BID PACKAGE FOR:

BELUGA T10 TRANSFORMER REPLACEMENT PROJECT
W.O. E1920053

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Chugach Electric Association, Inc. **Via e-mail**
INVITATION TO BID
September 19-2019

TO: Chugach Electric Association, Inc., 2018-19 Outside Electrical Line Construction Contract

You are invited to submit a Bid for Chugach Work Order E1920053, Beluga T10 Transformer Replacement Project.

In March of 2019, Beluga Substation (BGSS) transformer T10 experienced an internal fault taking it offline. The Beluga T10 Transformer Replacement project will replace the existing transformer T10 and other equipment in the Tyonek bay at BGSS.

The Work will includes retiring BRK 412 - a 138kV Oil Filled Circuit Breaker (OCB), TRF T09 - a 10MVA 138kV/13.8kV Transformer, VCB 816 – a 13.8kV Vacuum Circuit Breaker with a Ruptor Switch / Structure, TRF T10 – a 10 MVA 13.8kV/24.9kV Transformer, associated conduits, and miscellaneous substation bus and connection equipment.
Also included in the Work is the removal of foundations for OCB 412, VCB 816 and transformers T09 & T10.

The Contractor will install a 138kV Gas filled Circuit Breaker (GCB), a three phase 138kV gang operated double end break switch and steel switch support, a 10MVA 138kV/24.9kV Transformer (T10), associated foundations, control and power supply conduits, and miscellaneous substation bus and connection equipment. Also included in the Work is all dirt work required to remove and install foundations.

Included in the project Work is the installation of a secondary oil containment system and miscellaneous vac-truck trenching.

This project is not subject to the union signatory sections of Chugach's Outside or Generation Agreements contained in Exhibit N of the 2016 Outside Electrical Line Construction Contract.

Please base your bids on the following conditions:

- All Contractor bids must be valid until 5:00 pm on November 5, 2019. After that time the Contractor shall have the option of retracting its bid. Projects awarded as late as and including the last day the Contractor's bids are valid are not subject to contractor claim for delay of award.
- Contractor shall begin work within seven (7) calendar days of Notice to Proceed.
- Completion date for this project is December 31, 2019.
- There are no clearing requirements on this project.
- As-built drawings are required.
- A Bid Bond is required.

A bid bond in the amount of 10% of the bid shall be provided with the Bid documents. A certified check made payable to "Chugach Electric Association, Inc." may be substituted for the Bid Bond.

- Written releases of liens are required.

A Pre-Bid Conference is scheduled for 1:30 P.M. Anchorage time, September 24, 2019 at Chugach's Engineering Conference room. In-person Contractor representation attendance at this Pre-Bid Conference is mandatory.

RFB documentation is available on Chugach's website at www.chugachelectric.com, under Inside Chugach, Bid Opportunities tab. Contractors can access the RFB documentation under the "View advertisement and associated documents" button in WO E1920053.

All bids delivered in person or by Fax (907)762-4699 must be received prior to 2:00 P.M. Anchorage time, October 3, 2019, at Chugach's Headquarters Building, first floor Purchasing Office, 5601 Electron Drive, Anchorage, Alaska.

Notice to Proceed shall not be issued until Chugach has received (1) all bonds required by this Invitation to Bid (ITB) in the required amounts and forms and properly executed by the appropriate individuals, (2) a site specific HSE plan, (3) all documentation required in the Bid Documents. The contract time allowed for completion of this contract shall not be extended or suspended by any delay by Contractor in providing these documents necessary for the Notice to Proceed to be issued.

No work shall begin until the successful bidder has been issued a written Notice to Proceed.

A Pre-Construction Conference will be required. Construction progress meetings will be held. Frequency and schedule of Construction progress meetings will be determined based on construction activity.

All work shall be performed in compliance with all applicable local, state and federal ordinances, orders, statutes, rules and regulations.

The Contractor shall furnish all material required for the project that is not indicated on Chugach's Owner furnished Material List. Chugach must approve all Contractor-furnished material prior to installation.

The Contractor shall secure locates and assume responsibility for damage to any and all overhead and underground facilities.

Construction of this project will involve work on or around energized equipment. Outages will not be granted.

Contractor shall take delivery of all available materials within seven (7) days of Notice to Proceed.

Contractor's workmanship shall be warranted for two (2) years following Chugach acceptance of the project completion documentation.

The Contractor will not energize new or existing primary facilities in the absence of Chugach's Site Representative unless advanced written approval is secured from Chugach.

Payment for Contractor work is accomplished through use of a Completed Construction Report through prepared by Chugach's Site Representative and signed off by the Contractor's representative. Total payment is made on actual units completed not on estimated units stated in the bid documents unless otherwise stated in writing. Chugach has no obligation to subsequently reconcile or assist in reconciling the Contractor's billing records.

Chugach reserves the right to define and waive irregularities, to accept or reject any or all proposals/bids, in whole or in part, and to reissue, withdraw or cancel the solicitation/project in its entirety for any reason including its subsequent determination to perform the Work in-house without liability of any type to bidder/proposer, including but not limited to any costs associated with proposal/bid preparations and submittal.

All questions regarding the bid documents are to be directed to Chugach's Project Engineer, Shawn Wendling, via email shawn_wendling@chugachelectric.com. Question shall be submitted no later than 10:00 AM, September 27, 2019.

CHUGACH ELECTRIC ASSOCIATION, INC.

Shawn Wendling, PMP, MSPM
Sr. Manager, PROJECTS

cc: Manager, Distribution Construction
Manager, Administrative Services
W.O. E1920053 File

- End of Invitation to Bid -

Bid Sheet

WORK ORDER NUMBER: E1920053 CONTRACTOR: _____

LOCATION: Beluga T10 Transformer Replacement Project DATE: September 19, 2019

BIDS ARE DUE PRIOR TO 2:00 P.M: October 3, 2019

This bid is submitted subject to the terms of the 2015-2016 Outside Electrical Line Construction Contract between Chugach Electric Association, Inc. and the undersigned for the above project as set out in the Invitation to Bid.

Project Bid Quotation: _____

Quotation Expires: November 5, 2019 5 P.M.

Contractor's Alaska License No.: _____

Insurance Expires: _____

Worker's Compensation: _____

Liability: _____

Automobile: _____

Contractor Sell Rate: _____

Contractor Labor Man-Hours: _____

EXCEPTIONS AND QUALIFICATIONS

Exceptions or qualifications taken by the Bidder to any of the documents furnished with this Invitation to Bid or clarifications to the Proposal shall be stated below and, if none, Bidder shall state "NONE".

_____

_____

SUBCONTRACTORS

The Bidder shall indicate below the Work intended to be subcontracted to others.

_____

_____

By Contractor: _____
Dated: _____

BID ACCEPTED SUBJECT TO TERMS AND CONDITIONS OF THE OUTSIDE ELECTRICAL LINE CONSTRUCTION CONTRACT

By Chugach Electric Association, Inc: _____
Dated: _____

BELUGA TRANSFORMER T-10 REPLACEMENT
BID SCHEDULE SUMMARY
W.O. E1920053

NEW CONSTRUCTION

GROUP A: STRUCTURES	_____
GROUP B: SWITCHING	_____
GROUP C: CIRCUITS AND BUSWORK	_____
GROUP E: CIRCUIT BREAKERS	_____
GROUP F: FOUNDATIONS	_____
GROUP G: TRANSFORMERS	_____
GROUP K: CONDUIT AND CABLE	_____
GROUP M: SITE WORK	_____
GROUP O: GROUNDING	_____
TOTAL NEW CONSTRUCTION	_____

RETIREMENT

GROUP I: RETIREMENT	_____
TOTAL RETIREMENT	_____

MOB / DEMOB

TOTAL MOB / DEMOB	_____
TOTAL BID	_____

BELUGA TRANSFORM[illegible]-10 REPLACEMENT
BID SCHEDULE
W.O. E1920053

BID UNIT	DESCRIPTION	TAKEOFF QTY.	UNIT	UNIT LABOR	UNIT MATERIAL	UNIT LABOR & MATERIAL	EXTENDED COST
GROUP A: STRUCTURES							
A1	STEEL STRUCTURE, TYPE A01 24.9 kV BUS SUPPORT	1	ea.				
A2	STEEL STRUCTURE, TYPE A01 138 kV DISCONNECT SWITCH SUPPORT	1	ea.				
						Total Group A:	
GROUP B: SWITCHING							
B1	DISCONNECT SWITCH, DOUBLE END BREAK, 138 kV	1	ea.				
						Total Group B:	
GROUP C: CIRCUITS AND BUSWORK							
C1	BUSWORK, RIGID AND FLEXIBLE	1	lot				
						Total Group C:	
GROUP E: CIRCUIT BREAKERS							
E1	CIRCUIT BREAKER, 138 kV	1	ea.				
						Total Group E:	
GROUP F: FOUNDATIONS							
F1	FOUNDATION, TYPE F1	1	ea.				
F2	FOUNDATION, TYPE F2	1	ea.				
F3	FOUNDATION, TYPE F3	1	ea.				
F4	FOUNDATION, TYPE F4	2	ea.				
F5	FOUNDATION, TYPE F5	1	ea.				
F6	SECONDARY CONTAINMENT, POWER TRANSFORMER	1	ea.				
						Total Group F:	
GROUP G: TRANSFORMERS							
G1	POWER TRANSFORMER, 138/24.9 kV, 14 MVA	1	ea.				
						Total Group G:	
GROUP K: CONDUIT AND CABLE							
K1	CONDUIT, 2" HDPE	1	lot				
K2	CABLE, POWER and CONTROL, 600V AC & DC	1	lot				
K3	TEMPORARY STATION SERVICE	1	lot				
K4	MANHOUR	120	ea.				
						Total Group K:	

BELUGA TRANSFORMER T-10 REPLACEMENT
BID SCHEDULE
W.O. E1920053

BID UNIT	DESCRIPTION	TAKEOFF QTY.	UNIT	UNIT LABOR	UNIT MATERIAL	UNIT LABOR & MATERIAL	EXTENDED COST
GROUP M: SITE WORK							
M1	GEOTEXTILE FABRIC	1	lot				
M2	CRUSHED ROCK SURFACE COURSE	1	lot				
M3	FINAL GRADE/ CLEANUP	1	lot				
M4	TEMPORARY EROSION AND POLLUTION CONTROL	1	lot				
M5	VAC-TRUCK TRENCH UNIT	175	FT				
						Total Group M:	
GROUP O: GROUNDING							
O1	GROUNDING, SUBSTATION	1	lot				
						Total Group O:	
GROUP I: RETIREMENT							
I-A	RETIREMENT, STEEL STRUCTURE	1	lot				
I-B	RETIREMENT, DISCONNECT SWITCH	1	lot				
I-C	RETIREMENT, RIGID AND FLEXIBLE BUSWORK	1	lot				
I-E	RETIREMENT, POWER CIRCUIT BREAKER	1	ea.				
I-F	RETIREMENT, FOUNDATION	1	lot				
I-G1	RETIREMENT, POWER TRANSFORMER	2	ea.				
I-G2	RETIREMENT, 24.9 kV INSTRUMENT VOLTAGE TRANSFORMER	3	ea.				
I-K3	RETIREMENT, TEMPORARY STATION SERVICE	1	lot				
I-M4	RETIREMENT, TEMPORARY EROSION AND POLLUTION CONTROL	1	lot				
						Total Group I:	
MOB / DEMOB							
MOB	RETIREMENT, 24.9 kV INSTRUMENT VOLTAGE TRANSFORMER	3	ea.				
DEMOB	RETIREMENT, TEMPORARY STATION SERVICE	3	lot				
						Total MOB / DEMOB:	

BID BOND

KNOW ALL MEN BY THESE PRESENT, That we, _____

_____

of _____

_____as Principal, and _____

_____a corporation organized under the laws of _____

_____

_____ and authorized to transact surety business in the State of Alaska, of_____ as Surety, are held and firmly bound unto Chugach Electric Association, Inc., as Obligee in the full and just sum of ($_____) dollars, lawful money of the UNITED STATES, for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal is herewith submitting its proposal for

_____

_____

_____

_____

_____

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

Signed, sealed, and delivered _____, 20___.

WITNESS AS TO PRINCIPAL:

_____

Signature:

_____

Print Name:

_____

Principal

By: _____

Title: _____

_____ (Seal)

Corporate Surety

_____

Business Address

_____

By: _____

Attorney-in-Fact

CONTRACTOR'S BOND **Bond Number: _____**

1. Know all men that we, _____, as Principal, and_____, as Surety, are held and firmly bound unto CHUGACH ELECTRIC ASSOCIATION, INC. (hereinafter "Chugach") and unto all persons, firms and corporations who or which may furnish materials for or perform labor on the Work for the Project known as awarded to Principal by Chugach under the Outside Electrical Line Construction Contract (OELCC) executed by the parties on _____, 20____ and to its successors in the penal amount of _____ dollars ($_____), as hereinafter set forth and for the payment of which sum well and truly to be made, we bind ourselves, our executors, administrators, successors and assigns jointly and severally by these present.

2. The condition of this obligation is such that if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of the OELCC and any Projects thereunder and any amendments thereto, whether such amendments are for additions, decreases, or changes in materials, their quantity, kind of price, labor costs, mileage, routing or any other purpose whatsoever, and whether such amendments are made without notice to the Surety, and shall fully indemnify and hold harmless Chugach from all costs and damages which it shall suffer or incur by reason or any failure so to do, and shall fully reimburse and repay Chugach for all outlay and expense which Chugach shall incur in making good any such failure or performance on the part of the Principal and shall promptly make payment to all persons working on or supplying labor or materials for use in the construction of the Projects hereunder, in respect of such labor or materials furnished and used therein, to the full extent thereof, and in respect of such labor or materials furnished but not so used, the extent of the quantities estimated in the Projects to be required for the construction of the Projects, and shall well and truly reimburse Chugach for any excess in cost of construction of said Projects over the cost of such construction as provided in the Projects, occasioned by a default of the Principal under the Projects, then this obligation shall be null and void but otherwise shall remain in full force effect.

3. It is expressly agreed that this bond shall be deemed automatically and immediately amended, without formal and separate amendments hereto, upon any amendment to this Contract or the Projects hereunder so as to bind the Principal and the Surety to the full and faithful performance of the Projects as so amended provided only that the total amount of all increases in the costs of construction shall not exceed twenty percent (20%) of the amount of maximum price set forth in the construction contract. The terms "Amendment" wherever used in this bond and whether referring to this bond or the Projects shall include any alternation, addition, extension, modification, amendment, rescission, waiver, release or annulment, or any character whatsoever.

4. It is expressly agreed that any amendment which may be made by agreement between the Principal and Chugach in the terms, provisions, and conditions of a Project, or to the terms, provisions, and conditions of this Contract shall not in any way release the Principal and the Surety, or either of them or their respective executors, administrators, successors or assigns, from liability hereunder. The Surety hereby acknowledges receipt of notice of any amendment, indulgence or forbearance, made, granted or permitted.0.0.

5. This bond is made for the benefit of all persons, firms and corporations who or which may furnish any materials or perform any labor for or on account of the construction to be performed on any projects, and they, and each of them, are hereby made obliges hereunder with the same force and effect as if their names were written herein as such, and they and each of them may sue hereon.

IN WITNESS WHEREOF, the undersigned have caused this instrument to be executed and their respective corporate seals to be affixed and attested by their duly authorized representative this day of _____, 20_____.

_____
Principal
By: _____

Attest: Its: _____

_____
Secretary

_____
Surety
By:_____

Attest: Its: _____

_____

_____
Address of Surety's Home Office

_____

By: _____
Resident Agent of Surety
(For service of process)

Signatures

The Contractor's Bond must be signed with the full name of the Contractor. If the Contractor is a partnership, a partner must sign the Contractor's bond in the partnership name. If the Contractor is a corporation, the Contractor's bond must be signed in the corporate name by a duly authorized officer and the corporate seal affixed and attested by the Secretary of the corporation. A typewritten copy of all such names and signatures shall be appended.

Power of Attorney

The Contractor's Bond must be accompanied by a power of attorney authorizing execution on behalf of the Surety by a duly authorized Alaska resident agent of the Surety.

BELUGA TRANSFORMER T-10 REPLACEMENT
BID UNIT DESCRIPTIONS
W.O. E1920053

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 excavations including but not limited to those excavations provided for general excavation of the substation site, foundations, 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.
	6. Excavation in substation areas with existing conduit to remain in tact outside the limits of construction shall be done using a vac-truck. A vac-truck shall be provided on this project for excavation between the Tyonek System Bay and other Beluga Substation equipment, and the cost of this equipment shall be considered incidental to the cost of the Contract.
MOB	This unit consists of furnishing and delivering to the site, mobilization of all construction equipment, materials, supplies, appurtenances, and the like, manned and ready for commencing and prosecuting the work. This unit includes furnishing preperation of the Contractor's work and / or stroage area; the complete assembly, in working order, of equipment necessary to perform the required work; and all other preparatory work on construction items for which payment is provided under the Contract.
DEMOB	This unit consists of removal from the site of all equipment, appurtanances and the like used for the performance of the work, as well as restoration of the Contractor's work and / or stroage area, clean-up and disposal of all debris, spoils and trash after all work is completed.
A1	STEEL STRUCTURE, TYPE A01 24.9 kV BUS SUPPORT - This unit includes furnishing all labor, miscellaneous materials, and equipment required for the complete installation of one Chugach furnished type A01 structure. The unit includes placement and adjustment in accordance with specifications, drawings, and manufacturer's instructions.
A2	STEEL STRUCTURE, TYPE A02 138 kV DISCONNECT SWITCH SUPPORT - This unit includes furnishing all labor, miscellaneous materials, and equipment required for the complete installation of one Chugach furnished type A02 structure. The unit includes placement and adjustment in accordance with specifications, drawings, and manufacturer's instructions.
B1	DISCONNECT SWITCH, DOUBLE END BREAK, 138 kV - This unit includes installation of one Chugach furnished 3-phase manually operated disconnect switch. The unit includes placement, adjustment, and operation in accordance with specifications, drawings, and manufacturer's instructions. The unit includes all labor, miscellaneous materials and equipment required for a complete installation.
C1	BUSWORK, RIGID AND FLEXIBLE - This unit includes furnishing and installing buswork, connectors, clamps, and fittings required for rigid and flexible bus. This unit includes furnishing and installing all jumpers for connecting all equipment and switches to rigid and flexible buswork. This unit includes furnishing and installation of all filler compounds, fasteners, insulators on flexible and rigid bus and all miscellaneous labor and materials to provide a complete bus system for all switch connections, breaker connections, and other connections required to make a complete and functional bus.

BELUGA TRANSFORMER T-10 REPLACEMENT
BID UNIT DESCRIPTIONS
W.O. E1920053

BID UNIT	DESCRIPTION
E1	CIRCUIT BREAKER, 138 kV - This unit includes installation of one Chugach furnished gas circuit breaker. The unit includes placement, adjustment, and testing in accordance with specifications, drawings, and manufacturer's instructions. The unit includes all labor, miscellaneous materials and equipment necessary for a complete gas circuit breaker installation.
F1	FOUNDATION, TYPE F1 - This unit includes all labor and miscellaneous materials to install one Type F1 foundation. This unit includes installation of one Chugach furnished power transformer foundation. This unit includes all required excavating, compaction; furnishing backfill and miscellaneous materials required for a complete foundation.
F2	FOUNDATION, TYPE F2 - This unit includes all labor and miscellaneous materials to install one Type F2 foundation. This unit includes installation of one Chugach furnished gas circuit breaker foundation. This unit includes all required excavating, compaction; furnishing backfill and miscellaneous materials required for a complete foundation.

BELUGA TRANSFORMER T-10 REPLACEMENT
BID UNIT DESCRIPTIONS
W.O. E1920053

BID UNIT	DESCRIPTION
F3	FOUNDATION, TYPE F3 - This unit includes all labor and miscellaneous materials to install one Type F3 foundation. This unit includes installation of one Chugach furnished gas circuit breaker working platform foundation. This unit includes all required excavating, compaction; furnishing backfill and miscellaneous materials required for a complete foundation.
F4	FOUNDATION, TYPE F4 - This unit includes all labor and miscellaneous materials to install one Type F4 foundation. This unit includes installation of one Chugach furnished disconnect switch foundation. This unit includes all required excavating, compaction; furnishing backfill and miscellaneous materials required for a complete foundation.
F5	FOUNDATION, TYPE F5 - This unit includes all labor and miscellaneous materials to install one Type F5 foundation. This unit includes installation of one Chugach furnished bus support foundation. This unit includes all required excavating, compaction; furnishing backfill and miscellaneous materials required for a complete foundation.
F6	SECONDARY CONTAINMENT, POWER TRANSFORMER, TYPE F6 - This unit includes all material and labor to install one Chugach furnished secondary containment system for the power transformer. The unit includes all required labor, excavating, compaction, forming, finishing, geotextile fabric, bedding sand, AASHTO #57 coarse aggregate stone and backfill; furnishing and installing all fill material and miscellaneous materials as required for a complete secondary containment system.
G1	POWER TRANSFORMER, 138/24.9 kV, 14 MVA - This unit includes installation of one Chugach furnished 138/24.9 kV 14 MVA power transformer. The unit includes assisting the transformer manufacturer in placement of the transformer and welding the transformer to the foundation in accordance with specifications, drawings, and manufacturer's instructions.
K1	CONDUIT, 2" HDPE - This unit includes furnishing and installing all 2" HDPE conduits as shown on drawings and in conduit schedules. The unit includes furnishing and installing all couplings, fittings, elbows, bending, grounding hardware, trenching, core drilling, grouting, bedding sand, trench backfill, compaction and testing, and wall penetrations. This unit includes providing and installing conduit sealing bushings for spare conduits, and providing and installing pull ropes in all conduits. This unit includes all flexible liquid tight conduits and fittings for risers from GRS conduits to equipment cabinets and provision of entrance hole in equipment cabinets. This unit includes all miscellaneous labor and material for a complete conduit system.
K2	CABLE, POWER and CONTROL, 600V AC & DC - This unit includesinstallation of all 600V power cables as shown on drawings and in cable schedules. This unit includes installing power cables, providing and installing cable tags, cable ties, conduit sealing materials, testing and all miscellaneous labor and materials to provide a complete cable installation. Chugach will terminate power and control cables.
K3	TEMPORARY STATION SERVICE - This unit includes furnishing all labor and miscellaneous materials necessary to install temporary 1-phase 120/240V station service. This unit includes conduits, cables, trench, panelboard, and service hookup/metering coordination. This unit includes providing and installing terminations, cable tags, cable ties, conduit sealing materials, testing and all miscellaneous labor and materials to provide a complete temporary station service installation to be used during construction.
K4	MANHOUR - This unit includes all labor and miscellaneous support tools required to perform one hour of Chugach-directed work.
M1	GEOTEXTILE FABRIC - This unit Includes furnishing and installation of all separation geotextile fabric on top of the substation pad, beneath the crushed rock surface course as shown on the drawings.
M2	CRUSHED ROCK SURFACE COURSE - This unit includes all labor and materials to provide 6" of crushed rock surface course throughout the area shown on the drawings.

BELUGA TRANSFORMER T-10 REPLACEMENT
BID UNIT DESCRIPTIONS
W.O. E1920053

BID UNIT	DESCRIPTION
M3	FINAL GRADE/ CLEANUP - This unit includes the final grading and compaction of the substation pad, prior to placement of the surface course. This unit also includes removal from the substation site and disposal of excess excavated materials that are not utilized for final grading of the substation.
M4	TEMPORARY EROSION AND POLLUTION CONTROL - Includes all labor, equipment, and material required for the administration and implementation of the temporary erosion and pollution control for the substation area and access road, as shown and specified drawings and specifications.
M5	VAC-TRUCK TRENCH UNIT - Includes all labor, equipment and material required to trench across the Beluga access road providing a 1ft X 30 in deep trench.
O1	GROUNDING, SUBSTATION - This unit includes furnishing and installation of all copper ground conductor for ground grid, jumpers and structure mounted ground bus as shown and specified on the drawings. This unit includes furnishing and installation of all ground rods, copper connectors, clamps, and fittings. This unit includes all labor, equipment, materials required to install the grounding system, including equipment and structure grounds, in accordance with plans, specifications and manufacturer's instructions.
I-A	RETIREMENT, STRUCTURES - This unit includes all labor, equipment and material necessary for the removal and disposing of all miscellaneous materials necessary for complete removal of specified steel structures shown on the drawings.
I-B	RETIREMENT, DISCONNECT SWITCH - This unit includes all labor, equipment, and material necessary for the removal of specified disconnect switches shown on the drawings. This unit includes transportation, lifting equipment, and dunnage to stage disconnect switches at the Chugach West Storage Yard (Anchorage) as directed by Chugach.
I-C	RETIREMENT, RIGID AND FLEXIBLE BUSWORK - This unit includes all labor, equipment and material necessary for the removal and disposing of all miscellaneous materials necessary for complete removal of specified rigid and flexible buswork shown on the drawings.
I-E	RETIREMENT, POWER CIRCUIT BREAKER - This unit includes all labor, equipment, and material necessary for the removal of specified power circuit breakers shown on the drawings. This unit includes transportation, lifting equipment, and dunnage to stage power circuit breakers at the Chugach West Storage Yard (Anchorage) as directed by Chugach.
I-F	RETIREMENT, FOUNDATION - This unit includes all labor, equipment and material necessary for the removal and disposing of all miscellaneous materials necessary for complete removal of the specified foundations shown on the drawings.
I-G1	RETIREMENT, POWER TRANSFORMER - This unit includes all labor, equipment, and material necessary for the removal of specified power transformers shown on the drawings. This unit includes transportation, lifting equipment, and dunnage to stage power transformers at a storage location at Chugach West Storage Yard (Anchorage) as directed by Chugach
I-G2	RETIREMENT, 24.9 kV INSTRUMENT VOLTAGE TRANSFORMER - This unit includes all labor, equipment and material necessary for the removal and disposing of all miscellaneous materials necessary for complete removal of specified instrument transformers shown on the drawings.
I-K3	RETIREMENT, TEMPORARY STATION SERVICE - This unit includes all labor and materials required to retire and dispose of the temporary 1-phase 120/240V station service, including conductor, poles, transformers and other materials.
I-M4	RETIREMENT, TEMPORARY EROSION AND POLLUTION CONTROL - This unit includes all labor, equipment and material necessary for the removal and disposing of all the temporary erosion and pollution control for the substation area and access road, as shown and specified drawings and specifications.

BELUGA TRANSFORMER T-10 REPLACEMENT
LIST OF OWNER
FURNISHED MATERIAL
CHUGACH W.O. E1920053

Bid Unit	Description	Weight	QTY Rq'd	Spares	QTY Ord'd	Unit	CEA ID	MFR / Catalog #	P.O. / Req. Number	Price (ea/ft)	Total Cost	Status/ *Delivery Date	Delivered to Site By
A1	Steel Structure, Type A01 24.9 kV 3-Phase Bus Support		1	0	1	ea.	N/A	TBD		$3,000	$3,000	Out for Bid	Contractor
A2	Steel Structure, Type A02 138 kV Disconnect Switch Support		1	0	1	ea.	N/A	TBD		$5,000	$5,000	Out for Bid	Contractor
B1	Disconnect Switch, Double-End Break, 138 kV		1	0	1	ea.	N/A	Southern States RDA - 1-145-1200	P.O. 88197	$16,500	$16,500	TBA - ReMob?	Contractor
E1	Gas Circuit Breaker, 138 kV		1	0	1	ea.	N/A	Mitsubishi		$80,000	$80,000	On Site	On-Site
F1	Foundation, Pre-Cast, Power Transformer w/ Embeds		1	0	1	ea.	N/A	Pre-Cast Concrete Company		$8,500	$8,500	On Order - Late Oct	Contractor
F2	Foundation, Pre-Cast, Gas Circuit Breaker w/ Anchor Bolts		1	0	1	ea.	N/A	Pre-Cast Concrete Company		$5,500	$5,500	On Order - Late Oct	Contractor
F3	Foundation, Pre-Cast, Gas Circuit Breaker Working Platform		1	0	1	ea.	N/A	Pre-Cast Concrete Company		$4,000	$4,000	On Order - Late Oct	Contractor
F3	Gas Circuit Breaker Working Platform		1	0	1	ea.	N/A	TBD		$400	$400	Out for Bid	Contractor
F4	Foundation, Pre-Cast, 138 kV Disconnect Switch w/ Anchor Bolts		1	0	1	ea.	N/A	Pre-Cast Concrete Company		$6,500	$6,500	On Order - Late Oct	Contractor
F5	Foundation, Pre-Cast, 24.9 kV Bus Support w/ Anchor Bolts		1	0	1	ea.	N/A	Pre-Cast Concrete Company		$4,000	$4,000	On Order - Late Oct	Contractor
F6	Secondary Containment System, Power Transformer		1	0	1	ea.	N/A	C.I.Agent Solutions	P.O. 88388	$36,600	$36,600	On Order - Early Oct	Contractor
G1	Power Transformer, 138/24.9 kV, 14 MVA		1	0	1	ea.	N/A	SPX Transformer Solutions	Contract #53855	$710,000	$710,000	Ships from WI 10/29/19	Manufacturer
O1	Switch Grounding Platform		1	0	1	ea.	N/A	TBD		$300	$300	Out for Bid	Contractor
O1	Swaged Splice 3/4" Cu clad - 3/4" Cu clad		7	3	10	ea.		DMC Power / GC720B682-682		$25	$250	Late Oct	Contractor
O1	Swaged Split Elbow 4/0 - 3/4" Cu clad		7	3	10	ea.		DMC Power / GC739B004-682		$25	$250	Late Oct	Contractor
O1	Swaged Split Elbow 4/0 - 4/0		20	5	25	ea.		DMC Power / GC739B004-004		$25	$625	Late Oct	Contractor
O1	Swaged Split Elbow 250 - 4/0		8	3	11	ea.		DMC Power / GC739B025-004		$25	$275	Late Oct	Contractor
O1	Swaged Split Parallel 4/0 - 4/0		7	2	9	ea.		DMC Power / GC721B004-004		$25	$225	Late Oct	Contractor
O1	Swaged Split Parallel 250 - 4/0		5	2	7	ea.		DMC Power / GC721B025-004		$25	$175	Late Oct	Contractor
O1	Swaged Terminal 4/0 - 2 Hole Pad		20	4	24	ea.		DMC Power / GC920B004		$25	$600	Late Oct	Contractor
C1	Terminal, 2 Hole, offset, ARBUTIS, tinned		3	2	5	ea.		DMC Power / CPLK9202D07950T		$25	$125	Late Oct	Contractor
C1	Terminal, 2 Hole, 90 angle, ARBUTIS, tinned		3	2	5	ea.		DMC Power / CPLK9209D07950T		$25	$125	Late Oct	Contractor
C1	Terminal, 3"Wide, 4-hole, offset, TULIP		3	2	5	ea.		DMC Power / CPLK9432D03500S		$40	$200	Late Oct	Contractor
C1	Terminal, 3"Wide, 4-hole, offset, TULIP, tinned		3	2	5	ea.		DMC Power / CPLK9432D03500T		$40	$200	Late Oct	Contractor
C1	Terminal, 3"Wide, 4-hole, offset, ARBUTIS		15	3	18	ea.		DMC Power / CPLK9432D07950S		$40	$720	Late Oct	Contractor
C1	Terminal, 3"Wide, 4-hole, offset, ARBUTIS, tinned		15	3	18	ea.		DMC Power / CPLK9432D07950T		$40	$720	Late Oct	Contractor
C1	Tee, Split Main Cable run to 3" Wide 4-hole tap, ARBUTIS		3	2	5	ea.		DMC Power / CPLK9513D07950S		$40	$200	Late Oct	Contractor
C1	Terminal, 3"Wide, 4-hole, 2 cables, offset ARBUTIS		3	2	5	ea.		DMC Power / CPLK9632D07950S		$40	$200	Late Oct	Contractor
C1	Grounding Stud, 3" Bus		3	3	6	ea.		DMC Power / PLK1160D48		$40	$240	Late Oct	Contractor
C1	4-hole Terminal NEMA pad center formed, 3" Bus, 3" wide		6	2	8	ea.		DMC Power / PLK1850D48A		$40	$320	Late Oct	Contractor
C1	Slip/ Rigid Horizontal bus support assembly, 3" bus, 3"&5" bolt circles		6	0	6	ea.		DMC Power / PLK3210D48E12		$75	$450	Late Oct	Contractor
C1	Buswork, Linear Feet, 3" IPS AL Sch 40, Alloy 6063-T6 , 10 ft lengths		3	1	4	ea.				$200	$800		Contractor
C1	795 kcmil, AAC, ARBUTIS		270	50	320	Ft	1245			$2	$640		Contractor
C1	336.4 kcmil, AAC, TULIP		15	35	50	Ft				$2	$75		Contractor
C1	Insulator, Station Post, 24.9 kV		6	0	6	ea.		Hubbell / 2326863001		$150	$900		Contractor
C1	Bus Connection Insulating Cover for Rigid Bus Supports		6	0	6	ea.		Tyco Electrpmocs / BCIC-7.50/18-3(B3)		$50	$300		Contractor
C1	Medium Voltage Fusion Tape		24	2	26	roll		Tyco Electrpmocs / MVFT-G-2-12(B4)		$60	$1,560		Contractor
C1	Medium voltage Conductor Cover for ARBUTIS Conductor		100	20	120	Ft		Tyco Electrpmocs / MVCC-25/1.0(B25)		$2	$240		Contractor
C1	Medium Voltage Conductor cover for TULIP Conductor		15	10	25	Ft		Tyco Electrpmocs / MVCC-19/0.75(B50)		$2	$50		Contractor
C1	Bus Connection Insulating Cover for Transformer Bushings		3	0	3	ea.		Tyco Electrpmocs / BCIC-8D/18-HO (B3)		$50	$150		Contractor
K2	Power and Control Cable (Schedule to follow)										$40,000		Contractor
									Total OFM Value		$930,915		

PART 1

SPECIAL PROVISIONS

FOR

BELUGA T10 TRANSFORMER REPLACEMENT

W.O. E1920053

September 19, 2019

TABLE OF CONTENTS

SPECIAL PROVISIONS

These Special Provisions supplement the provisions of the Chugach Electric Association, Inc.'s (Chugach's) 2017 -18 Outside Electrical Line Construction Contract (OELCC) and the Technical Specifications.

SECTION 1

SUMMARY OF WORK

1.1 SECTION INCLUDES

- Description of project
- Contractor use of premises
- Permits and Licenses
- Supplementary Instructions to Bidders

1.2 DESCRIPTION OF THE PROJECT

In March of 2019, Beluga Substation (BGSS) transformer T10 experienced an internal fault taking it offline. The Beluga T10 Transformer Replacement project will replace the existing transformer T10 and other equipment in the Tyonek bay at BGSS.

The Work will include retiring BRK 412 - a 138kV Oil Filled Circuit Breaker (OCB), TRF T09 - a 10MVA 138kV/13.8kV Transformer, VCB 816 – a 13.8kV Vacuum Circuit Breaker with a Ruptor Switch / Structure, TRF T10 – a 10 MVA 13.8kV/24.9kV Transformer, associated conduits, and miscellaneous substation bus and connection equipment.
Also included in the Work is the removal of foundations for OCB 412, VCB 816 and transformers T09 & T10.

The Contractor will install a 138kV Gas filled Circuit Breaker (GCB), a three phase 138kV gang operated double end break switch and steel switch support, a 10MVA 138kV/24.9kV Transformer (T10), associated foundations, control and power supply conduits, and miscellaneous substation bus and connection equipment. Also included in the work is all dirt work required to remove and install foundations.

The Contractor will coordinate the installation of the secondary oil containment membrane with a representative from Spill-Chek Environmental Products & Services. At a minimum, the Contractor will provide two men to assist the Spill-Chek representative in the installation of the membrane in the prepared site.

In addition to the Work described above, excavation of a trench crossing the BGSS access road is included in the Work. The trench shall be excavated using a Vac-Truck.

Construction at BGSS will be performed in and around an energized substation. The 138kV East Bus, and the Beluga River Unit (Transformer T11) bay will remain energized for the duration of this project.

No temporary station service will be available at BGSS for the Contractor's use during construction. The Contractor shall provide all miscellaneous power required for planned construction needs. The cost of any Contractor provided power will be considered incidental to the cost of the project and no further compensation will be provided.

If during the course of construction, the Contractor chooses to remove any portion of the substation fence to provide construction access, the Contractor shall maintain security during construction activities and secure the fence opening while not in attendance.

1.3 WORK

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. No additional compensation will be made for costs associated with storage or work areas.

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. The Contractor shall maintain all best management practices (BMPs) required in the Contract Documents, in all areas affected by any construction activity. Cost of providing all measures required in the Contract Documents are considered incidental to the cost of the affected unit. No additional compensation will be paid for these 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. Beluga Substation (BGSS) is a historical site that may contain areas of contaminated soil located within the project area. If contaminated soils are encountered, contractor shall contact Chugach for further direction. It is anticipated that Chugach will coordinate, testing and removal of any contaminated soils in such a way as to mitigate the impact on the Work.

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 proposal.

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.

C. Contractor Personnel Transportation, Housing and Meals

The Contractor is responsible for transportation of all material, equipment and personnel both to and from Beluga. The Contractor is also responsible for the housing and feeding of construction personnel working on the project. The cost of these items is incidental to the cost of the project and no further compensation shall be paid by Chugach Electric.

D. All Contractor personnel shall participate in Beluga Contractor Safety and Coordination Orientation prior to beginning work. While working at Beluga, all Contractor personnel shall comply with conduct as described in the Beluga Power Plant – Contractor Coordination document (Appendix B).

END OF SECTION

SECTION 2

MEASUREMENT AND PAYMENT

2.1 SECTION INCLUDES

- Measurement Methods
- Measurement by Weight
- 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, 3.3 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.

F. Measurement Standards: All Work to be paid for at a Contract price per unit of measurement shall be measured by Chugach in accordance with United States Standard Measures.

2.3 MEASUREMENT BY WEIGHT

A. Material to be measured and paid for by weight and not measured by handbook weights, shall be weighed on accurate, State of Alaska approved scales, furnished by and at the expense of the Contractor. A ton is defined as 2,000 pounds avoirdupois.

2.4 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

- Coordination
- Field Engineering
- 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. Under the coordination of Chugach, the Contractor shall be responsible for the excavation, and "super-sacking" of an contaminated soils. Chugach will coordinate the disposition of the super sacks.

C. The disposition of surplus. Non-contaminated soils will be coordinated through Chugach.

D. Chugach's system operation may require other crafts to perform work at or near this project. Contractor shall coordinate activities with Chugach's site representative to avoid delays and interference.

E. After Chugach occupancy of premises, coordinate access to site with Chugach for correction of defective Work and Work not in accordance with Contract documents.

F. Contractor is responsible for coordinating with other entities for locates.

3.3 FIELD ENGINEERING

A. The Contractor shall use a Land Survey 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. 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 A-CAD 2000 through A-CAD 2012, shall be submitted to Chugach. 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.

H. No Geotechnical information for BGSS is provided. Geotechnical investigations can be performed by the Contractor if so desired with proper coordination. No additional compensation shall be made for such investigations.

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 depths of foundations in relation to finish floor datum.

   b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

   c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

   d. Field changes of dimension and detail.

   e. 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

Submit test and inspection reports per the following schedule and as specified elsewhere in the Technical Specifications

1. Compaction test reports – Submit the day after test is completed.

END OF SECTION

SECTION 4

SUBMITTALS

4.1 SECTION INCLUDES

- Submittal Procedures
- Construction Progress Schedules
- Shop Drawings
- Product Data
- Samples
- Manufacturers' Instructions
- Manufacturers' Certificates

4.2 SUBMITTAL PROCEDURES

The Contractor shall submit pertinent data as required in other parts of these Contract Documents for Chugach's approval:

A. Transmit each submittal with Chugach accepted form.

B. Sequentially number the transmittal forms. Resubmittals are to have the original submittal number with an alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or Supplier; pertinent drawing sheet and detail number(s), and Specification section number, as appropriate.

D. 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.

E. Schedule submittals to expedite the Project and deliver to Chugach. Coordinate submission of related items. Allow five (5) calendar days for Chugach's review.

F. 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.

G. Provide space on submittals for Contractor's and Chugach's review stamps.

H. Revise and resubmit submittals as required; identify all changes made since previous submittal.

I. Distribute copies of approved submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

J. 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. Mobilization
2. Site Work
3. Equipment Removal / Transport
4. Transformer Removal / Transport
5. Foundation Removal
6. Conduits
7. Ground Grid
8. Foundations
9. Equipment Installation
10. Transformer Installation
11. De-Mobilization

The schedule shall include milestone dates, time allowances for Chugach commissioning/testing, manpower loading, and cash flow.

B. The Contractor shall plan the execution of the Work in accordance with water transportation to / from Beluga.

C. 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 cashflow on a weekly basis for each individual bid unit and planned percent complete by task and overall project.

D. The construction schedule shall be updated with actual percent complete by task and manpower and one electronic copy submitted with all invoices.

E. The basic construction schedule (data on planned performance) shall not be changed without Chugach's concurrence.

4.4 SHOP DRAWINGS

The Contractor shall:

A. Submit three paper copies of shop drawings.

B. After review by Contractor, distribute in accordance with Submittal Procedures above and upon completion of Project, provide copies for Record Documents described in Special Provisions, Section 8 - Contractor Closeout.

4.5 PRODUCT DATA

The Contractor shall:

A. Submit the number of product data copies which the Contractor requires, plus three (3) copies 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.

4.6 SAMPLES

The Contractor shall:

A. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing Work.

B. Include identification on each sample with full product information.

C. Submit the number or samples specified in individual Specification sections; one of which will be retained by Chugach. Reviewed samples which may be used in the Work are indicated in individual Specification sections.

4.7 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.

4.8 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

- Temporary Utilities
- Temporary Controls
- Construction Facilities
- Staging Area

5.2 TEMPORARY UTILITIES

A. Temporary Construction Power

Temporary construction power is not available at the construction site. Contractor to provide temporary construction power to fit the needs of means and methods as determined by the Contractor.

B. Temporary Lighting

The Contractor shall provide and maintain adequate lighting for construction operations at all times.

C. Site Office and Telephone Service

Contractor shall provide, maintain and heat an office for its use at the jobsite. Chugach or its representative shall have access to this office. Said office shall have a workspace set aside for Chugach or Chugach's representative.

