaways shall be completed. The survey shall include the routing of each underground conduit. Horizontal and vertical control tables shall be included in the as-built survey include northing, easting, and elevation tables. The survey shall be completed and certified by the Land Surveyor. The Land Surveyor shall verify that the elevations and locations of the Work are in conformance with the Contract Documents. Survey shall comply with the CAD/GIS Spatial Data Standards (Appendix B). Vertical Control shall use Anchorage Bowl 2000.
- G. In addition to a signed, stamped paper copy of the as-built drawing, an electronic file containing the drawing information in AutoCAD Release compatible with AutoCAD 2019, shall be submitted to Chugach via Sharefile. The file shall be accompanied by the layer naming convention and other information as necessary to allow Chugach to utilize the file. The file shall also contain a listing of all surveyed points with coordinate positions listed by point number and again by like items.

### 3.4 PROJECT RECORD DOCUMENTS

- A. As-Built Drawings, Field Notes and Surveyor's Certificate
  - 1. Maintain on the Site two separate sets of marked-up full-scale Contract Drawings indicating as-built conditions. These drawings shall be maintained in a current condition at all times until completion of the Work and shall be available for review by Chugach at all times. All variations from the Contract Drawings, for whatever reason, including those occasioned by modifications, optional materials, and the required coordination between trades shall be indicated. These variations shall be shown in the same general detail utilized in the Contract Drawings. Upon completion of the Work, the marked-up drawings shall be furnished to Chugach.
  - 2. Store Record Documents separate from documents used for construction.
  - 3. Record information concurrent with construction progress.
  - 4. Record Documents and Shop Drawings shall be legibly marked to record actual construction including:
    - a. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.



- b. Field changes of dimension and detail.
  - c. Details not on original Contract Drawings.
5. Submit as-built drawings, field notes and Surveyor's certified as built not later than twenty (20) days after completion of construction.

B. Test and Inspection Reports

- 1. Submit test and inspection reports per the following schedule and as specified elsewhere in the Technical Specifications
  - a. Compaction test reports – Submit the day after test is completed.
  - b. Cable test reports and as-builts – Submit per Technical Specification.
  - c. Backfill and other imported material to site – material ticket shall be provided day that material is delivered to site.

END OF SECTION

SECTION 4  
SUBMITTALS

4.1 SECTION INCLUDES

- A. Submittal Procedures
- B. Construction Progress Schedules
- C. Product Data
- D. Manufacturers' Instructions
- E. Manufacturers' Certificates

4.2 SUBMITTAL PROCEDURES

- A. The Contractor shall submit pertinent data as required in other parts of these Contract Documents for Chugach's approval:
  - 1. Transmit each submittal with Chugach accepted form.
  - 2. Sequentially number the transmittal forms. Resubmittals are to have the original submittal number with an alphabetic suffix.
  - 3. Identify Project, Contractor, Subcontractor or Supplier; pertinent drawing sheet and detail number(s), and Specification section number, as appropriate.
  - 4. Apply Contractor's stamp, signed or initialed, certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Submittals will not be reviewed by Chugach until they have been reviewed by the Contractor.
  - 5. Schedule submittals to expedite the Project and deliver to Chugach. Coordinate submission of related items. Allow 14 calendar days for Chugach's review.
  - 6. If substitutions become necessary after Contract award and initial approval of Contractor furnished materials, the Contractor shall submit all information as required in the Bid and include a detailed explanation as to causes for the substitution.
  - 7. Provide space on submittals for Contractor's and Chugach's review stamps.
  - 8. Revise and resubmit submittals as required; identify all changes made since previous submittal.
  - 9. Distribute copies of approved submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
  - 10. No material and/or procedure requiring Chugach's approval shall be used or implemented until such approval has been given.

#### 4.3 CONSTRUCTION PROGRESS SCHEDULES

- A. A schedule shall be submitted with the Bid and include the planned duration of the following major construction groups:
  - 1. Outages
  - 2. Getaway Conduits
  - 3. Getaway Feeder Cabling
  - 4. Contractor Testing
  - 5. Chugach Testing/Commissioning
  - 6. Energization/Final Tap Connection
- B. The schedule shall include milestone dates, time allowances for Chugach commissioning/testing, manpower loading, and cash flow.
- C. The Contractor shall incorporate the following milestones dates into its schedule. Liquidated damages in the amount of \$600.00 as noted in the Invitation to Bid will be assessed for failure to meet specific milestone dates due to circumstances under the control of the Contractor. Liquidated damages will be assessed for each day beyond the milestone date the Work specified in the milestone is incomplete.

November 31, 2022 All work complete.

- D. Within five (5) working days of award, the Contractor shall submit one (1) hard copy and one (1) electronic copy of an updated construction schedule for approval by Chugach. The construction schedule shall be updated to include cash flow on a weekly basis for each individual bid unit and planned percent complete by task and overall project.
- E. The construction schedule shall be updated with actual percent complete by task and manpower and one electronic copy submitted with all invoices.
- F. The basic construction schedule (data on planned performance) shall not be changed without Chugach's concurrence.

#### 4.4 PRODUCT DATA

The Contractor shall:

- A. Submit the number of product data copies which the Contractor requires, plus one (1) copy which will be retained by Chugach.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to the Project.
- C. After review, distribute in accordance with Submittal Procedures above and provide copies for Record Documents described in Special Provisions, Section 8 - Contractor Closeout.

#### 4.5 MANUFACTURERS INSTRUCTIONS

The Contractor shall:

- A. When specified in individual Specification sections, submit manufacturers printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for product data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents. Notify Chugach in a timely manner to allow resolution of the conflicts without impact on the project completion.

#### 4.6 MANUFACTURERS CERTIFICATES

The Contractor shall:

- A. When noted in individual Specification Sections, submit manufacturers certificate in quantities specified for product data.
- B. Indicate material or product as it conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Chugach.

END OF SECTION

## SECTION 5

### CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

#### 5.1 SECTION INCLUDES

- A. Temporary Utilities
- B. Temporary Controls
- C. Construction Facilities

#### 5.2 TEMPORARY UTILITIES

- A. Temporary construction power is not anticipated for this project. If Contractor requires temporary construction power, the Contractor is responsible for obtaining a meter, acquiring and paying for all permits associated with the temporary service, and paying all costs associated with the temporary service. The cost for temporary construction power is incidental to the effected Bid Unit. No additional compensation shall be paid for temporary power.
- B. Water Service
  - 1. The Contractor shall obtain potable water as needed for the Work.
- C. Temporary Sanitary Facilities
  - 1. The Contractor shall provide sanitary facilities at the site as required by law or regulation.
- D. Barriers
  - 1. The Contractor shall:
    - a. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
    - b. Protect stored materials, site, and structures from damage.

#### 5.3 TEMPORARY CONTROLS

- A. Water Control
  - 1. Temporary erosion and pollution control measures are the responsibility of the Contractor. The Contractor shall comply with all municipal, state, and federal laws governing storm water pollution control. The Contractor shall provide all temporary erosion and sedimentation control measures in accordance with the SWPPP plan drawings to prevent soil erosion and discharge of soil bearing water runoff to adjacent properties.

2. The Contractor shall maintain excavations free of water. Provide, operate, and maintain pumping equipment as required. Costs for dewatering and disposal of water removed from all excavations are incidental to the cost of the affected unit. No additional compensation will be paid for dewatering any excavation.
3. The Contractor shall protect site from puddling or running water.

B. Dust and Mud Control

1. Provide temporary tracking mats as specified in the project drawings to control dust and tracking of dirt and mud onto paved areas and roadways adjacent to the project during construction operations. See SWPPP for specified mat locations. Costs for dust and mud control are incidental to the cost of the affected unit. No additional compensation will be paid for dust and mud control.

5.4 CONSTRUCTION FACILITIES

A. Protection of Installed Work. The Contractor shall:

1. Protect installed Work and provide special protection where specified in individual specification sections.
2. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.

B. Parking

1. All parking shall be in designated areas and not on road right-of-ways.

C. Cleaning

1. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in a clean and orderly condition.
2. Remove waste materials, debris, and rubbish from site weekly and dispose off-site in compliance with all local, State, and Federal regulations.

D. Removal of Utilities, Facilities and Controls

1. Remove temporary above grade or buried utilities, equipment, facilities, materials prior to final inspection.
2. Clean and repair damage caused by installation or use of temporary Work.

END OF SECTION

## SECTION 6

### MATERIAL AND EQUIPMENT

#### 6.1 SECTION INCLUDES

- A. Material and equipment quantities.
- B. Products.
- C. Transportation and Handling.
- D. Storage and Protection.
- E. Owner Furnished Material

#### 6.2 MATERIAL AND EQUIPMENT QUANTITIES

- A. Material and equipment quantities shown on drawings are the Engineer's best estimate and shall be verified by the Contractor. Discrepancies shall be brought to Chugach's attention and conflicts resolved in a timely manner so to not interfere with scheduled completion of the Work.

#### 6.3 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Product does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components authorized for reuse.
- B. The Contractor shall not reuse materials except as specifically permitted by the Contract Documents.

#### 6.4 TRANSPORTATION AND HANDLING

The Contractor shall:

- A. Furnish the necessary labor and equipment to load, haul to the jobsite, and offload all materials for the project.
- B. Exercise due care in the handling of all materials. Transport and handle products in accordance with manufacturer's instructions.
- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

## 6.5 STORAGE AND PROTECTION

The Contractor shall:

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.
- B. For exterior storage of products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when Site does not permit on-site storage or protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to ensure products are undamaged and are maintained under specified conditions.

## 6.6 Owner Furnished Material

- A. Material on the owner furnished material (OFM) list will be the ONLY material furnished by Chugach.

END OF SECTION



## SECTION 7

### CHUGACH-FURNISHED MATERIAL

#### 7.1 SECTION INCLUDES

- A. Chugach-Furnished Material
- B. Transfer of Material
- C. Damage to Chugach-Furnished Material
- D. Installation of Chugach-Furnished Material

#### 7.2 CHUGACH-FURNISHED MATERIAL

- A. All Chugach furnished material is listed in the "List of Owner-Furnished Materials." If material does not appear on this list, the Contractor shall provide it.
- B. The costs associated with the Chugach-furnished material listed represent original costs to Chugach and may or may not be replacement costs.
- C. The Contractor shall include the Chugach-furnished materials for this project in his insurance posted for the Work.

#### 7.3 TRANSFER OF MATERIAL

- A. Coordinate with Chugach for transfer and transportation of Chugach- furnished materials and equipment. Chugach furnished materials and equipment shall be located at Chugach's Operations Warehouse at 5601 Electron Drive, Anchorage, Alaska.
- B. Chugach-furnished materials and equipment may have been previously unpackaged for inspection. The Contractor shall repackage the material and equipment as necessary for transport and storage subject to the approval of Chugach.
- C. After the acceptance of Chugach-furnished items, the Contractor shall place them at the point of installation or in areas as approved by Chugach. The Contractor is responsible for transporting Chugach- furnished material from the specified storage location to the jobsite. The Contractor is responsible for loading all Chugach furnished materials at their storage location and offloading Chugach-furnished material at the jobsite.
- D. After acceptance, Chugach-furnished items are the Contractor's responsibility. The Contractor shall appropriately store and protect all Chugach-furnished items upon acceptance.
- E. Spare Parts: Place spare parts together with any unused materials and equipment in storage at the jobsite upon completion of the Work as directed by Chugach.

7.4 DAMAGE TO CHUGACH-FURNISHED MATERIAL

- A. The Contractor shall repair or replace any Chugach-furnished items damaged by the Contractor's handling and storage.

7.5 INSTALLATION OF CHUGACH-FURNISHED MATERIAL

- A. Except as otherwise specified, installation Work shall be the responsibility of the Contractor and all mistakes in installation and damage shall be corrected by the Contractor at no cost to Chugach.
- B. The Contractor will not be held liable for faulty manufacture of Chugach- furnished items or for mistakes in the manufacturer's drawings.
- C. Supply and fix all ancillary conduit, bolts, anchors, cabling, supports, and line required to place all Chugach-furnished items in operation.

END OF SECTION

SECTION 8  
CONTRACT CLOSEOUT

8.1 SECTION INCLUDES

- A. Closeout Procedures
- B. Closeout Documents
- C. Final Cleanup

8.2 CLOSEOUT PROCEDURES

- A. Provide notice and accompany Chugach and its representative(s) for final completion inspection per the OELCC.

8.3 DOCUMENTS

- A. Provide and sign all documents and as-built drawings per the OELCC.

8.4 FINAL CLEANUP

- A. The Contractor shall maintain the site in a clean and orderly condition. All equipment, packaging materials, temporary facilities, etc., shall be removed within ten (10) working days of construction completion.

END OF SECTION

**TECHNICAL  
SPECIFICATIONS**

**FOR**

**Boniface Substation 12.47kV Getaways**

**W.O. E2020057**

**May 23, 2023**

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## SECTION 260500

### COMMON WORK RESULTS FOR ELECTRICAL

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Special Provisions, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:

- 1. Electrical equipment coordination and installation.
- 2. Common electrical installation requirements.

##### 1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.

##### 1.4 REFERENCES

The latest and applicable sections of the following standards shall be used in the performance of the work:

- A. NESC – National Electric Safety Code
- B. NEC – National Electric Code
- C. IEEE – Institute of Electrical and Electronics Engineers
- D. RUS Bul. 1724E-300 (Design Guide for Rural Substations)
- E. RUS Pub. 202-1 (List of Materials)
- F. AEIC – Association of Edison Illuminating Companies
- G. NEMA- National Electrical Manufacturer’s Association
- H. NECA- National Electrical Contractor’s Association
- I. NETA – InterNational Electrical Testing Association

## 1.5 SUBMITTALS

- A. As required by Special Provisions and as outlined here.
- B. Product data for all Contractor furnished equipment and materials.
- C. Manufacturers' test reports.
- D. Approval of submittals required when materials substitutions are made.

## 1.6 PROJECT RECORD DOCUMENTS

- A. Maintain accurate information of all installations on drawings, product information, test reports and instruction manuals and as required by Special Provisions.

## 1.7 QUALITY ASSURANCE

- A. Use qualified crafts, trained in the specific task(s) to be performed. Certify special qualifications where required.
- B. Follow recommendations and instructions of equipment manufacturer in addition to requirements of drawings and specifications in handling and erection of equipment.

## 1.8 FIELD MEASUREMENTS

- A. Verify that all field measurements are as indicated on the drawings.

## 1.9 COORDINATION

- A. Coordinate timing of installations with other trades and Chugach's personnel working on other projects in the area.
- B. Coordinate installations of Chugach-Furnished materials with Chugach personnel.

## PART 2 - PRODUCTS

### 2.1 CONTRACTOR-FURNISHED EQUIPMENT AND MATERIALS

- A. Unless otherwise specified, the Contractor shall furnish all fittings, conduit, mounting brackets, cable supports, connectors, identification tags, identification signs, insulating tape, insulating compounds, grounding system hardware, and all other electrical accessories, hardware, or materials required to satisfactorily install and place into service all equipment and material specified or shown on the drawings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive the Work.
- B. Beginning of the installation means acceptance of existing conditions.

### 3.2 PREPARATION

- A. Schedule testing services and other inspections in a timely manner.

### 3.3 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. All electrical installations shall be in accordance with the applicable standards, manufacturer's instructions specified herein and any requirements of the local regulatory or code enforcing agencies, unless otherwise specified herein. The Contractor shall modify equipment where required and adjust and make ready for service the electrical equipment and material required by these Specifications or as shown on the drawings. After the installation is complete, the Contractor shall clean each piece of equipment. All Work shall be done in an orderly and skillful manner and shall present a neat appearance when completed.
- B. Construction installation quality and workmanship shall comply with NECA 1.

### 3.4 TESTS

- A. All materials and equipment installed and/or connected by the Contractor shall be thoroughly checked, tested, and made completely ready for in-service commercial operation. Refer to specifications Section 260550, Field Testing, for test requirements.

### 3.5 PROTECTION

- A. Maintain safe clearances from all existing installations not part of this Project.
- B. Safeguard all existing facilities.

**END OF SECTION**



## SECTION 260513

### CONDUCTORS AND CABLES

#### PART 1-GENERAL

##### 1.1 SUMMARY

- A. This section covers the furnishing and installation of all wire and cable, required to complete the installation of equipment as shown on the Drawings, and as specified herein with terminations and connections required to provide functioning power and control systems as required.
- B. This section includes high voltage cable installation, cable terminations, splices, and wiring connectors and connections.

##### 1.2 REFERENCES

References listed in Section 260500 shall apply in conjunction with the following:

- A. NEMA WC7 – Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and distribution of Electrical Energy.
- B. IEEE Standard 400 – IEEE Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5 kV and above.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product supplied.
- B. Approval of submittals required when materials substitutions are made.

##### 1.4 QUALIFICATIONS

- A. Manufacturer: As approved by Chugach.
- B. Construction Personnel: Foreman responsible for termination and installation of all cables in the station equipment and control building, shall have completed such work in the past for an electric utility. Inspected and reviewed with Chugach personnel similar Chugach installations for workmanship requirements and be acceptable to Chugach.

##### 1.5 PROJECT RECORD DOCUMENTS

- A. Submit As-built Drawings as specified in the Special Provisions.
- B. Accurately record any deviation from Project drawings.

## 1.6 QUALITY ASSURANCE

- A. Handle wire and cable in accordance with the manufacturer's instructions.
- B. Do not exceed minimum bending radii for cables and wires or exceed pulling tensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NFPA 70.

## 1.7 FIELD MEASUREMENTS

- A. Cable lengths shown on the cable schedule are estimates only. Contractor is responsible for verification of the exact lengths necessary.
- B. Determine required separation between cables and other work.
- C. Determine cable routing to avoid interference with other work.

## 1.8 COORDINATION

- A. Schedule cable installation in conjunction with raceway placement.

## PART 2 – PRODUCTS

### 2.1 CONDUCTORS AND CABLES

- A. Underground conductors: See Owner furnished material list for Chugach supplied conductors.

### 2.2 TERMINATIONS (1000V AND ABOVE)

- A. Modular terminators suitable for cables described under 2.1 of this section. Manufacturer: As specified on drawings.
- B. Connectors, NEMA 2- and 4-hole pads, as specified on drawings.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Completely and thoroughly swab raceway before installing cable.

### 3.2 CONDUCTOR AND INSULATION APPLICATIONS

- A. As indicated on the drawings.

### 3.3 INSTALLATION

- A. Install cable and accessories in accordance with manufacturer's instructions.
- B. Avoid abrasion and other damage to cables during installation.
- C. Ground cable shield only at switchgear enclosure end termination.
- D. Clean conductor surfaces before installing lugs and connectors.
- E. Make terminations which are rated to carry the full ampacity of conductors with negligible temperature rise.
- F. Do not exceed manufacturer's recommended maximum cable pulling tensions and sidewall pressure values or bending radius limitations. For Chugach supplied conductor information on these limitations will be furnished by Chugach at the time of construction.
  - 1. Use pulling lubricants where necessary.
    - a. Use only lubricants approved for use with cable types specified that do not leave flammable residue or support flame propagation.
    - b. Pulling lubricants shall not deteriorate conductor or insulation.
    - c. Soap/wax-based lubricants shall not be used.
    - d. Use Polywater J or equivalent where compatible with cable types installed as specified by the lubricant manufacturer.
  - 2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- G. Support cables according to Section 260500 "Common Work Results for Electrical".
- H. Identify and color-code conductors and cables according to Section 260553 "Electrical Identification".