D. Obtain Potable water as needed for the Work.

E. Sanitary facilities in the adjoining Beluga Power Plant may be utilized for this project.

G. Barriers

The Contractor shall:

1. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

2. Protect stored materials, site and structures from damage.

5.3 TEMPORARY CONTROLS

A. Water Control

1. No Storm Water Pollution Prevention Plan (SWPPP) has been prepared for this project. 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 during the draining of hydro-test water that are specified in the project Documents.

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 is 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. Traffic Control

No traffic control plan is required for this project.

C. Dust and Mud Control

Dirt and mud shall not be tracked into Beluga facilities by the Contractor.

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. Security

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

C. Parking

All parking shall be on Chugach property or in areas that the Contractor has obtained approval to park.

D. 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.

E. 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

- Material and equipment quantities.
- Products.
- Transportation and Handling.
- Storage and Protection.
- Owner Furnished Material

6.2 MATERIAL AND EQUIPMENT QUANTITIES

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

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.

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.

6.5 STORAGE AND PROTECTION

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

- Chugach-Furnished Material
- Transfer of Material
- Damage to Chugach-Furnished Material
- Installation of Chugach-Furnished Material
- Manufacturer's Representative

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. Chugach may direct that certain items be stored in heated storage buildings. 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. Heating: Store materials and equipment which are equipped with electric heaters with heaters energized. Provide electrical energy for all heaters.

Maintain temperature within enclosures above the dew point of the surrounding air; regularly check temperatures within the enclosures and heaters to ensure proper operation.

F. Spare Parts and Special Tools: Place spare parts and special tools 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

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.

7.6 MANUFACTURER'S DRAWINGS

A. Drawings approved by Chugach will be given to the Contractor for all equipment furnished by other contracts that is to be installed and connected by this contract. These drawings shall be used for construction and are provided as reference drawings for the project.

B. Drawings and specifications for equipment furnished by Chugach under other contracts for installation under this contract will be available in the office of Chugach for inspection before bidding.

7.7 MANUFACTURER'S REPRESENTATIVE

None Required

END OF SECTION

SECTION 8

CONTRACT CLOSEOUT

8.1 SECTION INCLUDES

- Closeout Procedures
- Closeout Documents
- 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

PART 2

TECHNICAL

SPECIFICATION FOR

BELUGA SUBSTATION

W.O. E1920053

September 19, 2019

TABLE OF CONTENTS

SECTION 024155

MISCELLANEOUS DEMOLITION

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. The Contractor shall supply all labor, materials, equipment, tools and supervision necessary to complete miscellaneous demolition at existing substation site including removing and disposing of structures and debris and site restoration.

B. Items of demolition work associated with this section include the following:

1. Remove designated and dispose of items as shown on drawings.

1.3 CERTIFICATION REQUIREMENTS

A. Conform to applicable local, State and Federal requirements.

B. Conform to applicable requirements for hauling and disposal of debris to contractor-furnished disposal site.

1.4 COORDINATION REQUIREMENTS

A. Traffic: Conduct demolition operations to ensure minimum interference with roads, streets, bike paths, walks and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, bike paths or other occupied or used facilities without prior written permission from authorities having jurisdiction.

B. The Contractor and its subcontractors shall minimize tracking soil onto adjacent sidewalks, trails, and streets. All tracked soil material shall be cleaned up at the end of each workday.

C. Locate and protect all utilities.

D. Coordinate all work with utility.

2 PRODUCTS - NOT USED

3 EXECUTION

3.1 PREPARATION

A. Remove improvements, or obstructions, as required, to the extent necessary for the execution of the work.

3.2 PROTECTION

A. Protect existing shrubs and vegetation adjacent to and outside of construction limits of work.

B. Locate, identify, and protect all existing facilities from damage.

C. Protect survey bench marks, property corners, existing structures and improvements to remain from damage or displacement.

D. Provide continuous vehicle access and egress.

3.3 DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated.

B. Verify all existing utilities, site conditions, information and dimensions.

C. Provide, erect, and maintain temporary barriers, security devices, and temporary support structures as necessary to protect and support existing items which are not indicated to be removed.

D. Notify the Chugach's Representative immediately in the event that hazardous or contaminated material are encountered or suspected. Conform to procedures applicable to local, State and Federal regulations when handling, transporting and disposing of hazardous or contaminated materials.

E. Identify and indicate all utility locations on Project Record Documents.

F. Remove materials to be re-installed or returned to Chugach in a manner to prevent damage.

G. Remove demolished materials, rubbish and debris from site as work progresses. Upon completion of work, leave areas of work in clean condition. Local, State and Federal regulations regarding hauling and disposal shall apply.

H. Anchors to be retired shall be completely removed. Cutoff anchor rods will not be acceptable.

I. Poles to be retired are to be completely removed and disposed of as required by law.

J. Do not burn or bury materials on site.

K. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.4 DISPOSAL OF WASTE MATERIAL

A. Remove waste materials and excess excavated material to a contractor-furnished disposal site in compliance with all applicable local, State and Federal requirements.

3.5 SALVAGED MATERIAL

A. All material and equipment designated for removal, not designated to be reused or relocated in other Sections or on the Drawings, will become the property of the Contractor on the date that it is removed.

3.6 REMOVED AND REINSTALLED ITEMS

A. Clean and repair items to functional condition adequate for intended reuse.

B. Pack or crate items after cleaning and repairing. Identify contents of containers.

C. Protect items from damage during transport and storage.

D. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.7 EXISTING ITEMS TO REMAIN

A. Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Chugach, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.8 USE OF EXPLOSIVES

A. Use of explosives will not be permitted.

END OF SECTION 024155

SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

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. Sleeves for raceways and cables.
3. Sleeve seals.
4. Common electrical installation requirements.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

1.4 REFERENCES

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

1. NESC - National Electric Safety Code
2. NEC - National Electric Code
3. IEEE - Institute of Electrical and Electronics Engineers
4. RUS Bul. 1724E-300 (Design Guide for Rural Substations)
5. RUS Pub. 202-1 (List of Materials)
6. AEIC - Association of Edison Illuminating Companies
7. NEMA - National Electrical Manufacturer's Association
8. NECA - National Electrical Contractor's Association
9. NETA - InterNational Electrical Testing Association

1.5 SUBMITTALS

A. As required by Special Provisions and as outlined here.

B. Shop drawings and product data for all Contractor furnished equipment and materials.

C. Manufacturers' test reports.

D. Equipment manuals and installation manuals.

E. 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.

B. Determine required location, arrangement and quantities of equipment and materials from drawings.

1.9 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, walls, and other structural components as they are constructed.

C. Coordinate timing of installations with other trades and Chugach's personnel working on other projects in the station.

D. Coordinate installations of Chugach-furnished materials with Chugach personnel.

2 PRODUCTS

2.1 CONTRACTOR-FURNISHED EQUIPMENT AND MATERIALS

A. Unless otherwise specified, the Contractor shall furnish all fittings, hangers, conduit, anchors, junction boxes, mounting brackets, cable supports, terminal board jumper wires, wire terminals, solderless lugs, 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, or supplied by Chugach.

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. Before assembly and erection thoroughly clean equipment of all protective coatings and foreign materials.

B. Verify all equipment elevations prior to placement.

C. 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 place the equipment accurately in position, level the equipment, assemble all equipment which requires such, including wire connections where required. Also the Contractor shall remove, modify and reinstall 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.

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete walls, or fire-rated floor and wall assemblies.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

F. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.

G. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.

H. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

I. Above ground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

J. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.5 SLEEVE-SEAL INSTALLATION

A. Install and seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 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.

3.7 PROTECTION

A. Maintain safe clearances from all existing installations not part of this project.

B. Safeguard all existing facilities.

END OF SECTION 260500

SECTION 260513

CONDUCTORS AND CABLES

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 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 building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

C. This section also includes high voltage cable installation, cable terminations, splices and wiring connectors and connections.

D. This section covers the termination and installation requirements for relaying, control and indication cables in the field equipment and control enclosure.

1.3 REFERENCES

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

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

1.4 SUBMITTALS

A. Product Data: For each type of product supplied.

B. Approval of submittals required when materials substitutions are made.

1.5 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.

1.6 PROJECT RECORD DOCUMENTS

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

B. Accurately record actual sizes and locations of direct buried cables on the drawings.

C. Accurately record any deviation from project drawings.

1.7 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.

1.8 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.

1.9 COORDINATION

A. Schedule cable and wire installation in conjunction with equipment and raceway placement.

2 PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements and approved by Chugach.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for type XHHW-2.

D. Overhead and Underground conductors: See Owner furnished material list for Chugach supplied conductors. Contractor to supply all other Conductors and Cables.

E. General Purpose Wiring:

1. General purpose wiring circuits shall be 600V UL type XHHW-LS 90°C, with low-smoke zero halogen (LS-ZH) insulation, flexible strand, with copper conductor. An example of acceptable wire would be Houston Wire and Cable type HW010. The Contractor shall submit wire types to be used for Chugach approval.

F. Switchboard Wiring

1. All switchboard wire shall be 600V UL type SIS 90°C, with gray XLP VW-1 insulation, flexible strand, with tinned copper conductor. An example of acceptable switchboard wire would be Houston Wire and Cable type HW052. The Contractor shall submit wire types to be used for Chugach approval.
2. Intra-panel current transformer circuits shall be #10 SIS wire. Intra-panel potential transformer circuits shall be #12 SIS wire. All other wire shall be #14 SIS except where specified.

G. Instrumentation Cable

1. Instrumentation cable/wiring installed in trays or raceways shall be indoor/outdoor low-smoke zero halogen (LS-ZH) jacketed non-PVC flame retardant 600V UL type TC (tray cable) color coded by ICEA method 9 or Chugach approved equivalent. An example of an acceptable instrumentation cable would be Houston Wire and Cable type HW120. The Contractor shall submit cable types to be used for Chugach approval.

H. Power Cable

1. Power cable/wiring installed in trays or raceways shall be indoor/outdoor low-smoke zero halogen (LS-ZH) jacketed non-PVC flame retardant 600V UL type TC (tray cable) color coded by ICEA method E-1 or Chugach approved equivalent. An example of an acceptable power cable would be Houston Wire and Cable type HW170 or HW172. The Contractor shall submit cable types to be used for Chugach approval.

2.2 CONNECTORS

A. Solderless pressure connectors.

B. Compression connectors: Ring-type lugs

C. Description: Factory-fabricated connectors of size, ampacity rating, material, type, and class for application and service indicated.

D. All terminals for #10 wire and smaller shall be made with the terminals shown in Table I or as specified on the drawings. All terminals for wire larger than #10 shall be made with terminals shown on Drawings. Burndy terminations shall be double crimped with a Burndy MR8-9Q tool. No substitutions will be permitted.

Table I: Wire Terminals

Wire Range (AWG)	Stud Range	Terminal Mfgr./Model
10 – 12	8 – 10	Burndy / YAV10-H
14 – 20	8 – 10	Burndy / YAV14-H
18 – 22	8 – 10	Burndy / YAV18-H

A. Contractor shall provide the correct Burndy YAV type terminals with the proper hole size for the specified screw size. Drilled out terminals are not acceptable.

2.3 TERMINATIONS (1000 V 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.

3 EXECUTION

3.1 EXAMINATION

A. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 CONDUCTOR AND INSULATION APPLICATIONS

A. As indicated on the drawings.

3.4 INSTALLATION

A. Install cable and accessories in accordance with manufacturer's instructions.

B. Avoid abrasion and other damage to cables during installation.

C. Do not exceed cable pulling tensions, sidewall pressures or bending radius limitations. For Chugach supplied conductors information on these limitations will be furnished by Chugach at the time of construction.

D. Ground cable shield only at switchgear enclosure end termination.

E. Neatly train and lace wiring inside boxes, equipment, panelboards, and cable trays.

F. Clean conductor surfaces before installing lugs and connectors.

G. Make terminations which are rated to carry the full ampacity of conductors with negligible temperature rise.

H. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

I. Use pulling lubricants where necessary.

1. Use only lubricants approved for use with cable types specified that do not leave flammable residue or support flame propagation.
2. Pulling lubricants shall not deteriorate conductor or insulation.
3. Soap/wax based lubricants shall not be used.
4. Use Polywater J or equivalent where compatible with cable types installed as specified by the lubricant manufacturer.
5. Use Polywater LZ or equivalent for Low Smoke Zero Halogen (LSZH) cables.

J. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

K. Support cables according to Section 260500 "Common Work Results for Electrical."

L. For low-voltage cable, 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 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 in color.

M. Identify and color-code conductors and cables according to Section 260553 "Electrical Identification."

N. Ensure that all control, communication, status or relaying cables and conductors have sufficient length to be re-terminated at any location within the cabinet or rack. Jacket shall be stripped and the uncovered conductors secured at no more then 6" intervals.

O. For spare conductors of multiconductor cables, sufficient length shall be secured to terminate the conductor at any location within the cabinet or rack. Ends of spare conductors shall be heat shrunk with Thomas & Betts CPO-series, thin-wall heat-shrinkable tubing that is black in color.

P. Where cable trench is used, leave a loop of minimum 3 feet of cable in the cable trench where the cable transitions to conduit.

Q. Wiring at Outlets: Install conductor at each outlet per NEC. Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

3.5 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.

B. Splicing

1. No splicing allowed.

3.6 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.

END OF SECTION 260513

SECTION 260526

GROUNDING AND BONDING

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 grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. This section covers:

1. Connectors
2. Conductors

1.3 REFERENCES

A. ANSI/IEEE C2 - National Electric Safety Code

B. ANSI/NFPA 70 National Electric Code

C. IEEE 80 - Guide for Safety in AC Substation Grounding

D. IEEE 142 - Grounding of Industrial and Commercial Power Systems

E. Motorola R56 - Standards and Guidelines for Communication Sites

1.4 SUBMITTALS

A. As required by Special Provisions and as outlined here.

B. Product Data: For each type of product indicated.

C. Approval required when materials substitutions are made.

D. Product Data: For the following:

1. Grounding connectors
2. Ground wire

E. 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 locations of electrodes and connections.

1.6 QUALITY ASSURANCE

A. Follow manufacturer's instructions in transporting, handling, assembling and installing the equipment.

B. Employ only qualified crafts for and adequate means of handling of the installation of the equipment.

1.7 COORDINATION

A. Coordinate work with site excavating, foundation installation, backfilling and final grading.

1.8 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; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Materials as shown on the drawings or as approved by Chugach.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section 260513 "Conductors and Cables."

B. Material: Copper.

C. Equipment Grounding Conductors (low-voltage): Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded soft-drawn copper cable.

F. Underground Conductors: Bare, stranded, soft-drawn copper unless otherwise indicated.

G. Copper Bonding Conductor: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.
2. Bonding Conductor: No. 4 or No. 10 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

H. Grounding Bus: Bare, annealed copper bars of rectangular cross section (with insulators at required locations).

2.3 CONNECTOR PRODUCTS

A. Provide swaged connections as shown on the drawings.

B. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

C. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

D. Welded Connectors: Not used, unless specifically approved by Chugach. Contractor shall submit written request for use.

2.4 CONNECTORS

A. Material: Bronze or copper.

B. Below Grade: Swaged.

C. Above Grade: Mechanical, Compression, or Swaged as specified on the drawings.

2.5 WIRE

A. Material: Stranded copper.

B. Horizontal electrodes: #4/0 AWG copper, minimum.

C. Grounding conductors for equipment shall be soft drawn copper and shall be sized no smaller than the following:

1. Steel Structures #4/0
2. Power Transformer #4/0
3. Gas Circuit Breaker #4/0
4. Ground Grid #4/0
5. Conduit Grounds #2
6. All other grounds that may be necessary shall be size in accordance with NFPA 70.

3 EXECUTION

3.1 EXAMINATION

A. Verify site is acceptable for installation of grounding system.

B. Commencement of work signifies acceptance of conditions.

3.2 APPLICATION

A. In raceways, use insulated equipment grounding conductors.

B. Exothermic-Welded Connections: Not allowed, unless specifically approved by Chugach.

C. Equipment Grounding Conductor Terminations: Use bolted pressure connections to attach to equipment.

D. Underground connections shall be swaged type.

1. Bolted connectors shall not be utilized in below grade applications.

3.3 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of control house equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated on the drawings.

B. Install equipment grounding conductors in all feeder and branch circuits.

3.4 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. All electrical equipment enclosures, equipment, and all metallic parts of the installation, including structures, pipe, conduit, wireways, frames, and metalwork, shall be grounded and connected to the nearest ground cable, even if such connection is not shown on Drawings.

C. The electrical continuity of wireways, pipes, rails and enclosures shall be maintained by bonding. Bonding of electrical raceway and enclosures shall assure electrical continuity and the capacity to conduct safely any fault current that could be imposed. Bonding shall comply fully with Article 250 of NFPA 70.

D. Paint, scale, rust, corrosion, or other foreign matter shall be removed from the points of contact on metal surfaces before ground connections are made.

E. Precautions shall be taken to assure that no damage is done to grounding conductors or connections during construction. All existing grounding conductors damaged during construction work shall be replaced or repaired to comply with this section.

F. Exposed grounding conductors shall be supported on surfaces of the structures and on equipment with non-corrosive hardware, such as Everdur or equal, at not less than four foot intervals. Ground grid risers shall be visible for inspection.

G. Make ground tap connections to equipment at the points provided on the equipment for grounding in accordance with the equipment manufacturer's recommendations. Connections from ground conductors to the ground buses of switchgear, and/or panel boards shall be made by means of an acceptable swaged fitting.

H. All other electrical power equipment shall be provided with a grounded, identified grounding conductor. Power and control circuits will contain a grounding conductor.

3.5 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Not allowed, unless specifically approved by Chugach.

C. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values.

D. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

E. Connections shall not be painted.

3.6 FIELD QUALITY CONTROL

A. Inspect all connections for tightness.

END OF SECTION 260526

SECTION 260533

RACEWAYS AND BOXES

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, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. FMC: Flexible Metal Conduit.

B. LFMC: Liquidtight Flexible Metal Conduit.

C. LFNC: Liquidtight Flexible Nonmetallic Conduit.

D. RNC: Rigid Nonmetallic Conduit.

E. HDPE: High Density Polyethylene Conduit.

F. RGS or GRSC: Rigid Galvanized Steel Conduit.

1.4 SUBMITTALS

A. Submit the following in accordance with Special Provisions:

1. Product Data: For raceways and fittings, enclosures, and cabinets.

B. Approval of submittals is 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 surface mount raceways, boxes, enclosures, cabinets, and suspension systems with other construction.

B. 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.

2 PRODUCTS

2.1 MANUFACTURERS

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

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit, Zinc Coated (RGS): ANSI C80.1.

B. LFMC: Flexible steel conduit with PVC jacket.

C. FMC: Zinc-coated steel or aluminum.

D. Fittings for Conduit (Including all Types and Flexible and Liquidtight): NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

2.3 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.

2.4 CONDUIT ADHESIVES

A. Bonduit by American Polywater Corporation.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1. Cast aluminum with factory finish and gasketed covers.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

E. Hinged-Cover and clamp cover Enclosures: Types and sizes and accessories as shown on drawings.

1. Interior Dry Locations: NEMA 250, Type 1, galvanized steel box with factory finish.

2. Exterior Cabinets: NEMA 250, Type 4 stainless steel.

F. Cabinets: Types and sizes and accessories as shown on drawings.

1. Interior Dry Locations: NEMA 250, Type 1, galvanized steel box with factory finish.
2. Exterior Cabinets: NEMA 250, Type 4 stainless steel.

2.6 FACTORY FINISHES

A. Finish: Enclosure or cabinet components, except for stainless, shall be finished with the manufacturer's standard gray standard rust proof enamel applied to factory-assembled enclosures, and cabinets before shipping.

2.7 ACCESSORIES

A. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.

B. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems."

C. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35°F. Capable of withstanding temperature of 300°F without slump and shall not have any permanent property changes when exposed to temperatures below 35°F, recovering original workability characteristics above 35°F. Compound shall adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

3 EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors where conduits are not specified on the conduit schedule:

1. Exposed: RGS.
2. Concealed: RGS.
3. Underground: RGS. HDPE schedule 40 shall be used for all conduits 4" diameter and greater unless otherwise noted on the drawings.
4. Connection to Vibrating or Moving Equipment (Including Transformers, circuit breakers and all outdoor equipment subject to seismic and/or frost jacking movements): LFMC.
5. Boxes and Enclosures: NEMA 250, Type 4 stainless steel.

B. Indoors where conduits are not specified on the conduit schedule:

1. Exposed, Concealed, Dry, Damp or Wet Locations: RGS.
2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.

3. Boxes and Enclosures: NEMA 250, Type 1, except as follows: a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 3/4-inch trade size (DN 21).

D. Where conduits sizes are not specified, conform to requirements of NFPA 70 for conduits sizing.

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

F. Conduit Elbows:

1. Underground elbows for 2" 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. Rigid galvanized steel Conduit: Use threaded rigid galvanized steel conduit fittings and factory elbows unless otherwise indicated.

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. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated. Each riser from the ground level to an outdoor piece of equipment shall include an offset equal to the diameter of the raceway between the end of the RGS conduit and the LFMC conduit.

H. 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.
4. Where connected to Vibrating or Moving Equipment (Including Transformers, circuit breakers and all outdoor equipment subject to seismic and/or frost jacking movements) the rigid section of conduit shall be physically anchored to the device foundation prior to transition to flexible conduit.

I. Raceways Embedded in Slabs: As indicated on the drawings.

J. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

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

1. Use insulating bushings to protect conductors.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. 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.

N. Stub-up Connections: Extend conduits through concrete floor and outdoor pad for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

O. Flexible Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

P. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

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.

1. "Devcon" or equivalent zinc rich paint, or approved equal, shall be used to touch up damaged galvanizing and applied to exposed threads at all galvanized conduit couplings and connectors. Touch up may be done by either a spray or brush application.
2. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 260533

SECTION 260550

FIELD TESTING

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 specification covers the field testing of the substation equipment and 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 subcontract the services of a QUALIFIED testing firm or INDIVIDUALS, hereafter referred to as the "Testing Subcontractor" to perform all electrical testing specified herein.

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

1. Testing of all wire, cable, electrical equipment 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 substation equipment and 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.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

1.4 REFERENCES

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

1. NESC - National Electric Safety Code
2. NEC - National Electric Code
3. IEEE - Institute of Electrical and Electronics Engineers
4. REA Bul. 1724E-300 (Design Guide for Rural Substations)
5. REA Pub. 202-1 (List of Materials)

6. AEIC - Association of Edison Illuminating Companies
7. NEMA - National Electrical Manufacturer's Association
8. NECA - National Electrical Contractor's Association
9. NETA - International Electrical Testing Association
10. ANSI - American National Standards Institute

1.5 SUBMITTALS

A. Testing Subcontractor qualifications.

B. Testing plan and schedule for all conductors and equipment.

C. Certified test equipment calibration reports.

D. Test Reports:

1. The Testing Subcontractor shall submit reports for all tests performed.
2. The Testing Subcontractor 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 two written copies and one electronic copy of the final test reports, as specified.
4. The Testing Subcontractor may use his standard report forms subject to the approval of Chugach.
5. Electronic documents shall be submitted in Word/Excel 2003, or earlier format, or in searchable unsecured PDF.

1.6 QUALITY ASSURANCE

A. The Testing Subcontractor shall furnish the services of a testing supervisor who is a graduate electrical engineer or an approved technician, thoroughly familiar with substation relaying and controls who shall perform the following:

1. Be personally present on the jobsite during the testing of all wiring, controls, 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 equipment, 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.

C. Follow recommendations and instructions of equipment manufacturer and NETA ATS in addition to requirements of drawings and specifications in testing of equipment.

1.7 COORDINATION

A. Coordinate tests with completion of equipment or system installation and with the completion of auxiliary or related equipment that may be effected by tests. 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.

1.8 EXAMINATION

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

1.9 TESTS

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

1. Power and control cable: All power and control cables installed by the Contractor shall receive a Megger test. Megger all 600 volt power and control cable with a 1000 volt Megger for one minute. Values at the end of one minute must be as follows:

Conductor Capacity Amps	Minimum Resistance Ohms
0 - 24	1,000,000
25 - 50	250,000
51 - 100	100,000
101 - 200	50,000
201 - 400	25,000
501 - 800	12,000
Over 800	5,000

1. Instrument cable: All instrument cables installed by contractor shall be Megger tested. Megger at 500 volts for one minute each conductor of a multi-conductor cable to all other conductors and the shield. Devices that can be damaged by Megger testing shall be removed from the circuit prior to testing. Megger wire and cable after installation and termination, not on the cable reel.
2. Instrument Transformer Tests: No Tests are required.
3. Continuity Tests – All power and control cables shall be tested for continuity between each termination point.

4. 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 as shown on the Drawings.

1.10 TESTING EQUIPMENT

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

B. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.11 PERFORMANCE OF TESTS

A. Testing requirements shall include all tests recommended by the equipment manufacturer for the lighting, high and low voltage power cable and instrumentation 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. After completing testing and checkout of equipment, wiring, control schemes, and other items associated with individual systems, and believing a system to be ready for operation, the Contractor shall notify Chugach, who may elect to witness a final operational test of each individual system.

D. 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.

1.12 EQUIPMENT TESTS

A. Equipment tests shall be performed in accordance with the following.

B. Miscellaneous Equipment.

1. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.
2. The Contractor shall perform tests on all equipment and systems installed by the Contractor. This shall include, but not be limited to, the following:
    a. Wiring Devices: After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Auxiliary System Energization. The auxiliary systems shall include the substation ac service power and the dc control power. Chugach shall be advised two weeks prior to the energization of this equipment. This equipment may be energized from a backup or emergency source upon the concurrence of Chugach. The Contractor will be required to have concluded all testing and checkout of equipment prior to energization. Preliminary test reports are required to be submitted to Chugach prior to the energization of the equipment.

1. The following procedure shall be followed when placing an auxiliary system in-service:
   a. Check all circuit connections and phase relationships immediately prior to energization.
   b. Megger all circuits phase-to-phase, phase-to-ground, wire-to-wire or wire-to-ground immediately preceding energization to assure temporary grounds have been removed.
   c. Disconnect all solid state equipment and ground fault circuit interrupters before making cable tests. Contractor responsible for damage to any such equipment caused by cable tests.
   d. Energize equipment one stage, section, circuit, or piece at a time to minimize damage upon equipment failure and to aid in locating trouble areas.
   e. The Contractor shall be responsible for implementing the tagging procedure upon energization of equipment. He shall also verify that proper voltage levels, current levels, phasing and rotation have been achieved after each energization step. If necessary, corrections shall be made beforeproceeding to the next step.
   f. All measurements and tests shall be recorded. All cables tested and installed by the Contractor shall be noted on a set of Contractor mark-ups. The mark-ups shall clearly note the cables and conductors the Contractor has tested for continuity and Megger. The date and testing person shall be clearly recorded on the mark-ups.

END OF SECTION 260550

SECTION 260553

ELECTRICAL IDENTIFICATION

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. Identification for conductors and communication and control cable.
2. Underground-line warning tape.
3. Warning labels and signs.
4. Instruction signs.
5. Equipment identification labels.
6. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

D. Approval of submittals required when materials substitutions are made.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with NESC.

D. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. 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.

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 surface mount raceways, boxes, enclosures, cabinets, and suspension systems with other construction.

B. 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.

2 PRODUCTS

2.1 CONDUCTOR, COMMUNICATION AND CONTROL 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. Heat Shrink Wire Markers: Provide polyolefin heat shrink tubing makers. Printing shall be by thermal transfer with black characters/lettering on a white background. Heat shrink tubing shall be compatible with printing device used. Provide heat shrink labels from the following manufacturers:

1. Brady B-342 permasleeve markers.
2. Kroy Shrink Tubing.
3. Substitutions will be permitted at Chugach's discretion. Contractor shall provide a written request for wire label substation. Chugach may request physical samples be submitted to approve a wire label substitution.

C. Cable Tags:

1. Provide Brady type B-145 polyethylene tag material with a grey background and black printed lettering.
2. Substitutions for this tag type will be permitted at Chugach's discretion. Contractor shall provide a written request for cable tag substation. 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.

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.4 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

B. Stenciled Legend: In non-fading, waterproof, black ink or paint. Minimum letter height shall be 2 inch (25 mm).

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength: 50 lb (22.6 kg), minimum.
3. Temperature Range: Minus 40°F to plus 185°F (Minus 40°C to plus 85°C).
4. Color: Black, except where used for color-coding.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

3 EXECUTION

3.1 APPLICATION

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

B. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use heat shrink markers. Identify each ungrounded conductor according to source and circuit number.

C. Wiring Devices: write panel and circuit number in inside on back side of cover-plate with indelible marker. Identify each ungrounded conductor according to source and circuit number with heat shrink markers.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of cable tags and heat shrink markers that is uniform and consistent with drawings or the system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

E. 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 warning tape as shown on drawings under ground conduit details.

F. 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. Labeling Instructions:
   a. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:
    a. Enclosures.
    b. Access doors and panels for concealed electrical items.
    c. Circuit Switchers.
    d. Power Fuses.
    e. Phasing on Medium Voltage Circuits.

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. Heat shrink wire markers: Markers shall be heat shrunk onto the wires so that the lettering is visible in the as-left condition.

D. Apply identification devices to surfaces that require finish after completing finish work.

E. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

F. Retain paragraph below for non-adhesive signs or labels.

G. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

    1. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. 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 260553

SECTION 261200

TRANSFOMERS

1 GENERAL

1.1 SECTION INCLUDES

A. New Power Transformer.

B. Auxiliary Equipment and Interconnections.

1.2 DESCRIPTION OF THE WORK

A. This section covers installing the Power Transformer. Work also includes making all connections necessary to other equipment to provide a functioning electrical installation. Major equipment to be installed under this section includes:

B. 14 MVA 138 kV/24.9 kV Power Transformer.

1.3 SUBMITTALS

A. Welder's certificate of fitness and welding procedures.

1.4 PROJECT RECORD DOCUMENTS

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

1.5 QUALITY ASSURANCE

A. Follow manufacturer's instructions in transporting, handling and installing the equipment.

B. Employ only qualified crafts.

C. Provide adequate means of handling of the installation of the equipment.

D. Verify that field conditions are acceptable and are ready to receive equipment.

E. Begin installation only after examination is complete and site is in all respects, ready for equipment installation to proceed.

F. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 COORDINATION

A. Coordinate all equipment transfer and installation activities with Chugach. Chugach to commission all equipment. Coordinate with Chugach for commissioning of installed equipment.

B. Power Transformer shall be dressed out and commissioned by Chugach personnel. Coordinate all activities through Chugach's Site Representative.

2 PRODUCTS

A. Power Transformer listed under description of work are Chugach-furnished. Product information is included on the project Drawings.

B. Contractor shall supply and install all additional materials for complete installation of Power Transformer.

3 EXECUTION

3.1 EXAMINATION

A. Visually inspect equipment for physical damage.

B. Verify dimensions as shown on the Drawings.

C. Assure work of other trades is complete and site is ready to receive the equipment.

D. Field cutting, drilling, punching, or burning is not permitted. Any parts which do not fit or are misaligned will be rejected.

3.2 PREPARATION

A. Clean placement surfaces of debris.

B. Clean all insulators.

C. Contractor shall verify allowed angle from vertical for oil filled devices. Contractor shall not exceed allowed angles during transport and placement of oil filled devices.

3.3 INSTALLATION

A. 14 MVA Power Transformer

1. This section covers installation of Chugach-furnished Power Transformer.
    a. The Power Transformer will be offloaded and set on the pad by the manufacturer. The Contractor shall ensure the Power Transformer is set on the pad in the correct location.
    b. The Contractor shall direct the placement of the Power Transformer onto the correct position on the pad, secure the Power Transformer to the pad, and install ground and conduit connections.
    c. Welding shall be performed by qualified personnel in accordance with AWS D1.1 and D1.8. Provide welded attachment to foundation embedded steel. The Contractor shall provide welder qualifications for Chugach review.
    d. Provide temporary dunnage to store Power Transformer radiators, bushings, and other equipment near Power Transformer location. Provide labor and equipment to off load radiators, bushings, and equipment. Power Transformer radiators, bushings, and other equipment associated with the Power Transformer shall be the Contractors responsibility for up to 30 days after the Power Transformer is installed. If any of the above equipment is damaged during this time period the contractor shall replace it with no additional compensation.
    e. Install all power, control and grounding connections as shown on drawings.

f. Lightning arresters, radiators, bushings, and insulating fluid will be installed by others.

g. Final installation of all medium and high-voltage jumpers shall be coordinated with Chugach.

3.4 TOLERANCES

A. Alignment 1/16 inches horizontal, 1/16 inches vertical.

3.5 TESTS

A. Chugach to test and commission equipment. No tests required.

3.6 PROTECTION

A. Assure adequate protection from the environment until all covers, valves etc. are installed and functioning.

END OF SECTION 261200

SECTION 261210

SWITCHES

1 GENERAL

1.1 SECTION INCLUDES

A. Disconnect Switches

1.2 DESCRIPTION OF THE WORK

A. This section covers receiving and installing hand operated disconnect switches and all connections to other equipment necessary to provide a functioning electrical installation. Major equipment to be installed under this section includes:

1. Disconnect Switch: 138 kV

1.3 SUBMITTALS

A. None.

1.4 PROJECT RECORD DOCUMENTS

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

B. Test reports.

C. Operating and installation manuals.

1.5 QUALITY ASSURANCE

A. Follow manufacturer's instructions in transporting, handling and installing the equipment.

B. Employ only qualified crafts.

C. Provide adequate means of handling of the installation of the equipment.

D. Verify that field conditions are acceptable and are ready to receive equipment.

E. Begin installation only after examination is complete and site is in all respects, ready for equipment installation to proceed.

1.6 COORDINATION

A. Switches shall be installed by the Contractor. Coordinate all equipment transfer and installation activities with Chugach.

B. Switches shall be commissioned by Chugach personnel. Coordinate all activities through Chugach's Site Representative.

2 PRODUCTS

A. Switches listed under description of work are Chugach-furnished. Product information is included on the project Drawings.

B. Contractor shall supply and install all additional materials for complete and functional installation and interconnection as shown on the Drawings.

3 EXECUTION

3.1 EXAMINATION

A. Visually inspect equipment for physical damage.

B. Verify dimensions as shown on the Drawings.

C. Assure work of other trades is complete and site is ready to receive the equipment.

D. Field cutting, drilling, punching, or burning is not permitted. Any parts which do not fit or are misaligned will be rejected.

3.2 PREPARATION

A. Clean placement surfaces of debris.

B. Clean all insulators.

C. Remove protective coverings.

3.3 INSTALLATION

A. Switches

1. This section covers installation of Chugach-furnished power transformer.
    a. Contractor shall load, transport and offload each Switch.
    b. Install the Switches on the structures as indicated on the Drawings. Provide all required field drilling of steel, brackets, piping, couplings, nuts, bolts, washers and other necessary hardware to complete the installation.
    c. The Contractor shall direct the placement of the Switch onto the correct position on the structure, secure the Switch to the structure, install ground connections, and install operating mechanism.
    d. Align the Switch contacts for proper operation.
    e. Do note pierce operator rods with piercing screws. Final adjustments, setting of piercing screws and commissioning shall be performed by Chugach.
    f. Provide high voltage and equipment ground connections.
    g. Final adjustments and commissioning shall be performed by Chugach.
    h. Provide temporary dunnage to store Switches near installation location. Provide labor and equipment to off load Switches. Switches and other equipment associated with the Switches shall be the Contractors responsibility until after the Switch is installed and commissioned. If any of the above equipment is damaged during this time period the contractor shall replace it with no additional compensation.

3.4 TOLERANCES

A. Alignment 1/4 inches horizontal, 1/4 inches vertical.

3.5 TESTS

A. Chugach to test and commission equipment. No tests required.

3.6 PROTECTION

A. None.

END OF SECTION 261210

SECTION 261220

BUSWORK, CONDUCTORS AND FITTINGS

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 specification includes, but is not limited to, the following:

1. Rigid bus
2. Flexible bus
3. Swaged, Bolted, and Compression Connections

1.3 DESCRIPTION OF THE WORK

A. This Section covers the material and installation of all buswork including rigid buses, flexible jumper buses, cable jumpers, fittings and all hardware required to form a complete system of current carrying paths connecting the equipment as shown on the Drawings.

1.4 SUBMITTALS

A. Shop Drawings and product data for all Contractor furnished equipment and materials.

1.5 PROJECT RECORD DOCUMENTS

A. Maintain accurate information of all installations on Drawings, product information, test reports and instruction manuals in accordance with the Special Provisions.

1.6 QUALITY ASSURANCE

A. Use qualified crafts, trained in the specific task(s) to be performed.

B. Provide complete details of swaged procedures.

C. Operate swaged connection press in accordance with manufacturer's instructions.

1.7 FIELD MEASUREMENTS

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

B. Determine required location, arrangement and quantities of materials from the Drawings.

1.8 COORDINATION

A. Coordinate timing of installations with other trades.

1.9 TOOLS

A. Contractor shall provide a swaged press for use to construct bus for this project.

2 PRODUCTS

2.1 MATERIALS

A. Tubular Bus: Extruded aluminum seamless pipe made of 6063-T6 alloy, ANSI schedule and size as indicated on the Drawings. Tubular bus shall be manufactured and supplied in conformance with ASTM B-241.

2.2 CONNECTIONS

A. Bolted Connectors: As indicated on the drawings or approved equal.

B. Compression Connectors:

1. As indicated on the drawings or approved equal.
2. Swaged for tubular and flexible jumper bus conductors.

C. Fasteners: All bolts, washers, and lock washers for bus connections shall be Grade 8 Cad Plated or Stainless Steel (300 series CRES) and provided by Contractor. All nuts shall be silicone bronze. Aluminum is not acceptable. All conductors at joints and fittings shall be clean and free of foreign matter. Excluding DMC Power swaged connections, an oxide-inhibiting compound (Burndy "Penatrox A" or an approved equal) shall be used at all connections involving aluminum conductor and fittings.

D. 138 kV and 24.9 kV Bus: Swaged compression type as shown on Drawings.

3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive the work.

B. Verify all dimensions prior to cutting bus section.

3.2 PREPARATION

A. When aluminum bus is prepared for shipment by wrapping in paper or packaging in cardboard cartons, the bus finish may be damaged if such materials are allowed to become wet and remain on the bus. The Contractor shall unpack, clean, and check aluminum bus immediately upon receipt from the carrier. Contractor shall remove all materials which might damage the bus finish and store the bus in such a manner that the finish will be protected.

B. Before assembly and erection thoroughly clean equipment of all protective coatings and foreign materials.

C. Aluminum to aluminum connections shall be prepared by covering the contact surfaces with "Penetrox A". Then the surface shall be thoroughly cleaned with fine steel wool and bolted together without removing the compound from the contact surfaces. When making aluminum-copper connections place the aluminum above the copper.

D. Aluminum to aluminum connections made with DMC Power swaged connectors do not require contact surfaces to be prepared with any compounds. Follow manufacturer's instructions for surface preparation.

E. Copper to copper connections shall be prepared by rubbing the tinned contact surfaces lightly with fine steel wool, covering them with "Penetrox A" and bolting together without removing the compound from the contact surfaces. If the copper terminals are not tinned, surfaces shall be prepared by cleaning with emery cloth down to bright metal and tinning before applying "Penetrox A".

3.3 INSTALLATION

A. Install buses, damping conductors, cable jumpers, fittings, and all connectors in complete conformance with manufacturers' recommendations.

B. Tubular Bus

1. All bus shall be field cut and trimmed to the required configurations. Bus supports shall be adjusted so that the centerline of the bus is uniform, in alignment, and fits snugly in its saddle. Placement of shims may be necessary. Skewing will not be permitted, and there shall be no offsets where joints are made. Vertical bus or risers shall be perpendicular to, and in alignment with, lower bus. Bus to equipment shall be carefully formed prior to installation by field cutting and bending so as to eliminate any strain on the porcelain equipment bushings from "forced" connection.
2. Where possible, the Contractor shall install bus conductor such that runs between fittings and terminal connectors shall be one continuous run without joints.
3. Care shall be exercised in handling bus to prevent damage to the surface such as nicks and abrasions. Sharp edges and protrusions shall be ground smooth in order to prevent corona discharge from the bus.
4. The Contractor shall drill weep holes in all bus risers, bends, A-frames, and horizontal runs at the lowest practical point to drain moisture accumulation. Unless otherwise noted on the Drawings, the size of weep holes shall be 3/16-inch diameter for bus 3-inch IPS and 4-inch IPS. All holes shall be reamed to remove sharp edges.
5. All tube cutting shall be done with an approved pipe cutter. Flame cutting will not be permitted.
6. Use extreme care not to scratch or mar aluminum surfaces. Contractor shall replace all damaged buswork and fittings without additional compensation.
7. Expansion joints will be shipped unassembled and shall be installed to the configuration as shown on the Drawings.
8. All tubular bus connectors shall be DMC Power swage fittings. Bus couplers shall be installed as specified on the Drawings within the first quarter span either side of a bus support. Bus couplers outside of the first quarter span are not approved.

C. Swaged and Compression Connections

1. Install per manufacturer's recommendations.
2. Minimum distance between two swaged fittings is 6 inches.

D. Bolted Connections

1. Use corrosion inhibiting compound (Penetrox-A) for all connections, except where using DMC Power swaged connectors.
2. Use torque wrenches in accordance with manufacturer's recommendations for bolt installations.

3. Remove excess compound.
4. All bolts, washers, and lock washers for bus connections shall be Grade 8 Cad Plated or Stainless Steel (300 series CRES) and provided by Contractor. All nuts shall be silicone bronze. Aluminum is not acceptable. All conductors at joints and fittings shall be clean and free of foreign matter. Excluding DMC Power swaged connections, an oxide-inhibiting compound (Burndy "Penatrox A" or an approved equal) shall be used at all connections involving aluminum conductor and fittings.
5. Bolts installed vertically shall have the bolt head oriented gravitationally down (nut on top).
6. No more than three and no less than one thread shall be showing when the nut is attached and tightened to the correct torque value.

E. Compression Connections for Flexible Conductors

1. Install connectors with properly sized dyes in accordance with the manufacturer's instructions. All required dies and equipment is to be furnished by the Contractor.
2. Apply oxide inhibiting compound compatible with the connections and surface conditions involved.
3. Where inverted connections are required provide swaged connections with weep hole. Inverted compression type connectors are not acceptable.

F. Jumper Loops and Strings

1. Flexible jumpers and flexible vertical cable taps shall be installed of such length and form as to maintain maximum clearance for surrounding objects and to give assurance that such contour will be stable. Cable for the jumper buses shall be the type and size shown on the Drawings. Jumper buses shall be smoothly formed, and adjacent runs shall be similarly and symmetrically shaped to provide a uniform and aesthetically pleasing appearance throughout.
2. Stranded conductor shall be installed without twists, kinks, or "bird-caging" and shall be handled to avoid abrasions or other damage. No splices shall be allowed in overhead strain buses.