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.5 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test conductors as specified in Section 260550, Field Testing and as specified in this section.
2. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
3. Inspect wire and cable for physical damage and proper connection.
4. Inspect shield grounding, cable supports, and terminations for proper installation.

### 3.6 PROTECTION

- B. Protect cable ends of medium voltage cables that have not been terminated with a suitable cap designed specifically for the purpose (heat shrink, etc.), taping of cable ends is not acceptable.

**END OF SECTION**

## SECTION 260553

### RACEWAYS AND BOXES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Special Provisions, apply to this Section.

##### 1.2 SUMMARY

A. This Section includes raceways and fittings for electrical wiring.

##### 1.3 DEFINITIONS

A. RNC: Rigid Nonmetallic Conduit.

B. HDPE: High Density Polyethylene Conduit.

C. PVC: Polyvinyl chloride Conduit.

D. RTRC: Reinforced Thermosetting Resin Conduit (or Fiberglass Conduit)

##### 1.4 SUBMITTALS

A. Submit the following in accordance with Special Provisions:

1. Product Data: For raceways and fittings.
2. Approval of submittals required when materials substitutions are made.

##### 1.5 PROJECT RECORD DOCUMENTS

A. Submit As-built Drawings as specified in Special Provisions.

B. Accurately record actual sizes, locations, and depths of conduits on the drawings.

C. Accurately record any deviation from project drawings.

##### 1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Comply with NECA 1.

## 1.7 COORDINATION

- A. Coordinate layout and installation of underground conduits as shown on the drawings and to avoid intersection with other conduits and underground structures while maintaining specified conduit clearances and burial depths.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. As specified on the drawings and as approved by Chugach.

### 2.2 NONMETALLIC CONDUIT AND TUBING

#### A. RNC:

1. PVC: NEMA TC 2.
2. PVC fittings: NEMA TC 3.
3. FIBERGLASS: NEMA TC 14.
4. HDPE: NEMA TC 7.

### 2.3 CONDUIT ADHESIVES

- A. PVC to PVC - PVC Primer and Glue (low temperature type)
- B. PVC to Fiberglass - Bonduit by American Polywater Corporation
- C. PVC to HDPE – Bonduit by American Polywater Corporation
- D. HDPE TO HDPE – PE Fusion
- E. HDPE to Fiberglass – Bonduit by American Polywater Corporation

### 2.4 ACCESSORIES:

1. Warning Tape: Underground-line warning tape specified in Section 260553, "Electrical Identification".
2. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and shall not have any permanent property changes when exposed to temperatures below 35F, recovering original workability characteristics above 35F. Compound shall adhere to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors where conduits are not specified on the conduit schedule:
  1. Underground: HDPE schedule 40 shall be used for all conduits 4” diameter and greater unless otherwise noted on the drawings.

B. Raceway Fittings: Compatible with raceways and suitable for use and location.

C. Conduit Elbows

1. Underground elbows for 4" diameter conduits or larger shall be fiberglass with factory installed couplers.
2. Elbow radius for underground conduits 4" diameter or larger shall be 3' or greater for vertical bends and 3' or greater for horizontal bends.

3.2 INSTALLATION

A. Complete raceway installation before starting conductor installation.

B. Seal and bond conduits with approved adhesives.

C. Support raceways as specified and in conformance with NFPA 70.

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs and in the field.

F. Install conduits so curved portions of bends are not visible above the finished slab or outdoor grade.

G. Underground Conduits

1. Provide trenching and backfill as specified in Section 312000, Earthwork.
2. Provide conduit depths, trench preparation, and backfill as shown on the drawings.
3. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line as shown in trench details. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

H. Join raceways with fittings designed and approved for that purpose and make joints tight.

I. Install and leave pull cords in all raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

**END OF SECTION**

## SECTION 260550

### FIELD TESTING

#### PART 1 - GENERAL

This specification covers the field testing of the electrical systems installed or constructed by the Contractor. It is the intent of this specification that field testing be extensive and complete, as specified, to provide positive assurance of correct installation and operation of equipment. The Contractor shall utilize QUALIFIED INDIVIDUALS to perform all electrical testing specified herein.

#### 1.1 SUMMARY

A. This specification includes, but is not limited to, the following:

1. Testing of all wire, cable, and systems installed or connected by the Contractor to assure proper installation, adjustment, setting, connection, and functioning in accordance with the drawings, these specifications, and the manufacturer's recommendations.
2. Furnishing of qualified personnel and labor required for, and incidental to testing.
3. Furnishing all test equipment required to perform all tests, including special equipment as required, and qualified operators for testing equipment.
4. This specification includes all testing required during installation and prior to energization of electrical systems installed or constructed by the Contractor. The scope of work does not include testing of equipment or systems off-site. The Contractor shall cooperate with and coordinate with Chugach for testing of systems and equipment that interface with Chugach's facilities that may be required to confirm phasing, rotation or other electrical characteristics.

#### 1.2 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

#### 1.3 REFERENCES

The latest and applicable sections of the following standards are to be used in the performance of the work:

- A. NESC – National Electric Safety Code
- B. NEC – National Electric Code
- C. IEEE – Institute of Electrical and Electronics Engineers
- D. REA Bul. 1724E-300 (Design Guide for Rural Substations)
- E. REA Pub. 202-1 (List of Materials)



F. NEMA- National Electrical Manufacturer's Association

G. NECA- National Electrical Contractor's Association

H. NETA – International Electrical Testing Association

I. ANSI - American National Standards Institute

#### 1.4 SUBMITTALS

A. Testing qualifications.

B. Testing plan and schedule for all conductors.

C. Certified test equipment calibration reports.

D. Test Reports:

1. The Contractor shall submit reports for all tests performed.
2. The Contractor shall maintain a written and electronic record of all tests showing date, personnel making test, equipment or material tests performed, and results. A copy of these reports shall be submitted to Chugach on a weekly basis.
3. Submit one electronic copy of the final test reports, as specified.
4. The Contractor may use his standard report forms subject to the approval of Chugach.
5. Electronic documents shall be submitted in Word/Excel 2021, or later format, or in searchable unsecured PDF.

#### 1.5 QUALITY ASSURANCE

A. The Contractor shall furnish the services of a testing supervisor who is an approved technician who shall perform the following:

1. Be personally present on the jobsite during the testing of all wiring and systems furnished, installed, or connected by the Contractor and until they are all in complete and satisfactory operation, and the substation is ready for Chugach's personnel.
2. Conduct and direct the complete program of testing specified herein.
3. Check all wiring installed by the Contractor for proper connection according to the diagrams shown in the plans, connection diagrams, and the manufacturer's shop drawings.

B. The Contractor shall submit to Chugach a proposed testing plan. This plan will detail at a minimum the following:

1. Specific tests to be performed on each piece of cable or system.
2. Testing procedures to be followed for each type of test.
3. List references and standards which require a specified test.

4. Provide a list of the manufacturers recommended tests and procedures.
5. List of testing equipment to be used and calibration certificates for proposed testing equipment
6. List of personnel responsible for performing tests and their qualifications. Provide certifications and proof of training applicable to the tests and equipment to be provided under this contract. Provide resumes which show testing and commissioning experience.
7. Testing schedule based on the project schedules.

#### 1.6 COORDINATION

- A. Coordinate tests with completion of system installation. Schedule testing and provide notification of testing to Chugach so as not to delay construction or system energization.
- B. Notify Chugach two weeks prior to commencement of all testing.

#### 1.7 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to be tested.

#### 1.8 TESTS: The types of tests to be performed under this specification shall include, but are not limited to, the following:

- A. Megger Tests: All power cables installed by the Contractor shall receive a Megger test. Megger all 15kV cable with a 5000-volt megger for one minute. Insulation resistance values shall be in accordance with Manufacturer's recommendations, or in the absence of those recommendations, 5000 Megaohms minimum for 15kV Cable.
- B. High Potential Tests. High potential tests shall be performed in accordance with the following: Observe all precautions to ensure the safety of all personnel associated with and near the area of the test. Perform a visual inspection of equipment to be tested prior to the commencement of the test for dirt and moisture accumulation and to assure work is complete. Record air temperature, barometric pressure, and humidity prior to the test. Perform megger test prior to high potential test.
- C. Power Cable. Medium voltage power cable for a new installation shall be performed as an acceptance test and shall be tested in accordance with IEEE Std. 400. In no case shall the cable manufacturer's maximum recommended test voltage be exceeded. Test Cable for 15 minutes with a dc test set only, from conductor to shield or armor with shield or armor grounded. Perform test with cable installed in permanent location, properly terminated, disconnected from equipment. Direct-buried cable shall be tested when the cable has a minimum 1 foot compacted permanent cover over the cable.
- D. Phase Relationships tests: Connections to all equipment shall be checked and verified by the Contractor. Any device which could be damaged by the application of a voltage of reversed phase shall be disconnected prior to the check. Contractor shall be responsible for maintaining the phasing to match existing phase rotation.

1.9 TESTING EQUIPMENT

A. The Contractor shall provide all testing equipment required to perform tests.

1.10 PERFORMANCE OF TESTS

A. Testing requirements shall include all tests recommended by the equipment manufacturer for high voltage power cable unless specifically waived by Chugach.

B. Additional tests shall be performed, as deemed necessary by Chugach, because of field conditions or to determine that equipment material and systems meet the requirements of the contract documents. The Contractor shall be responsible for all damage to equipment or material due to improper test procedures or test apparatus handling.

C. Test procedures, equipment, temporary circuits, etc., shall be designed and utilized to minimize danger to testing technicians and surrounding personnel; Furnish and use safety devices such as rubber gloves and blankets, provide protective screens and barriers, yellow tape, and danger signs, to adequately protect and warn all personnel in the vicinity of the tests.

D. Power Cable Tests. The following tests and checks shall be performed on all 15 kV power cables installed under this contract.

1. Hi-Pot and Insulation Resistance test (to be done after all splicing is completed within the cable circuit run).

**END OF SECTION**

## SECTION 260553

### ELECTRICAL IDENTIFICATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. This Section includes the following:

1. Identification for conductors and cable.
2. Underground-line warning tape.

##### 1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Approval of submittals required when materials substitutions are made.

##### 1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with NESC

##### 1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents and with those required by codes and standards. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.

## PART 2 - PRODUCTS

### 2.1 CONDUCTOR AND CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Cable Tags:

1. Provide Brady flame-retardant type B-145 polyethylene tag material with a grey background and black printed lettering. Cable tags shall be two-sided, oval-shaped measuring 1.75"W x 1.00"H. Cable tags shall be attached using Brady 81761 cable tag fasteners. Cable Number and To/From information shall be printed on both sides of the cable tag.
2. Substitutions for this tag type will be permitted at Chugach's discretion. Contractor shall provide a written request for cable tag substitution. Chugach may request physical samples be submitted to approve a cable tag substitution.

### 2.2 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

## PART 3 - EXECUTION

### 3.1 APPLICATION

A. All wires and cables installed by the Contractor will be labeled at their terminations as shown on the drawings and as approved by Chugach.

B. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway or conduit systems. Install underground-line warning tape for spare conduits in trench by themselves. Install warning tape as shown on underground conduit details on drawings.

C. Equipment Identification Labels: On each unit of equipment, install unique designation label as shown on the nameplate drawings or provide label consistent with equipment designations on drawings or wiring schematics.

1. Equipment to Be Labeled:

- a. Phasing on Transmission and Distribution Circuits.
- b. Conduits in vaults.

### 3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

**END OF SECTION**

## SECTION 312000

### EARTHWORK

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Special Provisions, apply to this Section.

##### 1.2 SUMMARY

A. This Section includes the following:

1. Classified Fill
2. Final Grading.
3. Excavating, backfilling, and compacting for trenching and other underground structures.
4. Landscaping

##### 1.3 DEFINITIONS

- A. Excavation: Removal of material encountered below subgrade.
- B. Backfill: Soil material used to fill an excavation.
- C. Subgrade: Final surface or elevation after completing cut, or top surface of a fill or backfill that will be directly below topsoil, crushed rock surface, or leveling course.
- D. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

##### 1.4 SUBMITTALS

- A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
1. Particle Size Analysis according to ASTM D 422 for Classified Fill and crushed rock.
  2. Laboratory density according to ASTM D 1557 for Classified Fill.
- B. Compaction density testing program and test equipment calibration certificate.

##### 1.5 QUALITY CONTROL/QUALITY ASSURANCE

- A. Contractor shall provide his own quality control program for field density testing, as further specified in Article 3, of this Section. Chugach may, at their option, provide additional field density testing for quality assurance.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities unless permitted in writing by Chugach and then only after arranging to provide temporary utility services according to requirements indicated.

1. Notify Chugach not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Chugach’s written permission.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. CLASSIFIED FILL

1. Classified Fill shall consist of sand and gravel material free from lumps, frozen material, balls of clay, organic matter, or other objectionable matter, durable and sound conforming to the quality requirements of AASHTO M-147 and shall meet the following washed sieve gradation. Municipality of Anchorage, Type II-A material qualifies as a Classified Fill.

Classified Fill	
Sieve Size	% Passing by Weight
3 inch	100
3/4 inch	50-100
#4	25-60
#10	15-50
#40	4-30
#200	0-6

2.2 STOCKPILE MATERIAL

A. Stockpiled Material: None

PART 3 - EXECUTION

3.1 EXPLOSIVES

A. Explosives: Do not use explosives.

3.2 EXCAVATION AND INSPECTION

A. Prior to filling or covering notify Chugach when excavations have reached required depth.

B. If Chugach determines that unsatisfactory soil is present, continue excavation as directed.

C. Where native soils are left at the subgrade surface in structural areas, subsurface shall be scarified to 6 inches depth and compacted to not less than 95% of maximum dry unit weight according to ASTM D 1557.



D. Reconstruct subgrade damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Chugach.

### 3.3 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation with compacted Classified Fill material.

### 3.4 STORAGE OF SOIL MATERIALS

A. Stockpile excavated backfill materials and excavated soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Stockpile soil materials away from edge of excavations.

### 3.5 FILL AND BACKFILL

A. Place and compact backfill in excavations promptly.

#### B. CLASSIFIED FILL

1. Place fill and backfill in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers. Compact Classified Fill materials to not less than 95% of maximum dry unit weight according to ASTM D 1557.
2. Uniformly moisten or aerate fill layer before compaction to within 2 percent of optimum moisture content. Remove and replace or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.6 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction and grading requirements.

B. Site Grading: Establish slope grades to pre-construction grades.

### 3.7 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will perform field quality control testing. Chugach may, at their option, engage a qualified independent geotechnical engineering testing agency to perform field quality-assurance testing.

B. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed on each lift of material at the following frequency:

1. Site Utility Trenches – One test in driveway area north of the substation.

C. When soils have not achieved degree of compaction specified, scarify, and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.

3.8 LANDSCAPING

A. Topsoil and seeding on the substation lot, adjacent lot, and road right-of-way shall be placed in vegetation areas (non-driveway areas) per SURL requirements.

3.9 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions. Reshape and recompact as directed by Chugach.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

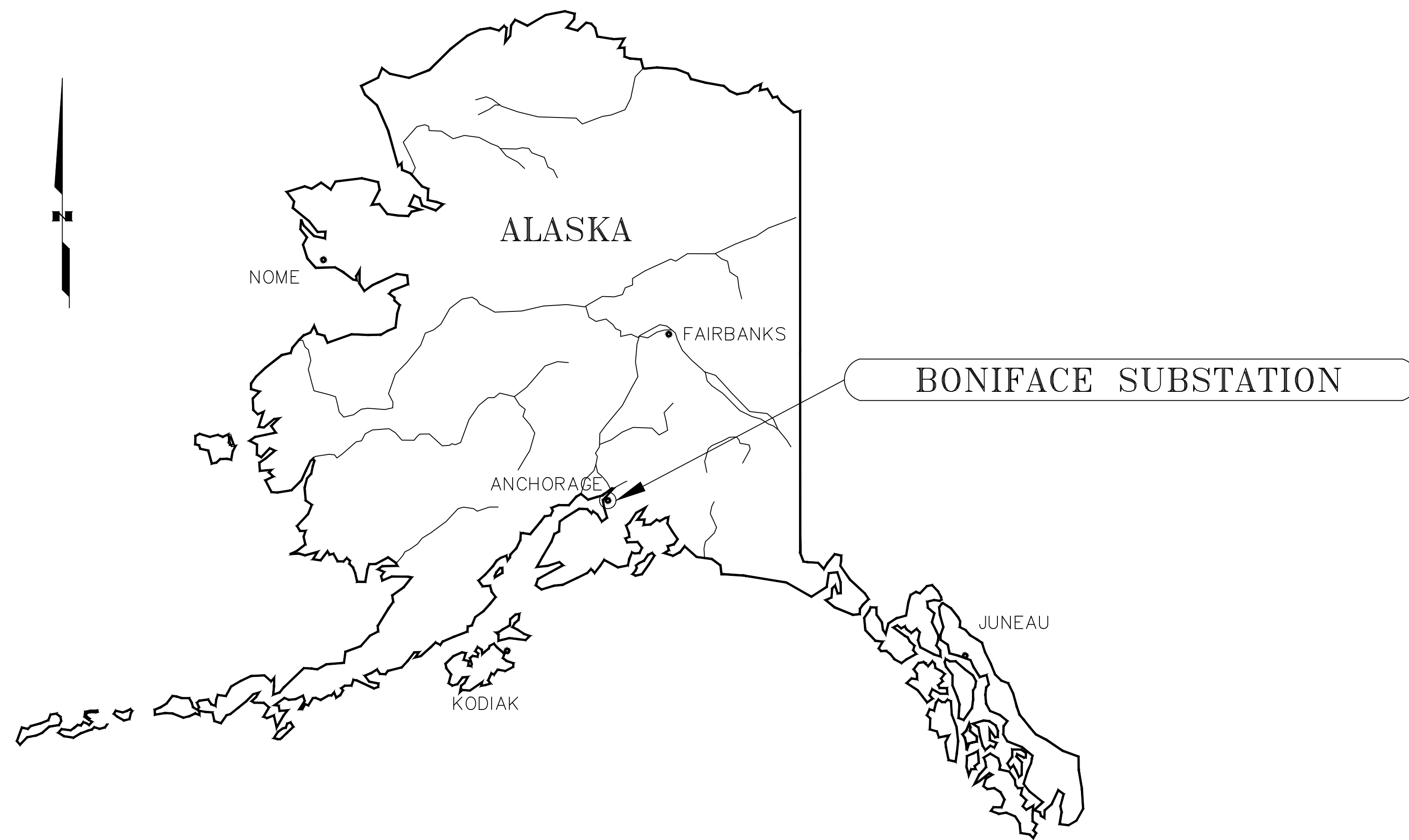
A. Disposal: Remove surplus excavated material from the project site.