3.4 TOLERANCES

A. Horizontal Bus: 1/8 inches per 10 Feet length.

B. Vertical Bus: 1/8 inches per 10 Feet length.

3.5 FIELD QUALITY CONTROL

A. Chugach's Representative may inspect all swaged, compression, and bolted connections. Contractor shall assist by providing equipment and operators to access locations.

B. Radiographic and/or infrared tests may be performed by Chugach. Contractor shall provide assistance in performing such tests.

3.6 PROTECTION

A. Maintain safe clearances from all existing installations not part of this project.

B. Safeguard all existing facilities.

END OF SECTION 261220

SECTION 261225

INSULATORS

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 specification includes, but is not limited to, the following:

1. Station Post Insulators
2. Auxiliary Equipment and Interconnections

1.3 DESCRIPTION OF THE WORK

A. This section covers receiving and installing insulators and their mounting and all connections necessary to other equipment to provide a functioning electrical installation.

1.4 SUBMITTALS

A. Shop Drawings and product data for all Contractor furnished equipment and materials.

1.5 PROJECT RECORD DOCUMENTS

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

1.6 QUALITY ASSURANCE

A. Follow manufacturer's instructions in transporting, handling and installing the equipment.

B. Employ only qualified crafts for and adequate means of handling of the installation of the equipment.

1.7 COORDINATION

A. Coordinate all activities through Chugach's Site Representative.

2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: As specified on the drawings or approved by Chugach.

3 EXECUTION

3.1 EXAMINATION

A. Visually inspect equipment for physical damage.

B. Verify dimensions as shown on the Drawings.

C. Assure work of other trades is complete and site is ready to receive the equipment.

3.2 PREPARATION

A. Clean placement surfaces of debris.

B. Remove protective coverings.

C. Clean Insulators.

3.3 INSTALLATION

A. Station Post Insulators

1. Install on support structures as shown on the Drawings.
2. Contractor to provide all required auxiliary equipment and materials required for mounting and interconnections.
3. Torque bolts to the manufacturer's instructions.
4. Make electrical connections in accordance with the Drawings.

3.4 TOLERANCES

A. Station post insulator alignment: 1/4 inches horizontal, 1/4 inches vertical.

END OF SECTION 261225

SECTION 261305

POWER CIRCUIT BREAKERS

1 GENERAL

1.1 SECTION INCLUDES

A. SF_6 Circuit Breakers.

B. Auxiliary Equipment and Interconnections.

1.2 DESCRIPTION OF THE WORK

A. This section covers receiving and installing power circuit breakers with SF_6 insulation, bushing current transformers and all connections to other equipment necessary to provide a competed and functional installation. Major equipment to be installed under this section includes:

1. Circuit Breaker: 138 kV

1.3 SUBMITTALS

A. None.

1.4 PROJECT RECORD DOCUMENTS

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

B. Test reports.

C. Operating and installation manuals.

1.5 QUALITY ASSURANCE

A. Follow manufacturer's instructions in transporting, handling and installing the equipment.

B. Employ only qualified crafts.

C. Provide adequate means of handling of the installation of the equipment.

D. Verify that field conditions are acceptable and are ready to receive equipment.

E. Begin installation only after examination is complete and site is in all respects, ready for equipment installation to proceed.

1.6 COORDINATION

A. Circuit Breakers shall be installed by the Contractor. Coordinate all equipment transfer and installation activities with Chugach.

B. Circuit Breakers shall be commissioned by Chugach personnel. Coordinate all activities through Chugach's Site Representative.

2 PRODUCTS

A. Circuit Breakers listed under description of work are Chugach-furnished. Product information is included on the project Drawings.

B. Contractor shall supply and install all additional materials for complete and functional installation and interconnection as shown on the Drawings.

3 EXECUTION

3.1 EXAMINATION

A. Visually inspect equipment for physical damage.

B. Verify dimensions as shown on the Drawings.

C. Assure work of other trades is complete and site is ready to receive the equipment.

D. Field cutting, drilling, punching, or burning is not permitted. Any parts which do not fit or are misaligned will be rejected.

3.2 PREPARATION

A. Clean placement surfaces of debris.

B. Clean all insulators.

C. Remove protective coverings.

3.3 INSTALLATION

A. Circuit Breakers

1. This section covers installation of Chugach-furnished power transformer.
    a. Contractor shall load, transport and offload each Circuit Breaker.
    b. Contractor shall remove Circuit Breaker and Circuit Breaker stands from manufacturers' crates and set on foundation in accordance with drawing.
    c. The Contractor shall assemble Circuit Breaker support stands and place Circuit Breakers on stands. The Circuit Breakers will be commissioned by Chugach. DO NOT OPERATE CIRCUIT BREAKERS.
    d. The Contractor shall direct the placement of the Circuit Breaker onto the correct position on the foundation, secure the Circuit Breaker to the foundation, install ground connections, and install conduit connections.
    e. Provide all required field drilling of steel, brackets, piping, couplings, nuts, bolts, washers and other necessary hardware to complete the installation.
    f. Provide high voltage and equipment ground connections.
    g. Install all power and control cables as shown on the Drawings.

h. The Contractor shall provide electrical service for all equipment containing heaters. The low-voltage AC electrical service shall be adequate to maintain temperature within enclosures above the dew point of the surrounding air. The Contractor shall regularly check temperatures within the enclosures and heaters to ensure proper operation.

i. Provide temporary dunnage to store Circuit Breakers and stands near installation location. Provide labor and equipment to off load Circuit Breakers and stands. Circuit Breakers and other equipment associated with the Circuit Breakers shall be the Contractors responsibility until after the Circuit Breaker is installed and commissioned. If any of the above equipment is damaged during this time period the contractor shall replace it with no additional compensation.

3.4 TOLERANCES

A. Alignment 1/4 inches horizontal, 1/4 inches vertical.

3.5 TESTS

A. Chugach to test and commission equipment.

3.6 PROTECTION

A. Assure adequate protection from the environment.

END OF SECTION 261305

SECTION 312000

EARTHWORK

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. Crushed Rock Surface Course.
3. AASHTO #57 Coarse Aggregate
4. Bedding Sand.
5. Separation Geotextile.
6. Final Grading.
7. Excavating, backfilling, and compacting for foundations, pads, and other underground structures.

1.3 DEFINITIONS

A. Crushed Rock Surface Course: Crushed gravel or rock placed above subgrade on substation site. Shown as 'Crushed Rock' on drawings.

B. AASHTO #57 Coarse Aggregate: Open-graded, self-compacting aggregate blend of size 5, 6, & 7 stone placed as part of the transformer oil secondary containment system.

C. Excavation: Removal of material encountered below subgrade.

D. Backfill: Soil material used to fill an excavation.

E. 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.

F. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data for the following:

1. Geotextile.

B. 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, AASHTO #57 Coarse Aggregate, and Crushed Rock.
2. Laboratory density according to ASTM D 1557 for Classified Fill.

C. 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 Section 3 of this Specification. 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.

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

B. Crushed Rock

1. Crushed Rock shall consist of hard, angular crushed, washed natural stone uniform in density and quality, and free from thin and elongated pieces, friable materials and debris, dirt, and other objectionable material. At least fifty (50) percent of the coarse aggregate particles shall have two or more mechanically fractured faces. The aggregate shall meet the following washed sieve gradation as follows:

Crushed Rock	
Sieve Size	% Passing by Weight
3 inch	100
2 inch	90-100
1 1/2 inch	80-95
1 inch	30-60
3/4 inch	0-10
3/8 inch	0-3

C. AASHTO #57 Coarse Aggregate

1. AASHTO #57 stone as defined by quarries, state agencies, etc. is an open-graded, self-compacting aggregate blend of size 5, 6, & 7 stone. The aggregate shall meet the following washed sieve gradation as follows:

AASHTO #57 Coarse Aggregate	
Sieve Size	% Passing by Weight
1 1/2 inch	100
1 inch	95-100
1/2 inch	25-80
#4	0-10
#8	0-5

D. Bedding Sand

1. Bedding Sand shall consist of clean, sound, durable particles of sand, stone, or gravel and shall be free from ice, frozen material, organic matter, excess coatings of clay, silt, and other deleterious material and shall contain no clay balls. Anchorage Sand & Gravel product 13206B Class E Bedding Material qualifies as Bedding Sand. Bedding sand shall be graded within the design range indicated as follows:

Bedding Sand	
Sieve Size	% Passing by Weight
1/2 inch	100
3/8 inch	80-100
#4	20-75
#8	12-60
#30	2-30
#200	0-6

E. Geotextile

1. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
2. Tensile Strength: 180 x 180 lb; ASTM D-4632.

3. Elongation: 15%; ASTM D-4632.
4. CBR Puncture: 550 psi; ASTM D-6241.
5. Trapezoidal Tear: 70 x 70 lb; ASTM D-4533.
6. UV Resistance (500 hours): 70%; ASTM D-4355.
7. Apparent Opening Size (AOS): No. 40 sieve maximum; ASTM D-4751.
8. Permittivity: 0.05 per second, minimum; ASTM D-4491.
9. Water Flow Rate: 4 gpm/sq. ft., minimum; ASTM D-4491.

2.2 STOCKPILE MATERIAL

A. Stock Piled Material: None

3 EXECUTION

3.1 PREPARATION

A. Preparation of subgrade is not applicable as this substation is existing.

3.2 EXPLOSIVES

A. Explosives: Do not use explosives.

3.3 EXCAVATION AND INSPECTION

A. Undeveloped areas to be graded shall be excavated minimum 12 inches below existing ground surface. Excavate additionally as required to expose planned subgrade, to remove frost susceptible (silty) soils within 30 inches of the depth below planned subgrade, or to completely remove organics, obstructions and debris.

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

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

D. Where frost susceptible (silty) soils are encountered in structural areas, place geotextile between the silty soils and backfill regardless of the depth to subgrade.

E. 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.

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

G. This project takes place in a historical substation where contaminated soils may exist. Should contaminated soils be encountered in the course of excavation, the Contractor shall cease excavation activities and notify Chugach.

3.4 FOUNDATION EXCAVATION

A. Foundations shall be over-excavated if silty, soft, or loose soils are encountered or as noted on the Drawings.

B. Bottom of excavation for other foundations shall be scarified to a depth of 6 inches and compacted to not less than 95% of maximum dry unit weight according to ASTM D 1557.

3.5 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation with compacted Classified Fill material.

3.6 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.

3.7 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.

3.8 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to contours indicated on the drawings.

B. Provide a smooth transition between adjacent existing grades and new grades surrounding all foundations and work areas.

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

3.9 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. Footings – One test per every 200 square feet of concrete footing, minimum of one test per concrete footing.
2. Site Utility Trenches – One test every 200 feet of trench.

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.

3.10 GEOTEXTILE

A. Separation Geotextile: Lay geotextile parallel to the slope at surface of subgrade. Stretch geotextile to remove any creases or wrinkles. Join edges by sewing a double-thread chain stitch or overlap a minimum of 3 feet. Sew or overlay areas torn or punctured.

3.11 CRUSHED ROCK

A. Place crushed rock surface course over separation geotextile.

B. Shape to required elevations.

C. Compact with a minimum of 6 passes of a 15-ton roller or other Chugach-approved vibrating equipment.

3.12 AASHTO #57 COARSE AGGREGATE

A. Place AASHTO #57 Coarse Aggregate as specified on the Drawings.

B. This material cannot be compacted in a true sense, but can be properly oriented with compaction equipment. Compaction testing of #57 stone with a nuclear gauge or other device is not possible. So rather than compaction tests, #57 stone should have it's individual stone facets properly oriented using a plate compactor, jumping jack, or other Chugach-approved vibratory compaction devices. Using compaction equipment, #57 stone will typically compact about one inch in vertical height, which is equivalent to about 8% settlement. This can be visually observed and verified.

C. Shape to required elevations.

3.13 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 re-compact as directed by Chugach.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

B. The Contractor shall remove contaminated soils from the excavation as directed by Chugach. Contaminated soils will be disposed of by Chugach.

END OF SECTION 312000

CHUGACH ELECTRIC ASSOCIATION, INC.
BELUGA TRANSFORMER T-10 REPLACEMENT
BELUGA, ALASKA 99695
W.O. E1920053

CHUGACH
POWERING ALASKA'S FUTURE

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

CALL BEFORE YOU DIG!

LOCATE CALL CENTER OF ALASKA (LCCA)	
ANCHORAGE AREA	278-3121
STATEWIDE	800-478-3121
AT&T ALASCOM INC.	264-8465
ALASKA RAILROAD UTILITIES	265-2457
ALYESKA CABLE TV (GIRDWOOD)	783-2982
MILITARY PETROLEUM FUEL LINES	552-2334 OR 552-5342
STATE STORM DRAINS & STREET LIGHTS	333-2411

DRAWING INDEX

DRAWING NUMBER	TITLE	SHEET NUMBER	DRAWING REVISION NUMBER	NOTES
BGSS-WO-INDEX1	TITLE & DRAWING INDEX	1	0	
BGSS-SS-7000	138KV BUS GENERAL ARRANGEMENT PLAN	1	0	DEMOLITION DRAWING
BGSS-SS-7001	13.8/12.5/24.9KV FEEDER CIRCUITS SUBSTATION ELEVATIONS	1	0	DEMOLITION DRAWING
BGSS-SS-7002	GROUNDING PLAN	1	0	DEMOLITION DRAWING
BGSS-SS-7003	138 KV YARD CONDUIT PLAN	1	0	DEMOLITION DRAWING
BGSS-SS-0071	GENERAL INFORMATION	1	0	
BPP-S-0003	138KV BUS GENERAL ARRANGEMENT PLAN	1	0	
BGPP-S-0018	13.8/12.5/24.9KV FEEDER CIRCUITS SUBSTATION ELEVATIONS	1	0	
BGSS-SS-0067	BUSWORK BILL OF MATERIAL	1	0	
BPP-S-0002	138 KV / 230 KV YARD FOUNDATION PLAN	1	0	
BGSS-SS-0065	FOUNDATION T10 TRANSFORMER FOUNDATION DETAILS	1	0	
BGSS-SS-0066	FOUNDATION MISC THONEX SYSTEM FOUNDATIONS DETAILS	2	0	
BPP-S-0004	138 KV YARD CONDUIT PLAN	1	0	
BGSS-SS-0068	CONDUIT DETAILS	1	0	
BGSS-SS-0068	CONDUIT BILL OF MATERIAL	2	0	
BGSS-SS-0068	CONTROL CABLE CABLE SCHEDULE	3	0	
BPP-S-0005	GROUNDING PLAN	1	0	
BGSS-SS-0069	GROUNDING DETAILS	1	0	
BGSS-SS-0069	GROUNDING DETAILS	2	0	
BGSS-SS-0069	GROUNDING BILL OF MATERIAL	3	0	
BGSS-EQ-0042	138 kV CIRCUIT BREAKER RATING NAMEPLATE	1	0	ISSUED FOR REFERENCE ONLY
BGSS-EQ-0042	138 kV CIRCUIT BREAKER BCT RATING NAMEPLATE MR-RELAYING	2	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0042	138 kV CIRCUIT BREAKER BCT RATING NAMEPLATE MR-RELAYING	3	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0042	138 kV CIRCUIT BREAKER OUTLINE	4	0	ISSUED FOR REFERENCE ONLY
BGSS-EQ-0042	138 kV CIRCUIT BREAKER GAS BUSHING OUTLINE	5	0	ISSUED FOR REFERENCE ONLY
BGSS-EQ-0042	138 kV CIRCUIT BREAKER GAS SYSTEM	6	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0042	138 kV CIRCUIT BREAKER SCHEMATIC DIAGRAM	7	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0042	138 kV CIRCUIT BREAKER SCHEMATIC DIAGRAM	8	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0042	138 kV CIRCUIT BREAKER WIRING DIAGRAM	9	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0042	138 kV CIRCUIT BREAKER WIRING DIAGRAM	10	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0042	138 kV CIRCUIT BREAKER BCT WIRING DIAGRAM	11	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 NAMEPLATE	1	0	ISSUED FOR REFERENCE ONLY
BGSS-EQ-0043	POWER TRANSFORMER T10 OUTLINE	2	0	ISSUED FOR REFERENCE ONLY
BGSS-EQ-0043	POWER TRANSFORMER T10 OUTLINE	3	0	ISSUED FOR REFERENCE ONLY
BGSS-EQ-0043	POWER TRANSFORMER T10 BUSHINGS AND ARRESTERS	4	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 CONTROL SCHEMATICS COOLING CONTROL AND ACCESSORIES CIRCUITS	5	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 CONTROL SCHEMATICS ALARMS, ETM, SEAL-IN PANEL AND FAN CIRCUIT	6	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 BUSHING CT'S AND MAIN LEGEND	7	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 CONTROL WIRING DIAGRAM BACK PANEL TERMINAL WIRING	8	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 CONTROL WIRING DIAGRAM BACK PANEL, LEFT SIDE PANEL AND OFF PANEL DEVICES WIRING	9	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 CONTROL WIRING DIAGRAM DUCTOR SEALS, BCT WIRING TABS AND EXTERNAL DEVICES	10	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 CONTROL WIRING DIAGRAM PANEL LAYOUT	11	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0043	POWER TRANSFORMER T10 TYPICAL CHARACTERISTIC CURVES	12	0	AVAILABLE BUT OMITTED FROM THE CONSTRUCTION PACKAGE
BGSS-EQ-0044	SECONDARY CONTAINMENT POWER TRANSFORMER T10	1	0	ISSUED FOR REFERENCE ONLY

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019		

NO	RECORD REVISION	TECH / DWN. BY	W.P. #	W.O. APPROVED	RECORD APPROVED	DATE

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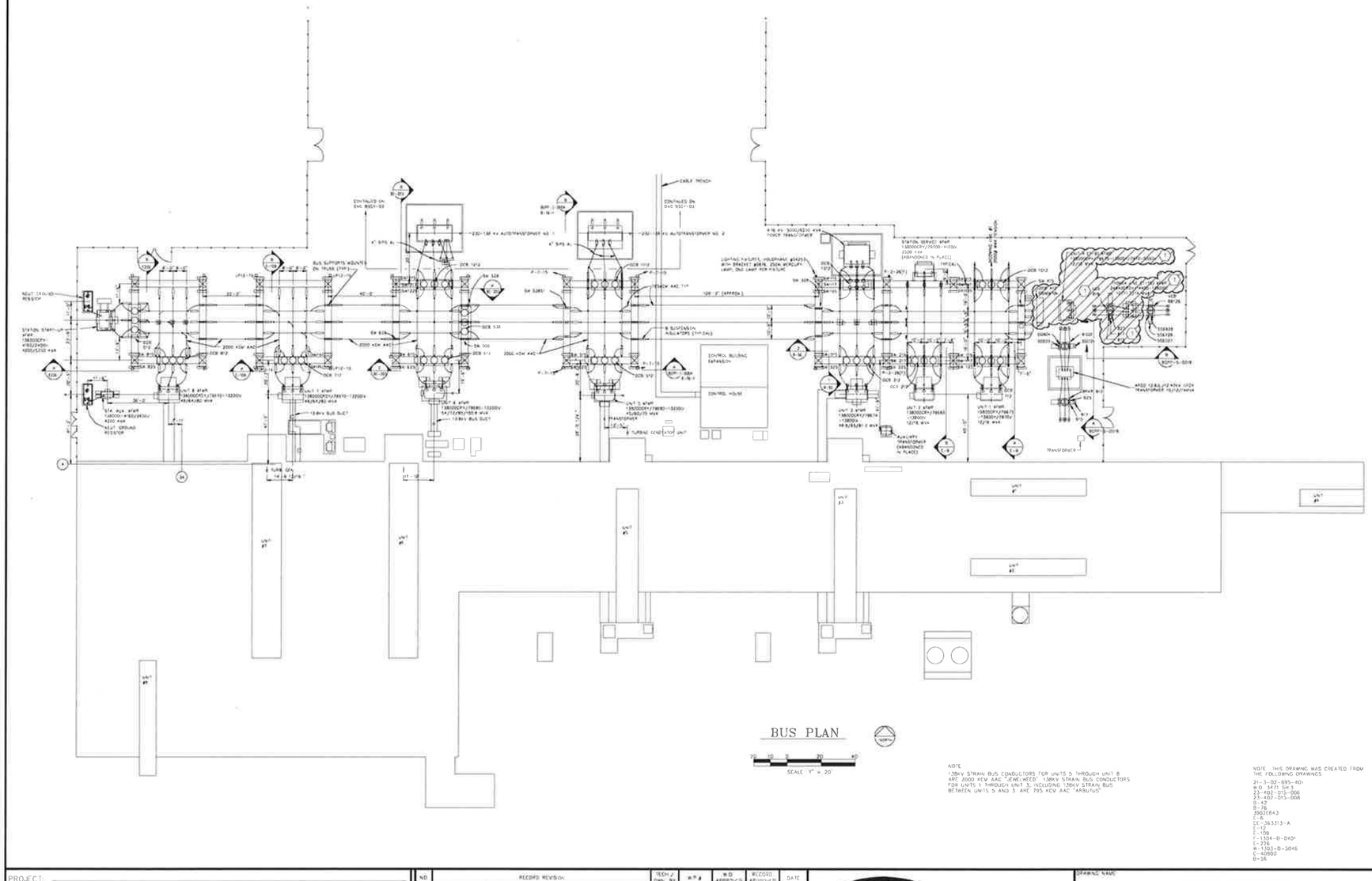
DRAWING NAME:
BELUGA SUBSTATION
BELUGA TRANSFORMER T-10 REPLACEMENT
TITLE & DRAWING INDEX

bgss-wo-index1_1.dwg

DRAWING NO - PREVIOUS/REFERENCE:
NEW

DRAWING NO: BGSS-WO-INDEX1

SHEET 1 OF 1
PAGE



PROJECT:
ENG./DESIGN: W.O. #

NO.	CONSTRUCTION REVISION	DWN BY	APPROVED (ENG/DES)	APPROVED (CHUGACH)	DATE	ENG. STAMP

NO.	RECORD REVISION	TECH / DWN. BY	W.P. #	W.O. APPROVED	RECORD APPROVED	DATE
2	CEI RECORD UPDATE					11/21/85
1	AS BUILT	SG/MP	E930085			10/12/93
2	AS BUILT, ARCO, TYONEK CIRCUIT UPGRADES FOR ARCO COMPRESSOR PROJECT		E930235EN	E951112	JPD	3/3/97

Chugach Electric ASSOCIATION, INC.
5601 Minnesota Drive
P.O. Box 196300
Anchorage, Alaska
99519-6300

DRAWING NAME
BELUGA SUBSTATION
138KV
BUS GENERAL ARRANGEMENT PLAN

x:/buvata/bgss/ss7000.dwg 5/22/97

DRAWING NO - PREVIOUS/REFERENCE

DRAWING NO: BPP-S-0003

SHEET 1 OF 1
PAGE /

Electric Power Systems
Consulting Engineers
TEL (907) 522-1953
3305 ARCTIC BLVD, STE 201, ANCHORAGE, AK 99503
CERTIFICATE OF AUTHORIZATION: AECC 738

DEMOLITION LEGEND:

DEMOLITION NOTES:
1. TRANSFORMER T-9, TRANSFORMER T-10, VCB 816, SW 815, SW 817, AND SW 825 SHALL BE REMOVED AND TRANSPORTED TO CHUGACH'S WEST STORAGE YARD AS DIRECTED BY CHUGACH.

DEMOLITION

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019		STATE OF ALASKA Timothy C. Conrad 10 ASSOCIATE PROFESSIONAL ENGINEER

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

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DRAWING NAME
BELUGA SUBSTATION
138KV
BUS GENERAL ARRANGEMENT PLAN

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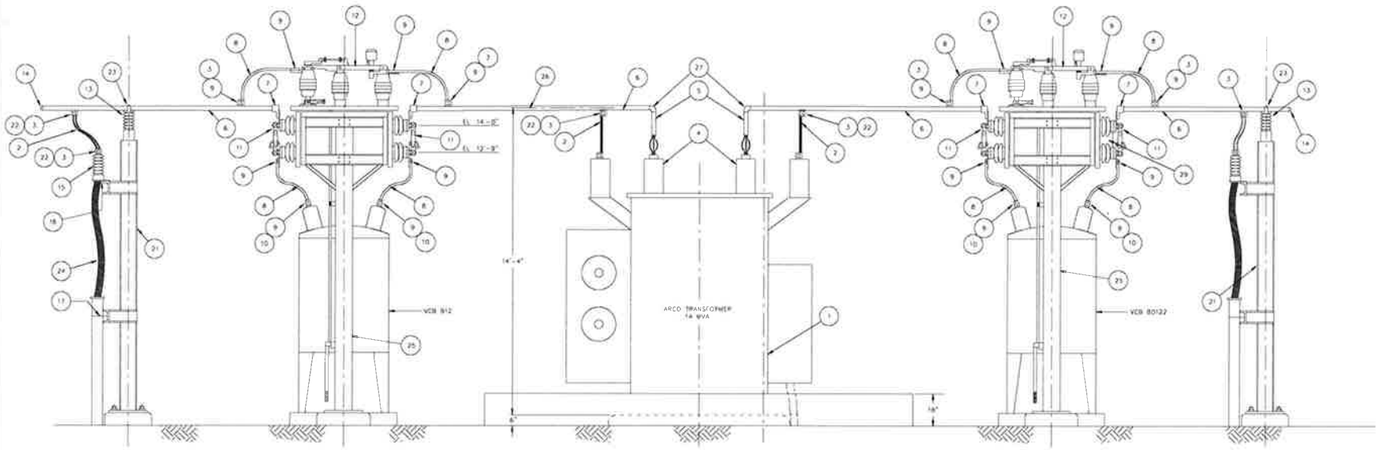
bgss-ss-7000.dwg

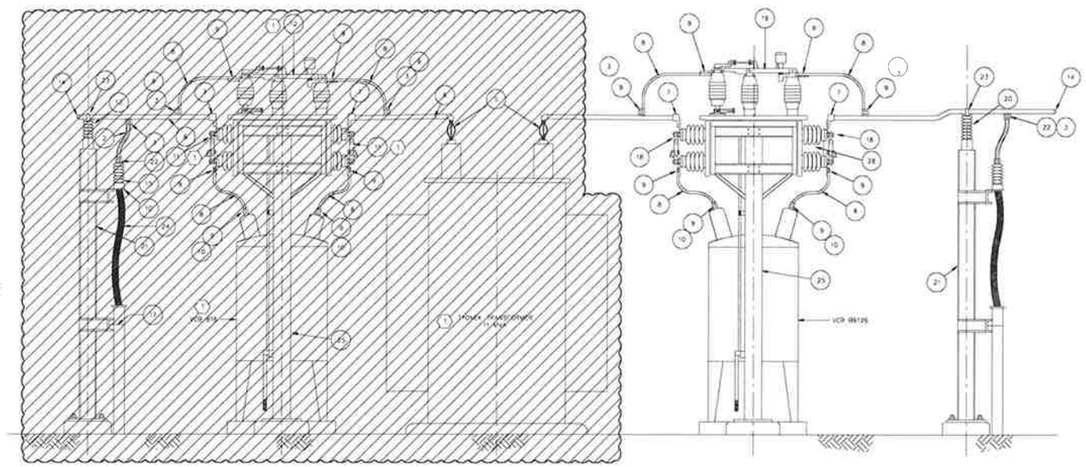
DRAWING NO - PREVIOUS/REFERENCE

DRAWING NO: BGSS-SS-7000

SHEET 1 OF 1
PAGE /



A BPP-S-0003 **ARCO SYSTEM BUS ELEVATION**
SCALE: 1/2" = 1'-0"



B BPP-S-0003 **TYONEK SYSTEM BUS ELEVATION**
SCALE: 1/2" = 1'-0"

SCALE 1/8" = 1'-0"

BILL OF MATERIALS

ITEM	QUANTITY	DESCRIPTION
1	1	13.8/12.47KV POWER TRANSFORMER 14 MVA
2	APPROX 80	#/0 BARE COPPER
3	42	4-HOLE PADDLE TEE CONNECTOR, AL
4	6	TRANSFORMER BUSHINGS, 1200 AMP, 15KV
5	12	WELDMENT EXPANSION CONN. STUD TO TUBE, AL
6	APPROX 300	3" IPS SCHEDULE 40 ALUMINUM BUS
7	24	WELDMENT TERMINAL TUBE TO FLAT BD.
8	APPROX 300	795 AAC ARBUTUS
9	96	COMPRESSION DI. PADDLE 4-HOLE
10	24	STUD CONNECTOR, 4-HOLE
11	18	S&C LOAD BUSTER DISCONNECT, 15KV 1Ø
12	6	S&C ALDUTY-RUPTER SWITCH, 15KV 1Ø
13	9	15KV INSULATOR, PORCELAIN, 10,000# COMP., 200# CANT
14	12	END PLUG, ALUMINUM 2"
15	9	OUTDOOR 15KV TERMINATION
16	6	MOUNTING BRACKET 15KV TERMINATION
17	12	U-BOLT FOR 6" PVC
18	6	S&C LOAD BUSTER DISCONNECTS, 35KV 1Ø
19	3	S&C ALDUTY-RUPTER SWITCH, 25KV 1Ø
20	3	25KV INSULATOR, PORCELAIN, 10,000# COMP., 200# CANT
21	4	STEEL RISER STRUCTURE
22	24	2-HOLE PADDLE TO #/0 DI COMPRESSION
23	15	SLIP-FIT BUS SUPPORT
24	APPROX 450	15KV CABLE, 350 KCMIL AL
25	4	BYPASS SWITCH STRUCTURE
26	13	ALUMINUM WELDMENT COUPLER TUBE TO TUBE
27	12	ALUMINUM WELDMENT COUPLER 90° TUBE TO TUBE
28	3	14.4KV (Ø-GROUND) POTENTIAL TRANSFORMER
29	3	7.2KV (Ø-GROUND) POTENTIAL TRANSFORMER

* DENOTES OWNER FURNISHED MATERIAL

Electric Power Systems, Inc.
Consulting Engineers
3305 ARCTIC BLVD, STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: ACCC 738

DEMOLITION LEGEND:

DEMOLITION NOTES:

1. TRANSFORMER T-9, TRANSFORMER T-10, VCB 816, SW 815, SW 817, AND SW 825 SHALL BE REMOVED AND TRANSPORTED TO CHUGACH'S WEST STORAGE YARD AS DIRECTED BY CHUGACH.

DEMOLITION

PROJECT:
ENG./DESIGN: W.O. #

NO	CONSTRUCTION REVISION	DWN BY	APPROVED (ENG/DES)	APPROVED (CHUGACH)	DATE

ENG. STAMP

NO	RECORD REVISION	TECH./ DWN. BY	W.P. #	W.O. APPROVED	RECORD APPROVED	DATE
1	AS BUILT, AREA TYONEK CIRCUIT UPGRADES FOR ARCO COMPRESSOR PROJECT		9305 2354/4	E95****2	PRO	3/31/97

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

DRAWING NAME:
BELUGA POWER PLANT
13.8/12.5/24.9KV FEEDER CIRCUITS
SUBSTATION ELEVATIONS
s:/substn/bgss/elvat/bgpss18.dwg 3/27/97

DRAWING NO - PREVIOUS/REFERENCE:

DRAWING NO: BGPP-S-0018 SHEET 1 OF 1 PAGE

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

ENG. STAMP
STATE OF ALASKA
49TH
Timothy C. Conrad
No. EE 11207
REGISTERED PROFESSIONAL ENGINEER

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

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Anchorage, Alaska 99519-6300

DRAWING NAME:
BELUGA POWER PLANT
13.8/12.5/24.9KV FEEDER CIRCUITS
SUBSTATION ELEVATIONS

CONFIDENTIAL

DRAWING NO - PREVIOUS/REFERENCE:

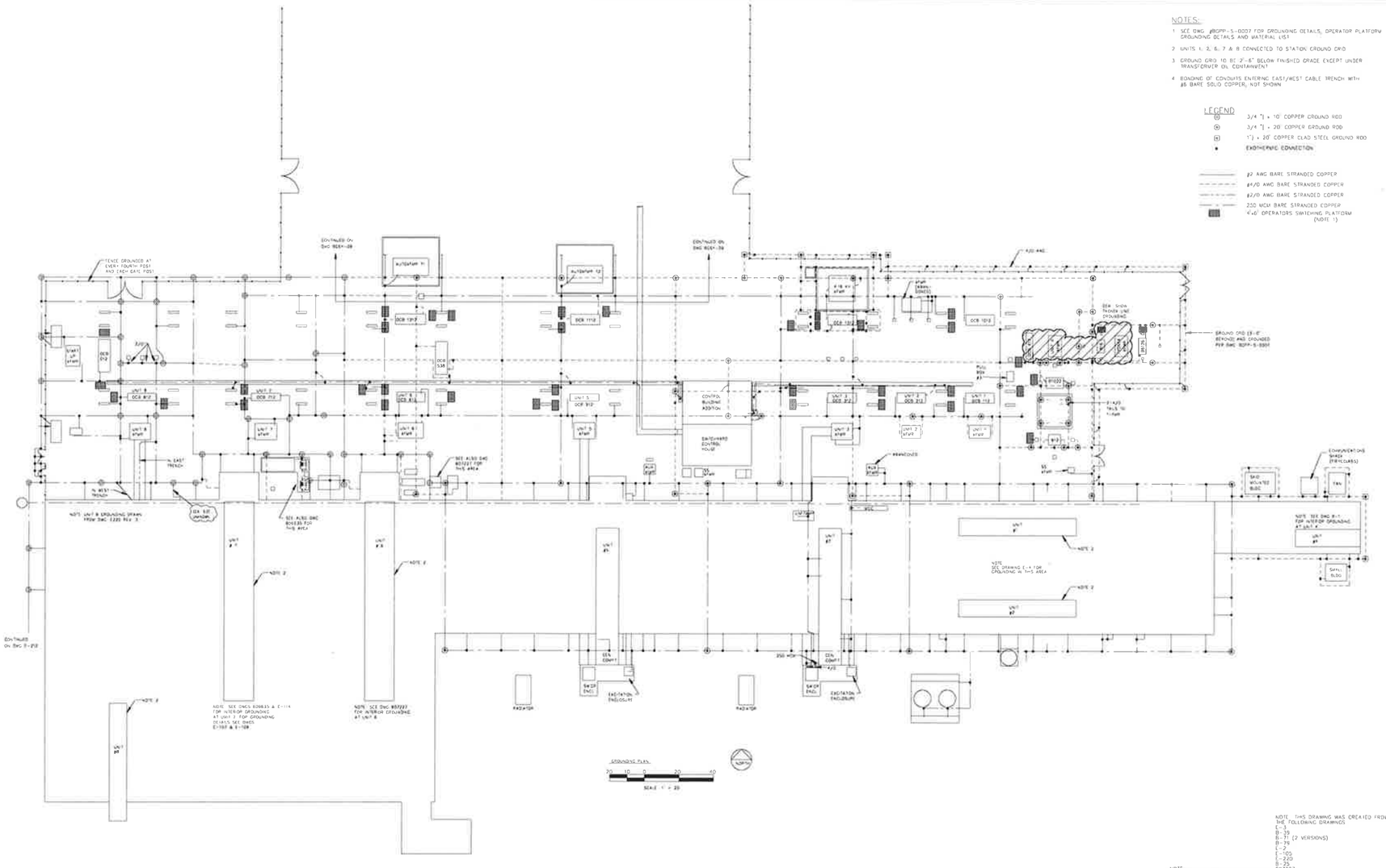
DRAWING NO: BGSS-SS-7001 SHEET 1 OF 1 PAGE

NOTES:

1. SEE DWG. #BGPP-S-0007 FOR GROUNDING DETAILS, OPERATOR PLATFORM GROUNDING DETAILS AND MATERIAL LIST
2. UNITS 1, 2, 6, 7 & 8 CONNECTED TO STATION GROUND GRID
3. GROUND GRID TO BE 2'-6" BELOW FINISHED GRADE EXCEPT UNDER TRANSFORMER OIL CONTAINMENT
4. BONDING OF CONDUITS ENTERING EAST/WEST CABLE TRENCH WITH #6 BARE SOLID COPPER, NOT SHOWN

LEGEND

- 3/4 "| x 10' COPPER GROUND ROD
- 3/4 "| x 20' COPPER GROUND ROD
- 1" | x 20' COPPER CLAD STEEL GROUND ROD
- EXOTHERMIC CONNECTION
- #2 AWG BARE STRANDED COPPER
- #4/0 AWG BARE STRANDED COPPER
- #2/0 AWG BARE STRANDED COPPER
- 250 MCM BARE STRANDED COPPER
- 4'xE' OPERATORS SWITCHYRD PLATFORM (NOTE 1)



NOTE
GPS LOCATIONS ARE APPROXIMATE THERE MAY BE MORE GROUND RODS THAN ARE SHOWN

NOTE: THIS DRAWING WAS CREATED FROM THE FOLLOWING DRAWINGS
E-1
E-35
B-37 (2 VERSIONS)
B-79
E-2
E-105
E-220
B-25
B07227
B09835
B-83
E-4

DEMOLITION LEGEND:

PROJECT:						
ENG./DESIGN:				W.O. #		
NO.	CONSTRUCTION REVISION	DWN BY	APPROVED (ENG/DES)	APPROVED (CHUGACH)	DATE	ENG. STAMP

NO	RECORD REVISION	TECH / DWN. BY	WP #	W.O. APPROVED	RECORD APPROVED	DATE
1	CEI RECORD UPDATE				MS	11/6/89
2	SWEC-GROUND GRID DESIGN					10/92
3	AS BUILT	SG/LMP	E9502065			12/93
4	AS BUILT AREA, PHASE CIRCUIT UPGRADES FOR ARCO COMPRESSOR PROJECT		9330.235(N)	E9511192	WD	3/3/97
5	ASBUILT – CABLE TRENCH AND CONDUIT INSTALLATION	DVE	100.3430	W9920156	D.CROFF	10/2/00

Chugach Electric Association

5601 Minnesota Drive
P.O. Box 196300
Anchorage, Alaska
99519-6300

DRAWING NAME:
BELUGA POWER PLANT
GROUNDING PLAN

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DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO.: BPP-S-0005 SHEET 1 OF 1 PAGE

EPS Electric Power Systems Consulting Engineers
TEL (907) 522-1953 3305 ARCTIC BLVD, STE 201, ANCHORAGE, AK 99503
CERTIFICATE OF AUTHORIZATION AECC 738

DEMOLITION

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019		STATE OF ALASKA 49TH APPROVED Timothy C. Conrad No. EE13307 09/03/19 REGISTERED PROFESSIONAL ENGINEER

NO	RECORD REVISION	CAD DRAWN BY	WP #	W.O. NUMBER	RECORD APPROVD	DATE

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5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

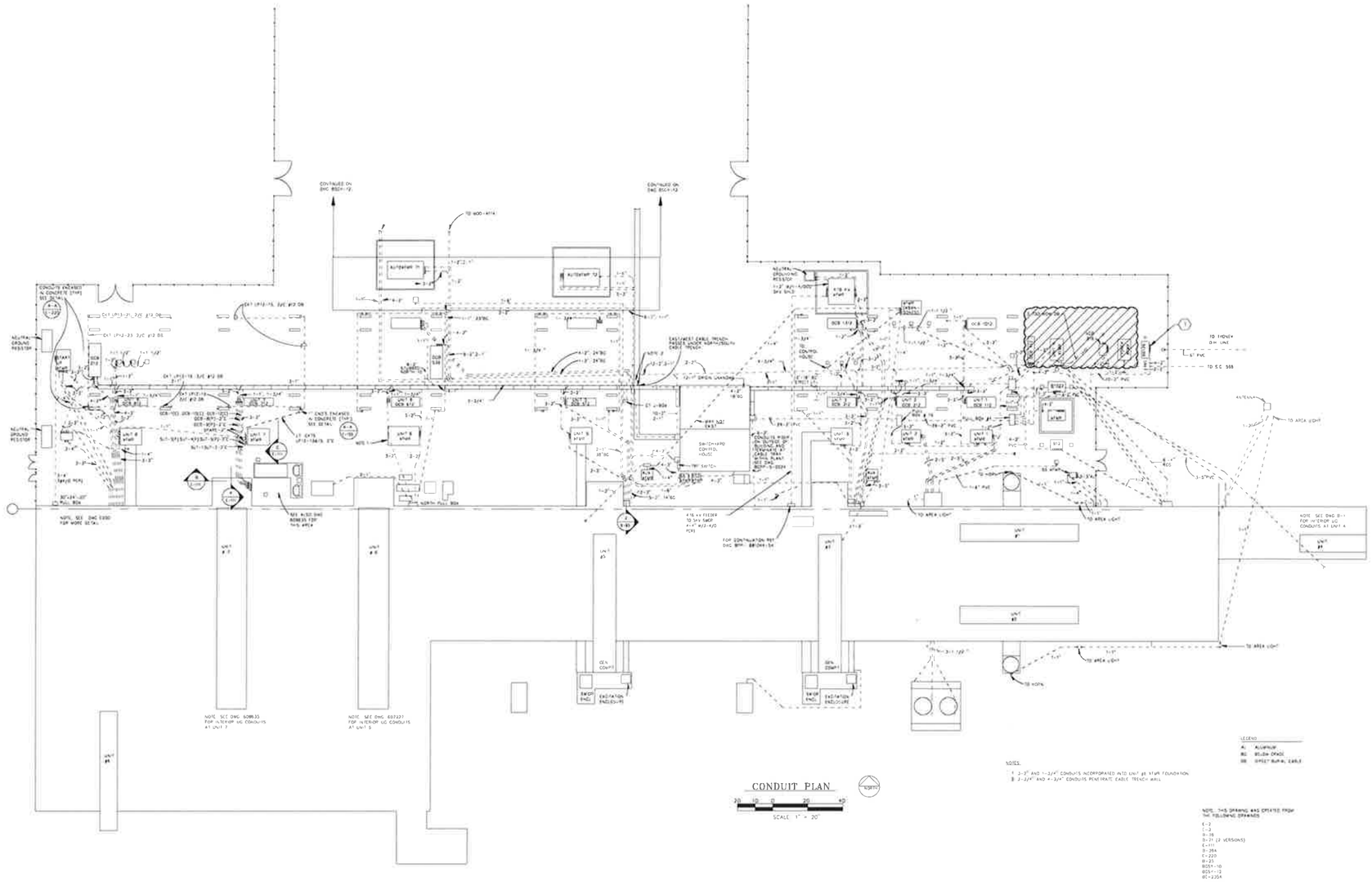
DRAWING NAME:
BELUGA POWER PLANT
GROUNDING PLAN

CONFIDENTIAL

BGSS-SS-7002 1 this

DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO.: BGSS-SS-7002 SHEET 1 OF 1 PAGE



CONDUIT PLAN

SCALE 1" = 20'

PROJECT:					
ENG./DESIGN:		W.O. #			
NO.	CONSTRUCTION REVISION	DWN BY	APPROVED (ENG/DES)	APPROVED (CHUGACH)	DATE

ENG. STAMP

NO	RECORD REVISION	TECH / DWN. BY	W.P. #	W.O. APPROVED	RECORD APPROVED	DATE
0	AS BUILT				WH	
1	AS BUILT	SCA/WP	E9320085			10/12/93
2	AS BUILT, ARCO, THONEX CIRCUIT UPGRADES FOR ARCO COMPRESSOR PROJECT		E9320356	E9511112	PFS	3/13/97
3	BREAKER FAIL PROJECT - CABLE TRENCH AND CONDUIT INSTALLATION	DWL	100.3405	H9320156	D.CROPP	10/2/00

Chugach Electric Association, INC.

5601 Minnesota Drive
P.O. Box 196300
Anchorage, Alaska
99519-6300

DRAWING NAME:

BELUGA POWER PLANT
138 KV YARD
CONDUIT PLAN

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DRAWING NO - PREVIOUS/REFERENCE

DRAWING NO: BPP-S-0004

SHEET 1 OF 1
PAGE /

Electric Power Systems
Consulting Engineers
3305 ARCTIC BLVD, STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION AECC 736

DEMOLITION LEGEND:

DEMOLITION NOTES:

1. CONDUIT RISERS TO EQUIPMENT SHALL BE DEMOLISHED ASSOCIATED BELOW GRADE CONDUIT EXPOSED IN THE COURSE EXCAVATION REQUIRED FOR THE PROJECT, SHALL BE DEMOLISHED. ASSOCIATED/CONTINUING CONDUIT NOT EXPOSED SHALL BE ABANDONED IN PLACE
2. SPECIAL CARE SHALL BE TAKEN NOT TO DAMAGE CONDUITS (NOT ASSOCIATED WITH EQUIPMENT IN CONTRACT) EXPOSED DURING EXCAVATION. NOTE 3. THE CONTRACTOR SHALL USE A VAC-TRUCK FOR AREAS OF EXCAVATION SHOWN TO HAVE EXISTING CONDUIT
3. THE CONTRACTOR SHALL USE A VAC-TRUCK FOR AREAS OF EXCAVATION SHOWN TO HAVE EXISTING CONDUIT

DEMOLITION

PROJECT:	BELUGA TRANSFORMER T-10 REPLACEMENT				
ENG./DESIGN.:	SHAWN WENDLING-CEA/TIM CONRAD-EPS	W.O. #	E1920053		
NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	END. STAMP
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019		STATE OF ALASKA Timothy C. Conrad LICENSED PROFESSIONAL ENGINEER

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

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Anchorage, Alaska 99519-6300

DRAWING NAME:

BELUGA POWER PLANT
138 KV YARD
CONDUIT PLAN

CONFIDENTIAL

bgss-ss-7003.1 dwg

DRAWING NO - PREVIOUS/REFERENCE

DRAWING NO: BGSS-SS-7003

SHEET 1 OF 1
PAGE /

BLOCKS/SYMBOLS – STRUCTURAL & EQUIPMENT

POST INSULATORS

POTENTIAL TRANSFORMER

POTENTIAL TRANSFORMER TOP VIEW

V-SWITCH (CENTER BREAK)

SWITCH (DOUBLE END BREAK)

SWITCH TOP VIEW (DOUBLE END BREAK)

SUSPENSION INSULATOR

CONSTRUCTION CONTROL MONUMENT

PERIMETER YARD LIGHT

IC — IN CONTRACT

NIC — NOT IN CONTRACT

— REVISION NUMBER

(#) — NOTE NUMBER

CIRCUIT BREAKER

CIRCUIT BREAKER TOP VIEW

DISTRIBUTION TRANSFORMER

TRANSFORMER SIDE & TOP VIEW

CLEARING LIMITS

LIMITS OF CRUSHED ROCK

AREA TO BE CLEARED AND GRUBBED

VEE DITCH

DRAIN FLOW

CULVERT

1094 — EXISTING CONTOUR

1094 — NEW CONTOUR

1104.0 — SPOT ELEVATION

— POINT COORDINATE

EXISTING POWER POLE

NEW POWER POLE

FENCE – NEW

EXISTING TRANSMISSION LINES

NEW TRANSMISSION LINES

RIGHT OF WAY/EASEMENT

X — DRAWING REFERENCE CALLOUT

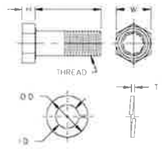
XX — MATERIAL REFERENCE NUMBER CALLOUT

RECEPTACLE

S — TWO-WAY SWITCH

S_3 — THREE-WAY SWITCH

DMC POWER BUS SUPPORT BOLT PACKAGE



BUS SUPPORT BOLT PACKAGE

BOLT PKG PART NO	H	L	W	THREAD	ID	OD	T
PLKB010C0612	15/64	1.25	9/16	3/8-16UNC-2A	.318	.688	.094
PLKB010C0615	15/64	1.50	9/16	3/8-16UNC-2A	.318	.688	.094
PLKB010C0620	15/64	2.00	9/16	3/8-16UNC-2A	.318	.688	.094
PLKB010C0815	5/16	1.50	3/4	1/2-13UNC-2A	.509	.879	.125
PLKB010C0820	5/16	2.00	3/4	1/2-13UNC-2A	.509	.879	.125
PLKB010C0825	5/16	2.50	3/4	1/2-13UNC-2A	.509	.879	.125
PLKB010C1015	25/64	1.50	15/16	5/8-11UNC-2A	.636	1.086	.156
PLKB010C1020	25/64	2.00	15/16	5/8-11UNC-2A	.636	1.086	.156
PLKB010C1025	25/64	2.50	15/16	5/8-11UNC-2A	.636	1.086	.156
PLKB010C1215	15/32	1.50	1 1/8	3/4-10UNC-2A	.766	1.265	.188
PLKB010C1220	15/32	2.00	1 1/8	3/4-10UNC-2A	.766	1.265	.188
PLKB010C1225	15/32	2.50	1 1/8	3/4-10UNC-2A	.766	1.265	.188

RECOMMENDED "STANDARD" BOLT PACKAGES FOR BUS SUPPORT CIRCLES

BOLT PACKAGE PART NUMBER	BUS SUPPORT BOLT CIRCLE
PLKB010C0815	5"
PLKB010C1015	5"
PLKB010C1215	7"

BOLTS AND WASHERS CAN BE SUPPLIED FOR BUS SUPPORTS
YOU'LL NEED TO ORDER THEM AS A SEPARATE LINE ITEM USING THE PART NUMBERS LISTED ABOVE
EACH BOLT PACKAGE CONSISTS OF FOUR BOLTS AND FOUR SPLIT WASHERS MADE FROM STAINLESS STEEL (300 SERIES CRES)
HEX NUTS SHALL BE SILICONE BRONZE (NOT INCLUDED IN PACKAGE)

ABBREVIATIONS – STRUCTURAL & EQUIPMENT

APPRX	APPROXIMATELY
BGSS	BELUGA SUBSTATION
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CPEP	CORRUGATED POLYETHYLENE PIPE
CY	CUBIC YARDS
D	DEGREE OF CURVATURE
DIA	DIAMETER
DIM	DIMENSION
DWG	DRAWING
E	EAST
E	EASTING
EA	EACH
EL	ELEVATION
FT	FEET
FTB	FLUIDIZED THERMAL BACKFILL
GCB	GAS CIRCUIT BREAKER
H	HORIZONTAL
HDPE	HIGH-DENSITY POLYETHYLENE
I	INTERSECTION ANGLE
IE	INLET ELEVATION
IN	INCHES
L	LENGTH
LF	LINEAR FEET
LT	LEFT
MAX	MAXIMUM
MIN	MINIMUM
N	NORTH
N	NORTHING
NE	NORTHEAST
NFS	NON-FROST SUSCEPTIBLE
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
NW	NORTHWEST
OAE	OR APPROVED EQUAL
OFM	OWNER FURNISHED MATERIAL
PC	POINT OF CURVATURE
PERF	PERFORATED
PI	POINT OF INTERSECTION
PM	PADMOUNT TRANSFORMER
PT	POINT OF TANGENCY
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
R	RADIUS
REF	REFERENCE
RT	RIGHT
S	SOUTH
SCH	SCHEDULE
SE	SOUTHEAST
SFA	SUBMIT FOR APPROVAL
STA	STATION
SW	SOUTHWEST
SW	SWITCH
T	TANGENT DISTANCE
TBD	TO BE DETERMINED
TOP	TOP OF PIPE
TYP	TYPICAL
UVSS	UNIVERSITY SUBSTATION
V	VERTICAL
W	WEST
W/P	WEATHERPROOF

ABBREVIATIONS:
WHEN USED IN THESE STRUCTURAL OR EQUIPMENT DRAWINGS SHALL CONFORM TO THE ABOVE LIST, UNLESS NOTED OTHERWISE. OTHER SECTIONS (SUCH AS ELECTRICAL AND CIVIL PLANS) MAY CONTAIN SPECIFIC REFERENCES AND LEGENDS WITH INTERPRETATIONS INTENDED ONLY FOR THOSE SECTIONS

CONTRACT NOTES

1) 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

IC — IN CONTRACT

2) 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

NIC — NOT IN CONTRACT

3) IF NO CLOUDS ARE NOTED ON THE DRAWING, THE CONTRACTOR'S SCOPE OF WORK SHALL INCLUDE THE ENTIRE DRAWING

4) 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

ISSUED FOR REFERENCE ONLY
– DO NOT EDIT –

5) SCOPE OF WORK OR PERFORMANCE INFORMATION FOR THE CONTRACTOR MAY BE CONVEYED WITH "CONSTRUCTION NOTES". BELOW IS AN EXAMPLE OF CONSTRUCTION NOTES

IC
CONSTRUCTION NOTES:
1. EXAMPLE NOTE
2. EXAMPLE NOTE

6) DEMOLITION DRAWINGS WILL BE IDENTIFIED WITH THE FOLLOWING BLOCK. DEMOLITION WORK THAT IS WITHIN THE CONTRACTORS 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

DEMOLITION

EXAMPLE DEMOLITION CLOUD

EXAMPLE DEMOLITION NOTES

IC
DEMOLITION NOTES:
1. EXAMPLE NOTE
2. EXAMPLE NOTE

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG STAMP
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KEF/09-03-2019	TCC/09-03-2019		

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

CHUGACH
POWERING ALASKA'S FUTURE

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

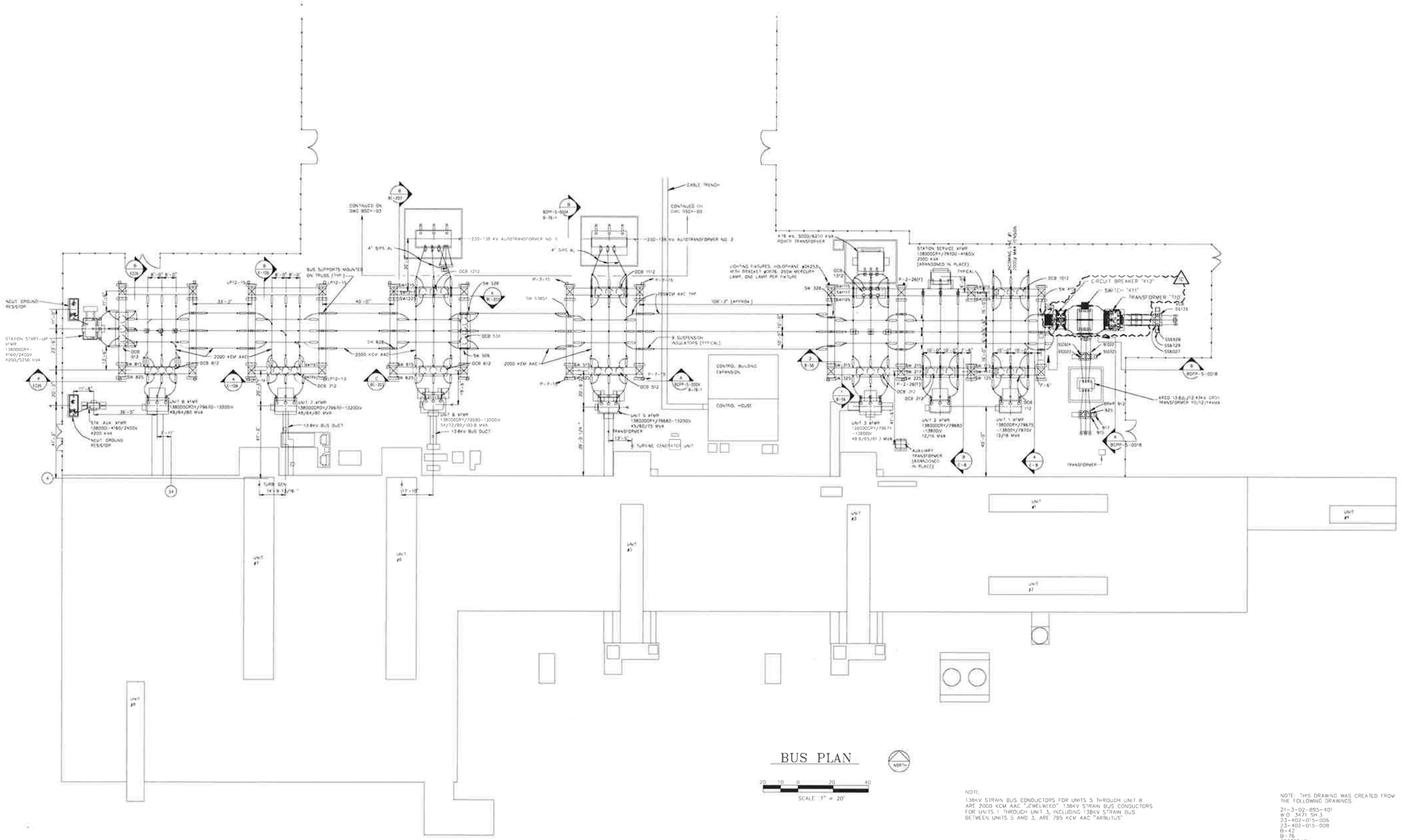
DRAWING NAME:
BELUGA SUBSTATION
GENERAL INFORMATION

CONFIDENTIAL

bgss-ss-0071 r 0A0

DRAWING NO. – PREVIOUS/REFERENCE
NEW DRAWING NO.: BGSS-SS-0071

SHEET 1 OF 1
PAGE /



BUS PLAN

SCALE: 1" = 20'

NOTE:
138KV STRAIN BUS CONDUCTORS FOR UNITS 5 THROUGH UNIT 8 ARE 2000 KCM AAC "JEWELWEED". 138KV STRAIN BUS CONDUCTORS FOR UNITS 1 THROUGH UNIT 3, INCLUDING 138KV STRAIN BUS BETWEEN UNITS 5 AND 3, ARE 795 KCM AAC "ARBUTUS"

NOTE: THIS DRAWING WAS CREATED FROM THE FOLLOWING DRAWINGS

21-3-02-895-401
W.O. 3471 SH.3
23-402-015-006
23-402-015-008
B-42
B-76
3902E643
E-6
CC-363313-A
E-12
E-109
F-1304-D-0401
E-226
W-1303-D-5046
C-40900
B-56

Electric Power Systems
Consulting Engineers
3301 ARCTIC BLVD. STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: AECC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

ENG. STAMP
STATE OF ALASKA
Timothy C. Conrad
No. 9532010
REGISTERED PROFESSIONAL ENGINEER

NO	RECORD REVISION	CAD DRAWN BY	W.P. #	W.O. NUMBER	RECORD APPROVED	DATE
0	CEI RECORD UPDATE					11/21/89
1	AS BUILT	SG/LMP	E9320085			10/12/93
2	AS BUILT, ARCO, TYONEK CIRCUIT UPGRADES FOR ARCO COMPRESSOR PROJECT		0300 235EN	E9511112	PFO	3/3/97

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME:
BELUGA SUBSTATION 138KV BUS GENERAL ARRANGEMENT PLAN

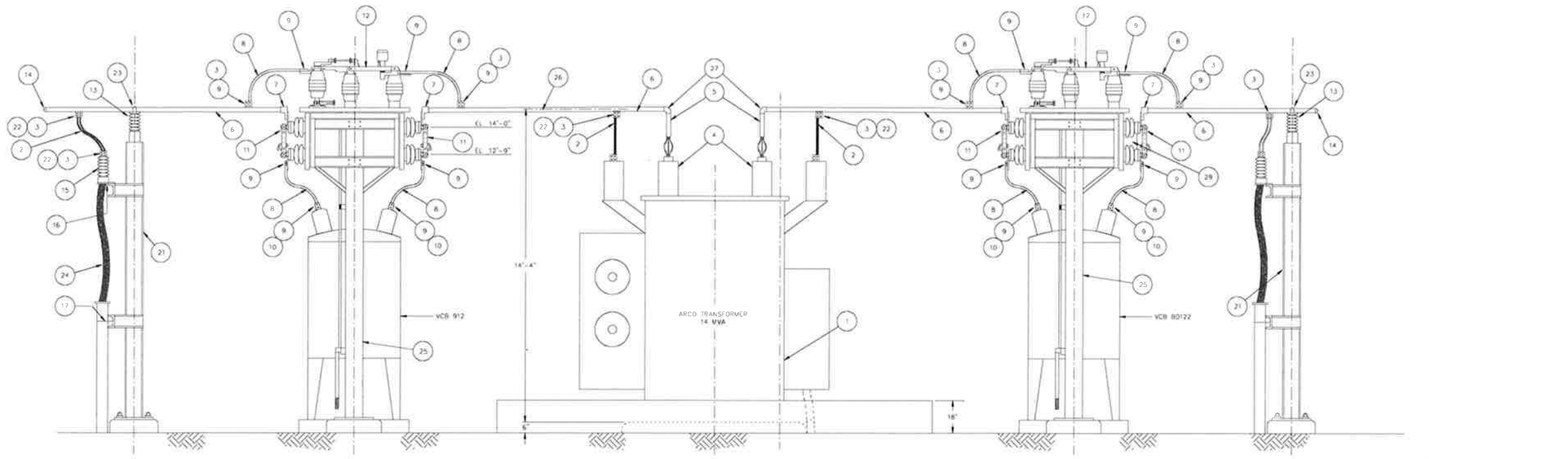
CONFIDENTIAL

v8:\d1519\bpp\struct\bpp03.dgn 5/22/97

DRAWING NO. - PREVIOUS/REFERENCE:

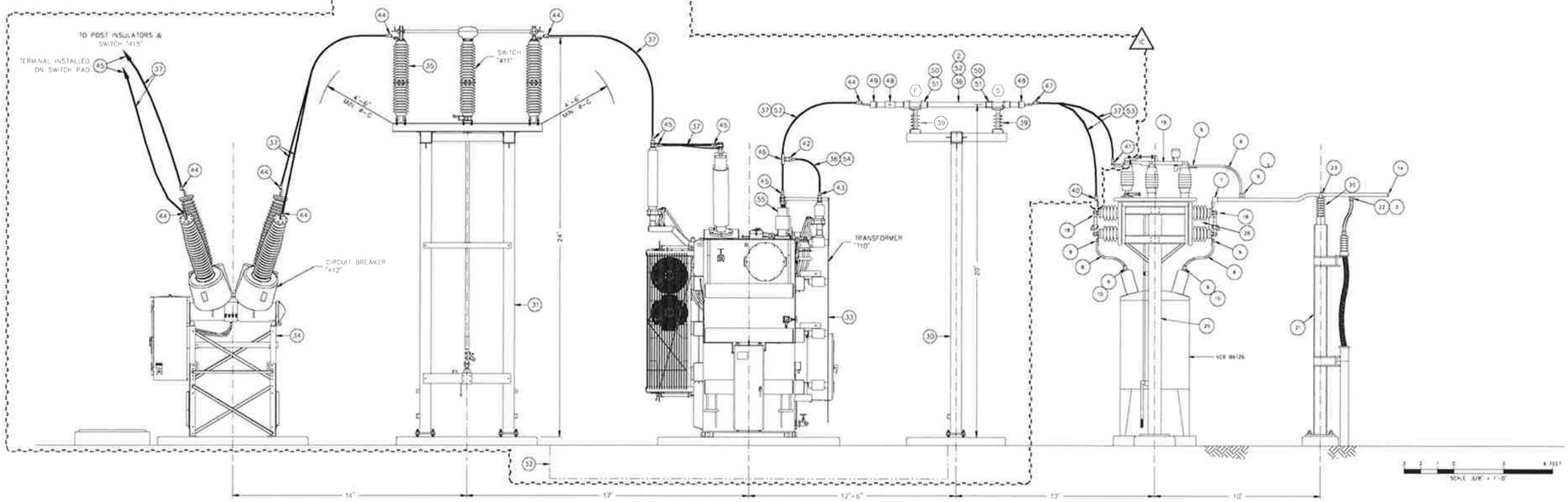
DRAWING NO: BPP-S-0003

SHEET 1 OF 1
FACE /



A BPP-S-0003 ARCO SYSTEM BUS ELEVATION

SCALE: 1/2" = 1'-0"



B BPP-S-0003 TYONEK SYSTEM BUS ELEVATION

SCALE: 3/8" = 1'-0"

NOTES:

(1) SEE DRAWING REFERENCE 1 FOR BILL OF MATERIAL

(2) APPLY TWO LAYERS OF (52) 1D BUSBARS

LEGEND:

(F) FIXED BUS SUPPORT ((50)) - SWAGED

(S) SLIP-FIT BUS SUPPORT ((50)) - NO SWAGES

(##) BILL OF MATERIAL ITEM

NO	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	BGSS-SS-0067/1	BUSWORK BILL OF MATERIAL
A	-	ARCO SYSTEM BUS ELEVATION
B	-	TYONEK SYSTEM BUS ELEVATION

Electric Power Systems
Consulting Engineers
3305 ARCTIC BLVD. STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: AECC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT

ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

END. STAMP: STATE OF ALASKA, Timothy C. Conrad, No. E11997, REGISTERED PROFESSIONAL ENGINEER

NO	RECORD REVISION	CAD DRAWN BY	W.P. #	W.O. NUMBER	RECORD APPROVED	DATE
1	AS BUILT, ARCO, TYONEK CIRCUIT UPGRADES FOR ARCO COMPRESSOR PROJECT		8300.23SEN	E9511112	PFD	3/3/97

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

DRAWING NAME:

BELUGA POWER PLANT
13.8/12.5/24.9KV FEEDER CIRCUITS
SUBSTATION ELEVATIONS

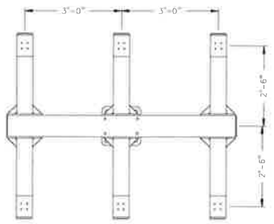
CONFIDENTIAL

dh/substn/bgpp/struct/bgpps18.dgn 5/27/97

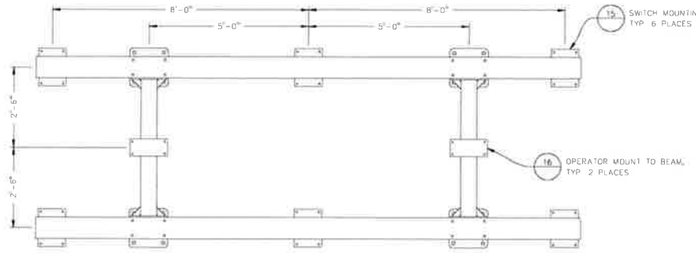
DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO. BGPP-S-0018

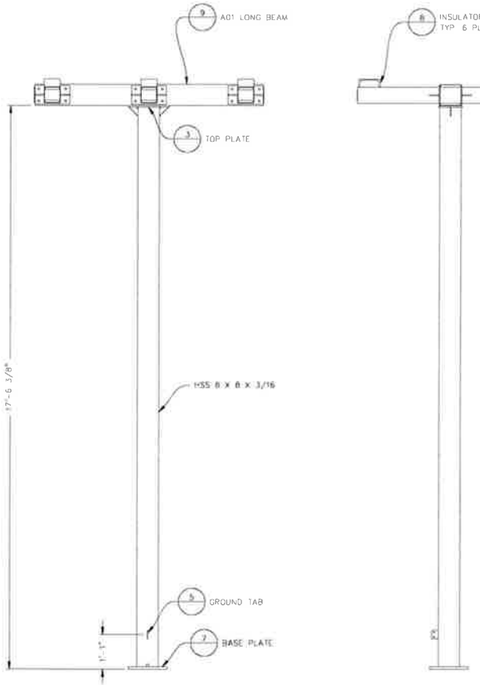
SHEET 1 OF 1
FACE /



PLAN



PLAN



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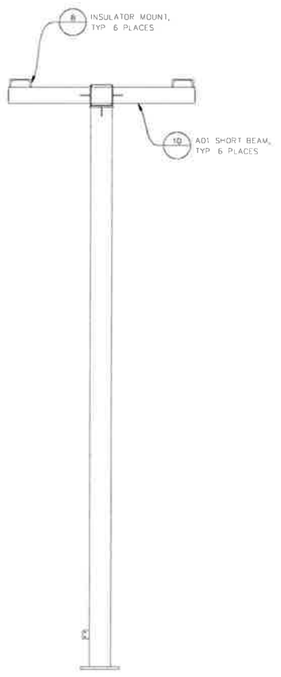
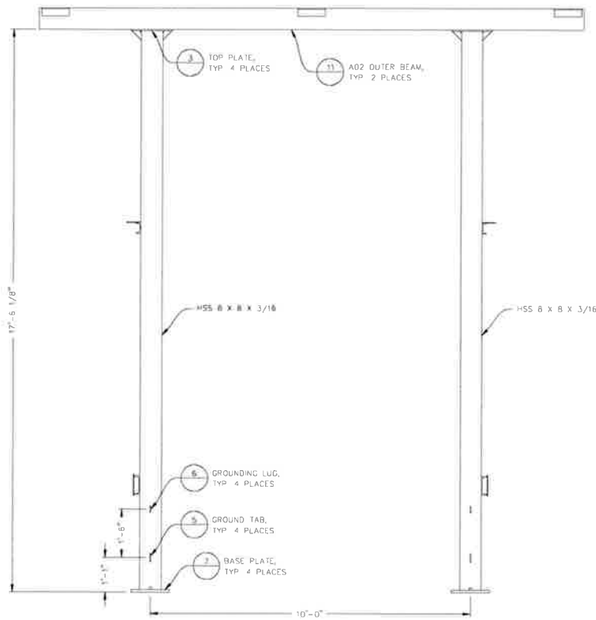


SIDE

1 ELEVATION – TYPE A01 24.9 kV 3-PHASE BUS SUPPORT

N T S



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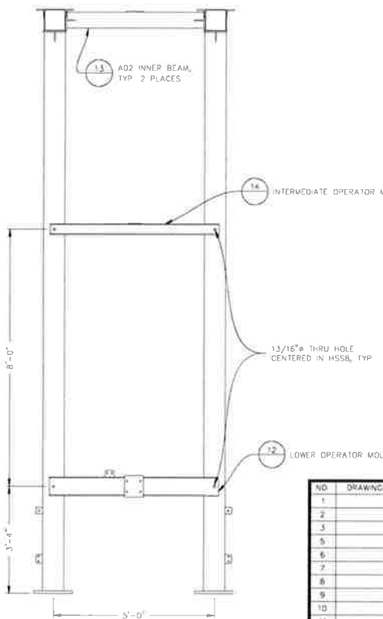


SIDE

2 ELEVATION – TYPE A02 138 kV DISCONNECT SWITCH SUPPORT

N T S

STRUCTURAL STEEL NOTES:

1. THE DESIGN, FABRICATION, AND ERECTION OF ALL STRUCTURAL STEEL SHALL COMPLY WITH THE CODE OF STANDARD PRACTICE OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION.
2. STRUCTURAL STEEL SHALL BE ASTM A500 GR. B FOR HSS SECTIONS AND A36 FOR PLATES AND MISCELLANEOUS SECTIONS.
3. WELDING SHALL BE DONE IN ACCORDANCE WITH THE CURRENT CODE OF THE AMERICAN WELDING SOCIETY, D1.1, MINIMUM WELD SHALL BE 3/16". USE AWS 5.1 E70XX ELECTRODES. ALL WELDING SHALL BE CONDUCTED USING PROCEDURES QUALIFIED WITH A CHARPY V-NOTCH (CVN) TOUGHNESS OF 20 FT-POUNDS AT MINUS 0 DEGREES F. SUBMIT WELDING PROCEDURES AND QUALIFICATIONS FOR WELDING PRIOR TO FABRICATION.
4. ALL STEEL TO BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A123.
5. CONNECTION BOLTS SHALL BE ASTM A325 TYPE 1 WITH NUT AND LOCK WASHER (LW). ALL HARDWARE SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A153.
6. FABRICATOR SHALL SUBMIT SHOP DRAWINGS TO ENGINEER FOR APPROVAL PRIOR TO FABRICATION.

MATERIAL FOR (1) STRUCTURE A01

QTY	DESCRIPTION	LENGTH FT	LENGTH IN
	(1) COLUMN		
1	HSS 8 x 8 x 3/16	17	4 7/8
1	BAR 2 1/2 x 3/8	0	3 1/4
1	PL 1 x 14 1/2	1	2 1/2
1	PL 1/2 x 9	1	3 1/2
2	BAR 2 x 3/8	0	4 3/4
	(1) LONG BEAM		
1	HSS 8 x 8 x 3/16	7	1
2	PL 1/8 x 6	0	7 3/4
4	3/4"ø BOLT/NUT/LW	0	10
	(6) SHORT BEAM		
1	HSS 6 x 6 x 3/16	2	6
1	PL 1/2 x 7	1	1
2	BAR 2 x 3/8	0	4 3/4
1	MC 8 X 18.7	0	6
1	PL 1/8 x 4	0	5 3/4
2	3/4"ø BOLT/NUT/LW	0	10 1/2

MATERIAL FOR (1) STRUCTURE A02

QTY	DESCRIPTION	LENGTH FT	LENGTH IN
	(4) COLUMN		
1	HSS 8 x 8 x 3/16	17	4 5/8
1	BAR 2 1/2 x 3/8	0	3 1/4
1	PL 1 x 14 1/2	1	2 1/2
1	PL 1/2 x 9	1	3 1/2
2	BAR 2 x 3/8	0	4 3/4
	(2) OUTER BEAM		
1	HSS 8 x 8 x 3/16	17	0
6	L3 x 3 x 3/8	0	10 1/4
2	PL 1/8 x 6	0	7 3/4
8	3/4"ø BOLT/NUT/LW	0	10
	(2) INNER BEAM		
1	HSS 6 x 6 x 3/16	4	3
2	PL 1/2 x 7	1	1
4	BAR 2 x 3/8	0	4 3/4
1	PL 3/8 x 6 1/2	1	2
8	3/4"ø BOLT/NUT/LW	0	10
	(2) INTERMEDIATE OPERATOR MOUNT		
1	C4 x 7.25	5	3
1	PL 3/4 x 5	0	5
2	3/4"ø BOLT/NUT/LW	0	10
	(2) LOWER OPERATOR MOUNT		
1	C7 x 12.25	5	3
1	PL 1/4 x 7	0	8
1	BAR 2 1/2 x 3/8	0	3 1/4
2	3/4"ø BOLT/NUT/LW	0	10

NO	DRAWING NO /SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	–	ELEVATION – TYPE A01 24.9 kV 3-PHASE BUS SUPPORT
2	–	ELEVATION – TYPE A02 138 kV DISCONNECT SWITCH SUPPORT
3	–	DETAIL – A01 & A02 TOP PLATE
5	–	DETAIL – GROUND TAB
6	–	DETAIL – GROUNDING LUG
7	–	DETAIL – A01 & A02 BASE PLATE
8	–	DETAIL – INSULATOR MOUNT
9	–	DETAIL – A01 LONG BEAM
10	–	DETAIL – A01 SHORT BEAM
11	–	DETAIL – A02 OUTER BEAM
NO	DRAWING NO /SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
12	–	DETAIL – LOWER OPERATOR MOUNT
13	–	DETAIL – A02 INNER BEAM
14	–	DETAIL – INTERMEDIATE OPERATOR MOUNT
15	–	DETAIL – SWITCH MOUNTING BOLT PATTERN
16	–	DETAIL – OPERATOR MOUNT TO BEAM

Electric Power Systems, Inc. Consulting Engineers
3305 ARCTIC BLVD. STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: ACCC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR FABRICATED STEEL BID	KER/09-03-2019	GDH/09-03-2019	

ENG. STAMP

NO	RECORD REVISION	CAD DRAWN BY	WP #	WO NUMBER	RECORD APPROVED	DATE

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME

BELUGA SUBSTATION
STRUCTURAL
FABRICATED STEEL STRUCTURES
TYPE A01 AND A02

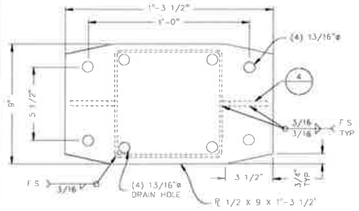
CONFIDENTIAL

Page ## of 0070 (BHS)

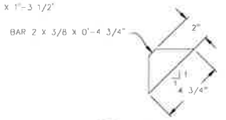
DRAWING NO – PREVIOUS/REFERENCE

DRAWING NO BGSS-SS-0070

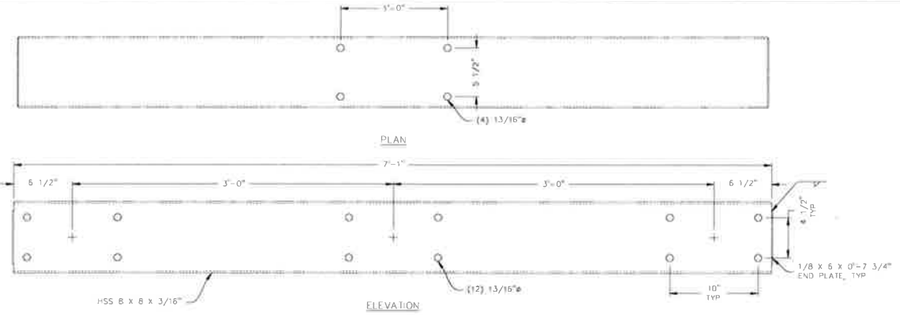
SHEET 1 OF 3
PAGE 1



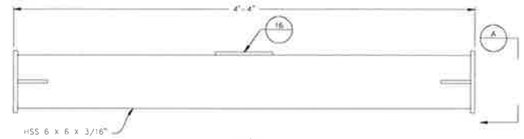
3 DETAIL
A01 & A02 TOP PLATE
N.T.S.



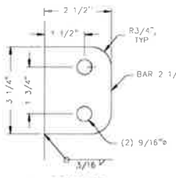
4 DETAIL
3/8" THK GUSSET
N.T.S.



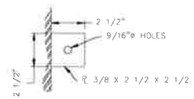
9 DETAIL
A01 LONG BEAM
N.T.S



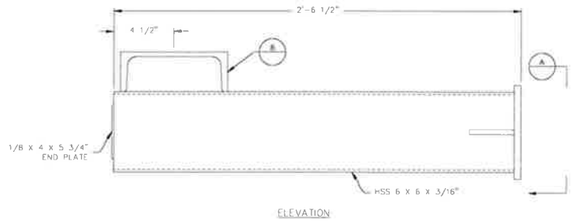
13 DETAIL
A02 INNER BEAM
N.T.S



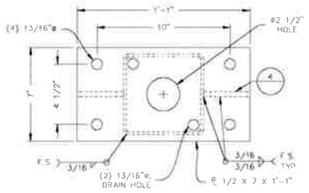
5 DETAIL
GROUND TAB
N.T.S



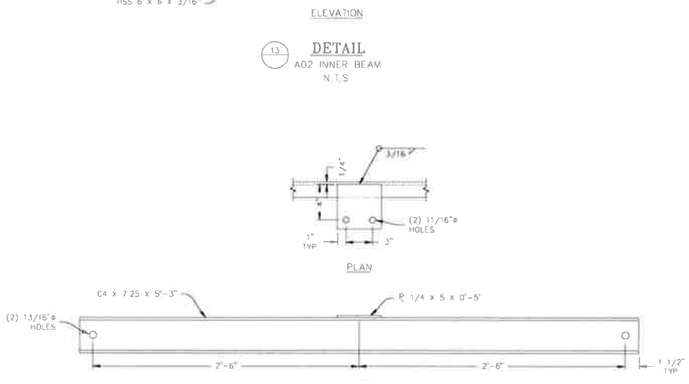
6 DETAIL
GROUNDING LUG
N.T.S



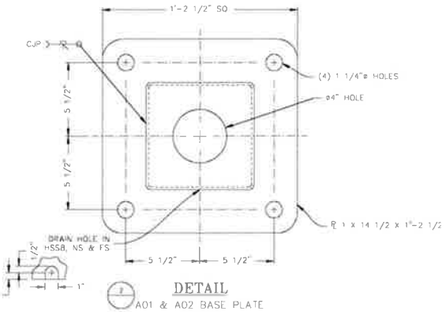
10 DETAIL
A01 SHORT BEAM
N.T.S



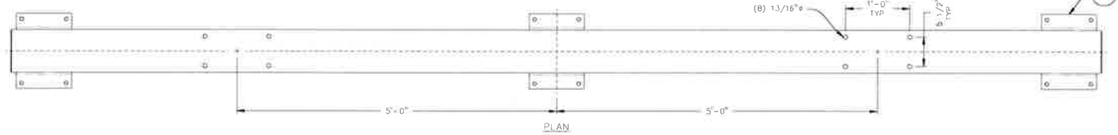
A SECTION
N.T.S

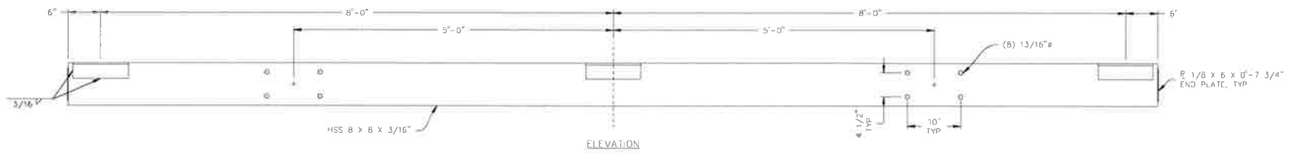


14 DETAIL
INTERMEDIATE OPERATOR MOUNT
N.T.S



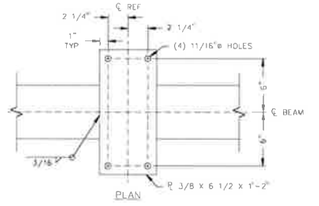
7 DETAIL
A01 & A02 BASE PLATE
N.T.S



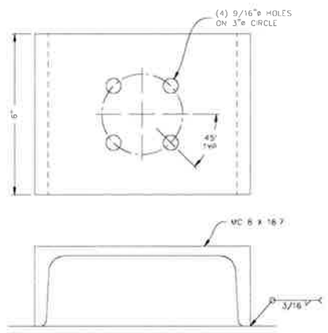


11 DETAIL
A02 OUTER BEAM
N.T.S.

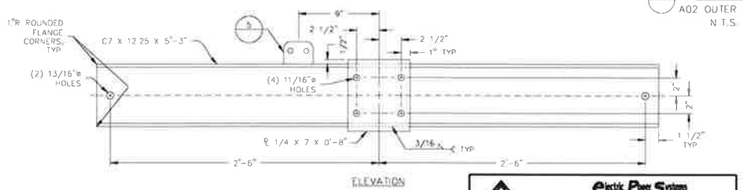
15 DETAIL
SWITCH MOUNTING BOLT PATTERN
N.T.S



16 DETAIL
OPERATOR MOUNT TO BEAM
N.T.S



8 DETAIL
INSULATOR MOUNT
N.T.S



12 DETAIL
LOWER OPERATOR MOUNT
N.T.S

Electric Power Systems
Consulting Engineers
3305 ARCTIC BLVD, STE 201, ANCHORAGE, AK 99503
TEL: (907) 522-1953
CERTIFICATE OF AUTHORIZATION: AECC 738

NO	DRAWING NO /SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
3	-	DETAIL - A01 & A02 TOP PLATE
4	-	DETAIL - 3/8" THK GUSSET
5	-	DETAIL - GROUND TAB
6	-	DETAIL - GROUNDING LUG
7	-	DETAIL - A01 & A02 BASE PLATE
8	-	DETAIL - INSULATOR MOUNT
9	-	DETAIL - A01 LONG BEAM
10	-	DETAIL - A01 SHORT BEAM
11	-	DETAIL - A02 OUTER BEAM
12	-	DETAIL - LOWER OPERATOR MOUNT

NO	DRAWING NO /SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
13	-	DETAIL - A02 INNER BEAM
14	-	DETAIL - INTERMEDIATE OPERATOR MOUNT
15	-	DETAIL - SWITCH MOUNTING BOLT PATTERN
16	-	DETAIL - OPERATOR MOUNT TO BEAM
A	-	SECTION

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG. /DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR FABRICATED STEEL BID	KER/09-03-2019	GDH/09-03-2019	