**END OF SECTION**

CHUGACH ELECTRIC ASSOCIATION, INC.  
 BONIFACE SUBSTATION 12.47KV GETAWAYS  
 4200 PATTERSON ST, ANCHORAGE, AK 99504  
 W.O. E2020057



Chugach Electric Association, Inc.  
 5601 Electron Drive - P.O. Box 196300  
 Anchorage, Alaska 99519-6300



DRAWING INDEX				
DRAWING NUMBER	TITLE	SHEET NUMBER	DRAWING REVISION	NOTES
BFSS-WO-INDEX1	12.47KV GETAWAYS TITLE & DRAWING INDEX	1	0	
BFSS-EL-OT-0001	ELECTRICAL GENERAL INFORMATION	1	0	
BFSS-EL-OT-0001	ELECTRICAL GENERAL INFORMATION	2	0	
BFSS-SS-0003	GROUND GRID AND CONDUIT PLAN	1	0	
BFSS-SS-0015	12.47KV GETAWAYS SITE PLAN AND DETAILS	1	0	
BFSS-SS-7015	12.47KV FEEDER 512 GETAWAY DEMO	1	0	

PROJECT: <b>BONIFACE SUBSTATION 512 FEEDER GETAWAY REPLACEMENT</b>					
ENG./DESIGN.: <b>STACEY BOTTORFF - CEA/MATHEW WILLIAMS - EPS W.O. # E2020057</b>					
NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP
0	ISSUED FOR CONSTRUCTION	MSW/08-12-22	MSW/08-12-22		

NO.	RECORD REVISION	CAD DRAWN BY	W.P.#	W.O. NUMBER	RECORD APPROVED	DATE



Chugach Electric Association, Inc.  
 5601 Electron Drive - P.O. Box 196300  
 Anchorage, Alaska 99519-6300

DRAWING NAME:	BONIFACE SUBSTATION 12.47KV GETAWAYS TITLE & DRAWING INDEX
<b>CONFIDENTIAL</b>	
<small>BFSS-WO-INDEX1 1.DWG</small>	
<small>DRAWING NO. - PREVIOUS/REFERENCE</small>	
DRAWING NO.:	BFSS-WO-INDEX1
<small>SHEET 0001 OF 1</small>	
<small>PAGE /</small>	

# BONIFACE SUBSTATION

4200 PATTERSON STREET, ANCHORAGE, ALASKA

CHUGACH ELECTRIC ASSOCIATION, INC.  
5601 ELECTRON DRIVE – P.O. BOX 196300  
ANCHORAGE, ALASKA 99519-6300

## STANDARD ABBREVIATIONS – ELECTRICAL

&	AND	EA	EACH	N	NEWTON	TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATION
⊙	AT	EIA	ELECTRONICS INDUSTRY ASSOCIATION	NC	NORTH	TRP	TRIP
⊔	CENTERLINE	EJ	EXPANSION JOINT	NCC	NORMALLY CLOSED	TURB	TURBINE
⊕	PHASE	EL	ELECTRICAL	N/C	NORMALLY OPEN CONTACT	TX	TRANSMIT
#	POUND OR NUMBER	ELEV	ELEVATION	NS	NO CONNECTION	TYP	TYPICAL
A	AMPERE	ENCL	ENCLOSURE	NO	NORMALLY OPEN	UG	UNDERGROUND
ACB	AIR CIRCUIT BREAKER	EQ	EQUAL	NOC	NORMALLY OPEN CONTACT	UNO	UNLESS NOTED OTHERWISE
AB	AIR BREAK	EQUIP	EQUIPMENT	NS	NOT TO SCALE	V	VOLT
ABV	ABOVE	EST	ESTIMATE	OD	OUTSIDE DIAMETER	VA	VOLTAMPERE
AC	ALTERNATING CURRENT	EXIST	EXISTING	OUT	OUTPUT	VA	PHASE A VOLTAGE
ADJ	ADJUSTABLE	F	FARAD	P	REAL POWER OR PRIMARY	VAR	REACTIVE POWER
ADJT	ADJACENT	FUSE	FUSE	PB	PUSH BUTTON	VB	PHASE B VOLTAGE
ALT	ALTERNATE	FREQ	FREQUENCY	PF	POWER FACTOR	VAC	ALTERNATING CURRENT VOLTAGE
APPRX	APPROXIMATE	FT	FEET	PLC	PROGRAMMABLE LOGIC CONTROLLER	VC	PHASE C VOLTAGE
B	BUS	FT	FEED THROUGH	PM	PAD-MOUNT TRANSFORMER	VCB	VACUUM CIRCUIT BREAKER
BF	BREAKER FAIL	FUT	FUTURE	PT	POINT	VDC	DIRECT CURRENT VOLTAGE
BF1	BREAKER FAIL INITIATE	G	CONDUCTANCE OR GROUND	PT	POTENTIAL TRANSFORMER	VERT	VERTICAL
BKR	BREAKER	GA	GAUGE	PT	POTENTIAL TRANSFORMER	VIF	VERIFY IN FIELD
BLDG	BUILDING	GALV	GALVANIZED	PTSS	PORTAGE SUBSTATION	VN	NEUTRAL VOLTAGE
BLK	BLOCK	GB	GROUND BUS	PVC	POLYVINYL CHLORIDE	VR	VOLTAGE REGULATOR
BOT	BOTTOM	GOB	GAS CIRCUIT BREAKER	PVMT	PAVEMENT	VREG	VOLTAGE REGULATOR
BTU	BRITISH THERMAL UNIT	GEN	GENERATOR	Q	REACTIVE POWER	VT	VOLTAGE TRANSFORMER
BTWN	BETWEEN	GI	GALVANIZED IRON	R	RESISTANCE OR RESISTOR	W	WEST
BU	BACKUP	GND	GROUND	RBS	RASPBERRY SUBSTATION	W	WATT
C	COLUMB	GOAB	GANG OPERATED AIR-BREAK SWITCH	RCLS	RECLOSE	W/O	WITHOUT
CAP	CAPACITOR OR CAPACITANCE	GRC	GALVANIZED RIGID CONDUIT	RD	RADIUS	X	REACTANCE
CAP	CORRUGATED ALUMINUM PIPE	GRD	GRADE, GRADING	RD	RADIATION	XFMR	TRANSFORMER
CB	CENTER BREAK	GRSC	GALVANIZED RIGID STEEL CONDUIT	RE	REMOTE END	XMSSN	TRANSMISSION
CBL	CABLE	H	HENRY	REF	REFERENCE	Y	ADMITTANCE
CEA	CHUGACH ELECTRIC ASSOCIATION	HDPE	HIGH-DENSITY POLYETHYLENE	REQD	REQUIRED	YL	YELLOW
CEM	CEMENT	HLO	HOT LINE ORDER	RET	REMOTE END TRIP	Z	IMPEDANCE
CF	CUBIC FOOT	HNSS	HANE SUBSTATION	RET	RETURN	2	TIME-DELAY
CHK	CHECK	HORIZ	HORIZONTAL	REV	REVISION	21	DISTANCE
CHK	CAST IRON	HP	HORSEPOWER	RLY	RELAY	25	SYNCHRONISM CHECK
CIP	CAST IRON PIPE	HPSS	HOPE SUBSTATION	RR	RAILROAD	27	UNDERVOLTAGE
CIPC	CAST-IN-PLACE CONCRETE	HZ	HERTZ	ROW	RIGHT OF WAY	30	ANNUNCIATOR
CIR	CIRCLE	IA	PHASE A CURRENT	RTS	READY TO SEND	32	DIRECTIONAL POWER
CKT	CIRCUIT	IB	PHASE B CURRENT	RTU	REMOTE TERMINAL UNIT	37	UNDERCURRENT OR UNDERPOWER BEARING
CLK	CLOCK	IC	PHASE C CURRENT	RK	RECEIVE	38	FIELD
CLS	CLOSE	ID	INSIDE DIAMETER	S	APPARENT POWER	40	FIELD
CMIL	CIRCULAR MIL	IN	INPUT	S	SOUTH	43	MANUAL TRANSFER OR SELECTOR DEVICE
CMP	CORRUGATED METAL PIPE	IN	INCH	S	SOURCE	46	REVERSE-PHASE
COS	COSINE	IN	NEUTRAL CURRENT	S-L	SOURCE-LOAD	47	PHASE-SEQUENCE VOLTAGE
CONC	CONCRETE	INCL	INCLUDE(D), INCLUDING	SA	SURGE ARRESTOR	49	MACHINE OR TRANSFORMER THERMAL RELAY
CONST	CONSTRUCTION	IND	INDUSTRY	SC	SWITCH CABINET	50	INSTANTANEOUS OVERCURRENT
CONT	CONTINUOUS	INT	INTERSECTION	SEC	SECTION	51	AC TIME OVERCURRENT
CONTR	CONTRACTOR	INV	INVERT	SEC	SECONDARY	52	AC CIRCUIT BREAKER
CS	CIRCUIT SWITCHER OR CONTROL SWITCH	IP	POLARIZING CURRENT	SVC	SERVICE	52a	NORMALLY OPEN BREAKER CONTACT
CSP	CORRUGATED STEEL PIPE	J	COMPLEX NUMBER	SVC	STATIC VAR COMPENSATOR	52b	NORMALLY CLOSED BREAKER CONTACT
CT	CURRENT TRANSFORMER	J	JOULE	SHT	SHEET	59	OVERVOLTAGE
CTRL	CONTROL	JB	JUNCTION BOX	SIM	SIMILAR	60	VOLTAGE BALANCE
CTS	CLEAR TO SEND	KA	KILOAMPERE	SIN	SINE	63	PRESSURE SWITCH
DC	DIRECT CURRENT	KV	KILOVOLT	SPEC	SPECIFICATION	64	APPARATUS GROUND
DCD	DATA CARRIER DETECT	KW	KILOWATT	SPECS	SPECIFICATIONS	67	AC DIRECTIONAL OVERCURRENT
DCE	DATA COMMUNICATIONS EQUIPMENT	L	INDUCTANCE	SS	SYNCHRONIZING SWITCH	68	BLOCKING
DDE	DOUBLE DEAD END	L	LINE	STA	STATION	69	PERMISSIVE
DE	DEAD END	L	LOAD	STD	STANDARD	71	LEVEL SWITCH
DEM	DEMOLISH, DEMOLITION	LB	LOAD BREAK	SUSS	SUMMIT LAKE SUBSTATION	74	ALARM
DEMOB	DEMOLIBLIZE	LT	LIGHT	SW	SWITCH	76	DC OVERCURRENT
DET	DETAIL	M	METER(S)	SWGR	SWITCHGEAR	78	OUT-OF-STEP
DFR	DISTURBANCE FAULT RECORDER	MAT	MATERIAL	SYM	SYMMETRICAL	79	RECLOSEING RELAY
DI	DIGITAL INPUT	MAX	MAXIMUM	SYNCH	SYNCHRONIZE	81	FREQUENCY
DIA	DIAMETER	MFG	MANUFACTURER	T	TIME OR TRANSFORMER	85	CARRIER OR PILOT WIRE
DIAG	DIAGONAL	MI	MILE	TAN	TANGENT	86	LOCK OUT
DIM	DIMENSION	MIN	MINIMUM	TCM	TRIP COIL MONITOR	87	DIFFERENTIAL
DIST	DISTRIBUTION	MISC	MISCELLANEOUS	TEL	TELEPHONE	94	TRIPPING
DBSS	DEBARR SUBSTATION	MM	MILLIMETER(S)	TERM	TERMINAL		
DLSS	DOWLING SUBSTATION	MO	MOTOR OPERATED (OR)	TEMP	TEMPORARY		
DNP	DISTRIBUTED NETWORK PROTOCOL	MOB	MOBILIZE	THK	THICK(NESS)		
DO	DIGITAL OUTPUT	MTR	METER				
DTE	DATA TERMINAL EQUIPMENT	MW	MEGAWATT				
DWG	DRAWING	N	NEUTRAL				

ABBREVIATIONS: WHEN USED IN THESE ELECTRICAL DRAWINGS SHALL CONFORM TO THE ABOVE LIST, UNLESS NOTED OTHERWISE. OTHER SECTIONS (SUCH AS STRUCTURAL AND CIVIL PLANS) MAY CONTAIN SPECIFIC REFERENCES AND LEGENDS WITH INTERPRETATIONS INTENDED ONLY FOR THOSE SECTIONS. NOT ALL ABBREVIATIONS MAY BE USED IN THIS DRAWING SET.

## STANDARD BLOCKS – ELECTRICAL

	GAS CIRCUIT BREAKER (XXXX = EQUIPMENT NUMBER)		FUSED DISCONNECT		ENTRELEC GATE BLOCK
	GAS CIRCUIT BREAKER (XXXX = EQUIPMENT NUMBER)		LINE SWITCH		ENTRELEC FUSE BLOCK
	VACUUM CIRCUIT BREAKER (ONE-LINE DIAGRAMS) (XXXX = EQUIPMENT NUMBER)		HOOK STICK OPERATED SWITCH		ENTRELEC FEED-THRU BLOCK
	VACUUM CIRCUIT BREAKER (THREE-LINE DIAGRAMS) (XXXX = EQUIPMENT NUMBER)		PROTECTION OR AUTOMATION DEVICE		30 AMP CURRENT SHORTING BLOCK
	POWER TRANSFORMER		INPUT		30 AMP 12-POLE TERMINAL BLOCK
	POTENTIAL TRANSFORMER (ONE-LINE DIAGRAMS)		COIL OR ELEMENT		CABLE TAG – WIRING DIAGRAMS & 3-LINES
	POTENTIAL TRANSFORMER (THREE-LINE DIAGRAMS)		DC CIRCUIT BREAKER		CABLE TAG – SCHEMATIC
	CURRENT TRANSFORMER		CIRCUIT BREAKER		INCANDESCENT LIGHT
	3-PHASE GROUNDED WYE CONNECTION		TRAPPED-KEY INTERLOCK (X = KEY NUMBER)		SHORTING BLOCK
	1-PHASE GROUNDED WYE CONNECTION				CONNECTION POINT
	3-PHASE DELTA CONNECTION				TERMINATION CONNECTION POINT
					POLARITY MARK
					GROUND

## CONTRACT NOTES

- THE FOLLOWING TRIANGLES AND CLOUDING WILL BE USED ON DRAWINGS TO IDENTIFY THE CONTRACTOR'S SCOPE OF WORK IN SPECIFIC AREAS. AREAS NOT CLOUDED ON DRAWINGS SHALL NOT BE IN THE CONTRACTOR'S SCOPE OF WORK.
- THE FOLLOWING TRIANGLES AND CLOUDING WILL BE USED ON DRAWINGS TO IDENTIFY SPECIFIC AREAS OUTSIDE OF THE CONTRACTOR'S SCOPE OF WORK. AREAS NOT CLOUDED ON DRAWINGS SHALL BE IN THE CONTRACTOR'S SCOPE OF WORK.
- IF NO CLOUDS ARE NOTED ON THE DRAWING, THE CONTRACTOR'S SCOPE OF WORK SHALL INCLUDE THE ENTIRE DRAWING.
- IF THE DRAWING IS ISSUED FOR REFERENCE ONLY, IT WILL BE IDENTIFIED WITH THE FOLLOWING BLOCK. THE PURPOSE OF AN "ISSUED FOR REFERENCE ONLY" DRAWING IS TO CONVEY INFORMATION THAT MAY BE USEFUL TO THE CONTRACTOR IN PERFORMANCE OF THE CONTRACT. NONE OF THE MATERIAL SHOWN ON THE DRAWING IS WITHIN THE CONTRACTOR'S SCOPE OF WORK TO SUPPLY.
- DEMOLITION DRAWINGS WILL BE IDENTIFIED WITH THE FOLLOWING BLOCK. DEMOLITION WORK THAT IS WITHIN THE CONTRACTOR'S SCOPE OF WORK WILL BE IDENTIFIED BY DEMOLITION CLOUDS. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIAL, AND EQUIPMENT FOR THE REMOVAL OF THE IDENTIFIED ITEMS. SCOPE OF WORK OR PERFORMANCE INFORMATION FOR THE CONTRACTOR MAY BE CONVEYED WITH "DEMOLITION NOTES". BELOW IS AN EXAMPLE OF A DEMOLITION CLOUD AND DEMOLITION NOTES.
- SCOPE OF WORK OR PERFORMANCE INFORMATION FOR THE CONTRACTOR MAY BE CONVEYED WITH "CONSTRUCTION NOTES". BELOW IS AN EXAMPLE OF CONSTRUCTION NOTES.

**ISSUED FOR REFERENCE ONLY**  
- DO NOT EDIT -

**CONSTRUCTION NOTES:**  
① EXAMPLE NOTE  
② EXAMPLE NOTE

**DEMOLITION**

EXAMPLE DEMOLITION CLOUD:

EXAMPLE DEMOLITION NOTES:

**DEMOLITION NOTES:**  
① EXAMPLE NOTE  
② EXAMPLE NOTE

PROJECT: _____					NO.		RECORD REVISION		CAD DRAWN BY	W.P.#	W.O. NUMBER	RECORD APPROVED	DATE
ENG./DESIGN: _____					1		-		-	-	-	-	-
W.O. # _____													
NO.	DESIGN/CONSTRUCTION/ASBUITL REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP								
0													

NO.	DESIGN/CONSTRUCTION/ASBUITL REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP							
0												



Chugach Electric Association, Inc.  
5601 Electron Drive - P.O. Box 196300  
Anchorage, Alaska 99519-6300

DRAWING NAME:		<b>BONIFACE SUBSTATION ELECTRICAL GENERAL INFORMATION</b>	
<b>CONFIDENTIAL</b>		BFSS-EL-OT-0001-0001-1-1	
DRAWING NO. - PREVIOUS/REFERENCE			
DRAWING NO.:		<b>BFSS-EL-OT-0001</b>	
SHEET 0001 OF 0002		PAGE _____ / _____	

# BONIFACE SUBSTATION

## CABLE AND WIRE STANDARD

### A. CABLE COLOR CODES

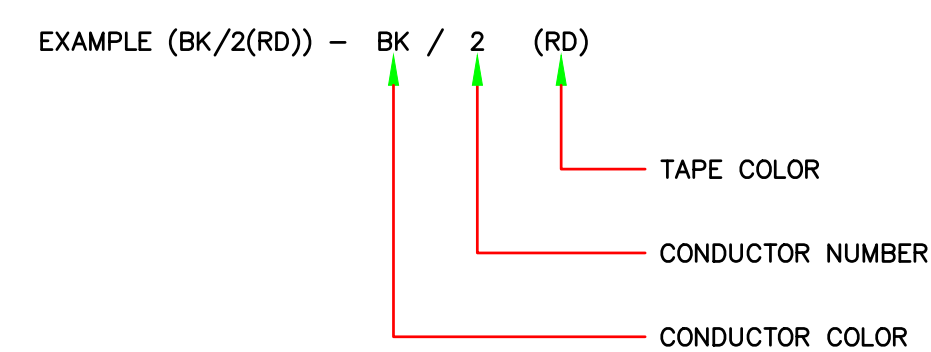
COND. NO.	BASE COLOR	TRACER COLOR	ABBR.
1	BLACK	--	BK
2	WHITE	--	WH
3	RED	--	RD
4	GREEN	--	GN
5	ORANGE	--	OR
6	BLUE	--	BL
7	WHITE	BK	WH/BK

PAIR NO.	COLOR
1	BLACK
2	WHITE
3	BLACK
4	WHITE
5	BLACK
6	WHITE
7	BLACK
8	WHITE
9	BLACK
10	WHITE
11	BLACK
12	WHITE

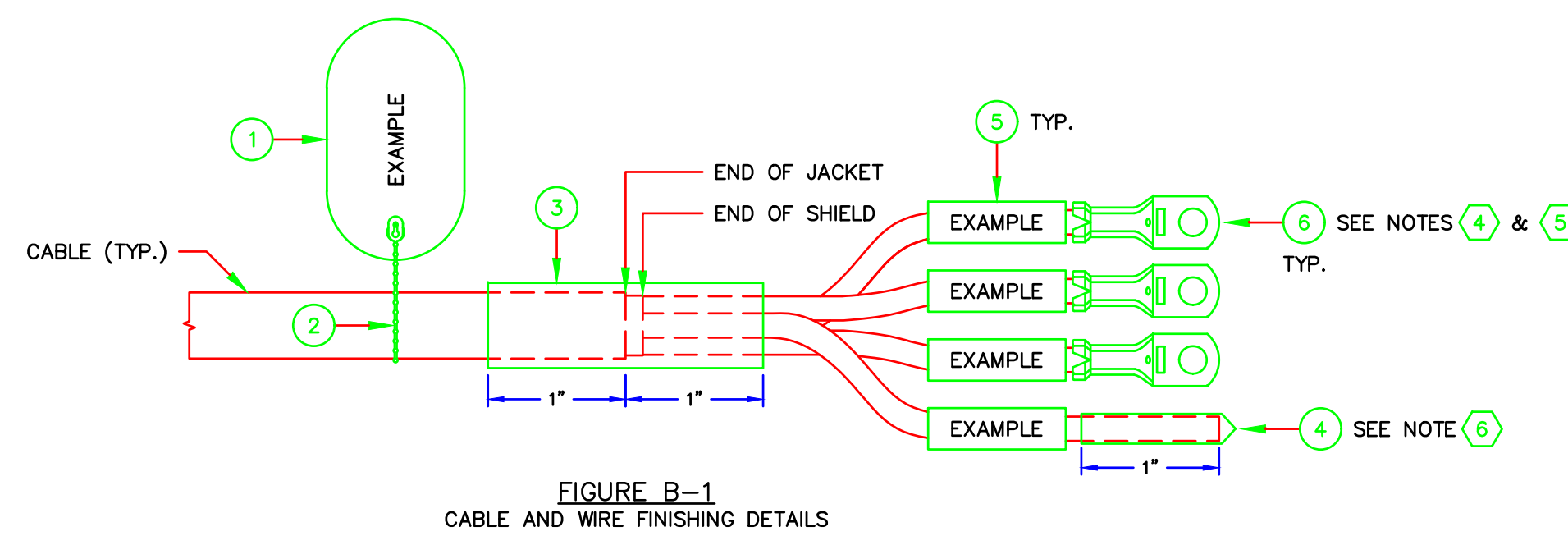
COND. NO.	BASE COLOR	TRACER COLOR	ABBR.
1	BLACK	--	BK
2	RED	--	RD
3	BLUE	--	BL
4	ORANGE	--	OR
5	YELLOW	--	YL
6	BROWN	--	BN
7	RED	BLACK	RD/BK
8	BLUE	BLACK	BL/BK
9	ORANGE	BLACK	OR/BK
10	YELLOW	BLACK	YL/BK
11	BROWN	BLACK	BN/BK
12	BLACK	RED	BK/RD
13	BLUE	RED	BL/RD
14	ORANGE	RED	OR/RD
15	YELLOW	RED	YL/RD
16	BROWN	RED	BN/RD
17	BLACK	BLUE	BK/BL
18	RED	BLUE	RD/BL
19	ORANGE	BLUE	OR/BL

NO.	COLOR	TAPE COLORS			
		240 VAC		DC	
1	BLACK	L1	BLACK	POS	RED
2	BLACK	L2	RED	NEG	BLACK
3	BLACK	N	WHITE	N/A	N/A
-	BARE	GND	N/A	N/A	N/A

NOTES:  
 ① POWER CABLES WITH ICEA METHOD 4 COLOR CODING SHALL HAVE THEIR CONDUCTORS IDENTIFIED WITH COLORED TAPE ACCORDING TO TABLE A-4, AND AS IDENTIFIED IN THE DRAWINGS. THE FOLLOWING IS AN EXAMPLE OF TAPE APPLICATION FOR A CONDUCTOR IN A POWER CABLE WITH ICEA METHOD 4 COLOR CODE.



### B. CABLE AND WIRE FINISHING

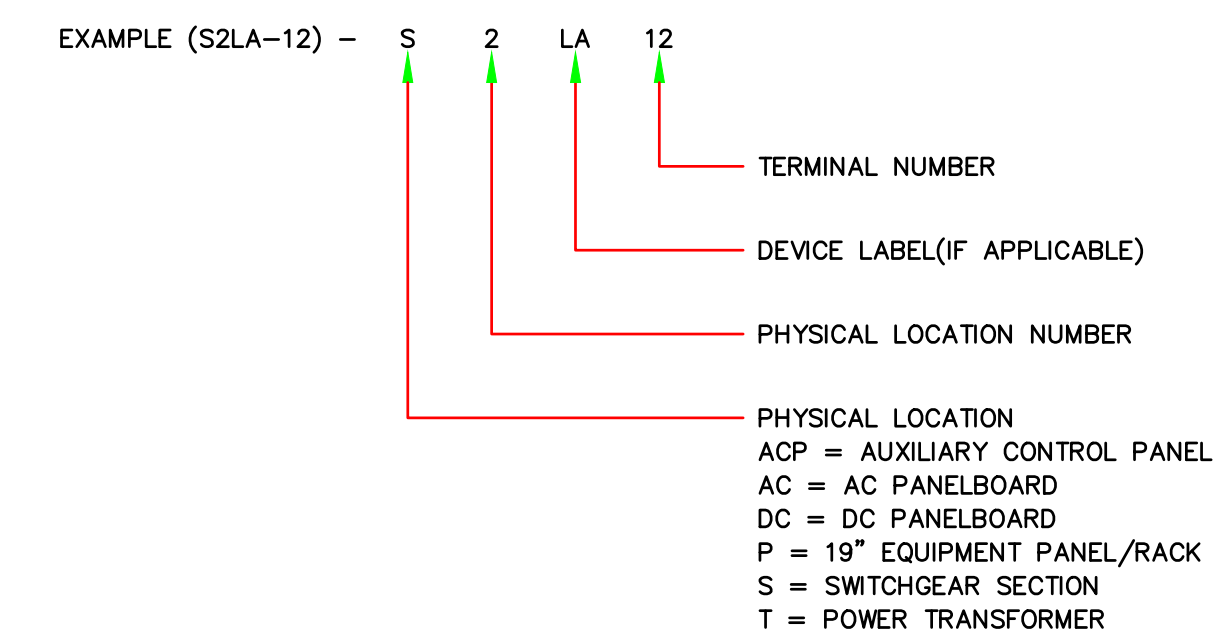


REF. NO.	DESCRIPTION	MANUFACTURER/CATALOG NUMBER
①	CABLE TAG, FLAME RETARDANT, 1.75" X 1.00"	BRADY/B-145 (OAE)
②	CABLE TAG FASTENER	BRADY/B1761 (OAE)
③	HEAVY WALL HEAT-SHRINKABLE TUBING	THOMAS & BETTS/HS-SERIES (OAE)
④	THIN WALL HEAT-SHRINKABLE TUBING	THOMAS & BETTS/OPO-SERIES (OAE)
⑤	WIRE LABEL	BRADY/B-342 (OAE) (SEE NOTE ②)
⑥	WIRE TERMINAL 10-12 AWG, 8-10 STUD 10-12 AWG, 1/4" STUD 8 AWG, 8-10 STUD 6 AWG, 8-10 STUD NOT LISTED	BURNDY/YAV10-H BURNDY/YAV10-H3 BURNDY/YAV8C-L BURNDY/YAV8C-L1 SUBMIT FOR APPROVAL

NOTES:  
 ① CABLE AND WIRE FINISHING MATERIAL QUANTITIES TO BE DETERMINED BY THE CONTRACTOR.  
 ② LABELS ARE NOT TO BE HEAT SHRUNK. LABELS SHALL BE CLEARLY VISIBLE IN THE AS-LEFT POSITION.  
 ③ SHIELDED COMMUNICATION CABLES SHALL HAVE ONLY ONE END OF THE SHIELD GROUNDED. SHIELD-GROUND CONNECTION SHALL BE MADE IN THE SWITCHGEAR ENCLOSURE FOR CABLES THAT EXTEND OUTSIDE OF THE SWITCHGEAR ENCLOSURE.  
 ④ TERMINATED CONDUCTORS SHALL HAVE SUFFICIENT LENGTH TO BE RE-TERMINATED AT ANY LOCATION WITHIN THE CABINET OR RACK.  
 ⑤ WIRE TERMINAL SHROUDS SHALL NOT HAVE HEAT SHRINK TUBING APPLIED.  
 ⑥ SPARE CONDUCTORS SHALL HAVE SUFFICIENT LENGTH TO BE RE-TERMINATED AT ANY LOCATION WITHIN THE CABINET OR RACK.  
 ⑦ AFTER THE CABLE JACKET HAS BEEN STRIPPED BACK TO THE APPROPRIATE LENGTH, EACH CABLE SHALL HAVE A MINIMUM 2 INCH PIECE OF HEAT SHRINK TUBING WITH INTERNAL HOT MELT SEALING COMPOUND INSTALLED. THE PURPOSE OF THE HEAT SHRINK TUBING IS TO SEAL THE END OF THE CABLE AND PROVIDE A CLEAN INSTALLATION. THE HEAT SHRINK TUBING SHALL BE LONG ENOUGH AND POSITIONED SO THAT APPROXIMATELY 1 INCH OF HEAT SHRINK TUBING IS POSITIONED OVER THE CABLE JACKET AND 1 INCH OF HEAT SHRINK TUBING IS POSITIONED OVER THE CONDUCTORS. HEAT SHRINK TUBING SHALL BE THOMAS & BETTS HS-SERIES, HEAVY-WALL HEAT-SHRINKABLE TUBING, BLACK.

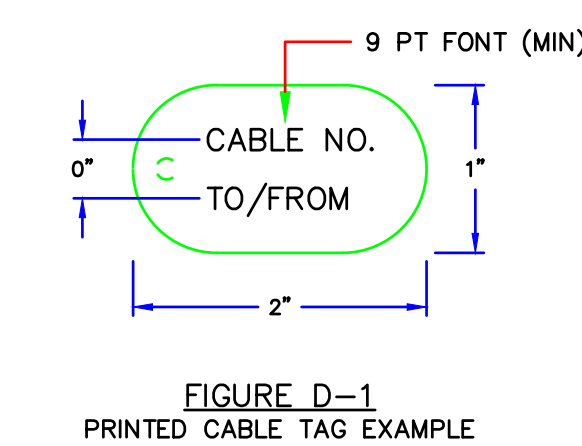
### C. WIRE LABELING

NOTES:  
 ① ALL WIRE LABELS SHALL BE TYPED, NOT HAND WRITTEN, AND INSTALLED SUCH THAT THEY ARE CLEARLY VISIBLE IN THE AS-LEFT POSITION.  
 ② WIRE LABEL TEXT SHALL BE UPPER CASE "ARIAL BOLD" FONT WITH A HEIGHT OF 0.125 INCHES (9PT).  
 ③ TEXT SHALL BE CENTERED ON THE WIRE LABEL.  
 ④ WIRE LABELING WILL USE THE "DESTINATION" METHOD TO LABEL INDIVIDUAL WIRES. THE FOLLOWING IS AN EXAMPLE OF WIRE TERMINAL NUMBERING:



### D. CABLE TAGGING

NOTES:  
 ① ALL CABLE TAGS SHALL BE TYPED, NOT HAND WRITTEN, AND INSTALLED SUCH THAT THEY ARE CLEARLY VISIBLE IN THE AS-LEFT POSITION.  
 ② CABLE TAG TEXT SHALL BE UPPER CASE "ARIAL BOLD" FONT WITH A MINIMUM HEIGHT OF 0.125 INCHES (9PT).  
 ③ TEXT SHALL BE CENTERED ON THE CABLE TAG.  
 ④ CABLE NUMBER SHALL BE ACCORDING TO THE CABLE SCHEDULE.  
 ⑤ PRINTED CABLE TAG EXAMPLE (BOTH SIDES):



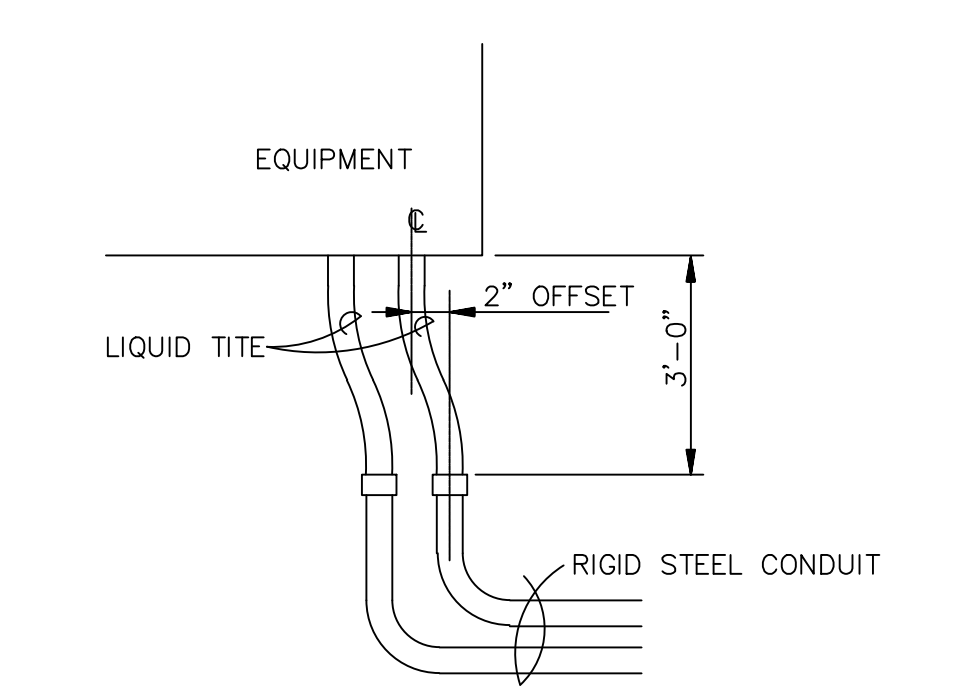
PROJECT: _____						W.O. # _____						
ENG./DESIGN: _____												
NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP	NO.	RECORD REVISION	CAD DRAWN BY	W.P.#	W.O. NUMBER	RECORD APPROVED	DATE
0						1						

NO.	RECORD REVISION	CAD DRAWN BY	W.P.#	W.O. NUMBER	RECORD APPROVED	DATE
1						

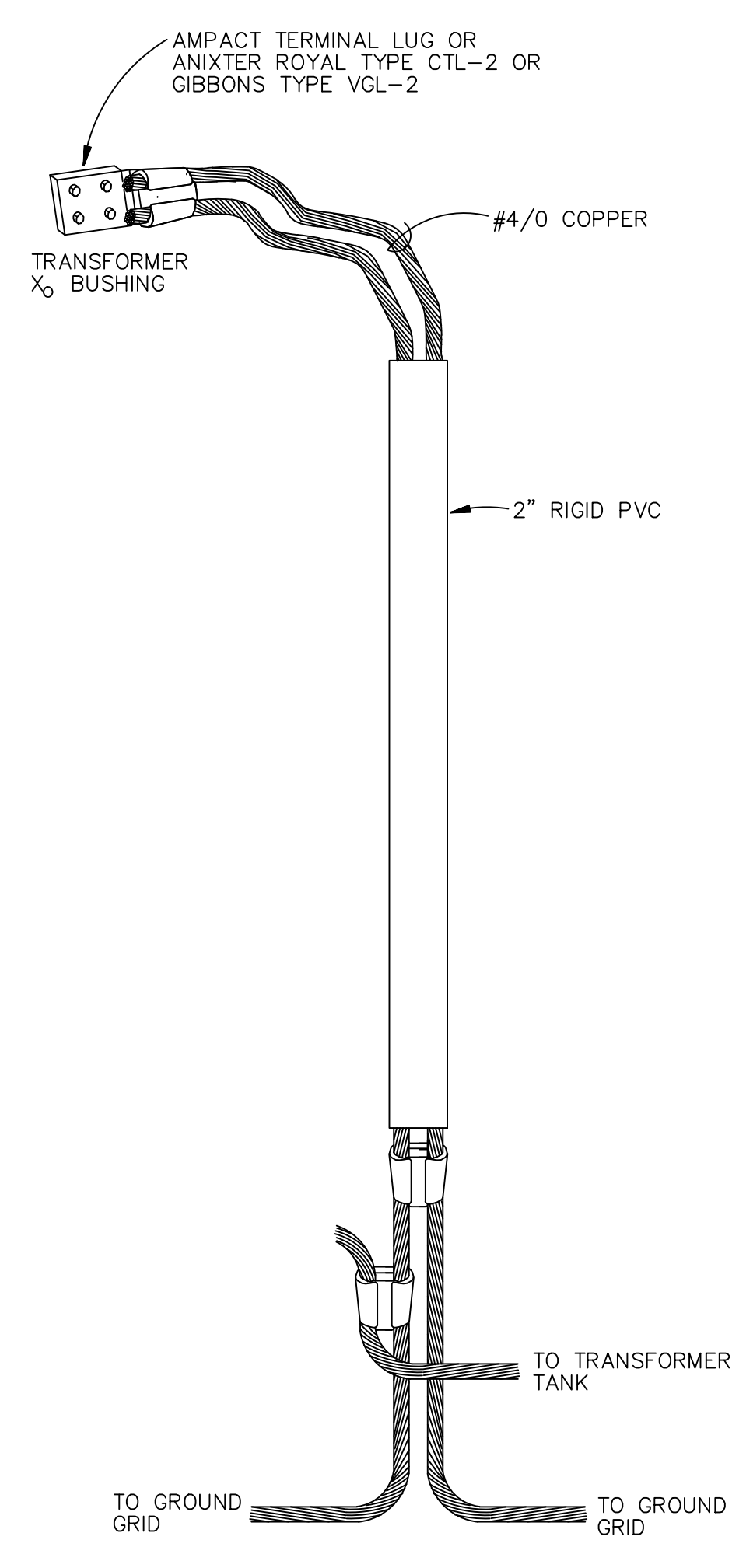


Chugach Electric Association, Inc.  
 5601 Electron Drive - P.O. Box 196300  
 Anchorage, Alaska 99519-6300