END STAMP

NO	RECORD REVISION	CAD DRAWN BY	WP #	WO NUMBER	RECORD APPROVED	DATE

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME
BELUGA SUBSTATION
STRUCTURAL
FABRICATED STEEL STRUCTURES
DETAILS

CONFIDENTIAL

bgss-ss-0070_2.dwg

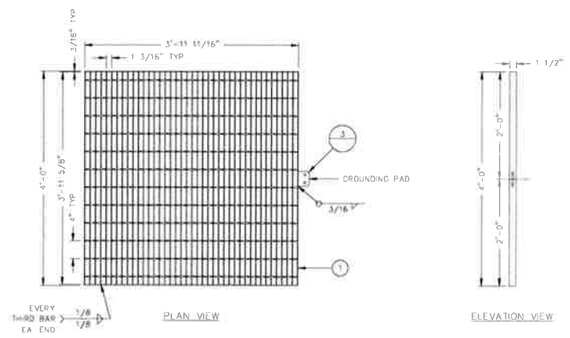
DRAWING NO - PREVIOUS/REFERENCE

DRAWING NO
BGSS-SS-0070

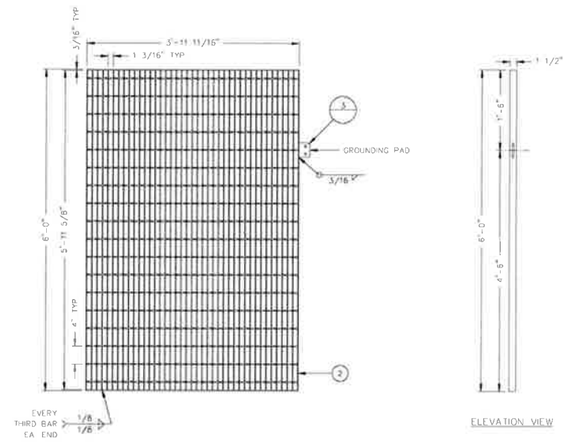
SHEET 2 OF 3
PAGE

MATERIAL FOR BAR GRATING

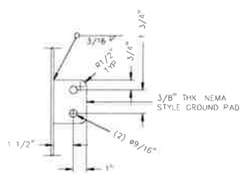
REF NO	UNIT	QUANTITY	DESCRIPTION
1	EA	1	1 1/2" X 3/16" 19-W-4, H.D. GALVANIZED STEEL BAR GRATING WELDMENT, 3'-11 11/16" x 4'-0"
2	EA	1	1 1/2" X 3/16" 19-W-4, H.D. GALVANIZED STEEL BAR GRATING WELDMENT, 3'-11 11/16" x 6'-0"



1 SWITCH GROUNDING PLATFORM
N.T.S



2 GCB WORKING PLATFORM
N.T.S



3 GROUNDING PAD
N.T.S

NO	DRAWING NO /SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	–	SWITCH GROUNDING PLATFORM
2	–	GCB WORKING PLATFORM
3	–	GROUNDING PAD

Electric Power Systems, Inc.
Consulting Engineers
3335 ARCTIC BLVD. STE 201, ANCHORAGE, AK 99503
PH: (907) 522-1953 CERTIFICATE OF AUTHORIZATION: AECC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR FABRICATED STEEL BID	KER/09-03-2019	CDH/09-03-2019	

ENG. STAMP

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

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME
BELUGA SUBSTATION
STRUCTURAL
FABRICATED STEEL STRUCTURES
BAR GRATING

CONFIDENTIAL

Rpss ss 0070 3.dwg

DRAWING NO - PREVIOUS/REFERENCE

DRAWING NO
BGSS-SS-0070

SHEET 3 OF 3
PAGE /

ARCO SYSTEM/REBUILT TYONEK SYSTEM BILL OF MATERIAL

ITEM	QUANTITY	DESCRIPTION
* 1	1	138/13.42KV POWER TRANSFORMER, 14 MVA
* 2	APPROX. 80'	4/0 BARE COPPER
* 3	33	4-HOLE PADDLE, TEE CONNECTOR, AL
* 4	6	TRANSFORMER BUSHINGS, 1200 AMP, 15kV
* 5	6	WELDMENT EXPANSION CONN. STUD TO TUBE, AL
* 6	APPROX. 300'	2", IPS SCHEDULE 40 ALUMINUM BUS
* 7	15	WELDMENT TERMINAL, TUBE TO FLAT 90°
* 8	APPROX. 300'	795 AAC, ARBUTUS
* 9	66	COMPRESSION D.E. PADDLE, 4-HOLE
10	15	STUD CONNECTOR, 4-HOLE
* 11	12	S&C LOAD BUSTER DISCONNECT, 15kV 1Ø
* 12	6	S&C ALDUTI-RUPTER SWITCH, 15kV 1Ø
* 13	6	15kV INSULATORS, PORCELAIN, 10,000# COMP., 200# CANT
* 14	9	END PLUG, ALUMINUM 2"
* 15	6	OUTDOOR 15kV TERMINATION
* 16	3	MOUNTING BRACKET 15kV TERMINATION
17	9	U-BOLT FOR 6" PVC
* 18	6	S&C LOAD BUSTER DISCONNECTS, 25kV 1Ø
* 19	3	S&C ALDUTI-RUPTER SWITCH, 25kV 1Ø
* 20	3	25kV INSULATOR, PORCELAIN, 10,000# COMP., 200# CANT
* 21	3	STEEL RISER STRUCTURE
22	21	2-HOLE PADDLE TO 4/0 CU COMPRESSION
* 23	12	SLIP-FIT BUS SUPPORT
* 24	APPROX. 450'	15kV CABLE, 750 KCMIL AL
* 25	3	BYPASS SWITCH STRUCTURE
* 26	12	ALUMINUM WELDMENT COUPLER, TUBE TO TUBE
* 27	6	ALUMINUM WELDMENT COUPLER, 90° TUBE TO TUBE
* 28	3	14.4kV (e-GROUND) POTENTIAL TRANSFORMER
* 29	3	7.2kV (e-GROUND) POTENTIAL TRANSFORMER

* DENOTES OWNER FURNISHED MATERIAL

QUANTITIES UPDATED FOR BILL OF MATERIAL ITEMS 3, 5, 7, 9-17, 21-23, 25, AND 27

THIS BILL OF MATERIAL RELATES TO THE ARCO (111) SYSTEM AND VCB B6126 AND RISER FROM THE TYONEK SYSTEM

TYONEK SYSTEM BILL OF MATERIAL

REF. NO.	UNIT	ESTIMATED QUANTITY	DESCRIPTION	MANUFACTURER/CATALOG NUMBER	FURNISHED BY
(30)	EA	1	TYPE A01 24.9 kV 3-PHASE BUS SUPPORT	TBD	C
(31)	EA	1	TYPE A02 138 kV DISCONNECT SWITCH SUPPORT	TBD	O
(32)	LOT	1	SECONDARY OIL CONTAINMENT SYSTEM	SPILL-CHEK SEE DRAWING REFERENCE 1	O
(33)	EA	1	POWER TRANSFORMER, 138/24.9 kV, 14 MVA	WAUKESHA/SER. NO. WT-04766	C
(34)	EA	1	GAS CIRCUIT BREAKER, 138 kV, 1600 A	MITSUBISHI/120-SFM1-40HE-1	C
(35)	EA	1	DISCONNECT SWITCH, 138 kV, 1200 A, 3-PHASE, DOUBLE END BREAK	SOUTHERN STATES/RDA-1-145-1200	O
(36)	EA	3	BUSWORK, LINEAR FEET, 3" IPS ALUMINUM SCH 40, ALLOY 6063-T6, 10 FT LENGTHS	ACA CONDUCTOR ACCESSORIES/ 300S40Y16E	O
(37)	LF	270	795 AAC, 37 STRAND, ARBUTUS	SOUTHWIRE/ARBUTUS CEA CAT ID# 1245	C
(38)	LF	15	336.4 AAC, 19 STRAND, TULIP	SOUTHWIRE/TULIP (OAE)	O
(39)	EA	6	INSULATOR, STATION POST, 24.9 kV	HUBBELL/2326863001	C
(40)	EA	3	TERMINAL, 2-HOLE, OFFSET, ARBUTUS, TINNED	DMC POWER/CPLK9202007950T	O
(41)	EA	3	TERMINAL, 2-HOLE, 90° ANGLE, ARBUTUS, TINNED	DMC POWER/CPLK9209D07950T	C
(42)	EA	3	TERMINAL, 3" WIDE, 4-HOLE, OFFSET, TULIP	DMC POWER/CPLK9432D03500S	C
(43)	EA	3	TERMINAL, 3" WIDE, 4-HOLE, OFFSET, TULIP, TINNED	DMC POWER/CPLK9432D03500T	O
(44)	EA	15	TERMINAL, 3" WIDE, 4-HOLE, OFFSET, ARBUTUS	DMC POWER/CPLK9432D07950S	O
(45)	EA	15	TERMINAL, 3" WIDE, 4-HOLE, OFFSET, ARBUTUS, TINNED	DMC POWER/CPLK9432D07950T	C
(46)	EA	3	TEE, SPLIT MAIN CABLE RUN TO 3" WIDE, 4-HOLE TAP, ARBUTUS	DMC POWER/CPLK9513D07950S	O
(47)	EA	3	TERMINAL, 3" WIDE, 4-HOLE, 2 CABLES, OFFSET, ARBUTUS	DMC POWER/CPLK9632D07950S	O
(48)	EA	3	GROUNDING STUD, 3" BUS	DMC POWER/PLK116004B	O
(49)	EA	6	4-HOLE TERMINAL NEMA PAD CENTER FORMED, 3" BUS, 3" WIDE	DMC POWER/PLK185004BA	C
(50)	EA	6	SLIP/RIGID HORIZONTAL BUS SUPPORT ASSEMBLY, 3" BUS, 3" & 5" BOLT CIRCLES	DMC POWER/PLK321004BE12	O
(51)	EA	6	BUS CONNECTION INSULATING COVER FOR RIGID BUS SUPPORTS	TYCO ELECTRONICS/ BCIC-750/18-X(83)	O
(52)	ROLL	24	MEDIUM VOLTAGE FUSION TAPE	TYCO ELECTRONICS/ MVFT-G-2-12(84)	O
(53)	FT	100	MEDIUM VOLTAGE CONDUCTOR COVER FOR ARBUTUS CONDUCTOR	TYCO ELECTRONICS/ MVCC-25/1.0(825)	C
(54)	FT	15	MEDIUM VOLTAGE CONDUCTOR COVER FOR TULIP CONDUCTOR	TYCO ELECTRONICS/ MVCC-19/0.75(850)	O
(55)	EA	3	BUS CONNECTION INSULATING COVER FOR TRANSFORMER BUSHINGS	TYCO ELECTRONICS/ BCIC-60/18-HO (93)	O
(56)	LOT	1	HEX BOLT/SPLIT WASHER CADMIUM (GR. B) OR STAINLESS STEEL (300 SERIES CRES), HEX NUTS SILICONE BRONZE, FOR ALUMINUM TO ALUMINUM CONNECTIONS SIZE AS REQ'D.	COMMODITY	C
(57)	LOT	1	HEX BOLT/HEX NUT/SPLIT WASHER, H.D. GALVANIZED, FOR GALVANIZED STEEL TO GALVANIZED STEEL OR GALVANIZED STEEL TO CAST ALUMINUM/STEEL CONNECTIONS SIZE AS REQ'D	COMMODITY	C
(58)			NOT USED		
(59)			NOT USED		
(60)			NOT USED		

C = CONTRACTOR O = OWNER OAE = OR APPROVED EQUAL

THIS BILL OF MATERIAL RELATES TO THE TYONEK SYSTEM INCLUDING GSB 412, SWITCH 413, TRANSFORMER T10 AND BUSWORK TO VCB B6126

NOTES:

1. BILL OF MATERIAL QUANTITIES ARE ESTIMATED. ACTUAL QUANTITIES SHALL BE VERIFIED BY THE CONTRACTOR
2. CHUGACH HAS ORDERED MATERIALS AS SHOWN IN THE BILL OF MATERIALS. IF THE CONTRACTOR REQUIRES INCREASED QUANTITIES DURING CONSTRUCTION, THE ACQUISITION OF MATERIAL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR

NO.	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	BGSS-ED-0044/1	SECONDARY CONTAINMENT POWER TRANSFORMER T10

Electric Power Systems, Inc. Consulting Engineers
3305 ARCTIC BLVD. STE. 201, ANCHORAGE, AK 99503
TEL: (907) 522-1953 CERTIFICATE OF AUTHORIZATION: AECC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

ENG. STAMP: STATE OF ALASKA — 49TH — Timothe C. Conrad — No. E11927 — REGISTERED PROFESSIONAL ENGINEER

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

CHUGACH — POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME:
BELUGA SUBSTATION BUSWORK BILL OF MATERIAL

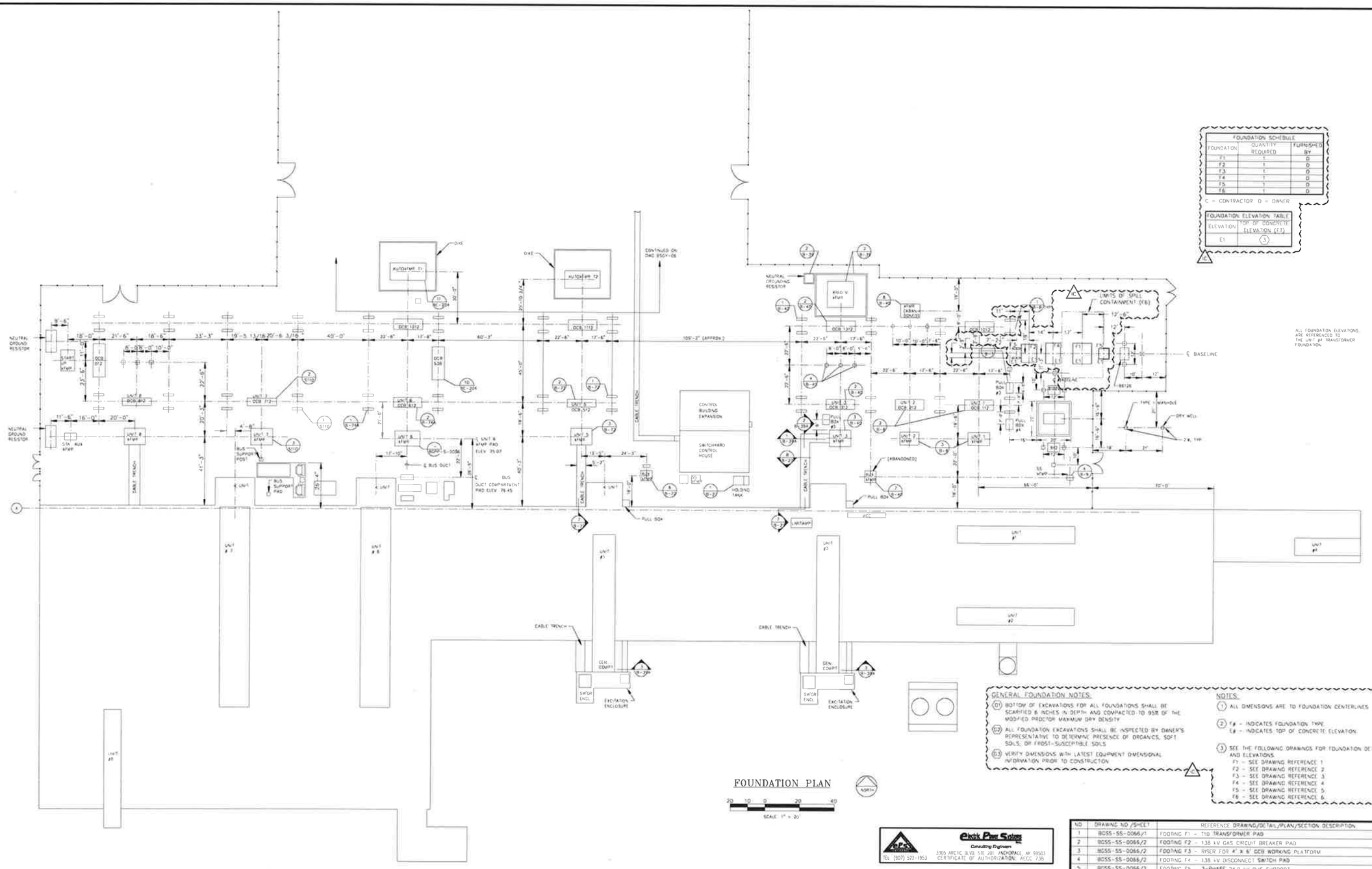
CONFIDENTIAL

bgss-ss-0067_1.dwg

DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO. BGSS-SS-0067

SHEET 1 OF 1
PAGE /



FOUNDATION SCHEDULE		
FOUNDATION	QUANTITY REQUIRED	FURNISHED BY
F1	1	C
F2	1	C
F3	1	C
F4	1	C
F5	1	C
F6	1	C

C = CONTRACTOR O = OWNER

FOUNDATION ELEVATION TABLE	
ELEVATION	TOP OF CONCRETE ELEVATION (FT)
E1	(3)

ALL FOUNDATION ELEVATIONS ARE REFERENCED TO THE UNIT #1 TRANSFORMER FOUNDATION.

GENERAL FOUNDATION NOTES:

(G1) BOTTOM OF EXCAVATIONS FOR ALL FOUNDATIONS SHALL BE SCARIFIED 6 INCHES IN DEPTH AND COMPACTED TO 95% OF THE MODIFIED PROCTOR MAXIMUM DRY DENSITY.

(G2) ALL FOUNDATION EXCAVATIONS SHALL BE INSPECTED BY OWNER'S REPRESENTATIVE TO DETERMINE PRESENCE OF ORGANICS, SOFT SOILS, OR FROST-SUSCEPTIBLE SOILS.

(G3) VERIFY DIMENSIONS WITH LATEST EQUIPMENT DIMENSIONAL INFORMATION PRIOR TO CONSTRUCTION.

NOTES:

(1) ALL DIMENSIONS ARE TO FOUNDATION CENTERLINES.

(2) F# = INDICATES FOUNDATION TYPE
E# = INDICATES TOP OF CONCRETE ELEVATION.

(3) SEE THE FOLLOWING DRAWINGS FOR FOUNDATION DETAILS AND ELEVATIONS.
F1 - SEE DRAWING REFERENCE 1
F2 - SEE DRAWING REFERENCE 2
F3 - SEE DRAWING REFERENCE 3
F4 - SEE DRAWING REFERENCE 4
F5 - SEE DRAWING REFERENCE 5
F6 - SEE DRAWING REFERENCE 6

FOUNDATION PLAN

SCALE: 1" = 20'

NOTE: THIS DRAWING WAS CREATED FROM EXISTING FOUNDATION DRAWINGS

NO	DRAWING NO /SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	BGSS-SS-0066/1	FOOTING F1 - T10 TRANSFORMER PAD
2	BGSS-SS-0066/2	FOOTING F2 - 138 kV GAS CIRCUIT BREAKER PAD
3	BGSS-SS-0066/2	FOOTING F3 - RISER FOR 4' X 6' GCB WORKING PLATFORM
4	BGSS-SS-0066/2	FOOTING F4 - 138 kV DISCONNECT SWITCH PAD
5	BGSS-SS-0066/2	FOOTING F5 - 3-PHASE 24.9 kV BUS SUPPORT
6	BGSS-EQ-0044/1	SECONDARY CONTAINMENT POWER TRANSFORMER T10

Electric Power Systems
Consulting Engineers
3305 ARCTIC BLVD, STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: ACCC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR/SUPV/DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

END STAMP: STATE OF ALASKA — Timothy C. Conrad — No. EE11007 — 9/03/19 — REGISTERED PROFESSIONAL ENGINEER

NO	RECORD REVISION	CAD DRAWN BY	W.P. #	W.O. NUMBER	RECORD APPROVED	DATE
0	CEI RECORD UPDATE				HUC	11/3/98
1	AS BUILT	SG/LMP	E9320085			10/12/98
2	AS BUILT, ARCO, TYONEK CIRCUIT UPGRADES FOR ARCO COMPRESSOR PROJECT		9300.23SEN	E9511112	PFD	3/3/97

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME:
BELUGA SUBSTATION
138 KV / 230 KV YARD
FOUNDATION PLAN

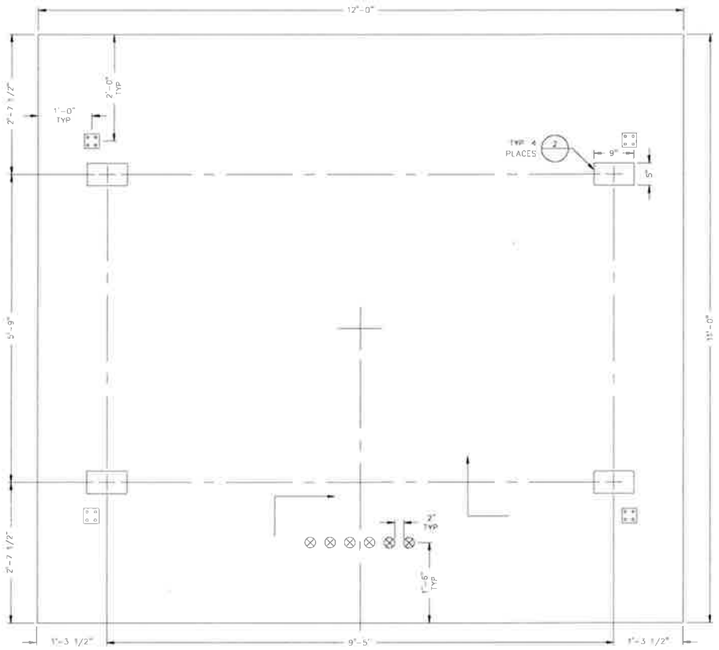
CONFIDENTIAL

v8:\vbplib\bppp\dtmp1\bpp02.pen 5/22/97

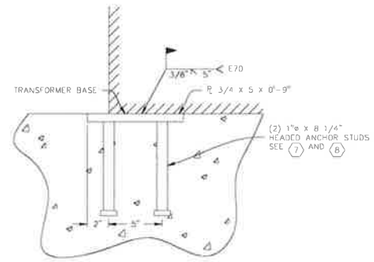
DRAWING NO - PREVIOUS/REFERENCE:

DRAWING NO: BPP-S-0002

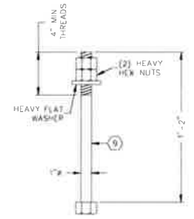
SHEET 1 OF 1
PAGE 1



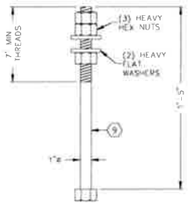
1 FOOTING F1
T10 TRANSFORMER PAD
(SEE NOTES 1, 2, & 3)
N.T.S.



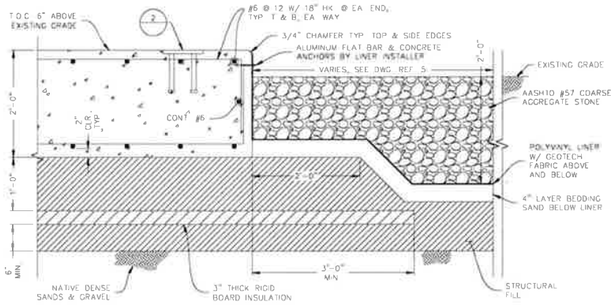
2 DETAIL
N.T.S.



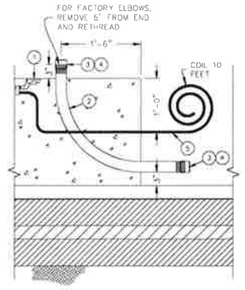
3 DETAIL
ANCHOR BOLT FOR CIRCUIT BREAKERS ASSEMBLY AB1
(4 REQ'D)
N.T.S.



4 DETAIL
ANCHOR BOLT FOR STRUCTURES
A01 AND A02
(TOTAL 20 REQ'D)
N.T.S.



A SECTION
FOOTING F1
N.T.S.



B SECTION
CONDUIT AND GROUNDING
(REINFORCING NOT SHOWN FOR CLARITY)
N.T.S.

BILL OF MATERIAL FOR FOUNDATION F1

REF NO	UNIT	QUANTITY	DESCRIPTION	MANUFACTURER/CATALOG NUMBER	FURNISHED BY
1	EA	4	GROUNDING PLATE, 4 HOLE	BURNDY/YGF28-4N (OAE)	O
2	EA	8	SWEEP, GALVANIZED RIGID STEEL, 90 DEGREE, 2" X 18"R	CALCONDUIT/ST2018SW90 (OAE)	O
3	EA	12	COUPLING, GALVANIZED RIGID STEEL, 2"	CALCONDUIT/ST2000CP00 (OAE)	O
4	EA	12	RECESSED PLUG, 2"	THOMAS & BETTS/PLG6-TB (OAE)	O
5	LF	60	4/0 STRANDED BARE COPPER	HOUSTON WIRE & CABLE/ HW000 4010- (OAE)	O

C = CONTRACTOR O = OWNER OAE = OR APPROVED EQUAL

NOTES:

1. TRANSFORMER SLAB SHALL BE PRECAST
2. PRE-CAST CONCRETE
   - A. CONCRETE WORK SHALL CONFORM TO ALL REQUIREMENTS OF ACI 301 "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS" AND ACI 318 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE"
   - B. MINIMUM 28-DAY COMPRESSIVE STRENGTH 5,000 PSI
   - C. MAXIMUM WATER TO CEMENT RATIO EQUALS 0.40
   - D. ENTRAIN AIR IN ACCORDANCE WITH IBC TABLE 1904.2.1 FOR SEVERE EXPOSURE CONCRETE
   - E. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60
3. PRE-CAST PLANT SHALL BE RESPONSIBLE FOR DESIGNING AND INSTALLING ALL LIFTING PROVISIONS AS REQUIRED FOR CONTRACTOR TO TRANSPORT, HANDLE, AND INSTALL PAD IN ITS FOUNDATION. AFTER FOUNDATION IS COMPLETE, THERE SHALL BE NO PROTRUSIONS ON THE TOP SURFACE OF THE PAD
4. RIGID BOARD INSULATION SHALL BE EXTRUDED OR EXPANDED (XPS OR EPS) WITH A RATED COMPRESSIVE STRENGTH OF 60 PSI MINIMUM
5. STRUCTURAL FILL SHALL BE MOA TYPE IIA CLASSIFIED FILL AND BACKFILL. STRUCTURAL FILL SHALL BE PLACED IN 12-INCH MAXIMUM LIFTS, COMPACT TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR METHOD
6. DRAIN ROCK SHALL BE HARD, ANGULAR, CRUSHED, WASHED NATURAL STONE MEETING THE GRADATION REQUIREMENTS OF MASS TYPE C FILTER MATERIAL. IT SHALL BE FREE OF SHALE, CLAY, FRIABLE MATERIALS AND DEBRIS
7. HEADED ANCHOR STUDS SHALL CONFORM TO ASTM A29 AND AWS D1.1 WITH A MINIMUM YIELD STRENGTH OF 51,000 PSI AND A MINIMUM TENSILE STRENGTH OF 65,000 PSI
8. HEADED ANCHOR STUDS SHALL BE ATTACHED TO 5/8" PLATE WITH A FULL STRENGTH WELD USING AUTOMATED STUD WELDING EQUIPMENT AND PROCEDURES
9. ANCHOR BOLTS SHALL CONFORM WITH ASTM F1554, GRADE 55 AND SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A153

NO	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	–	FOOTING F1 – T10 TRANSFORMER PAD
2	–	DETAIL
3	–	ANCHOR BOLT FOR CIRCUIT BREAKERS ASSEMBLY AB1
4	–	ANCHOR BOLT FOR STRUCTURES A01 AND A02
5	BGSS-ED-0044/1	SECONDARY CONTAINMENT POWER TRANSFORMER T10
A	–	SECTION – FOOTING F1
B	–	SECTION – CONDUIT AND GROUNDING

EPS Electric Power Systems
Consulting Engineers
3335 ARCTIC BLVD, STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953
CERTIFICATE OF AUTHORIZATION: AECC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	GDH/09-03-2019	

ENG. STAMP

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

CHUGACH
POWERING ALASKA'S FUTURE

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

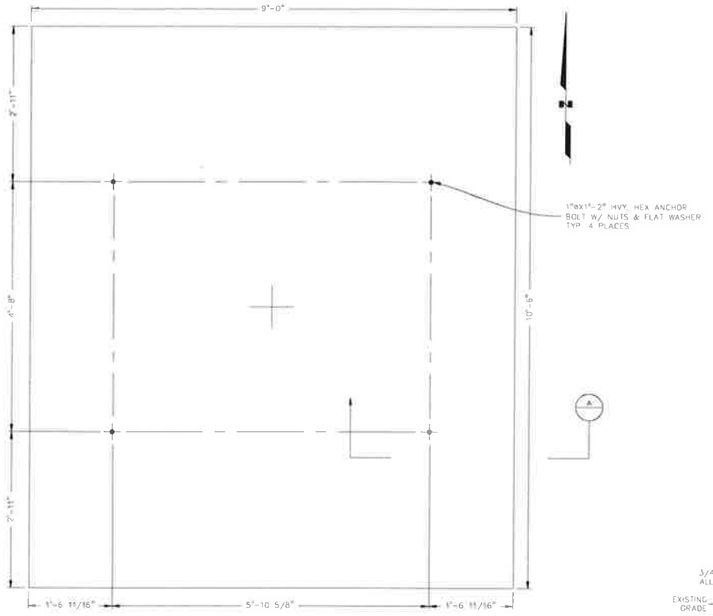
DRAWING NAME
BELUGA SUBSTATION
FOUNDATION
T10 TRANSFORMER FOUNDATION
DETAILS

CONFIDENTIAL

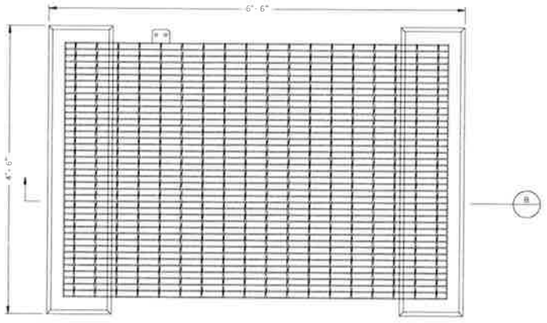
bgss-ss-0066_1.dwg

DRAWING NO. – PREVIOUS/REFERENCE
NEW
DRAWING NO. BGSS-SS-0066

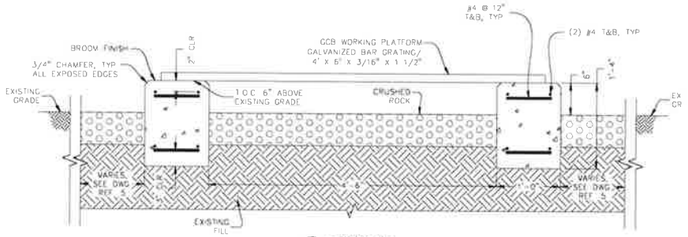
SHEET 1 OF 2
PAGE



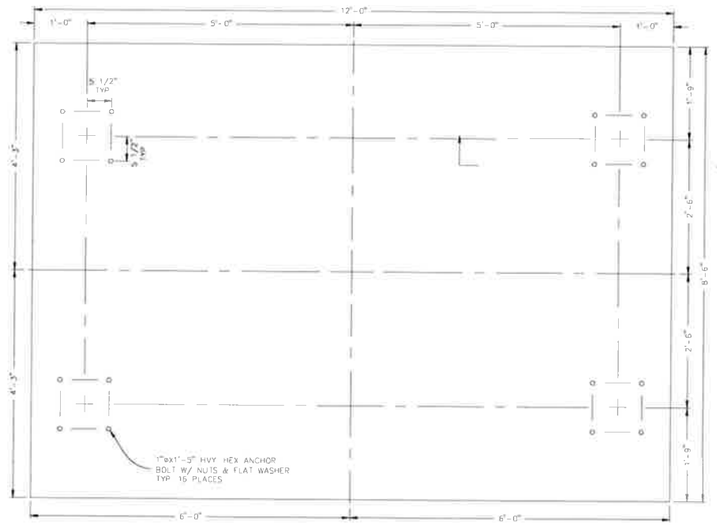
1 FOOTING F2
138 kV GAS CIRCUIT BREAKER PAD
(SEE NOTES (1), (2), & (3))
N.T.S.



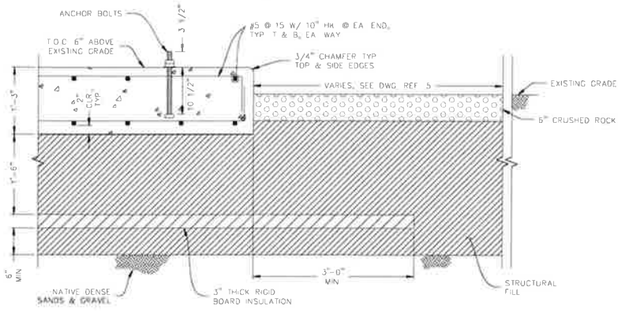
2 FOOTING F3
RISER FOR 4' x 6'
GCB WORKING PLATFORM
N.T.S.



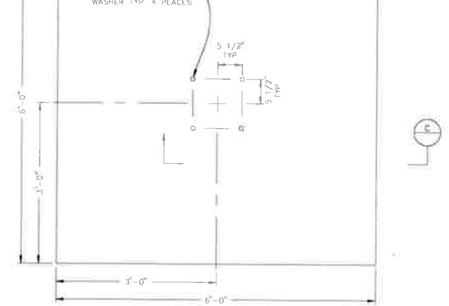
B SECTION
FOOTING F3
N.T.S.



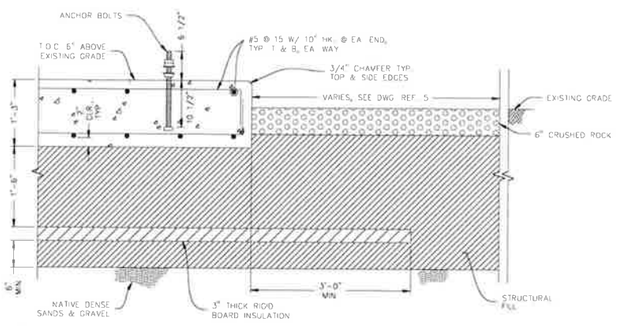
3 FOOTING F4
138 kV DISCONNECT SWITCH PAD
(SEE NOTES (1), (2), & (3))
N.T.S.



A SECTION
FOOTING F2
N.T.S.



4 FOOTING F5
3-PHASE 24.9 kV BUS SUPPORT
(SEE NOTES (1), (2), & (3))
N.T.S.



C SECTION
FOOTING F4 & F5
N.T.S.

NOTES:

(1) PADS SHALL BE PRECAST

(2) PRE-CAST CONCRETE

A CONCRETE WORK SHALL CONFORM TO ALL REQUIREMENTS OF ACI 301 "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS" AND ACI 318 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE".

B MINIMUM 28-DAY COMPRESSIVE STRENGTH: 5,000 PSI

C MAXIMUM WATER TO CEMENT RATIO EQUALS 0.40

D ENTRAIN AIR IN ACCORDANCE WITH IBC TABLE 1904.2.1 FOR SEVERE EXPOSURE CONCRETE

E REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60

(3) PRE-CAST PLANT SHALL BE RESPONSIBLE FOR DESIGNING AND INSTALLING ALL LIFTING PROVISIONS AS REQUIRED FOR CONTRACTOR TO TRANSPORT, HANDLE, AND INSTALL PAD IN ITS FOUNDATION.

(4) RIGID BOARD INSULATION SHALL BE EXTRUDED OR EXPANDED (XPS OR EPS) WITH A RATED COMPRESSIVE STRENGTH OF 60 PSI MINIMUM

(5) STRUCTURAL FILL SHALL BE MOA TYPE IIA CLASSIFIED FILL AND BACKFILL STRUCTURAL FILL SHALL BE PLACED IN 12-INCH MAXIMUM LIFTS, COMPACT TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR METHOD

NO	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	–	FOOTING F2 – 138 kV GAS CIRCUIT BREAKER PAD
2	–	FOOTING F3 – RISER FOR 4' x 6' GCB WORKING PLATFORM
3	–	FOOTING F4 – 138 kV DISCONNECT SWITCH PAD
4	–	FOOTING F5 – 3-PHASE 24.9 kV BUS SUPPORT
5	BPP-S-0005/1	GROUNDING PLAN
A	–	SECTION – FOOTING F2
B	–	SECTION – FOOTING F3
C	–	SECTION – FOOTING F4 & F5

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	CDH/09-03-2019	

ENG. STAMP

NO	RECORD REVISION	CAD DRAWN BY	WP #	WO NUMBER	RECORD APPROVED	DATE

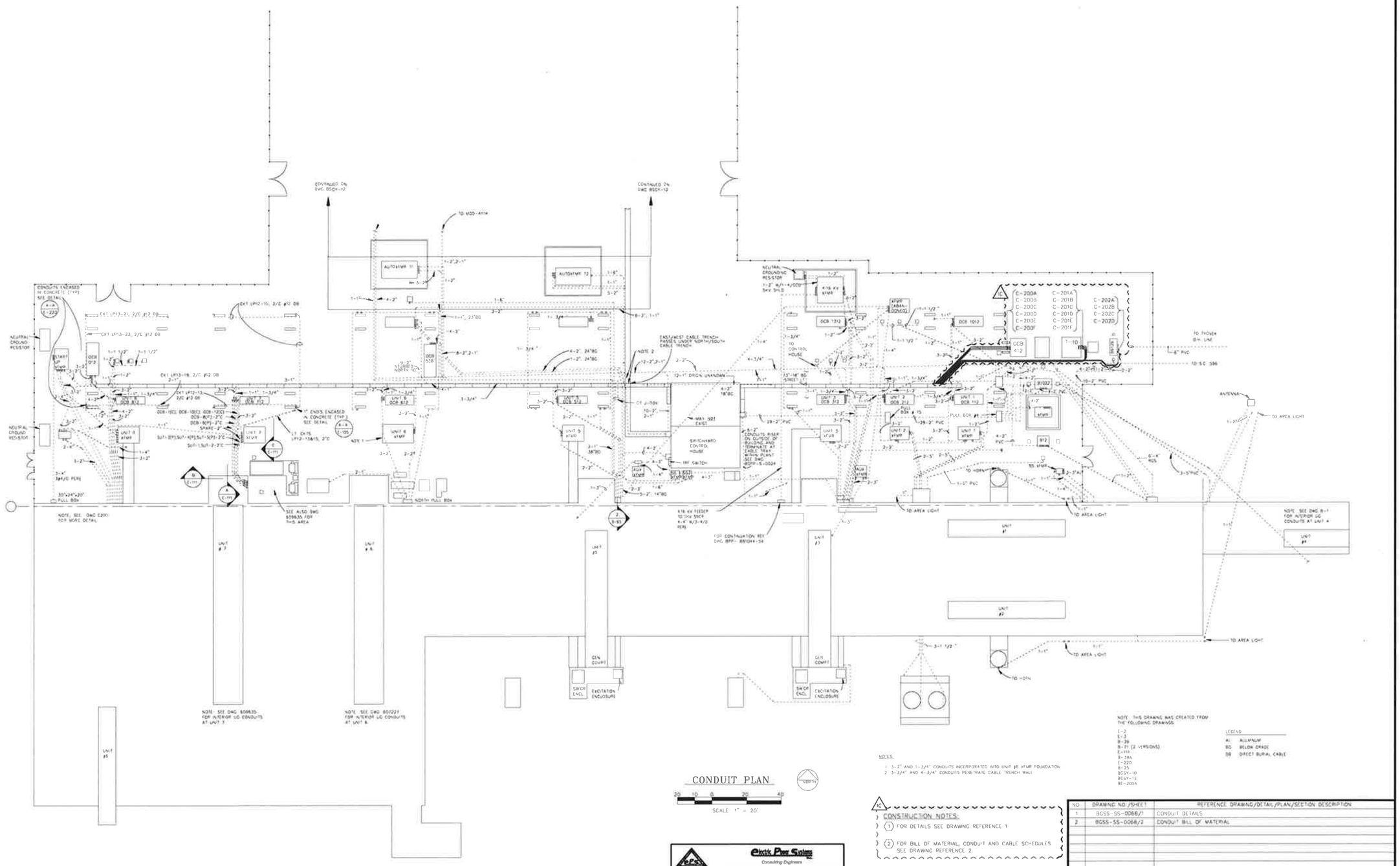
Electric Power Systems
Consulting Engineers
3305 ARCTIC BLVD. STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: AECC 738

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME:
BELUGA SUBSTATION
FOUNDATION
MISC. TYONEK SYSTEM FOUNDATIONS
DETAILS

CONFIDENTIAL

DRAWING NO. - PREVIOUS/REFERENCE: BGSS-SS-0065_7.dwg
NEW DRAWING NO.: BGSS-SS-0066
SHEET 2 OF 2
PAGE ____ / ____


CONTINUED ON DWG BSCH-12
CONTINUED ON DWG BSCH-12
TO MOD-4114
AUTOTRANS T1
AUTOTRANS T2
CONDUITS ENCASED IN CONCRETE (TYP) SEE DETAIL
NEUTRAL GROUND RESISTOR
NEUTRAL GROUND RESISTOR
EAST/WEST CABLE TRENCH PASSES UNDER NORTH/SOUTH CABLE TRENCH
SWITCHYARD CONTROL HOUSE
4.16 KV FEEDER TO SVC SWGR 4-#4/0 W/3-#1/0 PER
FOR CONTINUATION REF DWG BPP-S51044-S4
10 CONTROL HOUSE
TO TOWER
TO SC 386
TO AREA LIGHT
TO HORN
ANTENNA
TO AREA LIGHT
TO AREA LIGHT
TO AREA LIGHT
TO AREA LIGHT
TO HORN
NOTE: SEE DWG B-1 FOR INTERIOR LC CONDUITS AT UNIT 4
NOTE: SEE DWG E200 FOR MORE DETAIL
NOTE: SEE DWG 509835 FOR INTERIOR LC CONDUITS AT UNIT 7
NOTE: SEE DWG 507221 FOR INTERIOR LC CONDUITS AT UNIT 8
SEE ALSO DWG 509835 FOR THIS AREA
ADDTNL PULL BOX
UNIT #1
UNIT #2
UNIT #3
UNIT #4
UNIT #5
UNIT #6
UNIT #7
UNIT #8
GEN COMPT
SWGR ENCL
EXCITATION ENCLOSURE
GEN COMPT
SWGR ENCL
EXCITATION ENCLOSURE
PULL BOX #1
PULL BOX #2
C-200A C-201A C-202A
C-200B C-201B C-202B
C-200C C-201C C-202C
C-200D C-201D C-202D
C-200E C-201E C-202E
C-200F C-201F
GCB 412
GCB 1012
DCB 1012
DCB 538
DCB 512
DCB 312
DCB 112
DCB 212
DCB 012
DCB 412
DCB 612
DCB 812
DCB 1012
DCB 1212
DCB 1412
DCB 1612
DCB 1812
DCB 2012
DCB 2212
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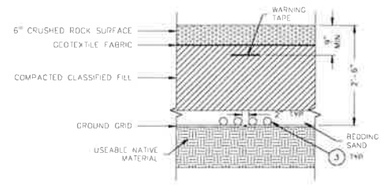
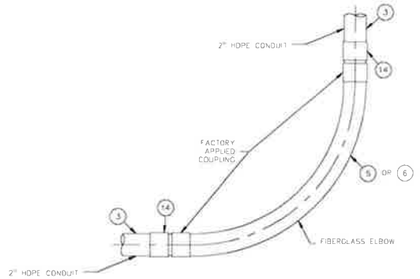
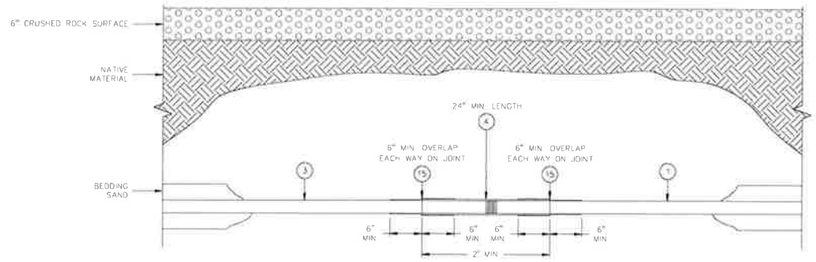


1 TYPICAL CROSS SECTION AND BACKFILL FOR LOW VOLTAGE CIRCUITS
N.T.S.

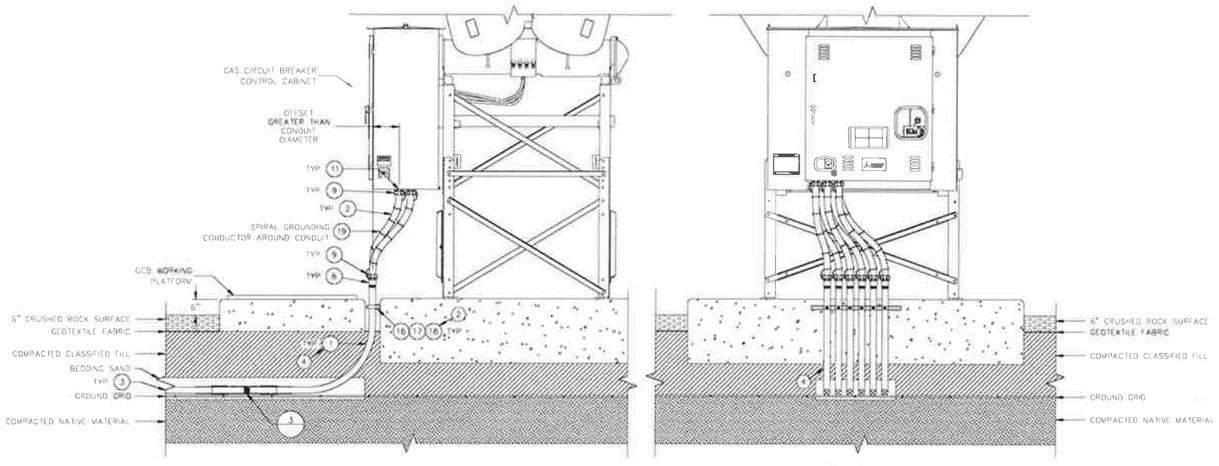


2 FIBERGLASS ELBOW (TYPICAL)
N.T.S.

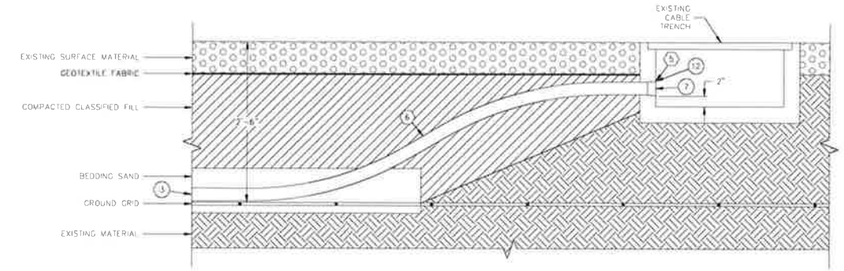


3 TYPICAL 2" GRSC TO HDPE CONNECTION
N.T.S.

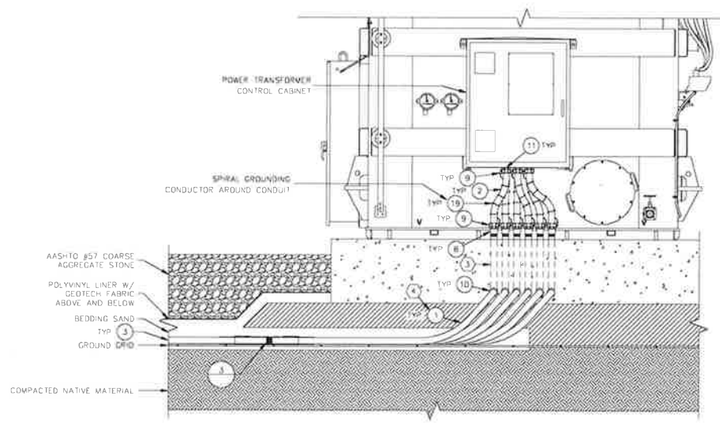
4 EMPTY CONDUIT SEALING (TYPICAL)
N.T.S.