DRAWING NAME: <b>BONIFACE SUBSTATION ELECTRICAL GENERAL INFORMATION</b>	
<b>CONFIDENTIAL</b>	
DRAWING NO. - PREVIOUS/REFERENCE	SHEET 0002 OF 0002
DRAWING NO.: <b>BFSS-EL-OT-0001</b>	PAGE _____ / _____

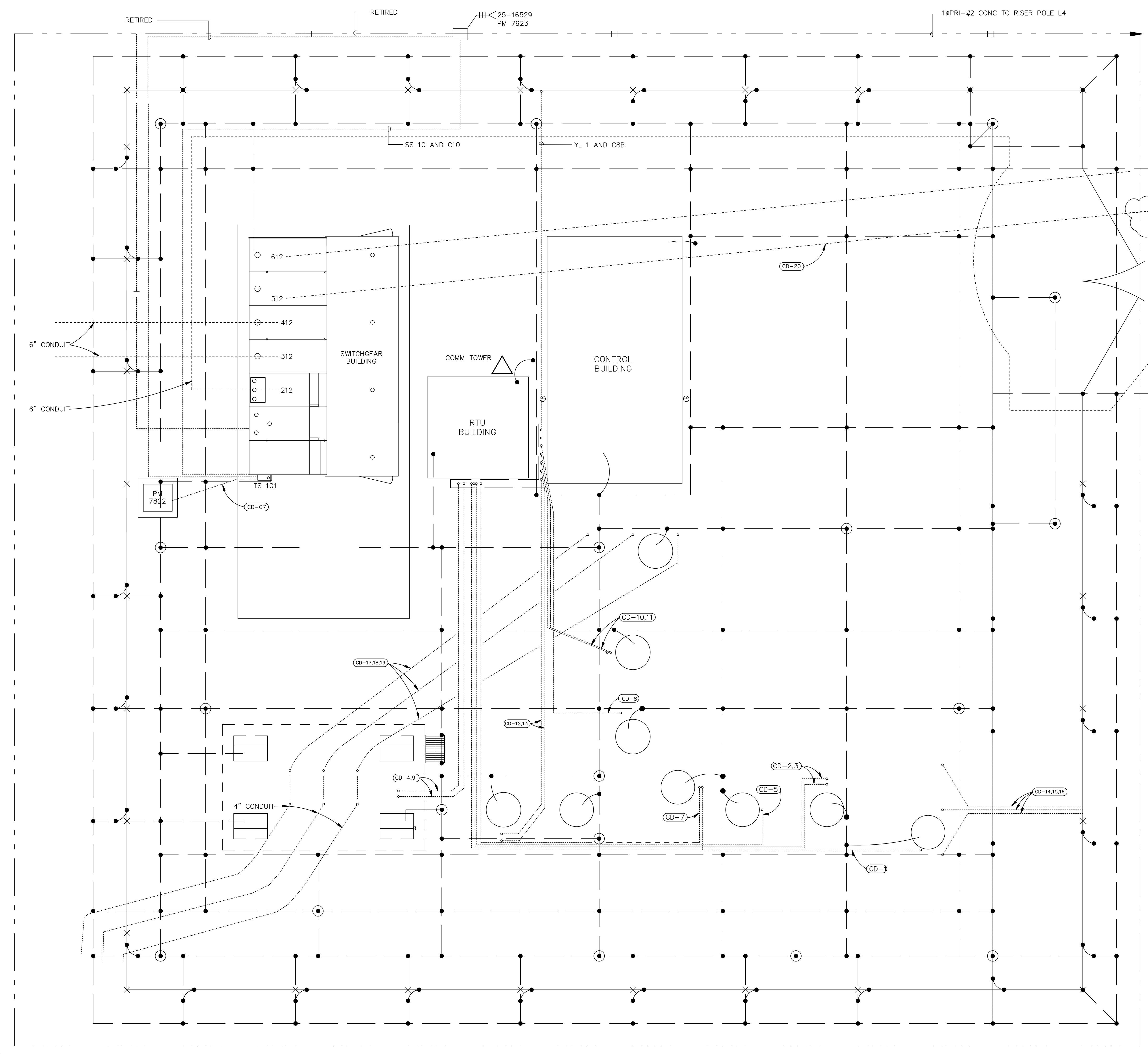


TYPICAL CONDUIT INSTALLATION  
N.T.S.

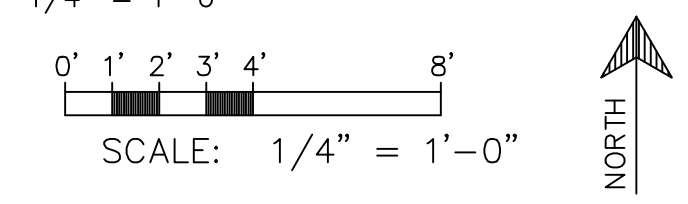


TRANSFORMER GROUNDING DETAILS  
N.T.S.

- LEGEND**
- x — FENCE
  - 3/4" x 10' COPPER GROUND ROD
  - EXOTHERMIC CONNECTION
  - #2/0 COPPER CABLE, GROUNDING CONDUCTOR LEADS
  - #4/0 COPPER CABLE
  - - - CONDUIT
  - - - CONDUIT (NEW)



GROUND GRID & CONDUIT PLAN  
1/4" = 1'-0"



**MATERIAL LIST**

ITEM	DESCRIPTION	CATALOG NUMBER	QUANTITY	CEA CAT #
65	PRIMARY TERMINATION	3M - MMS641	1	4767
66	SIMPLEX DUCT	TYCO - JM-SIM-21S136SG	1	12320
68	SUM1 XFMR PAD	N/A	1	3742
69	#1 XFMR 7.4/12.4 TO 120/240	N/A	1	4907
70	TRANSFER SWITCH	SQR D - DTU-224-NRB	1	N/A

**CONDUIT SCHEDULE**

NUMBER	DESCRIPTION	FROM	TO	CABLE NUMBER
1	1" RGS	A# PT	BUS PT J-BOX	
2	2" RGS	CTRL BLDG	CS 3406	
3	2" RGS	CTRL BLDG	CS 3406	
4	1" RGS	CTRL BLDG	A# PT	
5	1" RGS	CTRL BLDG	E CT J-BOX	
C5	RETIRED			
C6	RETIRED			
C7	2" RGS	PM 7822	TS 101	SS 8
7	2" RGS	CTRL BLDG	BUS PT J-BOX	
8	1" RGS	CTRL BLDG	N CT J-BOX	
C8A	1" RGS	CTRL BLDG	GROUND GRID	GG1
C8B	1" RGS	CTRL BLDG	YARD LIGHT	YL 1
C10	2" PVC	PM 7923	TS 101	SS 10
9	1" RGS	CTRL BLDG	W CT J-BOX	
10	2" RGS	CTRL BLDG	CS 3407	
11	2" RGS	CTRL BLDG	CS 3407	
12	2" RGS	CTRL BLDG	CS 3405	
13	2" RGS	CTRL BLDG	CS 3405	
14,15,16	6" PVC	EAST RISER	10' OUTSIDE FENCE	
17,18,19	6" PVC	NORTH RISER	INCOMING STRUCTURE	
20	6" PVC	RRKR-542	OUTSIDE FENCE	FDR BFSS-512
20A	6" HOPE	OUTSIDE FENCE	SC 1139	

PROJECT: **BONIFACE SUBSTATION 512 FEEDER GETAWAY REPLACEMENT**  
 ENG./DESIGN.: **STACEY BOTTORFF - CEA/MATTHEW WILLIAMS - EPS W.O. # E2020057**

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR CONSTRUCTION	DRK/08-12-22	MSW/08-12-22	

NO.	RECORD REVISION	TECH./DWN. BY	W.P.#	W.O. APPROVED	RECORD APPROVED	DATE
0	ISSUED FOR CONSTRUCTION - DPS				DCR	6/14/90
1	ADDED CONDUIT - DWB				DCR	6/18/90
2	ASBUILT - DCR				DCR	3/25/91
3	ASBUILT FENCE				BJH	11/91
4	NEW STATION SERVICE - CVA				BJH	5/19/92
5	ASBUILT 34.5kV U.G. CABLE TO UNIVERSITY	PFD/LP	0300.257EN	PFD		9/15/95
6	ASBUILT - ALTERNATE STATION SERVICE	JS/JG		E0712826		12/27/07
7	ENCLOSURE REPLACEMENT	CV/MS		H0812512		09/22/11



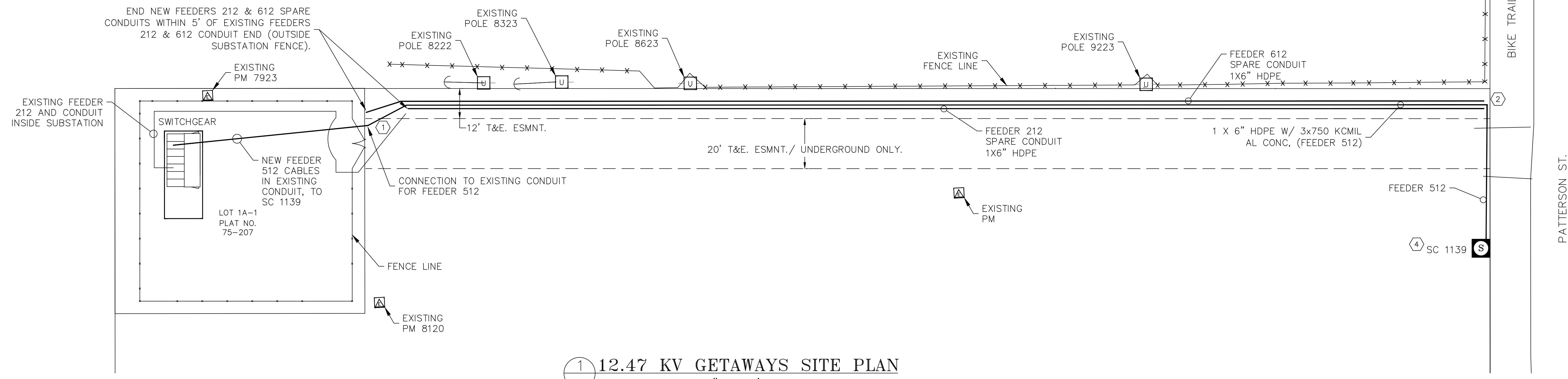
Chugach Electric Association, Inc.  
 5601 Electron Drive - P.O. Box 196300  
 Anchorage, Alaska 99519-6300

DRAWING NAME: **BONIFACE GROUND GRID AND CONDUIT PLAN**

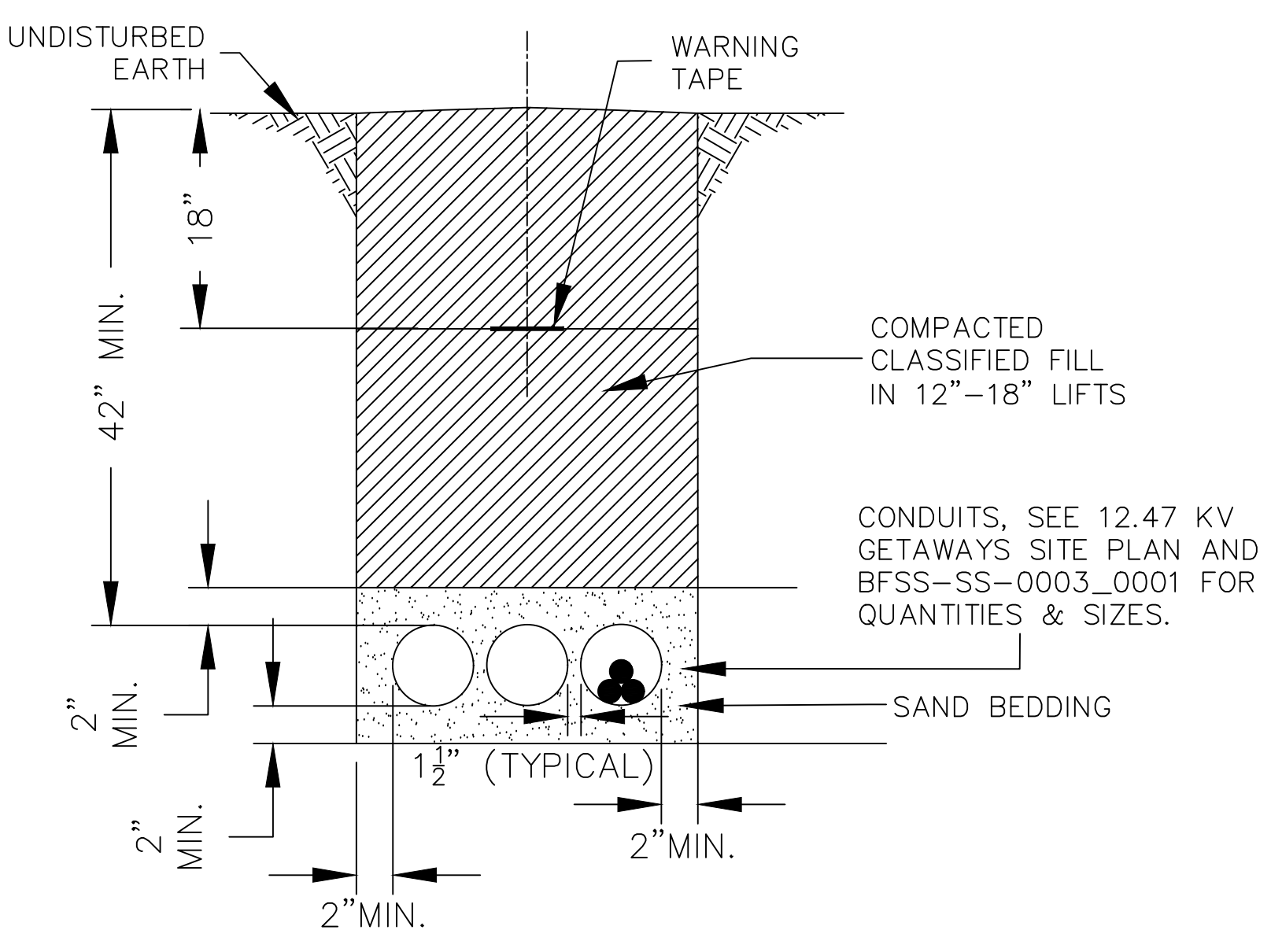
DRAWING NO.: **BFSS-SS-0003**

SHEET **0001** OF **0001**

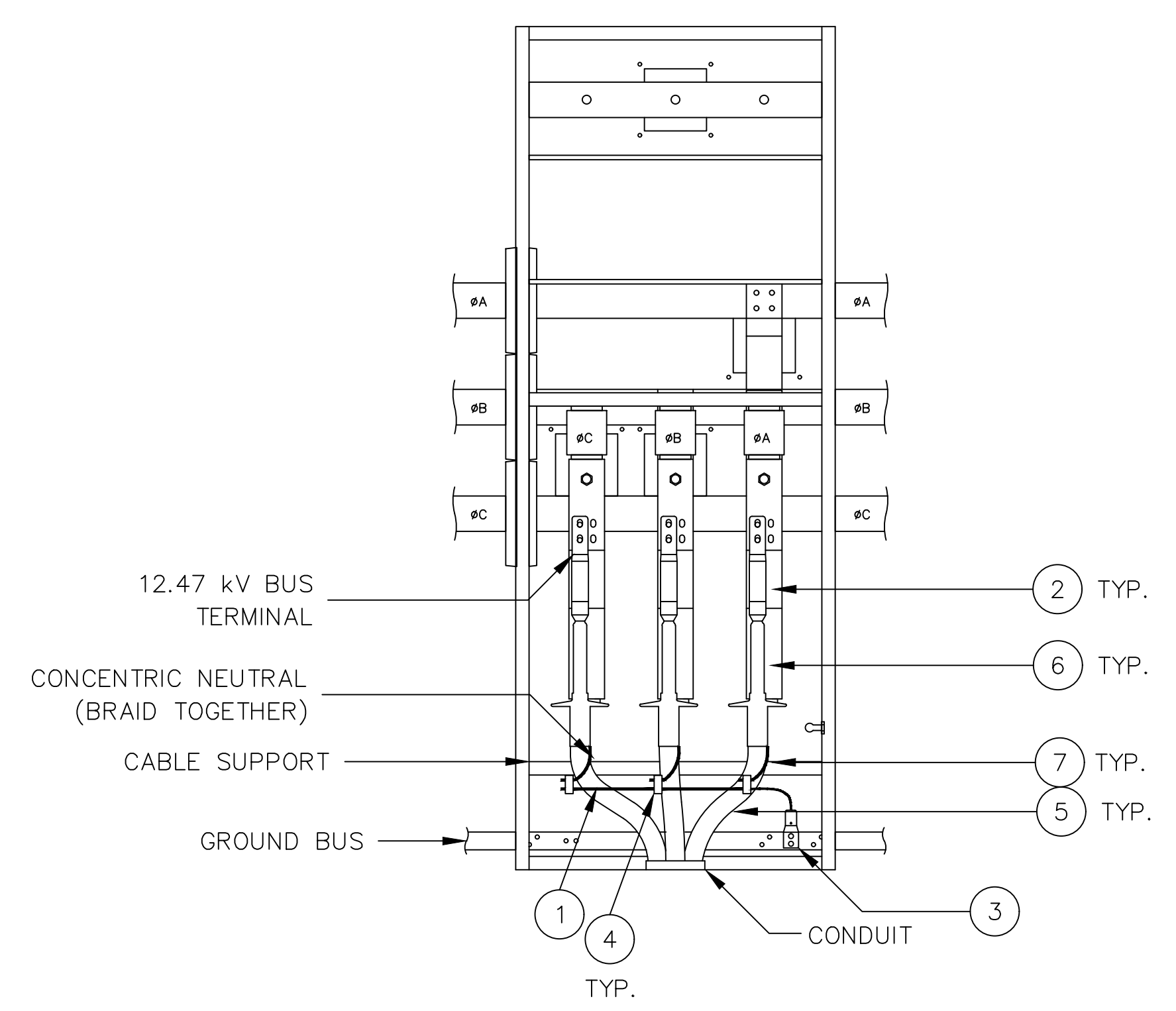
DATE: **09/22/11**



1 12.47 KV GETAWAYS SITE PLAN  
1" = 20'



2 TRENCH DETAIL LOCATIONS  
N.T.S.



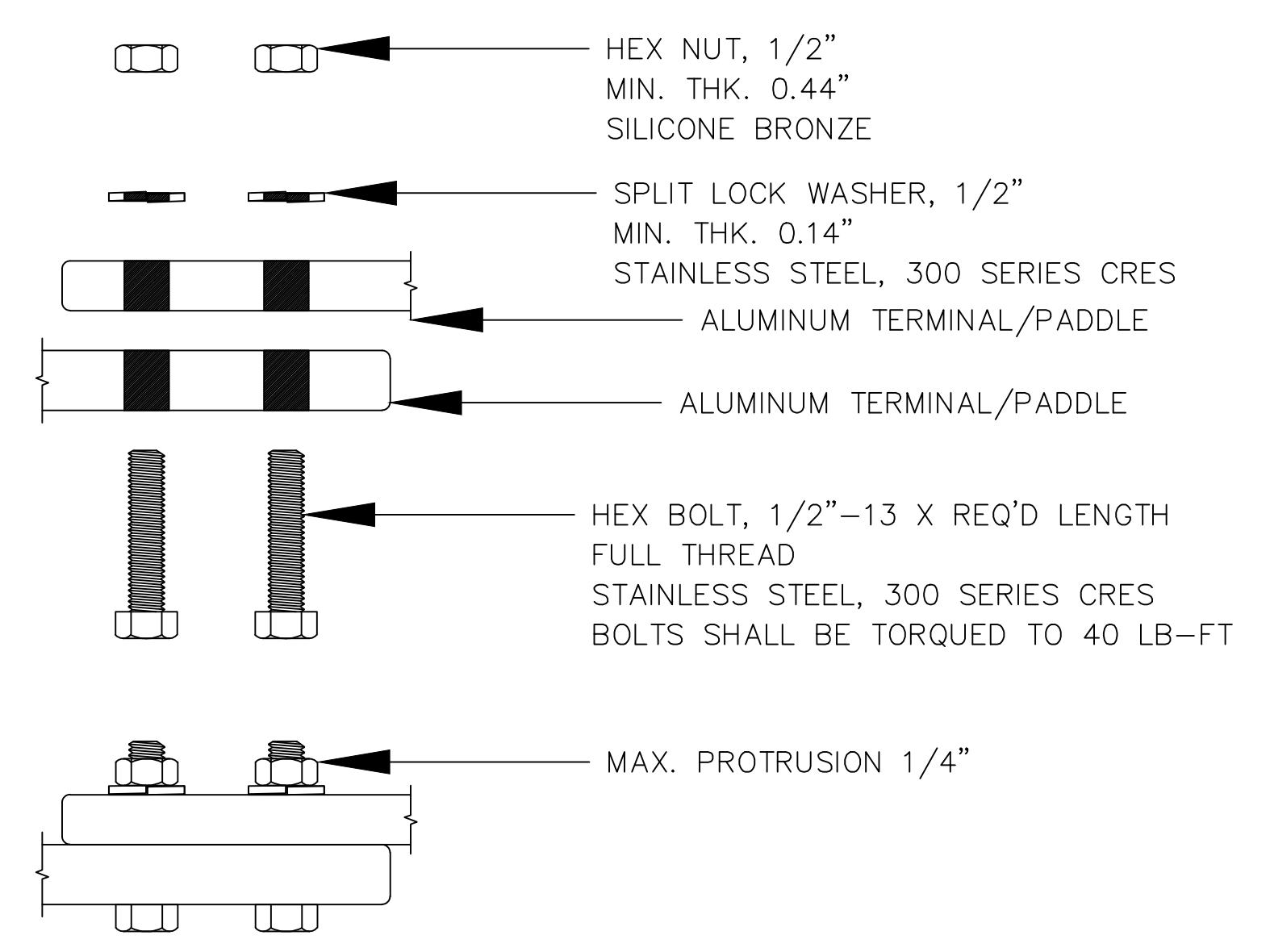
3 12.47 kV SWITCHGEAR FEEDER BREAKER CABLE ENTRY  
(TYPICAL)  
N.T.S.

BILL OF MATERIAL					
REF. NO.	UNIT	ESTIMATED QUANTITY	DESCRIPTION	MANUFACTURER/CATALOG NUMBER	FURNISHED BY
1	LF	15	4/0 STRANDED BARE COPPER	CEA CAT ID#: 378	O
2	EA	3	TERMINAL, 3" WIDE, 2-HOLE, OFFSET, 750 KCMIL, TINNED	CEA CAT ID#: 1515	O
3	EA	1	SWAGED TERMINAL 4/0 - 2 HOLE PAD, TINNED	CEA CAT ID#: 1513	O
4	EA	3	HYTAP CONNECTOR, "C", 4/0 - 3/0 (FOR 750 KCMIL NEUTRAL - SINGLE CKT)	BURNDY/YGHC29C29 (OAE)	C
5	LF	1905	15 kV CABLE ALUMINUM, EPR, 1/3 NEUTRAL, 133% INSULATION, 750 KCMIL	CEA CAT ID#: 346	O
6	EA	3	15 kV MEDIUM VOLTAGE TERMINATION, 750 KCMIL	CEA CAT ID#: 4773	O
7	EA	6	CABLE TAGGING ASSEMBLY, PRIMARY	CEA STAG-2	C
8	LOT	1	HEX BOLT/SPLIT WASHER STAINLESS STEEL (300 SERIES CRES), HEX NUTS SILICONE BRONZE, FOR ALUMINUM TO ALUMINUM CONNECTIONS, SIZE AS REQ'D.	COMMODITY	C
9	LF	1525	6" HDPE CONDUIT	CEA CAT ID#: 11888	O
10	EA	2	6" FIBER GLASS 30" ELBOW, 60" R	CEA CAT ID#: 15050	O
11	EA	1	6" FIBER GLASS 90" ELBOW, 48" R	CEA CAT ID#: 4172	O

C = CONTRACTOR, O = OWNER.

NOTES:

- 1 SPLICE NEW FEEDER BFSS 512 GETAWAY HDPE CONDUIT ONTO EXISTING SUBSTATION GETAWAY PVC CONDUIT WHICH ENDS APPROXIMATELY 5' OUTSIDE OF SUBSTATION FENCE. HAND DIG WITHIN 10' OF SUBSTATION FENCE TO AVOID DAMAGE TO EXISTING SUBSTATION GROUND GRID, AND HAND DIG WITHIN 3' OF EXISTING GETAWAY CIRCUITS, RETIRE EXISTING GETAWAY CONDUCTORS WITHIN THE SUBSTATION CONDUITS, ABANDON REMAINDER OF DIRECT BURIED GETAWAY CONDUCTORS IN PLACE. INSTALL NEW GETAWAY FEEDER CONDUCTORS (750 KCMIL AL, EPR, 1/3 NEUTRAL, 133% INSULATION) FOR FEEDER 512 BETWEEN SWITCHGEAR AND SC 1139. SEE DRAWING BFSS-SS-0003/1 FOR EXISTING CONDUIT PLAN WITHIN SUBSTATION AND CONDUIT SCHEDULES.
- 2 INSTALL SPARE CONDUITS FOR FEEDERS 212 & 612 TO THE PATTERSON STREET ROW LINE AND INSTALL LOCATOR DISCS FOR EACH OF THEM.
- 3 THE NEW UG FEEDER CONDUITS RUNNING FROM BONIFACE SUBSTATION TO PATTERSON ROAD WILL BE IN A COMMON TRENCH ON THE NORTH SIDE OF THE ACCESS ROAD. THIS GRAPHICAL DEPICTION IS FOR CLARITY ONLY.
- 4 SC 1139 INSTALLED UNDER DISTRIBUTION WO E1813854.



4 TYPICAL DMC BUSWORK ELECTRICAL CONNECTION  
N.T.S.  
FASTENER HARDWARE IS INCLUDED IN BILL OF MATERIAL ITEM (8)

NO.	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	BFSS-SS-0003/1	GROUND GRID AND CONDUIT PLAN

PROJECT: BONIFACE SUBSTATION 512 FEEDER GETAWAY REPLACEMENT			
ENG./DESIGN.: STACEY BOTTORFF - CEA/MATTHEW WILLIAMS - EPS W.O. # E2020057			
NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE
0	ISSUED FOR CONSTRUCTION	DRK/08-12-22	MSW/08-12-22

NO.	RECORD REVISION	CAD DRAWN BY	W.P.#	W.O. NUMBER	RECORD APPROVED	DATE



Chugach Electric Association, Inc.  
5601 Electron Drive - P.O. Box 196300  
Anchorage, Alaska 99519-6300

DRAWING NAME: BONIFACE SUBSTATION SITE & STRUCTURAL 12.47KV GETAWAYS SITE PLAN AND DETAILS

**CONFIDENTIAL**

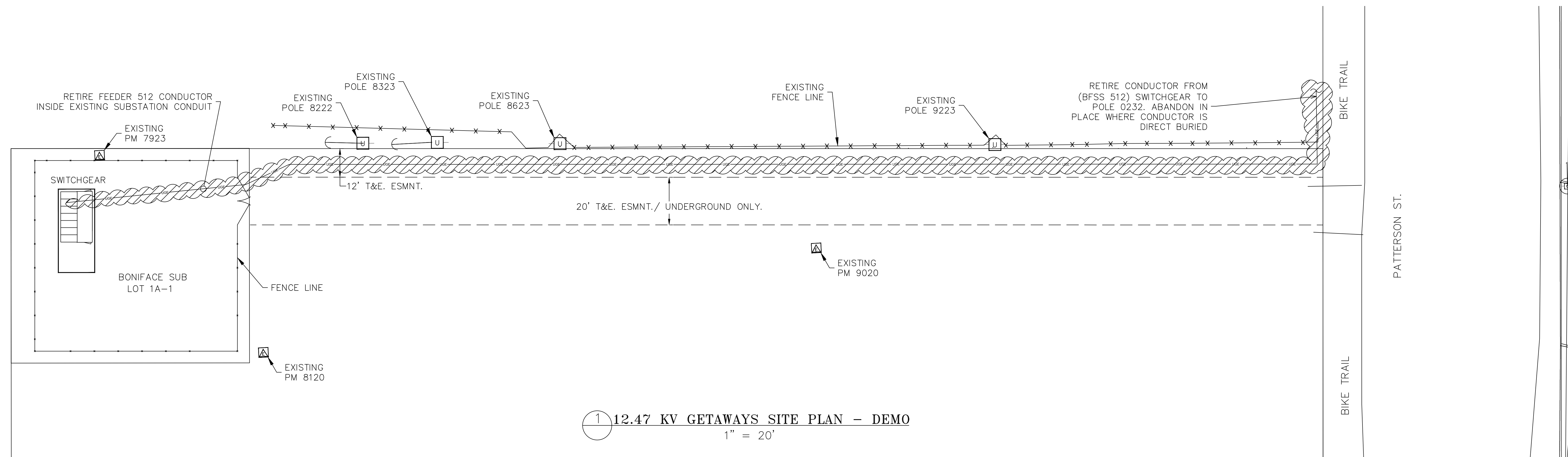
DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO.: BFSS-SS-0015

SHEET 0001 OF 1

PAGE /

BFSS-SS-0015\_0001\_0.DWG

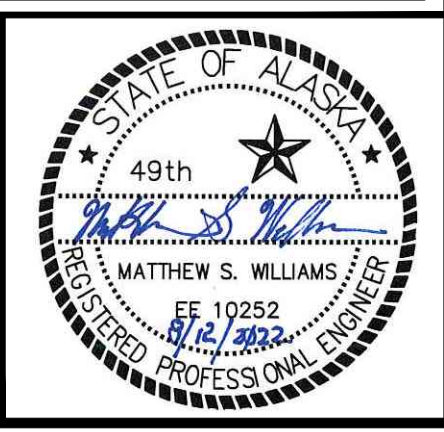


1 12.47 KV GETAWAYS SITE PLAN - DEMO  
1" = 20'

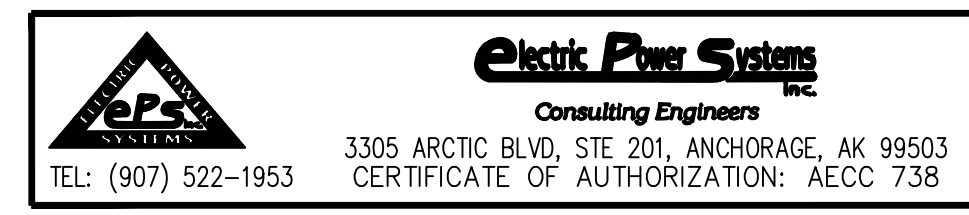
DEMOLITION

NO.	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	BFSS-SS-0015/1	SITE AND STRUCTURAL 12.47KV GETAWAYS SITE PLAN AND DETAILS
2	BFSS-SS-0003/1	GROUND GRID AND CONDUIT PLAN

PROJECT: <b>BONIFACE SUBSTATION 512 FEEDER GETAWAY REPLACEMENT</b>				
ENG./DESIGN.: <b>STACEY BOTTORFF - CEA/MATHEW WILLIAMS - EPS W.O. # E2020057</b>				
NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR CONSTRUCTION	DRK/08-12-22	MSW/08-12-22	



NO.	RECORD REVISION	CAD DRAWN BY	W.P.#	W.O. NUMBER	RECORD APPROVED	DATE



Chugach Electric Association, Inc.  
5601 Electron Drive - P.O. Box 196300  
Anchorage, Alaska 99519-6300

DRAWING NAME:		<b>BONIFACE SUBSTATION SITE &amp; STRUCTURAL 12.47KV FEEDER 512 GETAWAY DEMO</b>	
<b>CONFIDENTIAL</b>		BFSS-SS-0015_0001_0.DWG	
DRAWING NO. - PREVIOUS/REFERENCE			
DRAWING NO.:		<b>BFSS-SS-7015</b>	
SHEET 0001 OF 1		PAGE 1 / 1	





# CAD DRAWING STANDARD

CAD/GIS SERVICES

**REVISION: 7/17/18**

**Primary Editor:  
Gayle Christensen ACP, ACU**

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## I) BEGINNING A NEW DRAWING

### *Chugach Electric Prototype Drawing*

An AutoCAD prototype drawing can be provided by CAD/GIS Services and is to be used when beginning a new drawing for all departments and all consulting firms.

The provided Prototype drawing will contain standard Chugach Electric (Chugach) layers, line types, colors, blocks, settings, etc. When work is delivered to Chugach, the CAD drawing file, X-References, images, excel files, blocks and .ctb plot style files shall be included in the drawing package delivered to Chugach (if applicable, X-References shall be bound). The mask portion of any text masking shall be on its own layer, color yellow. **No yellow shall be used in the drawing with the exception of masking.** Model Space scale is 1:1 and the Title Block shall reside on the Layout tab when appropriate.

## II) DRAWING SETUP

The following are the standard defaults, unless otherwise defined within the prototype drawing:

### *A. Layers*

BLOCK	GREEN, CONTINUOUS, ALL BLOCKS
CONDUCTOR	BLUE, CONTINUOUS, 0.35 LINEWEIGHT
DIM	BLUE, DIM. LINES & LEADERS
DWG-GRID	GRAY #9, HIDDEN2, DEFAULT LINEWEIGHT
DWG-GRID TIC MARKS	RED, CONTINUOUS, DEFAULT LINEWEIGHT
GROUND LINE	RED, CONTINUOUS, 0.35 LINEWEIGHT
MASKING	YELLOW, ALL MASKING SEPARATE LAYER FROM TEXT
POLES	RED, CONTINUOUS, 0.35 LINEWEIGHT
POLE NUMBER TEXT	BLACK/WHITE
REV CLOUD PREVIOUS	BLUE, CONTINUOUS, CLOUD
REV CLOUD CURRENT	PURPLE, CONTINUOUS, CLOUD
REV NUMBER PREVIOUS	RED, CONTINUOUS, REV TRIANGLE
REV NUMBER CURRENT	RED, CONTINUOUS, REV TRIANGLE
TBLOCK	BLUE, TITLE BLOCK
TBLOCK TEXT	BLACK/WHITE
TEXT	BLACK/WHITE, NOTES, ALL OTHER TEXT & TEXT WITH LEADER LINES
VIEWPORT	COLOR 201, CONTINUOUS
AC	BLUE, CONTINUOUS, ALL AC CIRCUITS
CT	CYAN, CONTINUOUS, ALL CT CIRCUITS
DC	RED, CONTINUOUS, ALL DC CIRCUITS
PRIMARY	BLACK, 0.015" CONTINUOUS, ALL PRIMARY CIRCUITS & BUS

**B. Line Types**

<b>Name</b>	<b>Description</b>	<b>Color</b>	<b>Line type</b>
CONT	CONTINUOUS	RED	CONTINUOUS
CONT-THK	.015 WIDE CONTINUOUS	WHITE	PLINE
HIDDEN	A,0.1,-0.15	CYAN	HIDDEN
DASH	,0.5,-0.15	CYAN	DASHED
CENTER	A,0.6,-0.1,0.1,-0.1	CYAN	CENTER
PHANTOM	A,0.5,-0.1,0.15,-0.1,0.15,-0.1	MAGENTA	PHANTOM
BLOCK	CONTINUOUS	GREEN	CONTINUOUS
AC	CONTINUOUS	BLUE	CONTINUOUS
CT	CONTINUOUS	CYAN	CONTINUOUS
DC	CONTINUOUS	RED	CONTINUOUS
PRIMARY	.015 WIDE CONTINUOUS	WHITE	CONTINUOUS
PT	.015 WIDE CONTINUOUS	MAGENTA	CONTINUOUS
TEXT	CONTINUOUS	WHITE	CONTINUOUS
DIM	CONTINUOUS	BLUE	CONTINUOUS
TBLOCK	CONTINUOUS	BLUE	CONTINUOUS
REV	.015 WIDE CONTINUOUS	BLUE	CONTINUOUS

**Dimension Variables (DIM VARS)**

DIMASO	ON
DIMASZ	0.140
DIMCLRD	BLUE
DIMCLRE	BLUE
DIMCLRT	WHITE
DIMEXE	0.062
DIMEXO	0.062
DIMSCALE	1 = 1
DIMTEXT	0.1
DIMTXSTY	= SIMPLEX

**Unit of Measurement**

Units of Measure	Type = Decimal, Precision = 0.0000
Decimal Degrees	Type = Decimal Degrees, Precision = 0
Direction for East	East 3 o'clock = 0
Drawing Units	Inches

**Text**

All text	Upper case unless noted otherwise.
Primary headings	Romant, 0.187; White
Subheadings	Simplex, 0.125; White
The word "NOTES:"	Simplex,.125; White
Remainder of text or notes	Simplex, 0.10; White
Masking portion of all text on its own layer	Color Yellow

**Blocks**

1. Create all blocks on layer 0, at a scale of 1 to 1. All blocks shall be inserted on the layer named "BLOCK".
2. A set of blocks will be provided by Chugach.

*\*\*All contractor created blocks shall be furnished to Chugach.*

**Spatial Standards**

Drawings that are showing field facilities shall comply with the "CAD/GIS Spatial Data Standards" as appropriate. The minimum acceptable standard for a CAD drawing is incorporated below in AutoCAD. This coordinate standard can be assigned using the "AK83-4F" code:

**Datum and Coordinate System**

Name: NAD 1983 Alaska State Plane Zone 4 FIPS (Federal Information Processing Standards) 5004 (US Survey Feet)

Select "AK83-4F" from the Coordinate System Ribbon using the Assign button.

Please refer to the Survey Section of the "CAD /GIS Spatial Data Standards" for best practice when utilizing locations that can be surveyed.

**III) ENDING A DRAWING****A. Ending Parameters**

All drawings provided to Chugach shall be ended with the following parameters saved:

1. Purge all un-needed items.
2. Verify all x-refs and images are bound or included in package.
3. Before ending the drawing 'ZOOM EXTENTS'.
4. Text Style set to SIMPLEX.
5. Set plotter configuration to "NONE".
6. Send Plot Style (.ctb file) with package.