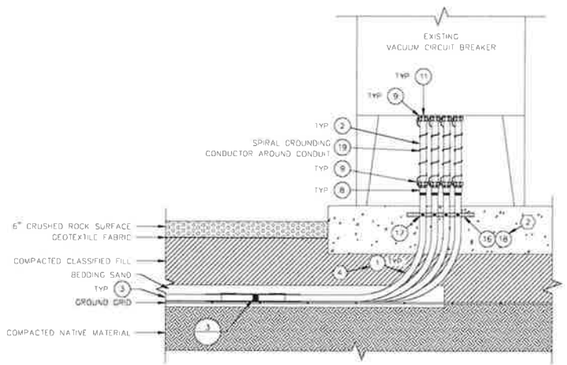
6 GAS CIRCUIT BREAKER CONDUITS
N.T.S.



5 HDPE CONDUIT ENTRANCE TO EXISTING CABLE TRENCH (TYPICAL)
N.T.S.



7 POWER TRANSFORMER CONDUITS
N.T.S.



8 VACUUM CIRCUIT BREAKER CONDUITS
N.T.S.

NOTES:

1. FOR BILL OF MATERIAL SEE DRAWING REFERENCE 9
2. ITEM (19) SHALL BE 3" MIN. BELOW TOP OF CONCRETE AND SPACED AT 8" MAX
3. 2" GRSC (R=18") CONDUIT ELBOWS IN PRE-CAST FOUNDATION
4. CONTRACTOR SHALL FIELD-BEND CONDUIT FROM ITEM (1) MINIMUM RADIUS SHALL BE 24 INCHES
5. CONTRACTOR SHALL CORE-DRILL EXISTING TRENCH TO INSTALL NEW CONDUITS. GROUT CONDUITS IN PLACE WITH ITEM (12)
6. CONTRACTOR SHALL FIELD-BEND CONDUIT FROM ITEM (3) MINIMUM RADIUS SHALL BE 24 INCHES

NO	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	–	TYPICAL CROSS SECTION AND BACKFILL FOR LOW VOLTAGE CONDUITS
2	–	FIBERGLASS ELBOW (TYPICAL)
3	–	TYPICAL 2" GRSC TO HDPE CONNECTION
4	–	EMPTY CONDUIT SEALING (TYPICAL)
5	–	HDPE CONDUIT ENTRANCE TO EXISTING CABLE TRENCH (TYPICAL)
6	–	GAS CIRCUIT BREAKER CONDUITS
7	–	POWER TRANSFORMER CONDUITS
8	–	VACUUM CIRCUIT BREAKER CONDUITS
9	BGSS-SS-0068/2	CONDUIT BILL OF MATERIAL

Electric Power Systems, Inc. — Consulting Engineers
3305 ARCTIC BLVD STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: ACEC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

END. STAMP: STATE OF ALASKA — TIMOTHY C. CONRAD — REGISTERED PROFESSIONAL ENGINEER

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

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME:
BELUGA SUBSTATION
CONDUIT
DETAILS

CONFIDENTIAL

DRAWING NO. - PREVIOUS/REFERENCE:
NEW
DRAWING NO: BGSS-SS-0068
SHEET 1 OF 3
PAGE 1/1

TYONEK SYSTEM BILL OF MATERIAL

REF NO.	UNIT	ESTIMATED QUANTITY	DESCRIPTION	MANUFACTURER/CATALOG NUMBER	FURNISHED BY
1	EA	16	GALVANIZED RIGID STEEL CONDUIT, 2" X 10'	CALCONDUIT/ST2010CT00 (OAE)	C
2	LF	160	LIQUIDTIGHT FLEXIBLE STEEL CONDUIT, 2"	ELECTRI-FLEX/ATLA-16 (OAE)	C
3	EA	(2)	HDPE CONDUIT, SMOOTHWALL, BLACK W/RED STRIPES, 1250 LB PULL TAPE, SCH. 40, 2"	DURA-LINE (OAE)	C
4	EA	4	PVC CONDUIT, SCH 40, 2-1/2" X 10'	CANTEX/A52CE12 (OAE)	C
5	EA	10	2" FIBERGLASS ELBOW, 90 DEGREE, 24" RADIUS WITH FACTORY PVC COUPLINGS	CHAMPION/20C-SW-91-2D (OAE)	C
6	EA	24	2" FIBERGLASS ELBOW, 45 DEGREE, 24" RADIUS WITH FACTORY PVC COUPLINGS	CHAMPION/20C-SW-81-2D (OAE)	C
7	EA	16	END BELL, PVC, 2"	CANTEX/5144008 (OAE)	C
8	EA	16	COUPLING, GALVANIZED RIGID STEEL, 2"	CALCONDUIT/ST2000CP00 (OAE)	C
9	EA	32	LIQUIDTIGHT STRAIGHT CONNECTOR, INSULATED, GROUNDING, 2"	THOMAS & BETTS/5337GR (OAE)	C
10	EA	6	THREE-PIECE COUPLING, 2"	THOMAS & BETTS/6807B (OAE)	C
11	EA	(4)	GROUNDING BUSHING, BLACKJACK, 2"	THOMAS & BETTS/BG200-14-20 (OAE)	C
12	EA	AS REQ'D	FAST-SETTING PORTLAND-CEMENT WATER-STOP	SIKA/SIKASET PLUG (OAE)	C
13	EA	6	DUCT PLUG, BLANK, 2"	CAL AM MANUFACTURING/5120-20	C
14	EA	AS REQ'D	BONDUIT CONDUIT ADHESIVE	POLYWATER/BT-KITC (OAE)	C
15	EA	10	HEAT-SHRINK TUBING, EXTRA HEAVY DUTY 4 - FOOT STANDARD LENGTHS	POLAR WIRE/CFW-3500-BK (OAE)	C
16	FT	10	FRAMING CHANNEL, 1-5/8"	UNISTRUT/P1000-HG (OAE)	C
17	EA	10	PIPE CLAMP FOR RIGID STEEL CONDUIT, 2"	UNISTRUT/P1117-HG (OAE)	C
18	EA	AS REQ'D	CONCRETE EXPANSION ANCHOR, 3/8" DIA X 3"	HILTI KWIK BOLT TZ/3437370 (OAE)	C
19	LF	(4)	#2 STRANDED TINNED BARE COPPER	HOUSTON WIRE & CABLE/HW000 00201 TN (OAE)	C
20	CU YD.	AS REQ'D	BEDDING SAND, 1/2" MINUS, FOR CONDUIT BACKFILL	COMMODITY/PER SPECIFICATION (SFA)	C
21			NOT USED		
22			NOT USED		
23			NOT USED		
24			NOT USED		
25			NOT USED		
26			NOT USED		
27			NOT USED		
28			NOT USED		
29			NOT USED		
30			NOT USED		

C = CONTRACTOR O = OWNER OAE = OR APPROVED EQUAL

NOTES:

(1) BILL OF MATERIAL QUANTITIES ARE ESTIMATED. ACTUAL QUANTITIES SHALL BE VERIFIED BY THE CONTRACTOR

(2) FOR CONDUIT LENGTH SEE CONDUIT SCHEDULE (THIS SHEET)

(3) FOR CABLE LENGTH SEE CABLE SCHEDULE (THIS SHEET)

(4) FOR MATERIAL QUANTITY SEE DRAWING REFERENCE 2

(5) CONDUIT AND CABLE LENGTHS ARE ESTIMATED

(6) SPARE/EMPTY CONDUITS SHALL BE PLUGGED

(7) RISERS FOR ALL EXPOSED ABOVE GRADE 2-INCH CONDUITS SHALL BE MADE WITH A CONTINUOUS 10 FOOT LENGTH OF 2 INCH GRSC FIELD-BENT

(8) ALL CABLE AND WIRE BY HOUSTON WIRE & CABLE UNLESS NOTED OTHERWISE

(9) COIL, TAG, AND SECURE 20 FEET OF CABLE OUTSIDE OF CABLE TRENCH IN THE RACK ROOM OF THE CONTROL BUILDING

(10) COIL, TAG, AND SECURE 20 FEET OF CABLE IN CABINET

(11) ALL POWER AND CONTROL CABLE WILL BE SUPPLIED BY CHUGACH

HDPE BEND RADIUS TABLE

TRADE SIZE (IN)	O.D (IN)	BEND RADIUS (IN)		SAFE WORKING LOAD (LBS)	
		SUPPORTED	UNSUPPORTED	SCH 40	SCH 80
2	2.375	24	48	2579	3545

HDPE BEND RADIUS DATA REPRODUCED FROM DURA-LINE

TYONEK SYSTEM CONDUIT SCHEDULE

CONDUIT NO.	CONDUIT SIZE	EST. CONDUIT LENGTH (FT.)	TYPE	FROM	TO	FUNCTION	REF DWG
C-200A	2"	65	HDPE, SCH 40	138 kV GAS CIRCUIT BREAKER 412	CABLE TRENCH	GCB CIRCUITS	1
C-200B	2"	65	HDPE, SCH 40	138 kV GAS CIRCUIT BREAKER 412	CABLE TRENCH	GCB CIRCUITS	1
C-200C	2"	65	HDPE, SCH 40	138 kV GAS CIRCUIT BREAKER 412	CABLE TRENCH	GCB CIRCUITS	1
C-200D	2"	65	HDPE, SCH 40	138 kV GAS CIRCUIT BREAKER 412	CABLE TRENCH	GCB CIRCUITS	1
C-200E	2"	65	HDPE, SCH 40	138 kV GAS CIRCUIT BREAKER 412	CABLE TRENCH	GCB CIRCUITS	1
C-200F	2"	65	HDPE, SCH 40	138 kV GAS CIRCUIT BREAKER 412	CABLE TRENCH	GCB CIRCUITS	1
C-201A	2"	115	HDPE, SCH 40	POWER TRANSFORMER T-10	CABLE TRENCH	XFMR CIRCUITS	1
C-201B	2"	115	HDPE, SCH 40	POWER TRANSFORMER T-10	CABLE TRENCH	XFMR CIRCUITS	1
C-201C	2"	115	HDPE, SCH 40	POWER TRANSFORMER T-10	CABLE TRENCH	XFMR CIRCUITS	1
C-201D	2"	115	HDPE, SCH 40	POWER TRANSFORMER T-10	CABLE TRENCH	XFMR CIRCUITS	1
C-201E	2"	115	HDPE, SCH 40	POWER TRANSFORMER T-10	CABLE TRENCH	XFMR CIRCUITS	1
C-201F	2"	115	HDPE, SCH 40	POWER TRANSFORMER T-10	CABLE TRENCH	XFMR CIRCUITS	1
C-202A	2"	130	HDPE, SCH 40	24.9 kV VACUUM CIRCUIT BREAKER 6126	CABLE TRENCH	VCB CIRCUITS	1
C-202B	2"	130	HDPE, SCH 40	24.9 kV VACUUM CIRCUIT BREAKER 6126	CABLE TRENCH	VCB CIRCUITS	1
C-202C	2"	130	HDPE, SCH 40	24.9 kV VACUUM CIRCUIT BREAKER 6126	CABLE TRENCH	VCB CIRCUITS	1
C-202D	2"	130	HDPE, SCH 40	24.9 kV VACUUM CIRCUIT BREAKER 6126	CABLE TRENCH	VCB CIRCUITS	1

TYONEK SYSTEM CABLE SCHEDULE

CABLE OR WIRE NO.	CATALOG NUMBER	ESTIMATED LENGTH (FT.)	FROM	TO	FUNCTION	VIA	FURNISHED BY
AC-412-1	3C#6 W/ #8 GND HW172 06033G	280	CONTROL BUILDING AC PANEL NOTE (9)	GAS CIRCUIT BREAKER 412 NOTE (10)	AC PANEL BRANCH CIRCUIT MOTOR CIRCUIT	CONDUIT "C-200A", CABLE TRENCH CONTROL BUILDING	O
AC-412-2	3C#6 W/ #8 GND HW172 06033G	280	CONTROL BUILDING AC PANEL NOTE (9)	GAS CIRCUIT BREAKER 412 NOTE (10)	AC PANEL BRANCH CIRCUIT HEATER CIRCUIT	CONDUIT "C-200A", CABLE TRENCH CONTROL BUILDING	O
AC-412-3	4C#10 HW170 01004 E1	280	CONTROL BUILDING AC PANEL NOTE (9)	GAS CIRCUIT BREAKER 412 NOTE (10)	AC PANEL BRANCH CIRCUIT CABINET LIGHT & RECEPTACLE	CONDUIT "C-200A", CABLE TRENCH CONTROL BUILDING	O
DC-412-1	3C#6 W/ #8 GND HW172 06033G	280	CONTROL BUILDING DC PANEL NOTE (9)	GAS CIRCUIT BREAKER 412 NOTE (10)	DC PANEL BRANCH CIRCUIT MOTOR, TRIP & CLOSE CIRCUITS	CONDUIT "C-200B", CABLE TRENCH CONTROL BUILDING	O
AC-110-1	4C#10 HW170 01004 E1	330	CONTROL BUILDING AC PANEL NOTE (9)	POWER TRANSFORMER T-10 NOTE (10)	AC PANEL BRANCH CIRCUIT FANS, RECEPTACLE, CABINET HEATER	CONDUIT "C-201A", CABLE TRENCH CONTROL BUILDING	O
DC-110-1	4C#10 HW170 01004 E1	330	CONTROL BUILDING DC PANEL NOTE (9)	POWER TRANSFORMER T-10 NOTE (10)	DC PANEL BRANCH CIRCUIT SUDDEN PRESSURE SEAL-IN RELAY	CONDUIT "C-201A", CABLE TRENCH CONTROL BUILDING	O

C = CONTRACTOR O = OWNER OAE = OR APPROVED EQUAL

NO.	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	BPP-S-0004/1	CONDUIT PLAN
2	BGSS-SS-0069/1	GROUNDING BILL OF MATERIAL

Electric Power Systems
Consulting Engineers
3305 ARCTIC BLVD STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: ACCO 735

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

ENG. STAMP
STATE OF ALASKA
EXPIRES: 12/31/2019
Timothy C. Conrad
No. E11001
REGISTERED PROFESSIONAL ENGINEER

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

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME:
BELUGA SUBSTATION
CONDUIT
BILL OF MATERIAL

CONFIDENTIAL

BGSS-SS-0068 2 0

DRAWING NO. = PREVIOUS/REFERENCE
NEW
DRAWING NO.: BGSS-SS-0068
SHEET 2 OF 3
PAGE 1

CABLE OR WIRE NO.	CATALOG NUMBER	ESTIMATED LENGTH (FT)	FROM	TO	FUNCTION	VIA	DRAWING NUMBER	FURNISHED BY
C1-412-1	4C#10 CHUGACH CAT ID # 3916	308	138 kV BKR 412	EAST BUS CT JUNCTION BOX NOTE (2)	DIFF CT CURRENT	CONDUIT "C-200C", CABLE TRENCH		O
C1-412-2	4C#10 CHUGACH CAT ID # 3916	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR CT CURRENT	CONDUIT "C-200C", CABLE TRENCH		O
C1-412-3	4C#10 CHUGACH CAT ID # 3916	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR CT CURRENT	CONDUIT "C-200C", CABLE TRENCH		O
C1-412-4	4C#10 CHUGACH CAT ID # 3916	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR CT CURRENT	CONDUIT "C-200C", CABLE TRENCH		O
C1-412-5	4C#10 CHUGACH CAT ID # 3916	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR CT CURRENT	CONDUIT "C-200C", CABLE TRENCH		O
C1-412-6	4C#10 CHUGACH CAT ID # 3916	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR CT CURRENT	CONDUIT "C-200C", CABLE TRENCH		O
C1-6126-1	4C#10 CHUGACH CAT ID # 3916	390	24.9 kV BKR 6126	BLDG PANEL 5 NOTE (2)	BKR CT CURRENT	CONDUIT "C-202C", CABLE TRENCH		O
C1-6126-2	4C#10 CHUGACH CAT ID # 3916	390	24.9 kV BKR 6126	BLDG PANEL 5 NOTE (2)	BKR CT CURRENT	CONDUIT "C-202C", CABLE TRENCH		O
C1-6126-3	4C#10 CHUGACH CAT ID # 3916	390	24.9 kV BKR 6126	BLDG PANEL 5 NOTE (2)	BKR CT CURRENT	CONDUIT "C-202C", CABLE TRENCH		O
C1-6126-4	4C#10 CHUGACH CAT ID # 3916	390	24.9 kV BKR 6126	BLDG PANEL 5 NOTE (2)	BKR CT CURRENT	CONDUIT "C-202C", CABLE TRENCH		O
C1-T10-1	4C#10 CHUGACH CAT ID # 3916	355	TRANSFORMER 10	BLDG PANEL 4 NOTE (2)	BKR CT CURRENT	CONDUIT "C-201C", CABLE TRENCH		O
C1-T10-2	4C#10 CHUGACH CAT ID # 3916	355	TRANSFORMER 10	BLDG PANEL 4 NOTE (2)	BKR CT CURRENT	CONDUIT "C-201C", CABLE TRENCH		O
C1-T10-3	4C#10 CHUGACH CAT ID # 3916	355	TRANSFORMER 10	BLDG PANEL 4 NOTE (2)	BKR CT CURRENT	CONDUIT "C-201C", CABLE TRENCH		O
C-412-1	12C#12 CHUGACH CAT ID # 984	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR CONTROLS	CONDUIT "C-200D", CABLE TRENCH		O
C-412-2	12C#12 CHUGACH CAT ID # 984	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR CONTROLS	CONDUIT "C-200D", CABLE TRENCH		O
C-T10-1	12C#12 CHUGACH CAT ID # 984	355	XFMR T10	BLDG PANEL 4 NOTE (2)	XFMR ALARMS	CONDUIT "C-201D", CABLE TRENCH		O
C-6126-1	12C#12 CHUGACH CAT ID # 984	390	24.9 kV BKR 6126	BLDG PANEL 5 NOTE (2)	BKR CONTROLS	CONDUIT "C-202D", CABLE TRENCH		O
C-6126-2	12C#12 CHUGACH CAT ID # 984	390	24.9 kV BKR 6126	BLDG PANEL 5 NOTE (2)	BKR CONTROLS	CONDUIT "C-202D", CABLE TRENCH		O
C-412-3	20C#16 CHUGACH CAT ID # 2052	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR ALARMS	CONDUIT "C-200E", CABLE TRENCH		O
C-412-4	20C#16 CHUGACH CAT ID # 2052	308	138 kV BKR 412	BLDG PANEL 3 NOTE (2)	BKR ALARMS	CONDUIT "C-200E", CABLE TRENCH		O
C-T10-3	20C#16 CHUGACH CAT ID # 2052	390	XFMR T10	BLDG PANEL 5 NOTE (2)	XFMR ALARMS	CONDUIT "C-201E", CABLE TRENCH		O
C-T10-4	20C#16 CHUGACH CAT ID # 2052	390	XFMR T10	BLDG PANEL 5 NOTE (2)	XFMR ALARMS	CONDUIT "C-201E", CABLE TRENCH		O

CABLE OR WIRE NO.	CATALOG NUMBER	ESTIMATED LENGTH (FT)	FROM	TO	FUNCTION	VIA	DRAWING NUMBER	FURNISHED BY
AC-6126-1	4C#10 CHUGACH CAT ID # 3916	390	AC BKR PANEL	BKR 6126	AC POWER	CONDUIT "C-202A", CABLE TRENCH		O
DC-6126-1	2C#10 CHUGACH CAT ID # 2954	390	DC BKR PANEL	BKR 6126	DC POWER	CONDUIT "C-202A", CABLE TRENCH		O

C = CONTRACTOR O = OWNER OAE = OR APPROVED EQUAL

NOTES:

(1) ALL CABLES ON THIS SHEET ARE TO BE FURNISHED BY CHUGACH AND INSTALLED BY THE CONTRACTOR UNLESS NOTED OTHERWISE

(2) CONT. TAG, AND SECURE 20 FEET OF CABLE OUTSIDE OF CABLE TRENCH IN THE RACK ROOM OF THE CONTROL BUILDING

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT

ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG STAMP
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KTR/09-03-2019	TCC/09-03-2019		

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

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME

BELUGA SUBSTATION
CONTROL CABLE
CABLE SCHEDULE

CONFIDENTIAL

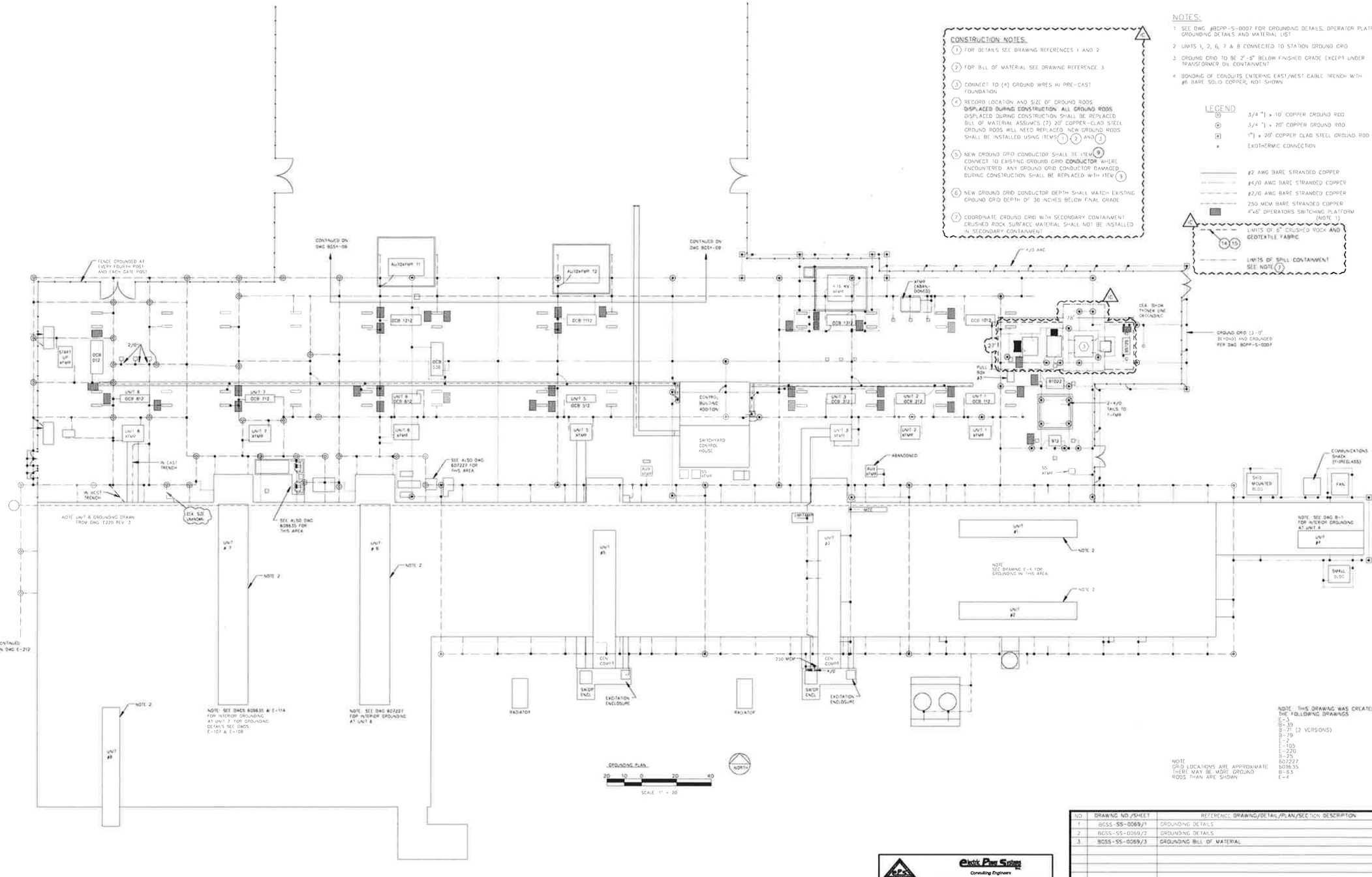
BGSS-SS-0068_3.dwg

DRAWING NO. - PREVIOUS/REFERENCE

NEW DRAWING NO.

BGSS-SS-0068

SHEET 3 OF 3
PAGE ____ / ____



NO.	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	BGSS-SS-0069/1	GROUNDING DETAILS
2	BGSS-SS-0069/2	GROUNDING DETAILS
3	BGSS-SS-0069/3	GROUNDING BILL OF MATERIAL

Electric Plant Systems, Inc.
Consulting Engineers
3305 ARCTIC BLVD. STE. 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION ACCC 730

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

ENG. STAMP: STATE OF ALASKA, 49TH, Timothy C. Conrad, No. E11307, REGISTERED PROFESSIONAL ENGINEER

NO	RECORD REVISION	CAD DRAWN BY	W.P. #	W.O. NUMBER	RECORD APPROVED	DATE
1	CEI RECORD UPDATE				MC	11/6/89
2	SWEC-GROUND GRID DESIGN					10/92
3	AS BUILT	SG/LMP	E9320085			10/12/93
4	AS BUILT, ARCO, TYONEK CIRCUIT UPGRADES FOR ARCO COMPRESSOR PROJECT		0300 235EN	E9511112	PFD	3/3/97
5	ASBUILT - CABLE TRENCH AND CONDUIT INSTALLATION	GME	100 340E	H9920156	D CROPP	10/2/00

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME:
BELUGA POWER PLANT GROUNDING PLAN

CONFIDENTIAL

x:\bwp\e\bgpp\xr\e1\bgps05.dwg 10/28/00

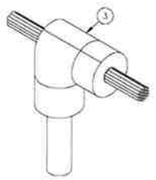
DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO.: BPP-S-0005

SHEET 1 OF 1
PAGE /

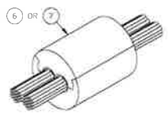
TAP TO RUN SPLIT ELBOW
SPLIT ELBOW
ONE CONDUCTOR LAYS IN
ONE CONDUCTOR DEAD ENDS

1 GROUND GRID INTERSECTION CONNECTOR
N.T.S



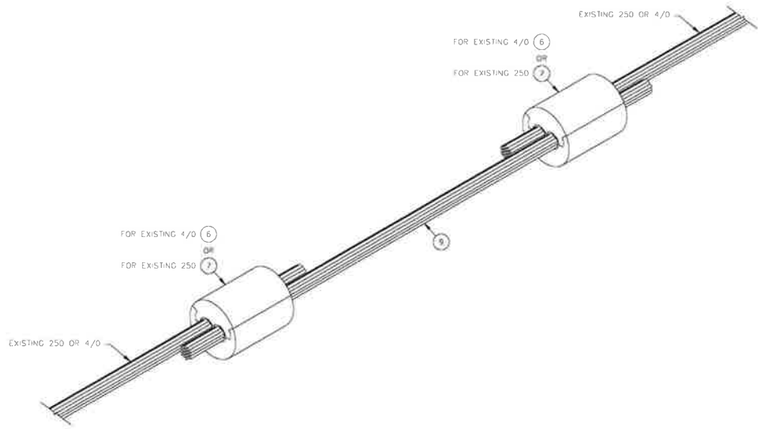
ROD TO RUN SPLIT ELBOW

2 GROUND GRID TO ROD CONNECTOR
N.T.S

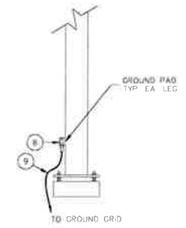


SPLIT PARALLEL
SWAGED SPLIT PARALLEL

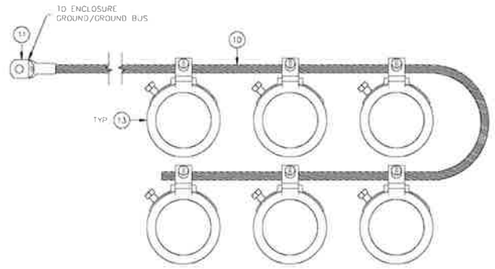
3 GROUND TAP CONNECTOR
N.T.S



4 GROUND GRID MESH WIRE REPAIR SPLICE
N.T.S

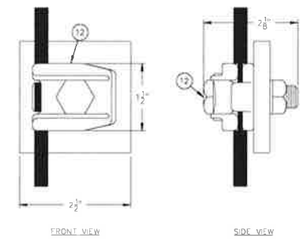


5 STRUCTURE GROUNDING (TYPICAL)
N.T.S



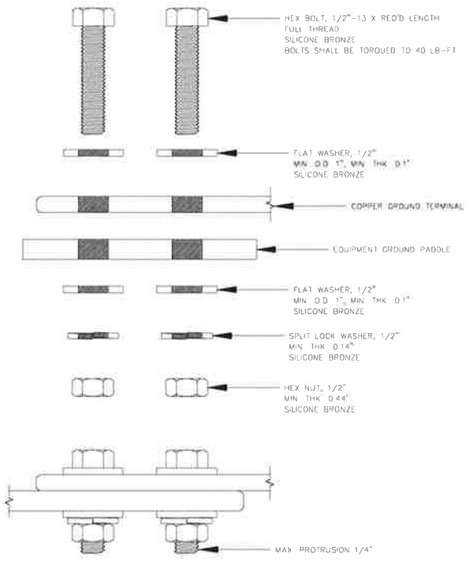
EQUIPMENT ENCLOSURE

6 GROUNDING BUSHING (TYPICAL)
N.T.S

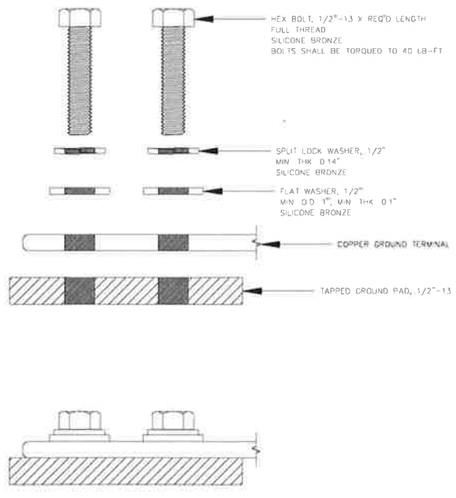


FRONT VIEW SIDE VIEW

7 GROUND CLAMP
SINGLE RUN
N.T.S



8 TYPICAL BOLTED GROUND PADDLE CONNECTION DETAIL
N.T.S.
FASTENER HARDWARE IS INCLUDED IN BILL OF MATERIAL ITEM (10)



9 TYPICAL BOLTED GROUND PAD CONNECTION DETAIL
N.T.S.
FASTENER HARDWARE IS INCLUDED IN BILL OF MATERIAL ITEM (10)

NOTES:
(1) FOR BILL OF MATERIAL SEE DRAWING REFERENCE 10

Electric Power Systems, Inc.
Consulting Engineers
3305 ARCTIC BLVD. STE. 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: AECC 738

NO	DRAWING NO /SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	–	GROUND GRID INTERSECTION CONNECTOR
2	–	GROUND GRID TO ROD CONNECTOR
3	–	GROUND TAP CONNECTOR
4	–	GROUND GRID MESH WIRE REPAIR SPLICE
5	–	STRUCTURE GROUNDING (TYPICAL)
6	–	GROUNDING BUSHING (TYPICAL)
7	–	GROUND CLAMP – SINGLE RUN
8	–	TYPICAL BOLTED GROUND PADDLE CONNECTION DETAIL
9	–	TYPICAL BOLTED GROUND PAD CONNECTION DETAIL
10	BGSS-SS-0069/3	GROUNDING BILL OF MATERIAL

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV/DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

ENG. STAMP
STATE OF ALASKA
49TH
Timothy C. Conrad
No. EE11107
9/30/2019
REGISTERED ENGINEER

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

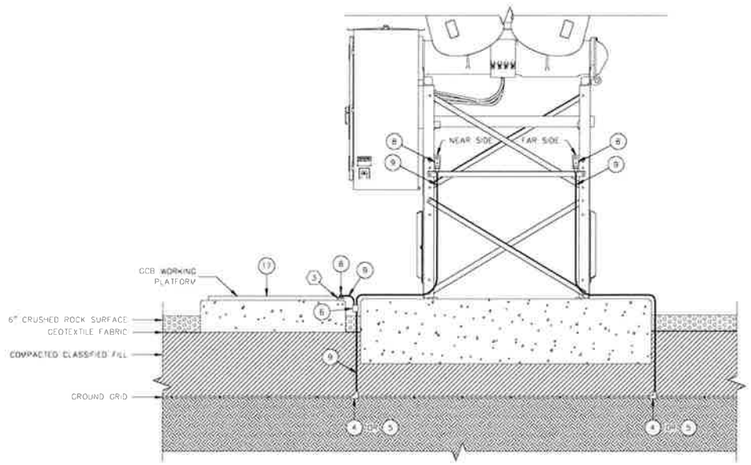
CHUGACH
POWERING ALASKA'S FUTURE

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

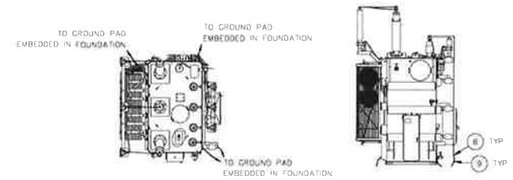
DRAWING NAME:
BELUGA SUBSTATION GROUNDING DETAILS

CONFIDENTIAL

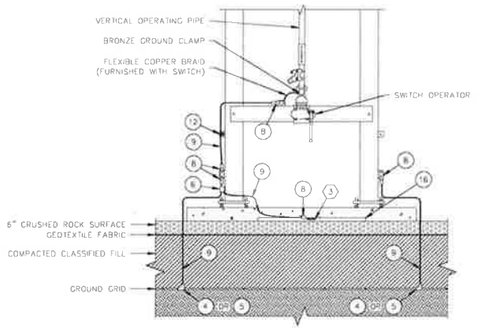
DRAWING NO – PREVIOUS/REFERENCE:
NEW DRAWING NO: BGSS-SS-0069
SHEET 1 OF 3
PAGE ____ of ____



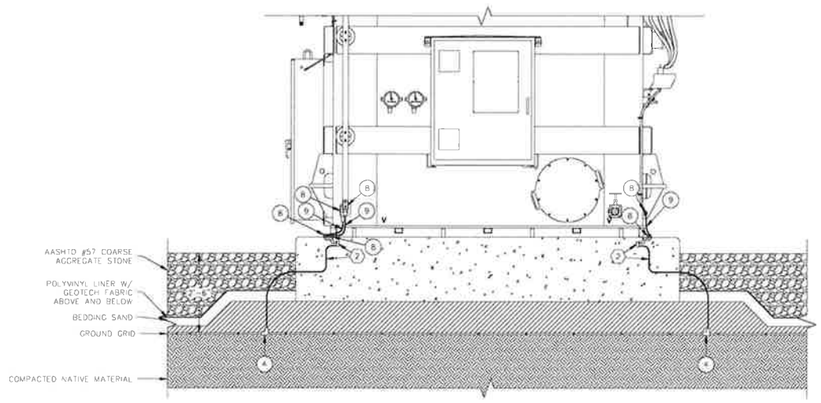
1 GAS CIRCUIT BREAKER AND PLATFORM GROUNDING DETAIL
N.T.S



3 138/24.9 kV TRANSFORMER (T10) GROUNDING DETAIL
N.T.S



2 SWITCH GROUNDING DETAIL
N.T.S



4 POWER TRANSFORMER GROUNDING DETAIL
N.T.S

NOTES

1. FOR BILL OF MATERIAL SEE DRAWING REFERENCE 5
2. GROUND PAD IN PRE-CAST FOUNDATION (4 LOCATIONS) WITH 10 FEET COIL OF 4/0 AWG COPPER CONDUCTOR EACH COIL SHALL BE INDIVIDUALLY CONNECTED TO THE GROUND GRID
3. GROUNDING PAD ON PLATFORM IS FACTORY-INSTALLED GROUNDING PAD SHALL BE ORIENTED TOWARD THE EQUIPMENT

NO	DRAWING NO /SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
1	–	GAS CIRCUIT BREAKER AND PLATFORM GROUNDING DETAIL
2	–	SWITCH GROUNDING DETAIL
3	–	138/24.9 kV TRANSFORMER (T10) GROUNDING DETAIL
4	–	POWER TRANSFORMER GROUNDING DETAIL
5	BGSS-SS-0069/3	GROUNDING BILL OF MATERIAL

Electric Power Systems, Inc. — Consulting Engineers
1305 ARCTIC BLVD, STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953
CERTIFICATE OF AUTHORIZATION: AECC 735

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KER/09-03-2019	TCC/09-03-2019	

ENG. STAMP
STATE OF ALASKA — 49TH — Timothy C. Conrad — No. 13197 — REGISTERED PROFESSIONAL ENGINEER

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

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME
BELUGA SUBSTATION
GROUNDING
DETAILS