## IV) USE OF EXISTING AUTOCAD RECORD DRAWINGS WITHIN PROJECTS

Chugach currently uses AutoCAD Map 3D 2017. Chugach will not be responsible to provide existing AutoCAD drawings in a release newer than AutoCAD Map 3D 2017. Chugach will accept drawings in formats that can be opened and saved in AutoCAD Map 3D 2017.

## V) USE OF EXISTING RASTERIZED RECORD DRAWINGS WITHIN PROJECTS

Existing rasterized record drawings are in CALS Group IV format with a .gp4 file extension. Edits to these drawings are to be made with AutoCAD using AutoCAD Map Raster Design 2012. All standards within this document, which can be used with raster files, shall be applied.

When the edit results in two files, keep both files (one file has the edits in vector format and the second file is the remaining raster portion of the original drawing as a hybrid file). Chugach will decide whether to redraw the remaining raster portion after a project is “as-built”.

## VI) CHANGES TO THE DRAWINGS

See Attachment A for an example of where information from sections VI A-D is to be provided.

### A. Design/Construction/As Built Revisions

1. The bottom left corner of the drawing has a “Revision” area. This revision area is used during DESIGN, CONSTRUCTION, and AS BUILT process only. When changes are made to the drawing during the DESIGN phase, capitalized alpha revisions are entered into the revision area, (see Table 1).

Table 1

NO.	DESIGN/CONSTRUCTION/AS BUILT REVISION	DWN. BY/DATE	REVIEWED MGR/SUPV/DATE	APPROVED DIRECTOR/DATE
A	PRELIMINARY DESIGN - TO ADD 75 MVA XFMR	D&L/3-3-12	RF/3-3-12	JDS/3-3-12
B	FINAL DESIGN	D&L/4-2-12	SW/4-9-12	JDS/4-10-12
C	IN-HOUSE REVIEW	SW/5-1-12	SW/5-4-12	JDS/5-5-12

2. Editing of a markup drawing being passed back and forth between the edit originator and a Chugach CAD/GIS Operator does not constitute a new revision in the revision block. The date above the drawing title block (far right corner) shall be updated each time an edited drawing is plotted and passed from the Chugach CAD/GIS Operator back to the edit originator.

3. When the DESIGN has been approved for bidding/construction, all alpha revisions are removed. Revision 0 ISSUED FOR CONSTRUCTION is placed in the revision area. Any addendums shall be numbered 0-1, 0-2, etc., with the addendum number and a brief description in the comments area. Any change orders shall be continued in consecutive order 0-3, 0-4, etc., with the change order number and a brief description in the comments area. "As built" by various entities shall also follow numerically in sequence, 0-5, 0-6, etc. with a description of the entity and/or extent of the As Built (see Table 2).

Table 2

NO.	DESIGN/CONSTRUCTION/AS BUILT REVISION	DWN. BY/DATE	REVIEWED MGR/SUPV/DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR CONSTRUCTION	PA/5-12-11	SW/5-15-11	JDS/5-16-11
0-1	ADDENDUM #1	RF/6-1-12	SW/6-3-12	JDS/6-5-12
0-2	CHANGE PER ICOR #444	GC/7-15-12	RF/7/16/12	JDS/7-16-12
0-3	CHANGE PER ICOR #446	GC/8-1-12	RF/8-4-12	JDS/8/10/12
0-4	AS BUILT BY CONSTRUCTION CONTRACTOR	D&L/9-15-12	SW/9-20-12	JDS/9-20-12
0-5	AS BUILT BY ARELAY SHOP≅	TH/10-15-12	RF/10-30-12	JDS/11/1/12
0-6	AS BUILT BY AOPS≅	GH/12-1-12	AL/12-15-12	JDS/12/15/12

4. If there is a handwritten signature or initials in the various columns of the revision block on the marked up original, the drafter shall add them to the electronic file, i.e. the name or initials and the date.
5. **SIGNED AND DATED CERTIFICATION STAMP:** If a signed and dated certification stamp is placed on the drawing, a note that describes the certification shall be added to the notes area within the body of the drawing above the Design Revision area if possible. Examples: A.) Design certified for construction by (first name, middle initial, last name), (license number), (firm worked for), (date on stamp). B.) Design certified for mfg./fabrication by first name, middle initial, last name), (license number), (firm worked for), (date on stamp). C.) "As-built" certified by first name, middle initial, last name), (license number), (firm worked for), (date on stamp). When the construction and as-built phases are complete ONLY the Certification notes from a PE will remain on the drawing and all others will be removed.
6. When the CONSTRUCTION and AS-BUILT phases are complete, **all** revisions are deleted from the bottom left revision area and a summary revision shall be placed in the "Record Revision" area (see table 3, rev. 3).

## B. Record Revisions

1. All record drawing revisions shall be entered under 'Record Revision' in the title block. All new revisions will be entered in numerical sequence starting at the top and working down through all revision lines, (see Table 3).

- The Project Engineer will submit signed "AS-BUILT" drawings for Record Revision. Typically, the Project Description will be used as the revision description, unless otherwise noted by the Project Engineer. The drafter shall type in the date and name or initials as provided by the Project Engineer in the appropriate areas and add a new revision accordingly, to include a work order number and when available the Work Plan Number.

Table 3

NO.	RECORD REVISION	TECH / DWN. BY	WP#	WO# APPROVED	RECORD APPROVED	DATE
1	AS-BUILT - CONTRACTOR	D&L		E1120378	JDS	04/14/10
2	DRAWN TO CAD - CONTRACTOR	D&L			JDS	09/4/10
3	ADD NEW TRANSFORMER	HP/EK/2-11	1001.345EN	E0920050	SW	03/14/11
4	ADD 2-1 TIME DELAY	MT/LP/8-11		E0920050	SW	09/1/11
5	AB-BUILT PER SHAWN WENDLING	GC		E1120376	SW	1/13/13

- Once the revision block is filled, the oldest revision will be dropped and all revisions moved up to make room for the new revision (Table 4).

Table 4

NO.	RECORD REVISION	TECH/ DWN BY	WP#	W.O. APPROVED	RECORD APPROVED	DATE
2	DRAWN TO CAD - CONTRACTOR	D&L			DG	09/8/01
3	INSTALLED NEW TRANSFORMER	HP/EK/2-18-04	1001.345EN	E0412365	SW	03/4/04
4	INSTALLED 2-1 TIME DELAY	MT/LP/6-18-04		E0412365	SW	09/16/04
5	AS-BUILT PER SHAWN WENDLING	GC			JDS	11/1/04
6	SWEC - GROUND GRID RELOCATED	D&L/7-16-10		E0913412	RF	08/10/10
7	AS -BUILT PER RYAN FREY	GC		E1016222	RF	12/14/10

- The Standard As-built Drawing Colors:

RED	CHANGE
GREEN	DELETE
BLUE	ADD



### C. *Clouds (around revised areas on the drawings)*

1. **New drawings:** When the “AS-BUILT” process is complete and the record revision (revision number 1) block is completed, all cloud layers will be turned off in new Chugach drawings.

2. **Existing record drawings:**

*DESIGN:* The previous record revision cloud layer and triangles with record revision number layer shall be turned off on the drawing at the beginning of the DESIGN phase. During the DESIGN phase all revisions shall be clouded on the drawing with a triangle and corresponding capitalized alpha revision on the correct cloud and revision layer.

*ISSUED FOR CONSTRUCTION:* When a drawing moves to “Issued for Construction” (revision 0), all clouds where changes occurred shall remain visible. All capitalized alpha characters within triangles shall be change to a 0 (zero).

*AS-BUILT:* When the construction is complete and the drawing is as-built, the current latest cloud layer will remain on, the previous cloud layer will be turned off and all the revision number triangles will remain on. There will be two cloud layers and two revision number layers to accommodate the layer on layer off process. See II Drawing Setup, Layers for correct naming and color for clouds and revision numbers.

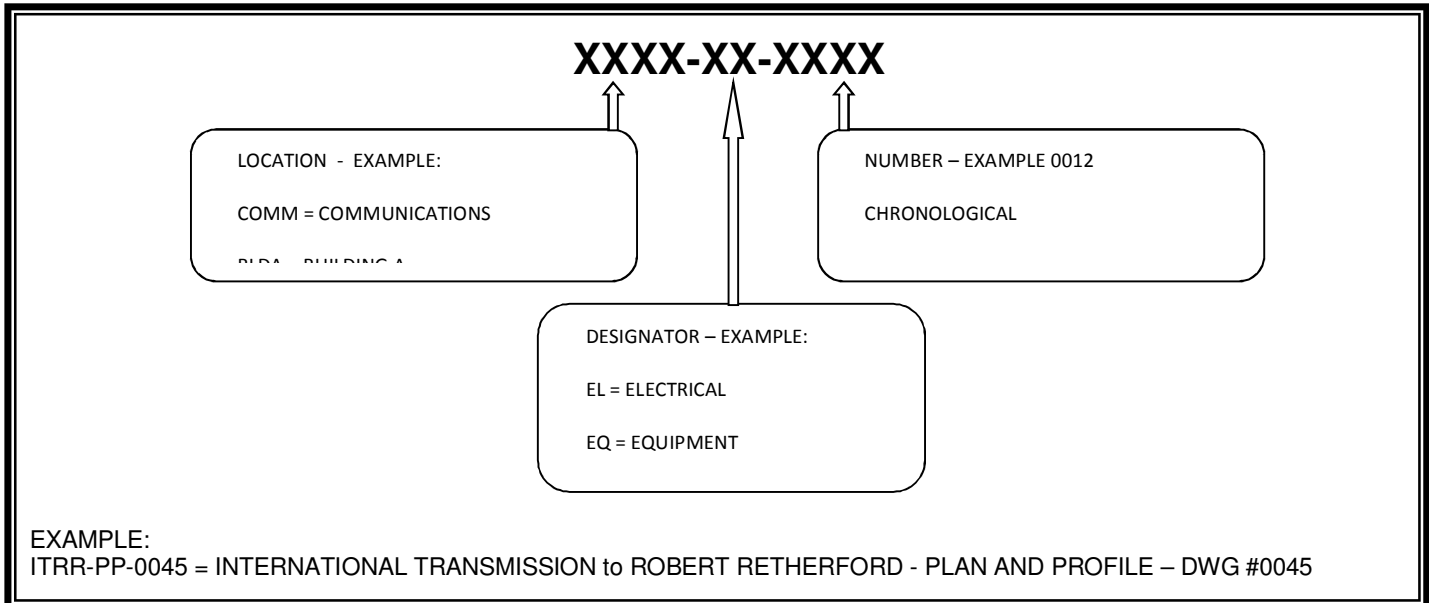
3. When the revision block area of the drawing becomes full, the earliest (top) revision shall be deleted. The triangle and cloud on the drawing which corresponds to that revision shall be removed, (see table 4).

## VII) **SUBMITTING THE FINAL DRAWINGS/PROJECT TO CHUGACH ELECTRIC**

1. Each CAD project shall be submitted in version from AutoCAD Map 3D 2017.
2. Documentation shall be provided listing new layers and blocks created during the project with a brief description of each.
3. An electronic copy shall be provided to Chugach containing the CAD file, all x-references, all images, world files, excel files, blocks and .ctb Plot Styles used and/or created during the project.
4. Projects that use a single electronic CAD file with multiple layout tabs as sheets in the set of drawings shall be limited to those that require match-lines, i.e. transmission line plan and profile sheets. X-referenced drawing shall be used on projects that have separate sheets for various layers within the project; examples would be substations with sheets for the ground grid, foundations, equipment, outlines, conduit, buildings, etc. All X-References shall be bound to the drawing when appropriate and an electronic file containing the X-Reference shall be provided to Chugach.
5. Reference the current version of the U.S. National CAD Standard for Architecture, Engineering, & Construction for any standards not specifically addressed within this document.

## VIII) DRAWING NUMBERING

1. Drawing Numbers shall be issued for **SUBSTATIONS, TRANSMISSION LINES, SUBMARINE CABLES, POWER PLANTS AND HEADQUARTER BUILDINGS** by Chugach CAD/GIS Services Staff via the responsible Chugach Project Engineer using the following format:



2. Chugach's CAD/GIS Services is the **SOLE SOURCE** provider of drawing numbers. There are **NO EXCEPTIONS** to this numbering process. All numbers shall be distributed by Chugach's CAD/GIS Services staff.

## IX) DRAWING NUMBER – PREVIOUS/REFERENCE

The Drawing Number area of the drawing's title block is to be completed for each drawing (see Attachment A). The following choices are available:

1. **New** – Include the word "NEW" and date when the drawing is new.
2. **Previous-Reference - Drawing Number** if the drawing is being re-numbered. Often a manufacture's number, an A/E firm's project numbers, or an old Chugach record drawing number are placed here when the drawing is renumbered per Chugach's standard numbering scheme.

## X) Drawing Title Block Lines 1 to 5

The first three lines of the drawing number in the Title Block are part of the CEA drawing database and must meet the required format. The last two lines describe the contents of the drawing. Chugach CAD/GIS Services Staff can provide the proper information format for the first three lines which are dependent on the type of drawing (Transmission, Substation, Communications, etc.).

DRAWING NAME:		138KV TRANSMISSION LINE GRAVEL JCT - NEW SEWARD HWY JCT PLAN & PROFILE 34.5 KV & 138KV OVERHEAD CIRCUITS	
DRAWING NO. - PREVIOUS/REFERENCE		GJSH-PP-0001_0001	
DRAWING NO. - PREVIOUS/REFERENCE		GJSH-PP-0001_0001	
DRAWING NO.:		GJSH-PP-0001	SHEET 0001 OF 2
		PAGE	/

## XI) Large Project Schema for Meridian Import via Excel Spreadsheet

1. When an AS-BUILT project will result in the need to mass import a large number of CAD drawings, the editing contractor shall request from the Project Engineer an Excel spreadsheet provided by CAD/GIS Services for importing the drawings into Meridian in mass.

## XII) Transmission Drawings General Guidelines

### TRANSMISSION CAD DRAWING GENERAL GUIDELINE

Revision Date: 7/17/18

1. As-built color standard:
  - RED – Add
  - GREEN – Delete
  - BLUE – Note for information / Do not add to drawing
2. No YELLOW on drawing. Yellow cannot be seen using a color printer.
3. Use current CEA Title Block – Request current Title Block and numbers from CAD/GIS Services via your CEA contact.

4. Current CEA CAD version **AutoCAD Map 3D 2017 (Save all drawings to this version)**.
5. Title Block resides in the LAYOUT not Model Space.
6. Verify the CONFIDENTIAL stamp is on Title Block and text follows the guidelines, taking care of spacing, dash marks, periods, etc. as required by our drawing database Meridian.  
Correct example:



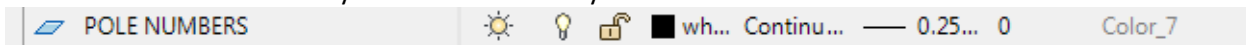
7. ALL TEXT is to be **MTEXT**.  
Any text or text blocks with masking must have the masking portion on its own layer and be color yellow.
8. Use **slash in all dates** (no dash). EXAMPLE 06/29/18
9. Format for adding alphabetical POLE NUMBER code is (MTEXT) and justified correctly:

Example:

**HPPT 44-12** in Model Space  
(AlphaAlphaAlphaAlphaSPACENumberDashNumber)

**STR HPPT 44-2 to HPPT 45-4** on Title Block line

Pole numbers are to be on layer POLE NUMBER layer COLOR White

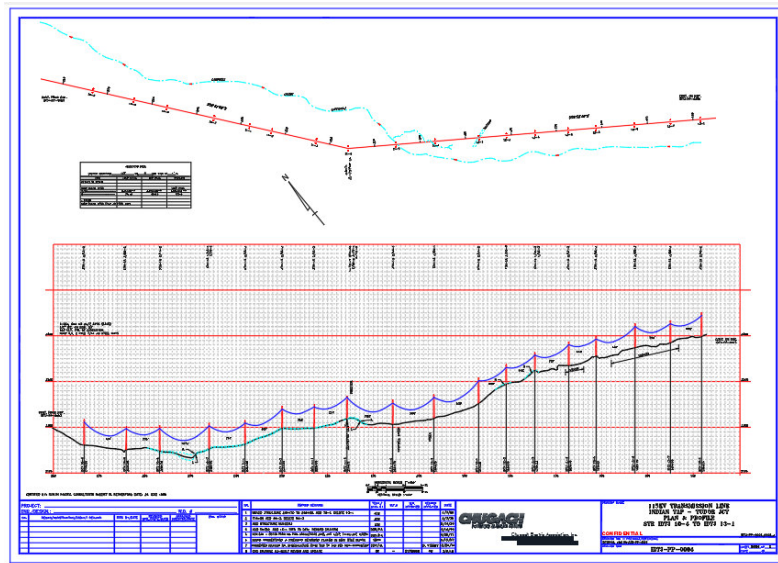


10. Scale Bar and North arrow reside in MODEL SPACE (Insert a scale bar with a reasonable and useable scale length).
11. All elements in MODEL SPACE should be grouped together and 1:1 where applicable.
12. PLAN & PROFILE elements: PLAN is on TOP and the PROFILE is on the BOTTOM.

- If a grid is involved (Example PP drawings) all of the VERTICAL AND HORIZONTAL grid lines should be on the same layer name "GRID" Color Gray9 Linetype HIDDEN2. Use red GRID TIC lines on the outside of the grid and tic marks at the horizontal stations on GRID-TIC layer. One horizontal line to be red at elevation tick mark location. Use GRID-TEXT layer for all grid text. Place structure information justified to the top red line as displayed in the example OR on top of the red line (justified to the red line) as space allows. Put structure code/number and structure station inside the bottom red line at structure station. Add structure number and station to PLAN VIEW (TOP) next to pole symbol (circle). From the centerline of the pole in the GRID, put Station Leader, color white, continuous line to the bottom station line. All text to be MTEXT and justified appropriately.

EXAMPLE:

	GRID					9	HIDDEN2	—	Defa... 0	Color_9
	GRID-TEXT					wh...	Continu...	—	Defa... 0	Color_7
	GRID-TEXT STATIONS					wh...	Continu...	—	Defa... 0	Color_7
	GRID-TIC					red	Continu...	—	Defa... 0	Color_1



- Verify all viewports and/or text in the LAYOUT will plot at the appropriate font size (the same font size of other elements) on the plotted drawing sheet AND use the same font type for similar items in the layout. The layout should look "balanced".