CONFIDENTIAL

bgss-ss-0069_2.dwg

DRAWING NO. - PREVIOUS/REFERENCE
NEW
DRAWING NO. BGSS-SS-0069

SHEET 2 OF 3
PAGE /

TYONEK SYSTEM BILL OF MATERIAL

REF NO	UNIT	ESTIMATED QUANTITY	DESCRIPTION	MANUFACTURER/CATALOG NUMBER	FURNISHED BY
1	EA	14	3/4" X 10' COPPER CLAD GROUND ROD	ERICO/613403 (OAE)	C
2	EA	7	SWAGED SPLICE 3/4" COPPER CLAD - 3/4" COPPER CLAD	DMC POWER/GC720B682-682	O
3	EA	7	SWAGED SPLIT ELBOW 4/0 - 3/4" COPPER CLAD	DMC POWER/GC739B004-682	O
4	EA	20	SWAGED SPLIT ELBOW 4/0 - 4/0	DMC POWER/GC739B004-004	O
5	EA	8	SWAGED SPLIT ELBOW 250 - 4/0	DMC POWER/GC739B025-004	O
6	EA	7	SWAGED SPLIT PARALLEL 4/0 - 4/0	DMC POWER/GC721B004-004	O
7	EA	5	SWAGED SPLIT PARALLEL 250 - 4/0	DMC POWER/GC721B025-004	O
8	EA	20	SWAGED TERMINAL 4/0 - 2 HOLE PAD	DMC POWER/GC920B004	O
9	LF	450	4/0 STRANDED BARE COPPER	HOUSTON WIRE & CABLE/ HW000 40101 (OAE)	C
10	LF	200	#2 STRANDED TINNED BARE COPPER	HOUSTON WIRE & CABLE/HW000 00201 TN (OAE)	C
11	EA	2	RING TONGUE TERMINAL, 1/4 STUD, #2 AWG	BURNDY/YAV2C-L2 (OAE)	C
12	EA	1	GROUND CONNECTOR, CABLE TO FLAT, SINGLE RUN, 4/0	BURNDY/GB29 (OAE)	C
13	EA	16	GROUNDING BUSHING, BLACKJACK, 2"	THOMAS & BETTS/BG200-14-20 (OAE)	C
14	SQ YD	310	GEOTEXTILE FABRIC	WILLACOOCHEE INDUSTRIAL FABRICS/ WINFAB 180W (OAE)	C
15	CU YD	25	CRUSHED ROCK SURFACE MATERIAL	PER SPECIFICATION (SFA)	C
16	EA	1	GROUNDING PLATFORM, SWITCH, 4' x 4'	TBD	O
17	EA	1	WORKING PLATFORM, GCB, 4' X 6'	TBD	O
18	LOT	1	HEX BOLT/HEX NUT/SPLIT WASHER, SILICONE BRONZE, FOR COPPER TO COPPER OR COPPER TO GALVANIZED STEEL CONNECTIONS SIZE AS REQ'D	COMMODITY	C
19			NOT USED		
20			NOT USED		
21			NOT USED		
22			NOT USED		
23			NOT USED		
24			NOT USED		
25			NOT USED		
26			NOT USED		
27			NOT USED		
28			NOT USED		
29			NOT USED		

C = CONTRACTOR O = OWNER OAE = OR APPROVED EQUAL

NOTES:

1. BILL OF MATERIAL QUANTITIES ARE ESTIMATED. ACTUAL QUANTITIES SHALL BE VERIFIED BY THE CONTRACTOR.
2. CHUGACH HAS ORDERED MATERIALS AS SHOWN IN THE BILL OF MATERIALS. IF THE CONTRACTOR REQUIRES INCREASED QUANTITIES DURING CONSTRUCTION, THE ACQUISITION OF MATERIAL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

NO	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION

Electric Power Systems
Consulting Engineers
3333 ARCTIC BLVD. STE 201, ANCHORAGE, AK 99503
TEL (907) 522-1953 CERTIFICATE OF AUTHORIZATION: ACCC 738

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE
0	ISSUED FOR TRANSFORMER T-10 REPLACEMENT CONSTRUCTION	KCR/09-03-2019	TCC/09-03-2019	

ENG. STAMP
STATE OF ALASKA
49TH
Timothy C. Conrad
No. 13113
REGISTERED ENGINEER
09/03/2019

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

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME
BELUGA SUBSTATION
GROUNDING
BILL OF MATERIAL

CONFIDENTIAL

BGSS-SS-0069-0 (REV)

DRAWING NO. - PREVIOUS/REFERENCE
NEW
DRAWING NO.: BGSS-SS-0069

SHEET 3 OF 3
PAGE /

DWG NO. C304354

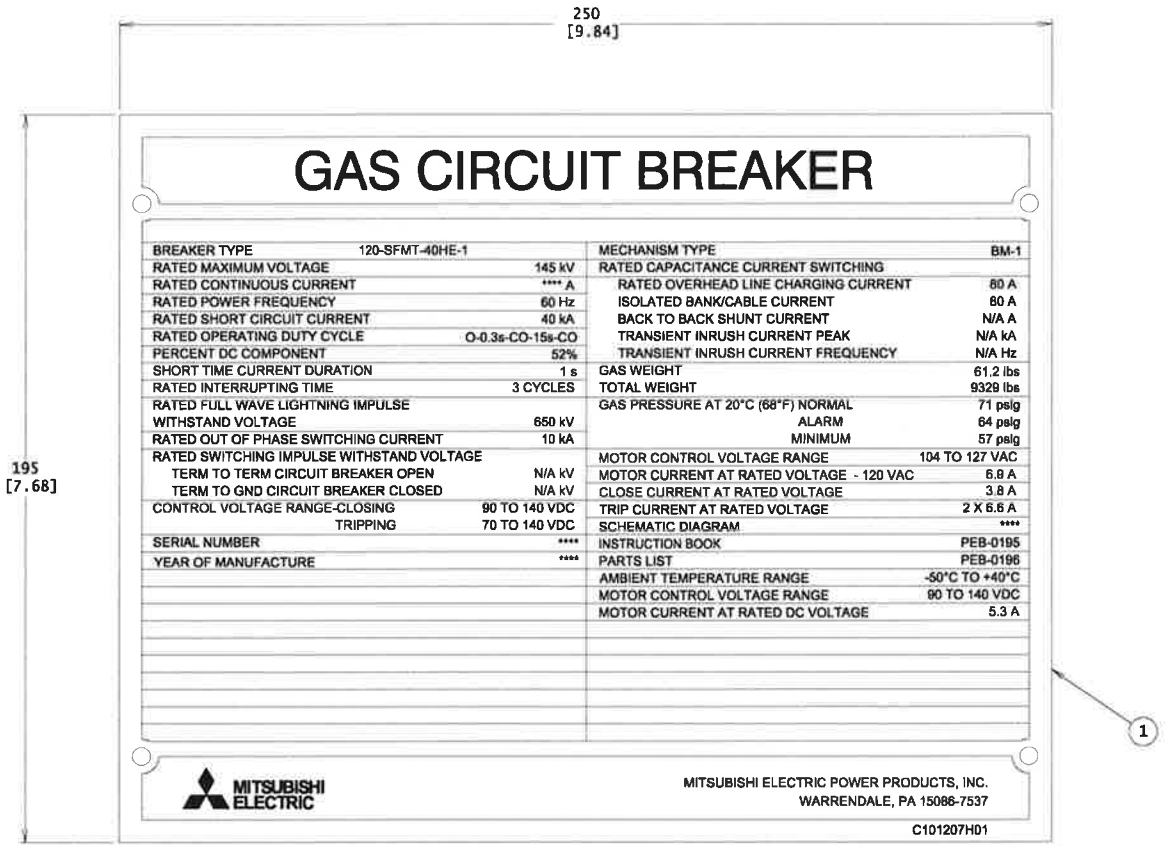
ITEM	NOTE	PART NAME	DESCRIPTION	DRAWING/PART NUMBER MATERIAL SPEC.	GROUP NUMBER 1	2	3	4	5	6	7	8	9	10
01		NAMEPLATE	MAKE FROM ARTWORK C101207H01	C101207H01										

GROUP NOTES:

NOTES:

1. MATERIAL -------- STAINLESS STEEL
2. THICKNESS ----------- 0.5mm [0.02]
3. STANDARD ------- ANSI C37.04-1999
4. ENGRAVE IN INFO FROM TABLE BELOW FOR ****:

SERIAL NUMBER	YEAR OF MANUFACTURE	SCHEMATIC DIAGRAM	RATED CONTINUOUS CURRENT
SG000074480001	2014	D304803	1600
SG000074480002	2014	D304803	1600
SG000079280001	2015	D304803	3000
SG000079280002	2015	D304803	3000
SG000079280003	2015	D304803	3000
SG000079280004	2015	D304803	3000
SG000087990001	2016	D305621	1600
SG000087990002	2016	D305621	1600
SG000097400001	2018	D306198	1600
SG000097400002	2018	D306198	1600
SG000098790001	2018	D306257	1600
SG000098790002	2018	D306257	1600



GAS CIRCUIT BREAKER

BREAKER TYPE	120-SFMT-40HE-1	MECHANISM TYPE	BM-1
RATED MAXIMUM VOLTAGE	145 kV	RATED CAPACITANCE CURRENT SWITCHING	
RATED CONTINUOUS CURRENT	**** A	RATED OVERHEAD LINE CHARGING CURRENT	80 A
RATED POWER FREQUENCY	60 Hz	ISOLATED BANK/CABLE CURRENT	80 A
RATED SHORT CIRCUIT CURRENT	40 kA	BACK TO BACK SHUNT CURRENT	N/A A
RATED OPERATING DUTY CYCLE	O-0.3s-CO-15s-CO	TRANSIENT INRUSH CURRENT PEAK	N/A kA
PERCENT DC COMPONENT	52%	TRANSIENT INRUSH CURRENT FREQUENCY	N/A Hz
SHORT TIME CURRENT DURATION	1 s	GAS WEIGHT	61.2 lbs
RATED INTERRUPTING TIME	3 CYCLES	TOTAL WEIGHT	9329 lbs
RATED FULL WAVE LIGHTNING IMPULSE WITHSTAND VOLTAGE	650 kV	GAS PRESSURE AT 20°C (68°F) NORMAL	71 psig
		ALARM	64 psig
RATED OUT OF PHASE SWITCHING CURRENT	10 kA	MINIMUM	57 psig
RATED SWITCHING IMPULSE WITHSTAND VOLTAGE		MOTOR CONTROL VOLTAGE RANGE	104 TO 127 VAC
TERM TO TERM CIRCUIT BREAKER OPEN	N/A kV	MOTOR CURRENT AT RATED VOLTAGE - 120 VAC	6.9 A
TERM TO GND CIRCUIT BREAKER CLOSED	N/A kV	CLOSE CURRENT AT RATED VOLTAGE	3.8 A
CONTROL VOLTAGE RANGE-CLOSING	90 TO 140 VDC	TRIP CURRENT AT RATED VOLTAGE	2 X 6.6 A
TRIPPING	70 TO 140 VDC	SCHEMATIC DIAGRAM	****
SERIAL NUMBER	****	INSTRUCTION BOOK	PEB-0195
YEAR OF MANUFACTURE	****	PARTS LIST	PEB-0196
		AMBIENT TEMPERATURE RANGE	-50°C TO +40°C
		MOTOR CONTROL VOLTAGE RANGE	90 TO 140 VDC
		MOTOR CURRENT AT RATED DC VOLTAGE	5.3 A

MITSUBISHI ELECTRIC

MITSUBISHI ELECTRIC POWER PRODUCTS, INC.
WARRENDALE, PA 15086-7537

C101207H01

REVISIONS

NO	A	B	C	D
	SG00007928 WAS NOT ON NAMEPLATE - RATED CONTINUOUS CURRENT WAS 1600 A TAH 02/16/15 DFW 02/20/15 KDC 02/20/15 HEB 02/20/15	SG00008799 WAS NOT ON MTD 07/11/16 MRE 07/12/16 DFW 07/12/16	SG00009740 WAS NOT ON MTD 11/17/17 MRE 11/21/17 HEB 11/21/17	SG00009879 WAS NOT ON TAH 01/26/18 MRE 01/31/18 HEB 02/01/18

CHUGACH ELECTRIC ASSOCIATION, INC.

P.O.#	MEPPI S.O. #
0000070586	SG00007448
0000072964	SG00007928
0000077275	SG00008799
0000081816	SG00009740
0000082568	SG00009879

DIM. IN MM [IN]
SCALE 1:1

PROPRIETARY
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REF DWG. NO. C303981
FILE LOCATION:

DRAFTER	TOM HATTRUP	DATE 05/09/14
CHECKED	MRE	DATE 05/14/14
ENGINEER	DFW	DATE 05/14/14
APPROVED	HEB	DATE 05/14/14

MITSUBISHI ELECTRIC
MITSUBISHI ELECTRIC POWER PRODUCTS, INC.
WARRENDALE, PA

TITLE 120-SFMT-40HE-1
RATING NAMEPLATE

DWG. NO. C304354 SHEET 1 OF 1
REV. D

ISSUED FOR REFERENCE ONLY
– DO NOT EDIT –

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS
W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG STAMP
0	MANUFACTURER'S DRAWING	02-01-2018			

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

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME
BELUGA SUBSTATION
138 kV CIRCUIT BREAKER
RATING NAMEPLATE

CONFIDENTIAL

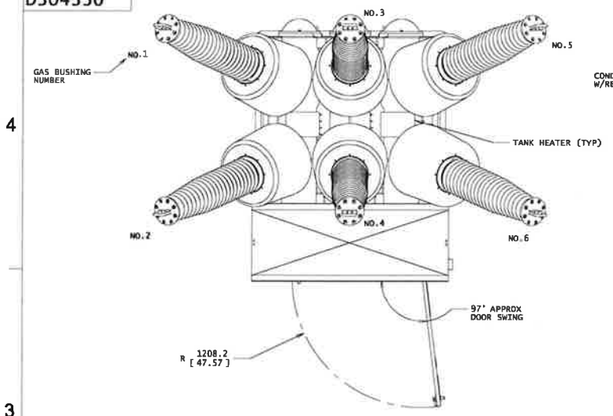
bgss-eq-0042_1.dwg

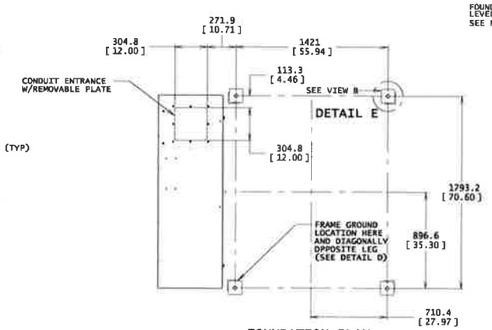
DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO. BGSS-EQ-0042

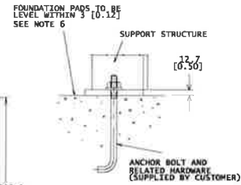
SHEET 1 OF 11
PAGE /

DWG. NO.
D304330

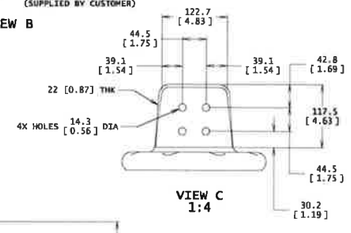




FOUNDATION PLAN
SECTION A-A



VIEW B



VIEW C
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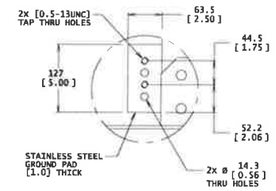

DETAIL D
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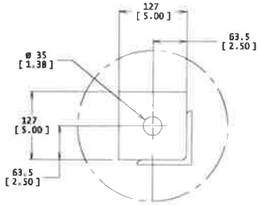
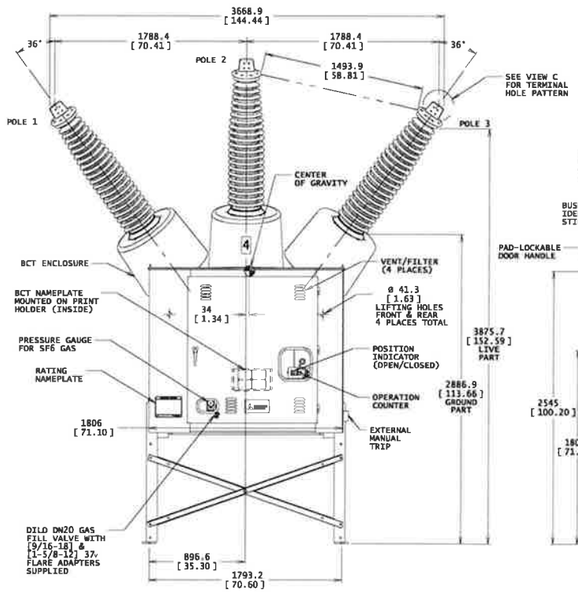
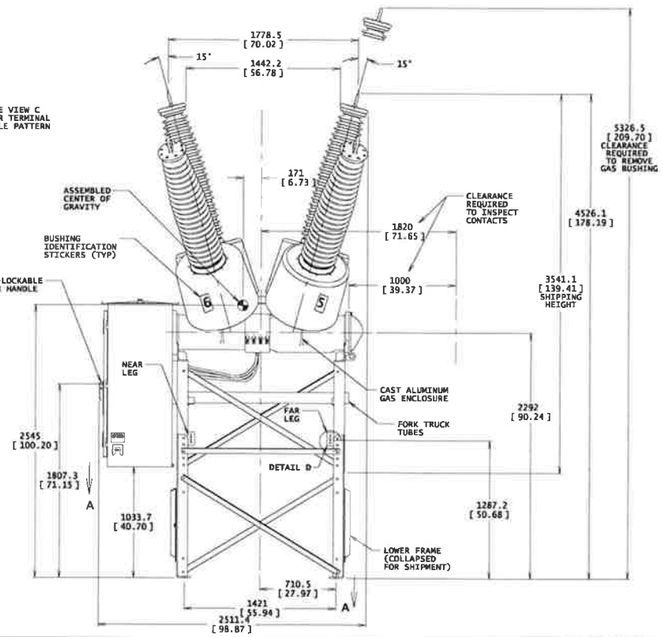


DETAIL E
1:4





NOTES

1. RATINGS
   - RATED MAXIMUM VOLTAGE ---------- 145 kV
   - RATED CONTINUOUS CURRENT ---------- 1600/3000 A
   - RATED SHORT-CIRCUIT CURRENT ---------- 40 kA
   - RATED LOW FREQUENCY WITHSTAND VOLTAGE (60 Hz) ----- 310 kV
   - RATED FULL WAVE IMPULSE WITHSTAND VOLTAGE --------- 650 kV
   - RATED GAS PRESSURE at 20°C [68°F] ---------- [71 psig]
   - AMBIENT TEMPERATURE RANGE ---------- -50°C TO +40°C
2. WEIGHT
   - TOTAL WEIGHT ---------- 4232 kg [9329 lb]
   - SF6 GAS WEIGHT (VACUUM TO 71 PSIG) ---------- 27.8 kg [61.2 lb]
   - (5 PSIG TO 71 PSIG) ---------- 23.5 kg [47.5 lb]
3. INSULATOR
   - TYPE ---------- GAS BUSHING
   - MINIMUM CREEPAGE DISTANCE ALONG PORCELAIN SURFACE - 3380 [133]
4. SURFACE TREATMENTS
   - SUPPORT STRUCTURE -------- HOT DIP GALVANIZED PER ASTM A123
   - CONTROL HOUSING ---------- PAINT ANSI NO.70 LIGHT GRAY
   - SF6 GAS ENCLOSURE ---------- UNFINISHED ALUMINUM
   - BCT COVER ---------- UNFINISHED ALUMINUM
   - PORCELAIN ---------- GLAZE ANSI NO. 70 LIGHT GRAY
5. DYNAMIC LOADING
   - HORIZONTAL --(ACTING ALONG TANK CENTERLINE)- 1200 kg [2650 lb]
   - VERTICAL UP --(ACTING THROUGH CG)---------- 1000 kg [2200 lb]
   - VERTICAL DOWN --(ACTING THROUGH CG)--------- 1000 kg [2200 lb]
   - VERTICAL FORCES ADD TO OR SUBTRACT FROM BREAKER WEIGHT
6. INSTALLATION NOTE
   - LEVEL THE BREAKER BY INSERTING SHIMS BETWEEN THE BREAKER STRUCTURE AND THE FOUNDATION.

REVISIONS

	DESCRIPTION	DATE	BY
A	DWG. TRUCK TIRES WERE NOT ON	01/08/14	TAW
B	ADDED CONTROL CABLE WAS ADDED, WAS NOT ON	08/04/14	MJE
C	ADDED CONTROL CABLE WAS ADDED, WAS NOT ON	01/21/15	TAW
D	ADDED CONTROL CABLE WAS ADDED, WAS NOT ON	07/12/16	MJE
E	ADDED CONTROL CABLE WAS ADDED, WAS NOT ON	11/21/17	MJE
	ADDED CONTROL CABLE WAS ADDED, WAS NOT ON	01/25/18	TAW
	ADDED CONTROL CABLE WAS ADDED, WAS NOT ON	03/02/18	MJE

CHUGACH ELECTRIC ASSOCIATION, INC.	
P.O.#	MEPPI S.O. #
0000066319	SG00006835
0000070586	SG00007448
0000072964	SG00007928
0000077225	SG00008799
0000081816	SG00009740
0000082568	SG00009879

DIM. IN [MM] | SCALE 0.05 = 1

PROPRIETARY

REF DWG. NO. D304264

DRAFTER	T HATTRUP	03/15/13
CHECKED	MVZ	03/18/13
ENGINEER	DPM	03/18/13
APPROVED	MJE	03/18/13

FILE LOCATION:

MITSUBISHI ELECTRIC POWER PRODUCTS, INC.
WARRENDALE, PA.

TITLE: 120-SFMT-40HE-1 OUTLINE DRAWING

DWG. NO. D304330 SHEET 1 OF 1 | REV. E

D304330G01 ~ SG00006835 SG00007448 SG00007928 SG00008799 SG00009740,OUTLINE ASSY ~ 120-SFMT-40HE-1 ~ D304330 ~ Model Rev. E

ISSUED FOR REFERENCE ONLY
- DO NOT EDIT -

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG STAMP
0	MANUFACTURER'S DRAWING	02-01-2018			

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

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME
BELUGA SUBSTATION
138 kV CIRCUIT BREAKER
OUTLINE

CONFIDENTIAL

DRAWING NO. - PREVIOUS/REFERENCE

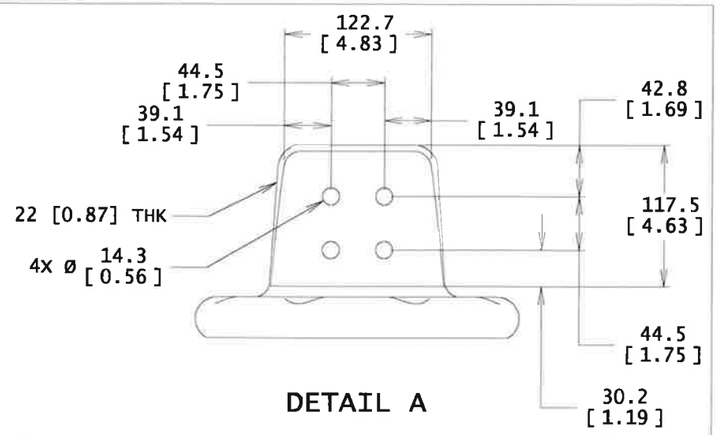
DRAWING NO. BGSS-EQ-0042 | SHEET 1 OF 11 | PAGE 1

DWG. NO.
B302160

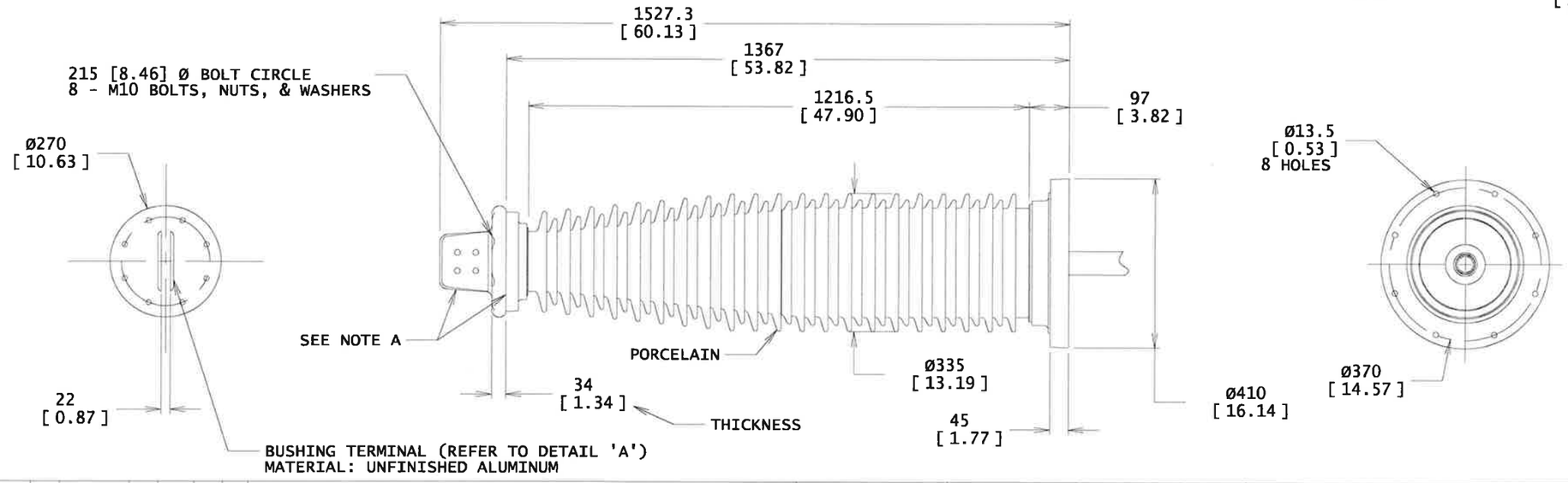
BIL	VOLTAGE	RATED CONTINUOUS CURRENT	MINIMUM CREEPAGE DISTANCE	APPROXIMATE WEIGHT
650 kV	145 kV	1600/3000 A	3378 [133.0]	127 kg [280 lb]

TYPE OF BUSHING: SF6 GAS BUSHING
INSULATOR COLOR: ANSI NO.70 (LIGHT GRAY)

NOTE A
CLEAN BOTH MATING SURFACES OF TERMINAL POINTS WITH SCOTCH-BRITE (GENERAL PURPOSE HAND PAD #7447, MEPPI PART NUMBER 11989) IMMEDIATELY PRIOR TO ASSEMBLY.
APPLY ELECTRICAL JOINT COMPOUND TO ALL SURFACES IMMEDIATELY AFTER CLEANING.



DETAIL A



REVISIONS

	A	B	C
	SG00008799 WAS NOT ON RATED CONTINUOUS CURRENT 1600/3000 A, WAS 3000		SG00008799 WAS NOT ON
	MTO 07/11/16		TAH 01/26/19
	MRE 07/12/16		MRE 01/31/18
	SG00007928 WAS NOT ON		HEB 02/01/18
	MTO 11/17/17		
	MRE 11/21/17		
	HEB 11/30/17		

CHUGACH ELECTRIC ASSOCIATION, INC.	
P.O.#	MEPPI S.O. #
0000072964	SG00007928
0000077275	SG00008799
0000081816	SG00009740
0000082568	SG00009879

DIM. IN MM [IN]	SCALE 1:10	DRAFTER T HATTRUP	DATE 02/17/15
PROPRIETARY This document is the property of Mitsubishi Electric Power Products, Inc. and contains proprietary and confidential information which must not be duplicated, used or disclosed other than as expressly authorized by Mitsubishi Electric Power Products, Inc.		CHECKED KDC	DATE 02/20/15
		ENGINEER DFW	DATE 02/20/15
REF DWG. NO. B301957		APPROVED HEB	DATE 02/20/15
FILE LOCATION:			

MITSUBISHI ELECTRIC
MITSUBISHI ELECTRIC POWER PRODUCTS, INC.
WARRENDALE, PA

TITLE 120-SFMT-40HE-1
GAS BUSHING OUTLINE

DWG. NO. B302160 SHEET 1 OF 1 REV. C

B302160G01 ~ SG00007928 SG00009740,GAS BUSHING ASSY ~ 100-SFMT-40HE-1 ~ B302160 ~ Model Rev. C

ISSUED FOR REFERENCE ONLY
- DO NOT EDIT -

PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O # E1920053

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG STAMP
0	MANUFACTURER'S DRAWING	02-01-2018			

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

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME
BELUGA SUBSTATION
138 kV CIRCUIT BREAKER
GAS BUSHING OUTLINE

CONFIDENTIAL

DRAWING NO - PREVIOUS/REFERENCE

DRAWING NO BGSS-EQ-0042 SHEET 5 OF 11 PAGE

NOTE: THE LAST REVISION AFFECTING THE ACTUAL NAMEPLATE WILL MATCH THE REVISION NUMBER IN THE LOWER RIGHT CORNER OF THE PLATE

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	1	UPDATED LV VOLTS PER ECP 57557 PLATE REV 1	07/08/19	EAH

SPX TRANSFORMER SOLUTIONS, INC.
WAUKESHA® POWER TRANSFORMER

SPX TRANSFORMER SOLUTIONS, INC.
WAUKESHA, WISCONSIN, USA

	60 HZ	SER. NO	WT04766
	3-PHASE	CONT. TEMP. RISE	55° C
		CONT. TEMP. RISE	65° C
CLASS	ONAN/ONAF	VOLTS	BIL 650 KV
MVA	10.0/12.5	VOLTS	BIL 150 KV
MVA	11.2/14.0	VOLTS	BIL 150 KV
HV	13800		
LV	24940Y/14400		
LV NEUTRAL			
POSITIVE			
IMPEDANCE	% AT 13800-24940	VOLTS	AND 10.0 MVA
ZERO SEQUENCE			
IMPEDANCE	% AT 13800-24940	VOLTS	AND 10.0 MVA

SOUND PRESSURE LEVEL TEST DATA
dB (A) ONAN
dB (C) ONAF

BUSHING CURRENT TRANSFORMER
MULTI-RATIO METERING
ACCURACY CLASS 0.3B-1.8
CT A,B,C
THERMAL RATING FACTOR = 2.0

CURRENT RATIO	TAP	CURRENT RATIO	TAP
50:5	X4-X5	300:5	X1-X5
100:5	X1-X2		
150:5	X2-X4		
200:5	X1-X3		
250:5	X1-X4		

BUSHING CURRENT TRANSFORMER
MULTI-RATIO RELAYING C400
ACCURACY CLASS
CT D,E,F
THERMAL RATING FACTOR = 2.0

CURRENT RATIO	TAP	CURRENT RATIO	TAP
50:5	X1-X2	300:5	X1-X5
100:5	X1-X3		
150:5	X2-X4		
200:5	X1-X4		
250:5	X2-X5		

BUSHING CURRENT TRANSFORMER
MULTI-RATIO METERING 0.3B-1.8
ACCURACY CLASS
CT H,J,K
THERMAL RATING FACTOR = 2.0

CURRENT RATIO	TAP	CURRENT RATIO	TAP
50:5	X2-X3	300:5	X2-X4
100:5	X1-X2	400:5	X1-X4
150:5	X1-X3	450:5	X3-X5
200:5	X4-X5	500:5	X2-X5
250:5	X3-X4	600:5	X1-X5

BUSHING CURRENT TRANSFORMER
MULTI-RATIO RELAYING C400
ACCURACY CLASS
CT G,L,M,N
THERMAL RATING FACTOR = 2.0

CURRENT RATIO	TAP	CURRENT RATIO	TAP
50:5	X2-X3	300:5	X2-X4
100:5	X1-X2	400:5	X1-X4
150:5	X1-X3	450:5	X3-X5
200:5	X4-X5	500:5	X2-X5
250:5	X3-X4	600:5	X1-X5

BUSHING CURRENT TRANSFORMER
CT W FOR WINDING TEMP EQUIP
3255 RATIO CLASS C100
THERMAL RATING FACTOR = 2.0

HIGH VOLTAGE TAPCHANGER
DE-ENERGIZED OPERATION

VOLTS L-L	AMPS AT 14.0 MVA	TAP	CONNECTS
124900	558	1	3 - 4
131450	571	2	4 - 2
138000	586	3	2 - 5
134550	601	4	5 - 1
131100	617	5	1 - 6

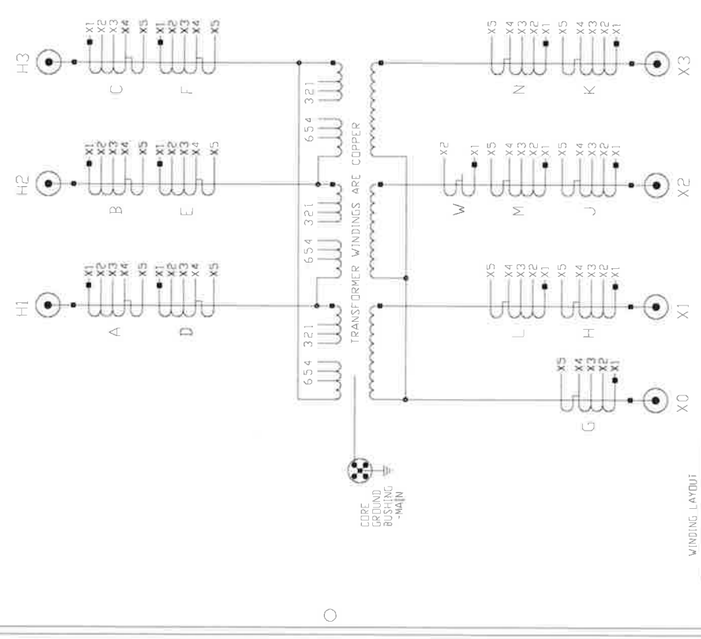
LOW VOLTAGE

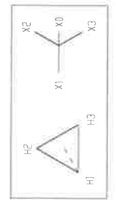
VOLTS L-L	AMPS AT 14.0 MVA
24940	324

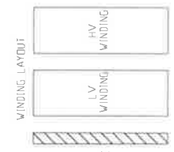
FOR STEP DOWN OPERATION

APPROXIMATE WEIGHTS	LBS
CORE & COIL (UNTANKING WEIGHT)	258000
TANK, FITTINGS & RADIATORS	259700
RADS, CRLT (2ND)	3800 LBS
OIL-MAIN TANK	5300 GALS
OIL-RADIATORS	1650 GALS
OIL-TOTAL	3660 GALS
TOTAL WEIGHT	517700
SHIPPING WEIGHTS	WITHOUT OIL 399000
SHIPPING UNIT	94500 WITH OIL 491000
SHIPPING PARTS	7000 7200
SHIPPING TOTAL	61500 89000

INSTRUCTION BOOK NO WT04766 DATE OF MANUFACTURE 95104766.R00) REV. ( )







OIL LEVEL BELOW TOP SURFACE OF THE HIGHEST POINT OF THE MANHOLE FLANGE AT 25°C IS 11.5 INCHES
OIL LEVEL CHANGES 0.76 INCHES PER 10 °C CHANGE IN OIL TEMPERATURE
INHIBITED OIL 0.30 % DBPC
OPERATING PRESSURE OF OIL PRESERVATION SYSTEM IS 5 LBF/IN^2
OPERATING PRESSURE OF N2 POSITIVE AND FULL VACUUM
TANK DESIGNED FOR 10 LBF/IN^2 POSITIVE AND FULL VACUUM
CONTAINS NO DETECTABLE LEVEL OF PCB (LESS THAN 1 PPM) AT THE TIME OF MANUFACTURE
DESIGN ALTITUDE OF 3300 FEET AMSL

Ø .28 (7) 6 HOLES

SHOP NOTE: NAMEPLATE MATL STAINLESS STEEL THE DATE OF MANUFACTURE IS TO BE ELECTRONICALLY ETCHED ON THE NAMEPLATE AFTER TEST AND PRIOR TO SHIPMENT

GUARANTEE IMPEDANCE
HV-LV 8.00 % AT 138000-24940 VOLTS AND 10.0 MVA

CUSTOMER ENDEAVOR ELECTRIC ASSN, INC

CUSTOMER ORDER NO	WAUKESHA PROJECT NO	WAUKESHA SERIAL NO
Contract 53855	WT04766	WT04766
SUBSTATION NAME	TRANSFORMER T10 REPLACEMENT	

SPX TRANSFORMER SOLUTIONS, INC.
WAUKESHA®

NAMEPLATE

ENG REF DWG FILE NAME: / NEW_NAMEPLATE_MASTER

DWN	CHK	DATE	UNITS
EAH	DVR	07/08/2019	INCHES (mm)

SHEET 1 OF 1	SCALE 1.000	95IT04766D001	D

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PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT
ENG./DESIGN.: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP
0	MANUFACTURER'S DRAWING	07-18-2019			

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

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME
BELUGA SUBSTATION
POWER TRANSFORMER T10
NAMEPLATE

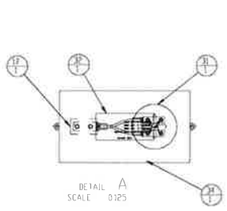
CONFIDENTIAL

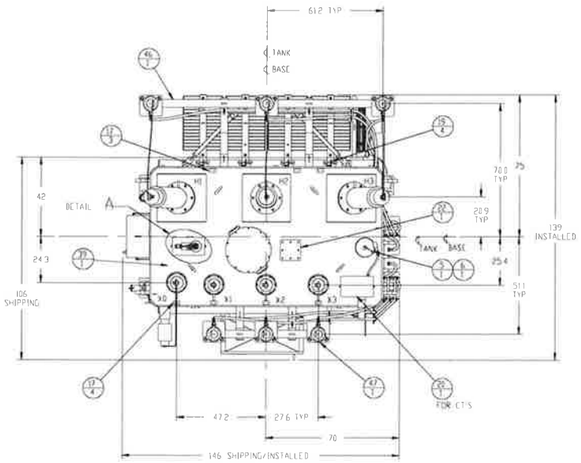
DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO. BGSS-EQ-0043

SHEET 1 OF 12
PAGE ____/____

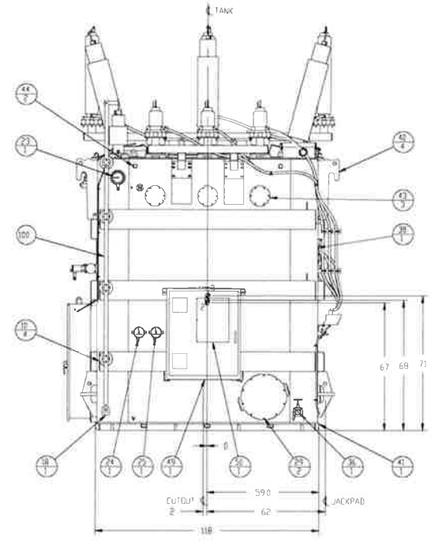
ITEM	QTY	DESCRIPTION	VENDOR DATA	WAUKESHA P/N
1	3	BUSHING LINE TERMINAL - HV	ANDERSON HDSF-14-1-3-1-1/2-12-TP	2003116
2	4	BUSHING LINE TERMINAL - LV	ANDERSON HDSF-20-1-D-1/2-12-TP	2003123
3	1	TAP CHANGER FOR DE-ENERGIZED OPERATION, W/PADLOCKING PROVISIONS & 3/8" HASP	WAUKESHA 2-PIECE 5-POSITION	2003310
4	4	LV/VALVE BUSHING THREAD 2.00-12 SPADE	ABB 0254V20008E	2003622
5	1	RELIEF DEVICE, SEMAPHORE	QUALITROL 207-60-3	2013595
6	1	PRESSURE RELIEF DEVICE W/CONTACTS	QUALITROL 208-009-01	2013593
7	1	RAPID PRESSURE RISE RELAY	QUALITROL 900-014-02	2013662
8	6	DISCHARGE COUNTER	BOWTHORPE MODEL SC13 24-5121 WITH METER	2013730
9	6	ARRESTER SUB BASE	OHIO BRASS CAT NO 273097-3001	2016551
10	4	INSULATING STANDOFF	LAPP SDJ 315208-70	2018565
11	1	IDENTIFICATION NAMEPLATE (X1) - DISCHARGE COUNTER		2019385
12	1	IDENTIFICATION NAMEPLATE (X2) - DISCHARGE COUNTER		2019386
13	1	IDENTIFICATION NAMEPLATE (X3) - DISCHARGE COUNTER		2019387
14	1	IDENTIFICATION NAMEPLATE (H1) - DISCHARGE COUNTER		2019388
15	1	IDENTIFICATION NAMEPLATE (H2) - DISCHARGE COUNTER		2019389
16	1	IDENTIFICATION NAMEPLATE (H3) - DISCHARGE COUNTER		2019495
17	10	GROUND PAD, W/2 1/2-13 UNC TAPS ON 1.75 CENTERS (COPPER FACED)		2020104
18	1	GROUND PAD, W/4 1/2-13 UNC TAPS ON 1.75 CENTERS (COPPER FACED)		2020105
19	4	520 RADIATOR (BOLT-ON W/VALVES WELDED TO TANK) - GALVANIZED	MEMC USA	2021164
20	1	JUNCTION BOX FOR 3IN CONDUIT		2021232
21	3	HV BUSHING THREAD 1.50-12 DRAWLEAD	ABB 1302880AA	2028045
22	1	TETHER POLE FLANGE - FOR WISCONSIN LIFTING SPECIALTY, INC MODEL P-C TETHER POLE		2041016
23	1	LIQUID LEVEL GAGE	QUALITROL CAS-797-1	2041973
24	1	LIQUID TEMPERATURE GAGE, EYE LEVEL, W/CONTACTS	QUALITROL 104-330-05	2042021
25	1	WINDING TEMPERATURE GAGE, EYE LEVEL, W/CONTACTS	QUALITROL 104-314-01	2042033
26	1	INERT GAS SYSTEM, SEE NOTE 8		2046490
27	3	SURGE ARRESTER 18 KV, 15.3 MCOV	HUBBELL DB EVP001560-3001ST, 18KV	2049036
28	3	SURGE ARRESTER 108 KV, 84 MCOV	HUBBELL DB EVP009400-3001ST, 108K	2049068
29	2	MANHOLE - 20 INCH DIA WITH GASKETED BOLT-ON COVER		2053083
30	2	MANHOLE - 24 INCH DIA WITH GASKETED BOLT-ON COVER		2053084
31	1	CORE GROUND BUSHING 5KV 200 AMPS	KAIZEN	2056253
32	1	CORE GROUND NAMEPLATE - MAIN		2057087
33	2	FAN 1/6 HP, 1140 RPM, 208-230 VOLTS, 1 PHASE		2057896
34	1	CORE GROUND BUSHING ENCLOSURE		2058231
35	1	2" GLOBE VALVE - FLANGED INLET, NPT THREADED OUTLET		2058987
36	1	2" GLOBE VALVE - FLANGED INLET, NPT THREADED OUTLET W/3/8" SAMPLER		2058988
37	1	20 IN GATE VALVE		2059013
38	1	TANK (PAINT GRAY ANSI-70)		1337B4766R001
39	1	COVER SLOPED (WELD ON), W/NON-SKID SURFACE, W/4 COVER LIFTING EYES		1371B4766R006
40	4	HOOKS FOR LIFTING TRANSFORMER		7301B4766R010
41	1	BASE FOR SKIDDING IN ANY DIRECTION - STRUCTURAL		7301B4766R014
42	4	JACK PAD, W/PULLING EYES		7301B4766R027
43	4	HANDHOLE, 20" DIA W/BOLT-ON COVER		7321B4766R020
44	2	GUARD RAIL BRACKET		7431B4766R328
45	2	SEISMIC VERTICAL BRACING		7551B4766R156
46	1	HIGH VOLTAGE SURGE ARRESTER BRACKET (BOLT-ON)		7601B4766R037
47	1	LOW VOLTAGE SURGE ARRESTER BRACKET (BOLT-ON)		7601B4766R067
48	1	FAN MOUNTING BRACKET		7631B4766R149
49	1	CONTROL EQUIPMENT CABINET W/36 IN DOOR SWING		9229B4766R001
50	1	NAMEPLATE		9511B4766R001
51	2	FRONT FAN GUARD		2018918
100	3	1/4" X 20" CU BUS BAR FOR NEUTRAL GROUND		
101	6	HIGH VOLTAGE CABLE, 4/0 STRANDED, 15KV INSULATED FOR ARRESTERS TO DISCHARGE COUNTERS		
102	1	4/0 CU INSULATED CABLE FOR DISCHARGE COUNTER TO GROUND		
103	3	4/0 BARE CU GROUND CABLE		