15. Layer Example:

S...	Name	Fre...	O...	L...	Color	Linetype	Lineweig...	Trans...	Plot Style	Plot
	0				wh...	Continu...	— Defa...	0	Color_7	
	ACCESS				192	CENTER2	— Defa...	0	Color_192	
	ALIGNMENT				red	Continu...	— Defa...	0	Color_1	
	CONDUCTOR 1				blue	Continu...	— 0.35...	0	Color_5	
	CONDUCTOR 2				ma...	Continu...	— 0.35...	0	Color_6	
	CONDUCTOR MARKER BALLS				red	Continu...	— 0.00...	0	Color_1	
	CONDUCTOR SPLICE				red	Continu...	— 0.00...	0	Color_1	
	CONT 1				red	Continu...	— Defa...	0	Color_1	
	CONT 2				red	Continu...	— Defa...	0	Color_1	
	DIM				blue	Continu...	— Defa...	0	Color_5	
	FISH_STREAM				cyan	PHANTO...	— Defa...	0	Color_4	
	GRID				9	HIDDEN2	— Defa...	0	Color_9	
	GRID-TEXT				wh...	Continu...	— Defa...	0	Color_7	
	GRID-TEXT STATIONS				wh...	Continu...	— Defa...	0	Color_7	
	GRID-TIC				red	Continu...	— Defa...	0	Color_1	
	GROUND LINE PROFILE				wh...	Continu...	— 0.30...	0	Color_7	
	IMPASS				96	Continu...	— Defa...	0	Color_96	
	NORTH ARROW				wh...	Continu...	— Defa...	0	Color_7	
	POLE LEADER				wh...	Continu...	— 0.30...	0	Color_7	
	POLE NUMBERS				wh...	Continu...	— 0.25...	0	Color_7	
	POLE-STRUCTURE-PROPOSED				red	Continu...	— Defa...	0	Color_1	
	POLE-STRUCTURES				red	Continu...	— 0.50...	0	Color_1	
	ROAD				wh...	CENTER2	— Defa...	0	Color_7	
	ROW				ma...	HIDDEN2	— Defa...	0	Color_6	
	SCALE BAR				wh...	Continu...	— Defa...	0	Color_7	
	SECTION LINE				wh...	Continu...	— Defa...	0	Color_3	
	TB TEXT				wh...	Continu...	— Defa...	0	Color_7	
	TBLOCK				blue	Continu...	— Defa...	0	Color_5	
	TEXT				wh...	Continu...	— Defa...	0	Color_7	
	TEXT BACKSPAN				wh...	Continu...	— Defa...	0	Color_7	
	TEXT PI NUMBER				wh...	Continu...	— Defa...	0	Color_7	
	TEXT-DWG				wh...	Continu...	— Defa...	0	Color_7	
	TOWNSHIP LINE				blue	Continu...	— Defa...	0	Color_5	
	TRAILS				gr...	DASHD...	— Defa...	0	Color_3	
	VIEWPORT				201	Continu...	— Defa...	0	Color_201	
	WETLAND				140	Continu...	— Defa...	0	Color_140	
	WOLOGO				159	Continu...	— Defa...	0	Color_159	

# Attachment A

VI) CHANGES TO THE DRAWING DESIGN/CONSTRUCTION/AS-BUILT REVISION (TABLE 1 & 2)

VI) CHANGES TO THE DRAWING RECORD REVISION (TABLE 3 & 4)

VIII) DRAWING NUMBER (EXAMPLE)

<p>PROJECT: HOPKINS TAP TO PORTAGE TAP ENERGY REPLACEMENT          216, 216-01011, 216-01012 &amp; 216-01013 RECLAIM</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NO.</th> <th>DESCRIPTION</th> <th>DATE</th> <th>BY</th> <th>CHECKED</th> <th>DATE</th> </tr> <tr> <td>1</td> <td>RECLAIM/REUSE OF P&amp;ID 1-10</td> <td>04-23-18</td> <td>JKS-111</td> <td>JKS-111</td> <td></td> </tr> </table>	NO.	DESCRIPTION	DATE	BY	CHECKED	DATE	1	RECLAIM/REUSE OF P&ID 1-10	04-23-18	JKS-111	JKS-111		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> <th>BY</th> <th>CHECKED</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>ONE CHANGE AS-BUILT REVISION</td> <td>05</td> <td></td> <td>CHUGACH</td> <td>04/24/18</td> </tr> </tbody> </table>	NO.	REVISION	DATE	BY	CHECKED	DATE	1	ONE CHANGE AS-BUILT REVISION	05		CHUGACH	04/24/18	<div style="text-align: center;"> <p>Chugach Electric Association, Inc.              2001 Brydon Drive - P.O. Box 78280              Anchorage, Alaska 99507-0280</p> </div> <p style="text-align: right;">115KV/69KV TRANSMISSION LINE          HOPKINS TAP - PORTAGE TAP          PLAN &amp; PROFILE          NEW STRUCTURE SCHEDULE          SEE SHEET 47-6 TO 518 ACFT 65-5</p> <p style="text-align: right;">HPT-EP-001</p>
NO.	DESCRIPTION	DATE	BY	CHECKED	DATE																					
1	RECLAIM/REUSE OF P&ID 1-10	04-23-18	JKS-111	JKS-111																						
NO.	REVISION	DATE	BY	CHECKED	DATE																					
1	ONE CHANGE AS-BUILT REVISION	05		CHUGACH	04/24/18																					

Chugach Electric  
 CAD/GIS Services  
 Gayle Christensen ACP, ACU  
 CAD Specialist  
 907.762.4552  
[gayle\\_christensen@chugachelectric.com](mailto:gayle_christensen@chugachelectric.com)



# CAD / GIS Spatial Data Standards

Last Revision Date: May 21, 2014

**Vision:** *Establish collection standards that affirm GIS as the visualization tool to integrate corporate information assets and facilitate data visualization and analysis.*

Chugach Electric Association, Inc.  
5601 Electron Drive  
P.O. Box 196300  
Anchorage, AK 99519-6300



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# CAD /GIS - Spatial Data Standards

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# CAD /GIS - Spatial Data Standards

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## 1. Introduction

The following document describes the spatial data standards of Chugach Electric Associations, Inc. (Chugach). The intent is to describe the:

- Coordinate System and Map Projection standard for delivered electronic data,
- Format of GPS and electronic survey data delivered in AutoCAD,
- Format of delivered electronic GIS data, project files, maps, and metadata.

This document is a reference guide for Chugach and Contractor employees working on behalf of Chugach; it specifies the standards for CAD/GIS spatial data deliverables. Any deviation from these specifications set forth in this document **MUST BE APPROVED PRIOR TO DATA COLLECTION**. This requirement ensures that the data collected will be viable when it enters Chugach's GIS records. When you request a deviation it enables us to evaluate and update this standards document as necessary. This document is intended to be a "living document" which will be updated as technology changes or as the standards adopted by Chugach change. In either case, we welcome your comments and specific feedback upon the Spatial Data Standards that follow.

# CAD /GIS - Spatial Data Standards

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## 2. Coordinate System, Datum & Map Projection

The standard coordinate system, datum and map projection currently used in Chugach's GIS is Alaska State Plane Zone 4 NAD 83 (2002) also known as the (CORS96) realization.

NOTE: The term 'realization' is the National Geodetic Service's official name for revisions to the NAD83 system; however, 'epoch' is more commonly used in its place throughout the industry with the occasional use of 'revision' and 'datum tag'. Chugach has elected to use the term 'epoch' when referring to NGS realizations.

### a. Map Projection

The map projection that best serves Chugach facilities is Transverse Mercator. The specified coordinate system, datum and map projection is used by all of Chugach's GIS-based Transmission and Distribution Design and Mapping products.

Maps may be delivered to Chugach in other projections, with advance approval by the CAD/GIS manager.

### b. Datum, Coordinate System & Projection Information

Name: NAD 1983 Alaska State Plane Zone 4 FIPS (Federal Information Processing Standards) 5004 (US Survey Feet)

Projection: Transverse\_Mercator

#### i. **Map Projection Parameters**

Projection: Transverse\_Mercator

False\_Easting: 1640416.666667

False\_Northing: 0.000000

Central\_Meridian: -150.000000

Scale\_Factor: 0.999900

Latitude\_Of\_Origin: 54.000000

Linear Unit: Foot\_US (0.304800609601219)

#### ii. **Geographic Coordinate System**

Name: GCS\_North\_American\_1983

Angular Unit: Degree (0.017453292519943295)

Prime Meridian: Greenwich (0.000000000000000000)

#### iii. **Datum**

Name: D\_North\_American\_1983

Spheroid: GRS\_1980

Semimajor Axis: 6378137.000000000000000000

Semiminor Axis: 6356752.314140356100000000

Inverse Flattening: 298.257222101000020000

### c. NAD 27 to NAD 83 Conversion

The State Plane grid coordinates is a mathematical conversion that translates latitude and longitude into a Cartesian (or map) Northing (Y) and Easting (X) coordinate system, and this transformation must maintain the same datum tag (NAD83, NAD27, etc...) as the origin latitude and longitude coordinates. Following the conversion into State Plane (NAD27) a Lat-Long (NAD27) can be converted into State Plane (NAD83), using the NADCON conversion for Alaska.

# CAD /GIS - Spatial Data Standards

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Chugach's original ArcINFO coverages were stored in Alaska State Plane Zone 4 NAD27. These coverages were converted in June 2003 to Alaska State Plane Zone 4 FIPS 5004 (US Survey Feet), NAD83 (CORS96) (2002) using ESRI's ArcToolbox, and the **NAD\_1927\_to\_NAD\_1983\_Alaska** algorithm, to avoid the 400ft errors that the standard NAD\_1927\_to\_NAD\_1983\_NADCON creates. Chugach stores our Spatial Database in an Oracle GeoDatabase. The Municipality of Anchorage's GIS data is also stored in the Alaska State Plane Zone 4 (it is Chugach's understanding that the Datum is NAD83 (CORS96) (2002).

**NOTE: Some State and Federal data may still be stored in the NAD27 Datum. If you utilize NAD27 data it will be necessary to convert your deliverable information into Chugach's standard datum. The NADCON datum conversion algorithm specific for Alaska will be used.**

NADCON is a very common algorithm, which is included in projection software such as ESRI ArcCatalog, Intergraph Projection Manager, Tralaine and others. NADCON works very well for transforming data which spans a large geographic area such as Chugach's distribution and transmission network.

# CAD /GIS - Spatial Data Standards

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## GIS Data Deliverable Standards

The following standard is a guide for delivering GIS data to Chugach. These standards are designed to allow Chugach to easily import GIS data into their Oracle/SDE database.

### d. Data Format

GIS Data delivered to Chugach will be submitted in the currently installed version of ArcGIS in a personal or file geodatabase format. The use of feature datasets is encouraged within the personal or file geodatabase. Requests to deliver data in formats other than personal or file geodatabase must be approved by the GIS manager.

### e. Map Production

All GIS map products shall be completed using the currently installed version of ArcMap. Maps must be delivered to Chugach in MXD format. All data used to create maps must be contained within a personal or file geodatabase and delivered to Chugach. MXD's must be able to locate all data and attached files when transferred to Chugach. Maps must contain the following information:

- Chugach Logo
- All GIS map products shall display the copyright (©) symbol as follows: Copyright Chugach Electric Association, Inc. ©
- Chugach Disclaimer –  
“**Chugach** does not warrant the accuracy or completeness of the information contained on this map. The map may not be suitable for user's particular purpose. When accuracy is necessary for any purpose, it is the responsibility of the user to request locates of **Chugach** facilities. This map was produced for Chugach by [insert Engineering/Survey Firm Name].”

### f. Metadata

Complete ESRI metadata in the personal or file geodatabase will be required for each feature dataset or feature class. All fields listed as required in the metadata are to be filled out and detail the data acquisition and transformation processes utilized with the data being submitted to Chugach. In addition to populating, the Description Tab as shown in the sample of FGDC metadata below with the **REQUIRED** sections in bold, (which is important to Chugach long-term; it is vital that the Attributes Tab be populated, as it will allow us to know the meaning of the data represented in a given feature class.

NOTE: If you are editing metadata in ArcCatalog this can be found on the Attribute Tab inside the Entity Attribute Tab. It is imperative that column definitions be input and should include all value defaults and named domains. This information is the most important information for long term maintenance of the collected data being handed over to Chugach.

Identification\_Information:

Citation:

Citation\_Information:

Originator: **REQUIRED: The name of an organization or individual that developed the data set.**

Publication\_Date: **REQUIRED: The date when the data set is published or otherwise made available for release.**

Title:

Geospatial\_Data\_Presentation\_Form: vector digital data

Online\_Linkage:

Description:

Abstract: **REQUIRED: A brief narrative summary of the data set.**

# CAD /GIS - Spatial Data Standards

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Purpose: **REQUIRED: A summary of the intentions with which the data set was developed.**

Time\_Period\_of\_Content:  
Time\_Period\_Information:  
Single\_Date/Time:  
Calendar\_Date: **REQUIRED: The year (and optionally month, or month and day) for which the data set corresponds to the ground.**

Currentness\_Reference: **REQUIRED: The basis on which the time period of content information is determined.**

**Status:**  
Progress: **REQUIRED: The state of the data set.**  
Maintenance\_and\_Update\_Frequency: **REQUIRED: The frequency with which changes and additions are made to the data set after the initial data set is completed.**

Spatial\_Domain:  
Bounding\_Coordinates:  
West\_Bounding\_Coordinate: **REQUIRED: Western-most coordinate of the limit of coverage expressed in longitude.**  
East\_Bounding\_Coordinate: **REQUIRED: Eastern-most coordinate of the limit of coverage expressed in longitude.**  
North\_Bounding\_Coordinate: **REQUIRED: Northern-most coordinate of the limit of coverage expressed in latitude.**  
South\_Bounding\_Coordinate: **REQUIRED: Southern-most coordinate of the limit of coverage expressed in latitude.**

Keywords:  
Theme:  
Theme\_Keyword\_Thesaurus: **REQUIRED: Reference to a formally registered thesaurus or a similar authoritative source of theme keywords.**  
Theme\_Keyword: **REQUIRED: Common-use word or phrase used to describe the subject of the data set.**

Access\_Constraints: **REQUIRED: Restrictions and legal prerequisites for accessing the data set.**  
Use\_Constraints: **REQUIRED: Restrictions and legal prerequisites for using the data set after access is granted.**  
Native\_Data\_Set\_Environment: Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 3; ESRI ArcCatalog 8.2.0.700

Spatial\_Data\_Organization\_Information:  
Direct\_Spatial\_Reference\_Method: Vector

Distribution\_Information:  
Resource\_Description: Downloadable Data

Metadata\_Reference\_Information:  
Metadata\_Date: 20030425  
Metadata\_Contact:  
Contact\_Information:  
Contact\_Organization\_Primary:  
Contact\_Organization: **REQUIRED: The organization responsible for the metadata information.**  
Contact\_Person: **REQUIRED: The person responsible for the metadata information.**  
Contact\_Address:  
Address\_Type: **REQUIRED: The mailing and/or physical address for the organization or individual.**  
City: **REQUIRED: The city of the address.**  
State\_or\_Province: **REQUIRED: The state or province of the address.**  
Postal\_Code: **REQUIRED: The ZIP or other postal code of the address.**  
Contact\_Voice\_Telephone: **REQUIRED: The telephone number by which individuals can speak to the organization or individual.**

Metadata\_Standard\_Name: FGDC Content Standards for Digital Geospatial Metadata  
Metadata\_Standard\_Version: FGDC-STD-001-1998  
Metadata\_Time\_Convention: local time  
Metadata\_Extensions:  
Online\_Linkage: <http://www.esri.com/metadata/esriprof80.html>  
Profile\_Name: ESRI Metadata Profile

# CAD /GIS - Spatial Data Standards

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## 3. Survey (AutoCAD) Deliverable Standards

The following standards are a guide to use when submitting survey data stored in an AutoCAD drawing file.

### a. Format

The AutoCAD format is a (.dwg) file that is no more than two (2) previous platforms release behind the most current version of AutoCAD.

NOTE: A platform release is defined as a change to the .dwg file format and not necessarily the incremental release of updated AutoCAD software.

### b. Block and Data Dictionary

With the submittal of AutoCAD mapping to Chugach, a data dictionary describing the layer naming convention and a copy of blocks used will be required. The data dictionary should list all layers in the drawing and describe what is present on the layer, list all blocks in the file, and include a title or description of the block. If the block is per a certain industry standard (i.e., ANSI, etc.), indicate the standard used. Any inserted blocks or XREF files should be listed in data dictionary.

### c. Projection Information

#### c.1 Horizontal Projection Information

The map projection will be required to be documented for the data set. If a plant (or local) grid is used, tie coordinates to NAD 1983 (2003) (CORS96) epoch Alaska State Plane Zone 4 FIPS 5004 (US Survey Feet) will be required.

#### c.2 Vertical Projection Information

All vertical data shall be based on the most current geoid, unless otherwise specified.

### d. Plant Grid

Chugach also uses a “plant grid” for construction projects. Plant Grid may also be referred to as a construction grid or a local coordinate system. When using the plant grid it will be necessary to establish at a minimum 3 control points at opposite sides of the Plant Grid which have both plant grid coordinates and Alaska State Plane Zone 4 NAD83 (2003) (CORS96) epoch coordinates established. This will allow Chugach to scale and rotate the data used in the plant grid so that it can be incorporated with Chugach’s existing GIS data.

#### d.1 Linear Projects

Linear Projects, such as transmission lines, shall incorporate the requirements noted above in 3.d and shall require an additional control point for every line-mile included in the scope of the project.

### e. Survey Datum

The datum used for survey purposes will be NAD83 (2003) (CORS96) epoch; this level of precision is specified to ensure that the coordinates referenced will be re-creatable when the NGS CORS Multi-Year Solution is implemented, by Chugach.



# CAD /GIS - Spatial Data Standards

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## 4. Conventional and GPS (RTK) Survey Standards

The following standards are a guide to use when using GPS survey techniques on Chugach projects. All surveying must meet the minimum requirements set out in the ASPLS; Standards of Practice for Professional Land Surveyors.

### a. Electronic Data Collection

Chugach recognizes that some of the field data may be electronically collected and printed out on supplemental sheets rather than being written by hand in the field book. If used, these supplemental sheets must be initialed by the Party Chief or GPS Operator, referenced in the field book, kept with the field book, and are considered part of the field book.

### b. Minimum Standards and Limitation of Use for GPS Technology

We require the use of Bureau of Land Management standards as set forth in their publication: Standards for the Positional Accuracy of Cadastral Surveys When Using Global Navigation Satellites Systems (GNSS), February 23, 2009. See Attachment 1.

### c. GPS Deliverables

The following are required:

- Station Observation Logs (and Field Notes for conventional surveying)
- Digital Raw GPS Data (for Trimble that would be a .dat file)
- Copies of all processing reports produced by GPS processing software (like Trimble Geomatics Office and OPUS)
- Survey Report containing the following:
  - Equipment used
  - Methodology used
  - Control used
  - Datum used
  - Issues with the survey

### d. Emerging GPS Technologies

Chugach recognizes the dynamic nature of GPS surveying in the areas of real time positioning, quick ambiguity determination and "on the fly" initializing. Chugach's specifications are not intended to hinder the integration of advancements which may be beneficial, efficient, and accurate to our program, but rather, to guarantee the degree of confidence, reliability, and repeatability for verification that Chugach considers necessary in the performance of Cadastral Surveys.

Chugach encourages the presentation and discussion of these emerging technologies when considered a viable option in the performance of specific projects or portions of projects. In these instances the Chugach GPS standards must guide the formulation of procedures that maintain the degree of confidence, reliability, and repeatability in the final product that Chugach attains in the current standards. These procedures must closely reflect the approach that follows the professional standards and accepted procedures of the established surveying community.