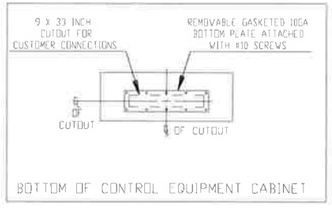
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	ADDED TITLE, ADDED DETAIL OF CBM CUTOUT, REVISED DESCRIPTIONS PER CUSTOMER RETURNED APPROVAL MARKUPS DCR12157	7-23-19	ADD
	2	ADDED FRONT FAN GUARDS, 4/0 VOLTAGE WAS 249081 PER FINAL	7-18-19	ADD

NOTES
1) OIL IN TRANSFORMER IS INHIBITED
2) TRANSFORMER IS DESIGNED TO BE SHIPPED BY TRUCK, RAIL OR BARGE
3) ℄ = CENTERLINE
4) UNIT IS TO BE SHIPPED IN OIL WITH NITROGEN BLANKET
5) CENTER OF GRAVITY SHIPPING W/OIL = ⊕1 W/O OIL = ⊕2
   INSTALLED = ⊕3
6) APPROXIMATELY 950 GALS OF OIL MUST BE REMOVED TO REPLACE LV BUSHINGS AND NEUTRAL BUSHING(S) IN COMPLETELY ASSEMBLED TRANSFORMER (RADIATOR VALVES CLOSED IF RADIATOR ARE BOLT-ON)
7) POSITIVE PRESSURE SYSTEM TO BE OPERATING DURING SHIPMENT
8) INERT GAS EQUIPMENT IS EQUIPPED WITH NITROGEN BOTTLE, REGULATORS, PRESSURE, VACUUM AND GAS SUPPLY PRESSURE GAGES WITH CONTACTS
9) JACKING PROVISIONS PER ANSI C57.12.10



SEGMENT 1

APPROXIMATE WEIGHTS			
CORE & COIL (UNTANKING WEIGHT)			75800
TANK, FITTINGS & RADIATORS			25700
RADS (BOLT-ON)	3800	LBS	
OIL - MAIN TANK	3500	GALS	
OIL - RADIATORS	160	GALS	
OIL - TOTAL	3660	GALS	27500
TOTAL WEIGHT			69000
SHIPPING WEIGHTS	WITHOUT OIL		WITH OIL
SHIPPING UNIT		54500	81800
SHIPPING PARTS		7000	7200
SHIPPING TOTAL		61500	89000



NOTE - THE FOLLOWING ITEMS ARE REMOVED FOR SHIPMENT:
HIGH VOLTAGE BUSHINGS AND LINE TERMINALS
LOW VOLTAGE BUSHINGS AND LINE TERMINALS
LOW VOLTAGE NEUTRAL BUSHING AND LINE TERMINAL
HIGH VOLTAGE SURGE ARRESTERS
LOW VOLTAGE SURGE ARRESTERS
HIGH VOLTAGE SURGE ARRESTER BRACKET(S)
LOW VOLTAGE SURGE ARRESTER BRACKET(S)
RADIATORS AND FANS
INSULATING STANDOFFS
BUS BAR
DISCHARGE COUNTERS
ARRESTER SUB BASES
FAN BRACKET

POWER TRANSFORMER		
CLASS	ONAN/ONAF	3 PHASE 60 HZ
KVA	10.0/12.5	CONT. TEMP RISE 55C
KVA	11.2/14.0	CONT. TEMP RISE 65C
HV	138000	VOLTS
LV	24940Y/14400	VOLTS
CUSTOMER: CHUGACH ELECTRIC ASSN, INC		
CUSTOMER ORDER NO	WAUKESHA PROJECT NUMBER	PROJECT TITLE
Contract 53855	W104766	TRANSFORMER T10 REPLACEMENT

SPX TRANSFORMER SOLUTIONS, INC.
WAUKESHA®

OUTLINE
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PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT					
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053					
NO	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP
0	MANUFACTURER'S DRAWING	07-18-2019			

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

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
5601 Electron Drive - P.O. Box 196300
Anchorage, Alaska 99519-6300

DRAWING NAME
BELUGA SUBSTATION
POWER TRANSFORMER T10
OUTLINE

CONFIDENTIAL

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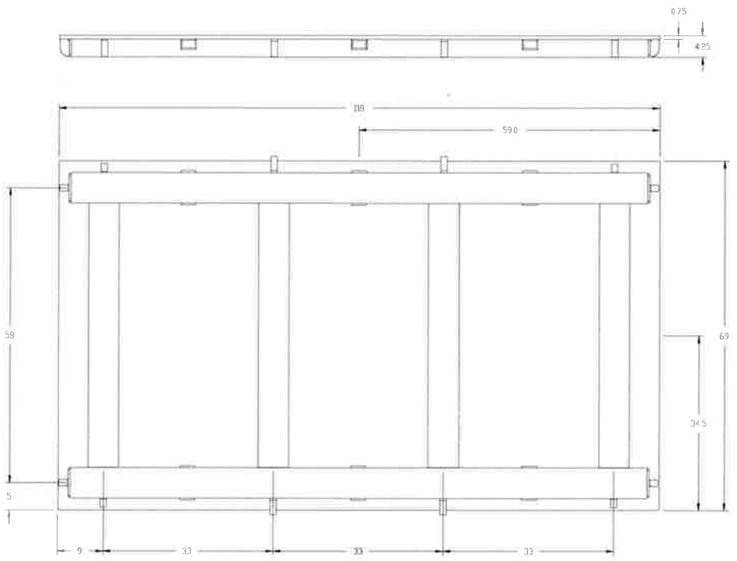
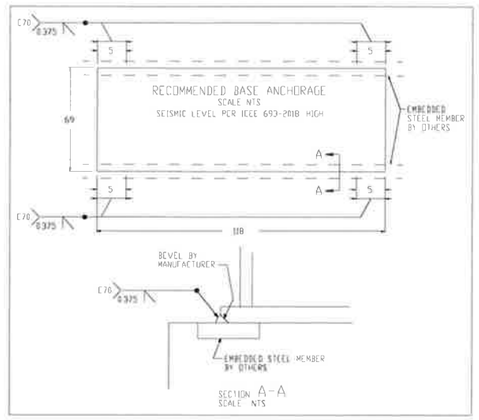
DRAWING NO. BGSS-EQ-0043

SHEET 2 OF 12
PAGE

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	F	ADDED ITEMS. ADDED DETAIL OF CROW CUTOUT. REVISED DESCRIPTIONS PER CUSTOMER RETURNED APPROVAL MARKUPS DCR12052	7-15-19	ADD.
	G	ADDED FRONT TAG CLARIFIED L.V. VOLTAGE WAS 24800Y PER FINAL	7-30-19	ADD



STRUCTURAL BASE DETAIL



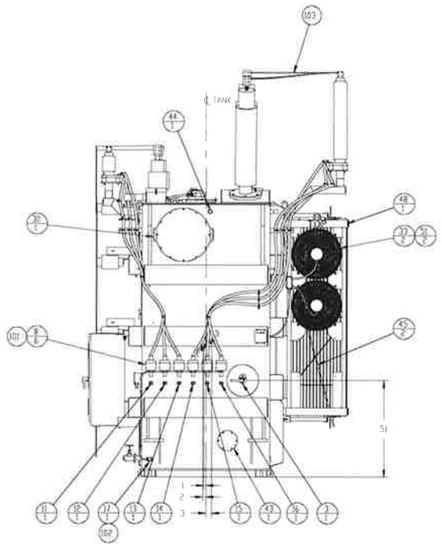
SEISMIC ANCHORAGE ESTIMATION

HORIZONTAL LOAD 0.50
VERTICAL LOAD 0.40

TOTAL FORCE AT C.O.G
fx = 44.5 KIPS
fy = 44.5 KIPS
fz = 52.4 KIPS

OVERTURNING MOMENT 2625 KIP-FT (DOWNWARD DIRECTION FROM SHORTEST EDGE TO C.G.)

MAX LOAD AT ANY ANCHOR POINT
fx = 19.7 KIPS
fy = 19.7 KIPS
fz = 14.4 KIPS



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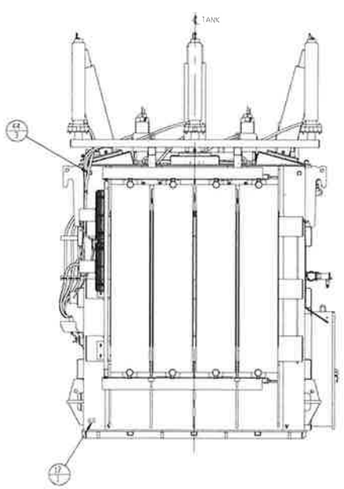
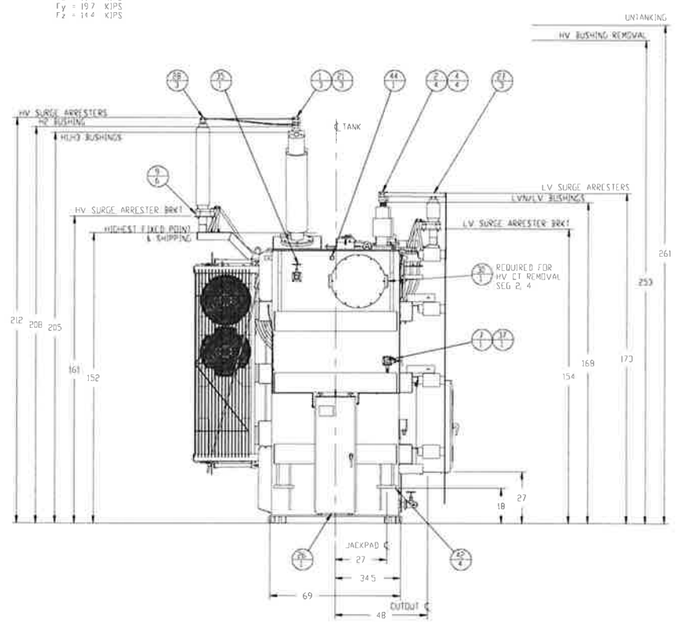


SEGMENT 3



SEGMENT 2

SPX TRANSFORMER SOLUTIONS, INC. WAUKESHA®			
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SHEET: 2 OF 2	SCALE: 0.031	100T04766R001	D

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PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT					
ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS				W.O. # E1920053	
NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN. BY/DATE	REVIEWED MGR./SUPV./DATE	APPROVED DIRECTOR/DATE	ENG. STAMP
0	MANUFACTURER'S DRAWING	07-18-2019			

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

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME:
BELUGA SUBSTATION
POWER TRANSFORMER T10
OUTLINE

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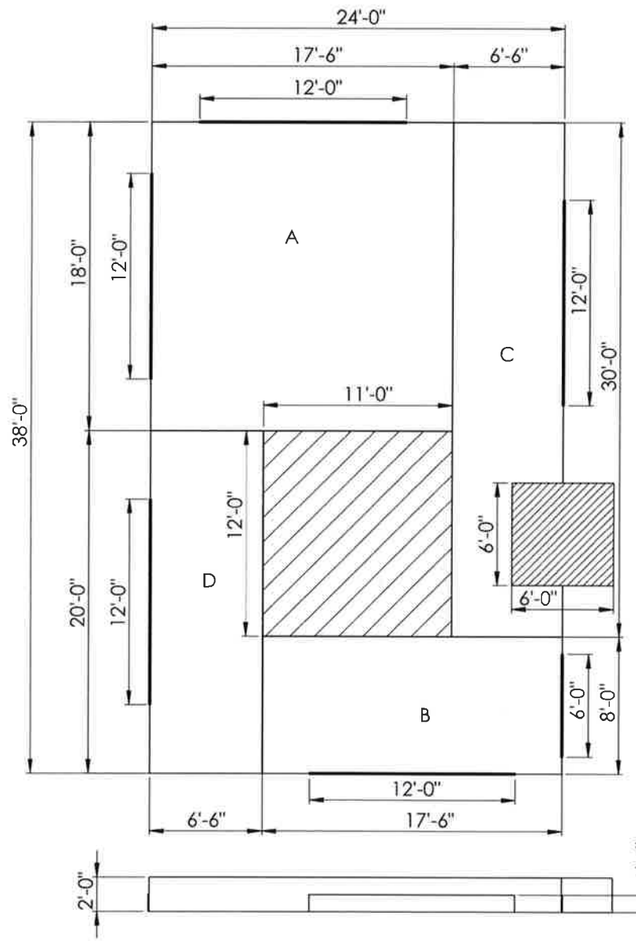
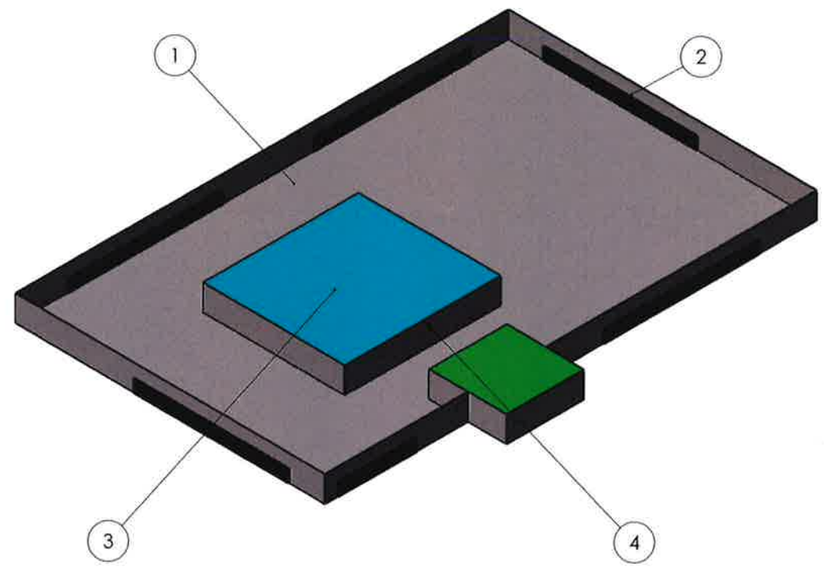
DRAWING NO. - PREVIOUS/REFERENCE

DRAWING NO.: BGSS-EQ-0043

SHEET 3 OF 12
PAGE #

ITEM	DESCRIPTION
1	POLYVINYL LINER
2	BARRIER BOOM
3	TRANSFORMER PAD
4	ALUMINUM FLAT BAR





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UTILITY	SPILL-CHEK
SUB-NAME	CHUGACH - BELUGA
CONTAINMENT DIMENSIONS	38' X 24' X 24"
PVL	22(OZ)

COMMENTS:

	NAME	DATE
DRAWN	MM	08/30/2019
CUST APPR		

SCALE: 1:100 DO NOT SCALE DRAWING

TITLE CHUGACH - BELUGA

DWG. NO. CIA-01097d

SIZE B

SHEET 1 OF 1

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PROJECT: BELUGA TRANSFORMER T-10 REPLACEMENT

ENG./DESIGN: SHAWN WENDLING-CEA/TIM CONRAD-EPS W.O. # E1920053

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

CHUGACH
POWERING ALASKA'S FUTURE

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

DRAWING NAME:
BELUGA SUBSTATION
SECONDARY CONTAINMENT
POWER TRANSFORMER T10

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bgss-eq-0044.dwg

DRAWING NO. = PREVIOUS/REFERENCE

DRAWING NO.: BGSS-EQ-0044

SHEET 1 OF 1
PAGE ____ / ____

BELUGA SITE ORIENTATION

Chugach Electric Association, Inc.

PURPOSE: *Provide clear expectations and standards for onsite personnel and visitors to the Beluga Power Plant and Camp facilities.*

TABLE OF CONTENTS

A). Access and Security

Visitors are typically transported directly from the Beluga airstrip to the secured Power Plant site. All employees (other than Production employees assigned to Beluga) and contractors are "**required"** to sign the visitor log in the Plant Control Room upon arrival and sign out at the end of their work shift. This information is critical for safety and security.

A Beluga Supervisor will issue Beluga Power Plant access cards at their discretion. All recipients shall acknowledge the rights and responsibilities for Beluga security and sign for their ID access card. These cards are only valid at the Beluga site. Employees with existing Chugach ID cards may request a proximity access sticker to apply to their current card.

Acknowledgements include:

- All Beluga vehicle and personnel security gates are to remain closed when not in use. The person opening a gate is responsible for its closure.
- The Beluga facilities are under video surveillance and images are recorded.
- All Chugach personnel issued an Access card or Access Proximity sticker shall immediately report a lost or stolen card to their supervisor.
- Employees shall return their ID Access card or Proximity Access sticker to the Beluga Administrator on the employee's last day of work at Chugach.
- Contractors shall return their ID Access card to the Beluga Administrator on the contractor's last day of work at Beluga, or when flying out of the Beluga area for a break.
- Contractors shall immediately report a lost or stolen card to their Chugach Project Manager.
- All employees (other than Production employees assigned to Beluga) and contractors shall sign the visitor log upon arrival at the Beluga plant and when leaving the Beluga plant at the end of a work shift.

Be alert and immediately report any suspicious activity to the Control Room! (x 6644)

B) On-Site Coordination

Point of Contact - Contractors will be designated a Site Manager. The Site Manager will maintain a Chugach representative as a single point of contact at all times, generally the Chugach Project Manager. This Chugach representative will have the authority to coordinate personnel activities with on-site Chugach employees and facilities. In the absence of Chugach's representative, the following on-site management personnel will be responsible for any coordination and contact prior to any work being under taken:

Operations Supervisor (Greg Bunting)**.....Office (x 6626)**

Operations Supervisor (Jim Mehall)**.....Office (x 6650)**

Plant Manager (Mike Brodie)**..... Office (x 4835, Cell: 529-8605)**

Maintenance Manager (Paul Park) **.....Office (x 7710)**

Camp Supervisor –Housing and Meals (Jim Pickel / Kitchen)**.....(x 4547) or (x 6634)**

Flight Reservations (Valarie Beaudoin) "Off-site" **.....Office (x 4620)**

The site is remote and there are no retail stores or restaurants. There are daily flights into and out of Beluga. There are recreational activities available to individuals visiting Beluga. Camp amenities include pool table, workout facilities, TV room, and WIFI.

WIFI Network Name: BelugaWIFI
Password: Chugach2018

C) Safety Requirements

All Contractors will receive a safety briefing upon their initial visit to the Beluga Power Plant and whenever conditions warrant it thereafter. The Chugach representative will schedule a training time for the Contractor with the Safety Specialist in order to ensure training is accomplished as soon as possible. At a minimum, contractors will view the Beluga orientation video and receive orientation training that includes the following topics as appropriate: Confined Space, Fall Protection, Hazards at Beluga (including environmental as well as job related), Hazard Communication (HAZCOM), Hazardous Waste Operations and Emergency Response (HAZWOPER) Awareness, Energy Isolation (Lock Out / Tag Out), Trenching and Excavation, and Work Permits (Hot Work and Permit Required Confined Space).

Contractors will not bring chemicals onto the site until Material Safety Data Sheets have been provided to Chugach Electric Assoc., Inc. This can be done during the contract approval phase or before work commences.

The Contractor will be responsible for providing his/her own personal protective equipment (PPE). All PPE must meet Federal and State standards.

The Chugach Project Manager for the Project effort shall provide the Contractor Site Manager with a copy of the Chugach Safety Manual. The Chugach Project Manager shall specify those sections of the manual pertinent to the Project. The Contractor Site Manager, with the attendance of the Chugach Project Manager, shall conduct safety orientation training for all Contractor and Subcontractor employees, prior to their beginning work on the work site.

As appropriate to the type of work contracted, Contractor and Subcontractor employees shall also provide evidence of:

1) Having received the program training for:

    a. Chemical Hazard Information Communications
    b. Respiratory Protection Program
    c. Fire Extinguisher Training
    d. Hot work Permit Training

2) Being familiar with and capable of providing appropriate records for:

    a. Chain Sling Inspection Records
    b. Tool and Equipment Inspection Records (Any Man lift Inspections)

3) Possession of applicable certifications;

    a. Painter Certification
    b. Commercial Driver's License
    c. Mobile Crane Certification
    d. First Aid Certificate
    e. Excavation-Competent Person Certification
    f. Scaffolding Erection

The Contractor (or Contractor Site Manager) shall be responsible for providing all appropriate records documenting that each Contractor and Subcontractor employee has complied with the above awareness, training and documentation requirements.

D) First Aid and Medical Emergencies

****(Dial 6644 from any phone)****

Beluga Power Plant Emergency Medical Responders (EMR's) are on site to assist as needed. All information regarding medical emergencies will be relayed through the Control Room Operator (6644) as soon as possible. This will expedite Beluga EMR's response to the situation as well as notifying appropriate personnel of the emergency. A copy of the accident investigation form must be given to the Operations Supervisor or an on-site Chugach Supervisor. Further information

regarding response to medical emergencies can be found in the Beluga Emergency Medical Procedure.

A well-maintained dispensary is available in the administration building to provide minor first aid treatment for injured persons. A Beluga EMR must accompany any individual while using the Infirmary in order to prevent possible misuse of the equipment.

In the event an injured person requires medical evacuation from Beluga Power Plant to a hospital, notify the Control Room Operator (6644) and they will take appropriate actions to activate the emergency medical service.

Chugach utilizes a MedCall Assist service that is available to all Beluga employees. This service allows for an individual to be connected directly to an on-call doctor who can provide over the phone medical guidance and recommendations. In the event that this service is required please call the following phone number:

MedCall Assist: 907-212-3070

E) Telephones

Emergency ..... Ext. 6644

Beluga Power Plant (Clerk) 907-762-4620

Outside line: ..... Press 9, then phone number.

Contractor employees will not be permitted to place station-to-station long distance calls from Beluga. The Contractor Site Manager shall provide a list of names to be given to the Control Room and Energy Supply Clerk so that incoming calls can be properly handled. Incoming calls to employees should be limited; after hours location of employees can be extremely difficult and time consuming. Contractors without telephones in their rooms are allowed to use the mess hall telephone for local calls during and after working hours. Personal long distance calls are typically placed by using a pre-paid phone card.

F) Air Transportation

All flights must be coordinated in advance through the Chugach central flight reservation system. Every effort will be made to utilize regularly scheduled flights to minimize cost. Contractors shall consult with their Chugach Representative prior to establishing travel arrangements.

Flights 762-4620

G) Meals and Lodging

The Contractor will provide a list, by name of all individuals to be in camp each day and night for the duration of job. This list will be given to the Camp Supervisor. The Camp Supervisor will

make room assignments and/or changes as necessary. A current list of room assignments will be kept by Culinary for cost accounting and to provide for off-hour emergency contacts. The Contractor will immediately notify the Camp Supervisor of any personnel or schedule changes that may affect meals and/or overnight accommodations.

Personnel not currently working under the present contract will not be allowed to remain in camp for their personal convenience. Contractor employees will only be allowed to utilize the mess hall for breaks, meals and after-hours recreation.

Meal Hours:	**Breakfast:**	**06:30 to 07:00**
	Lunch:	**12:00 to 12:30**
	Dinner:	**19:00 to 19:30**

If bag lunches are necessary, arrangements must be made with Culinary in advance.

H) Standards of Conduct

The following rules and regulations prescribing minimum standards of conduct recognize the working conditions pertinent to the Beluga Power Plant and Camp facility. In the interest of maintaining coordination necessary for the proper operation and management of the Beluga Power Plant, and in order to avoid misunderstandings, these rules and regulations are furnished to all Contractors prior to employment, are provided to all new Chugach employees during orientation and are posted on the Camp bulletin board.

Infraction of these "Standards of Conduct" will result in appropriate disciplinary action. Contractors may be discharged from continued contract services.

It shall be a violation of the "Standards of Conduct" at Chugach's Beluga Power Plant and Camp facility for any Chugach Employee, Contractor or Visitor:

1. To violate any public law, or regulation having the effect of law.

2. To injure or damage willfully or negligently the person or property of another, including Chugach.

3. To be guilty of larceny in any degree.

4. To falsify in a material respect any record or document pertaining to his/her activities or to the activities of others.

5. To create safety hazards or otherwise to prejudice the health and safety of others through intentional or careless practices or disregard for their welfare.

6. To engage in gambling, fighting, use of abusive or obscene language or otherwise be guilty of conduct, which is disorderly, violates common decency, or is otherwise prejudicial of reasonable decorum and order.

7. To use or possess any narcotics, including marijuana.

8. To consume or possess alcoholic beverages while on Chugach's premises.

9. Except as otherwise authorized by proper authority, to engage in any commercial or promotional activities on Chugach's premises, including but not limited to, the sale or solicitation for sale of any item, and the distribution of any literature or other material.

10. To have firearms in his/her possession while on Chugach's premises. Exception: Permanent Chugach Employees assigned to Beluga may maintain up to 3 firearms in the secured Armory for after-hours recreational purposes only. Specific rules are detailed in the Beluga Firearm Policy, posted in the Armory.

11. To violate any work rule or regulation which may be contained in any labor agreement between Chugach and their employees or contractors.

12. To accesses warehouse beyond front desk without accompaniment by a Beluga warehouseman or a Chugach Manager/Supervisor.

13. To receive freight and materials coming into Beluga facilities without being cleared through the warehouse first. All freight and materials must be routed through the Beluga warehouse, unless otherwise agreed to with the warehousemen.

14. (Specific to Contractors) To access the Chugach exercise building without accompaniment by a Chugach employee or permission from a Chugach Manager/Supervisor.

15. To utilize any Chugach equipment offsite for personal use. Vehicles and/or equipment may be assigned to Contractors/Visitors at Chugach Management's discretion, but use is limited to on-site work-related activities. Contractor recreational use of vehicles and/or any other Chugach equipment is prohibited. Per Operating Policy 016, only Chugach Employees regularly assigned to Beluga may use Cooperative vehicles for recreational use after-hours. Employees are required to provide proof of acceptable insurance, a valid driver's license and a signed Financial Responsibility and Indemnification Agreement. Chugach vehicles are prohibited past the gate going to the Chuitna River and at any local drinking establishments. Vehicles are Chugach property and all "Rules of Conduct" apply. Possession or use of drugs and/or alcohol is prohibited. Vehicle use is restricted to maintained roads. Off-road use is prohibited.

16. To smoke in any Chugach building, including the Camp facility.

17. To tamper with, disable or provide information to unauthorized persons regarding security systems and their respective equipment.

SUGGESTED CONTRACTOR HSE PLAN WORK SHEET AND CHECKLIST

WORK HAZARD ASSESSMENT AND MITIGATION PLAN

1. _____ Have you reviewed the project Work scope and analyzed it for potential hazards such as confined space entry, excavations, falls, electrical safety, and other OSHA recognized hazards?

2. _____ Have you included a written assessment of the hazards from question 1 that includes a list of them and discusses how you will handle each of them**? (Your response for handling them can be to list your existing appropriate procedure.)**

3. _____ Have you reviewed Chugach Electric Association Procedure 10.5, Confined Space Entry?

MSDS INFORMATION

1. _____ Will you be using or creating chemicals that must have Material Safety Data Sheets on them?

2. _____ If you answered "yes" to question 1, have you provided a separate list of those chemicals with your bid?

3. _____ Have you reviewed the requirements of Chugach Electric Association Safety Procedure 7.3, Hazard Communications?

ENERGY ISOLATION PROCEDURE/PLAN

1. _____ Have you reviewed the project Work scope to determine from the scope the need for energy isolation (lockout/tagout)?

2. _____ If you answered "yes" to question 1, do you have a written energy isolation procedure?

3. _____ Have you attached a copy of the procedure?

PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. _____ Have you reviewed the project Work scope to determine the type of PPE you are required to provide for your crew, and included a list of it with your HSE?

2. _____ If the project Work is located at Chugach's Beluga generating plant, have you reviewed Chugach Electric Association Procedure 11.7, Visitor Checklist?

EMERGENCY RESPONSE PLAN

1. _____ Have you reviewed the project Work scope to determine from the scope the types of emergencies that may be reasonably anticipated due to the work tasks or work location**? (This can include such topics as First Aid, emergency evacuation, fire hazard, etc.)**

2. _____ Based on your review, have you included a list or discussion of your response plan for those emergencies? **(Make sure you consider existing conditions such as weather, remote location, and existing resources in developing your plans.)**

HAZARDOUS MATERIAL/HAZARDOUS WASTE MITIGATION and RESPONSE PLAN

1. _____ Have you reviewed the project Work scope to determine the type of hazardous material you may be handling, and the type of hazardous waste your operation may generate?

2. _____ Have you included a discussion of your plan for safely handling and disposing of these materials and wastes?

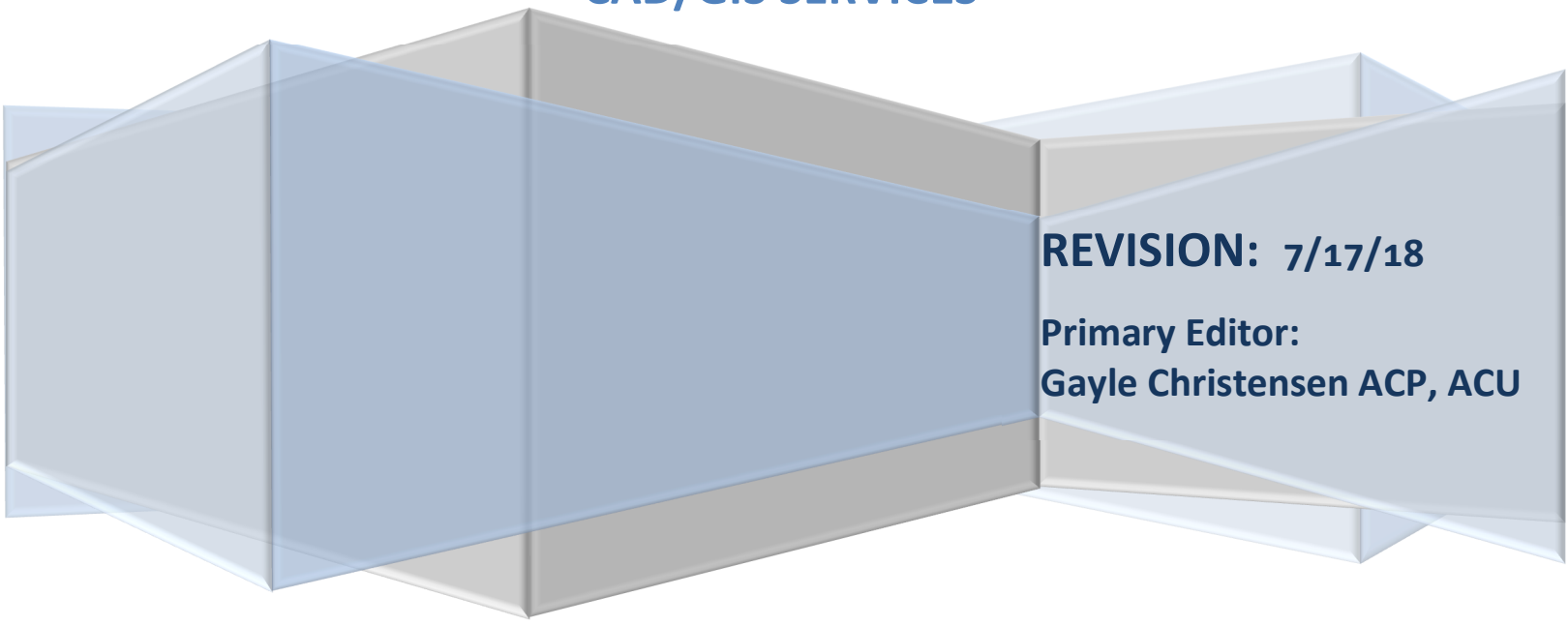
3. _____ Have you included a discussion of your response plan in case of a release?

CHUGACH

POWERING ALASKA'S FUTURE

CAD DRAWING STANDARD

CAD/GIS SERVICES



REVISION: 7/17/18

Primary Editor:
Gayle Christensen ACP, ACU

Table of Contents

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

Name	*Description*	*Color*	*Line type*
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 builting" 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 place 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).

2. 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

3. 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

4. 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).

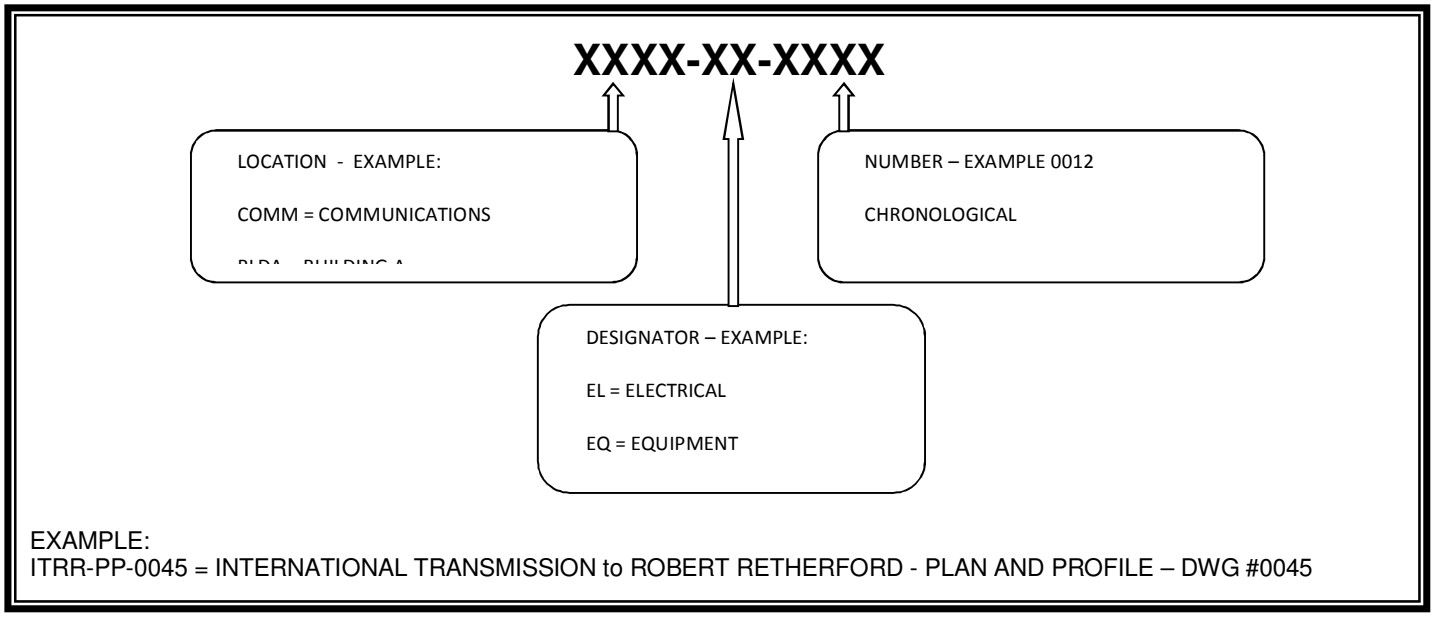
   AS-BUILT: When the construction is complete and the drawing is as-built, the current latest cloud layer will remain on, the previous cloud layer will be turned off and all the revision number triangles will remain on. There will be two cloud layers and two revision number layers to accommodate the layer 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:



EXAMPLE:
ITRR-PP-0045 = INTERNATIONAL TRANSMISSION to ROBERT RETHERFORD - PLAN AND PROFILE – DWG #0045

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.

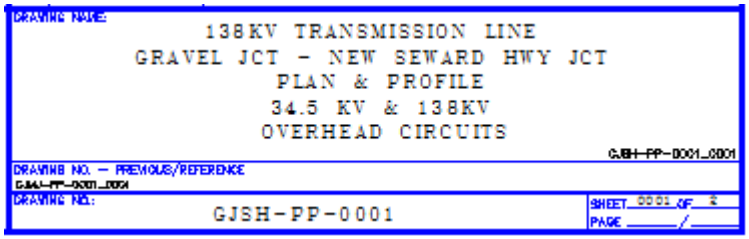
IX) DRAWING NUMBER – PREVIOUS/REFERENCE

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.).



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

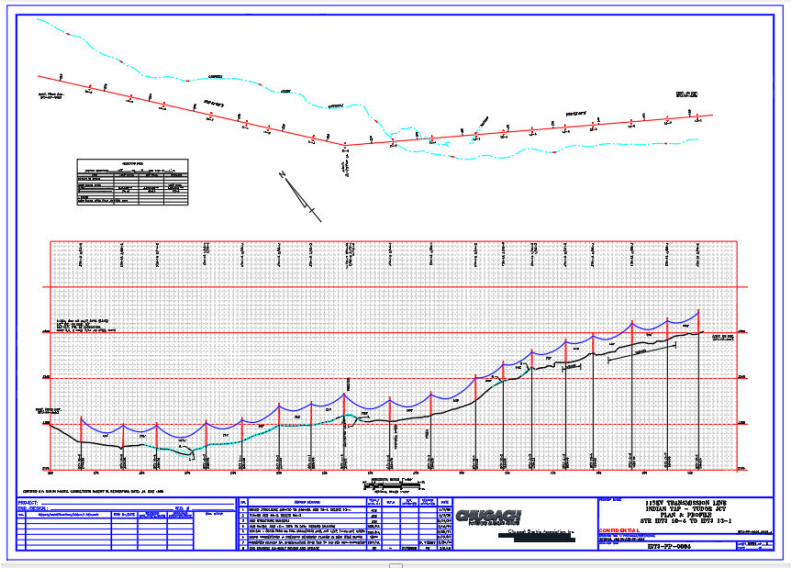
10. Scale Bar and North arrow reside in MODEL SPACE (Insert a scale bar with a reasonable and useable scale length).

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.

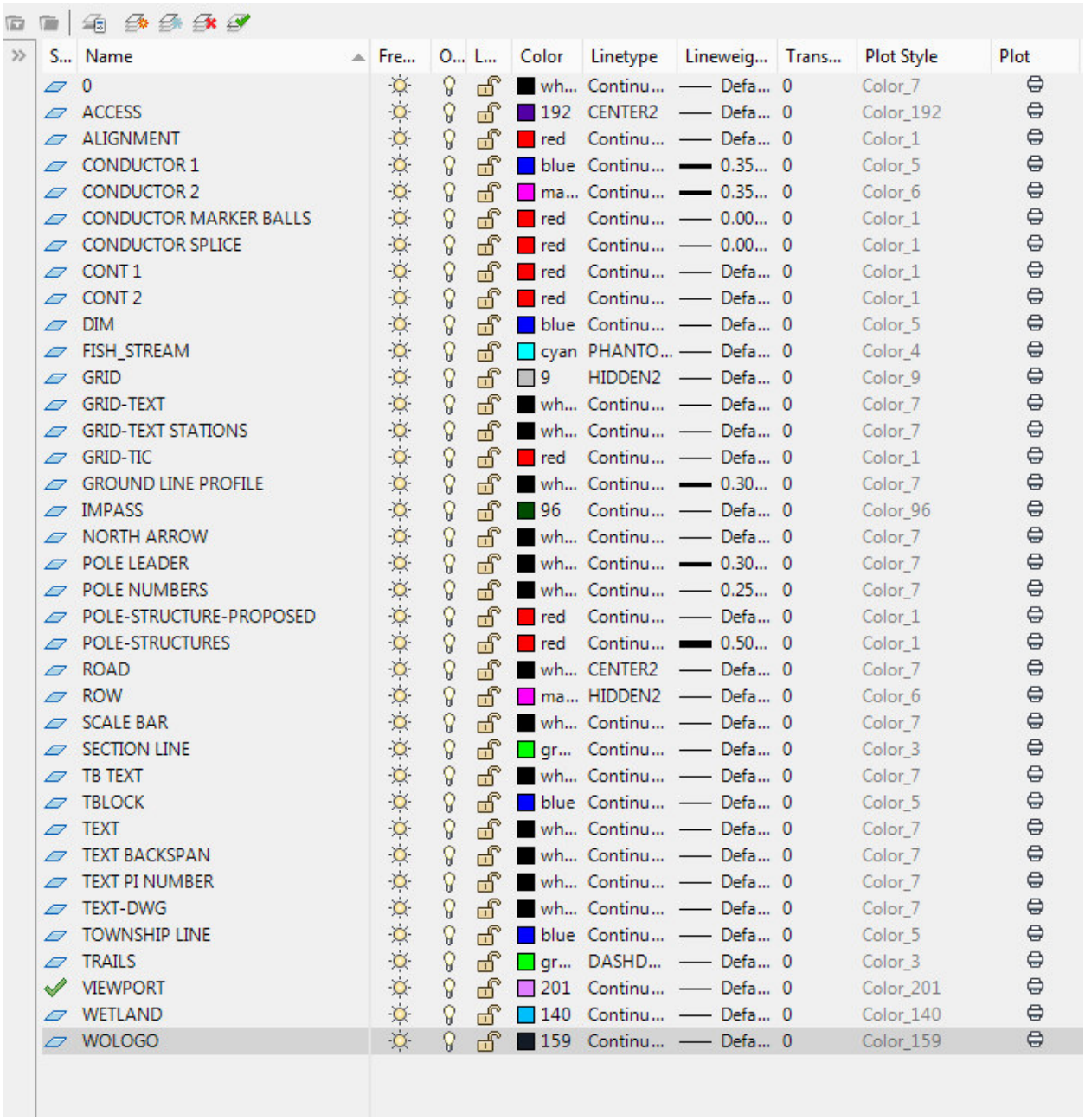
13. If a grid is involved (Example PP drawings) all of the VERTICAL AND HORIZONTAL grid lines should be on the same layer name "GRID" Color Gray9 Linetype HIDDEN2. Use red GRID TIC lines on the outside of the grid and tic marks at the horizontal stations on GRID-TIC layer. One horizontal line to be red 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:



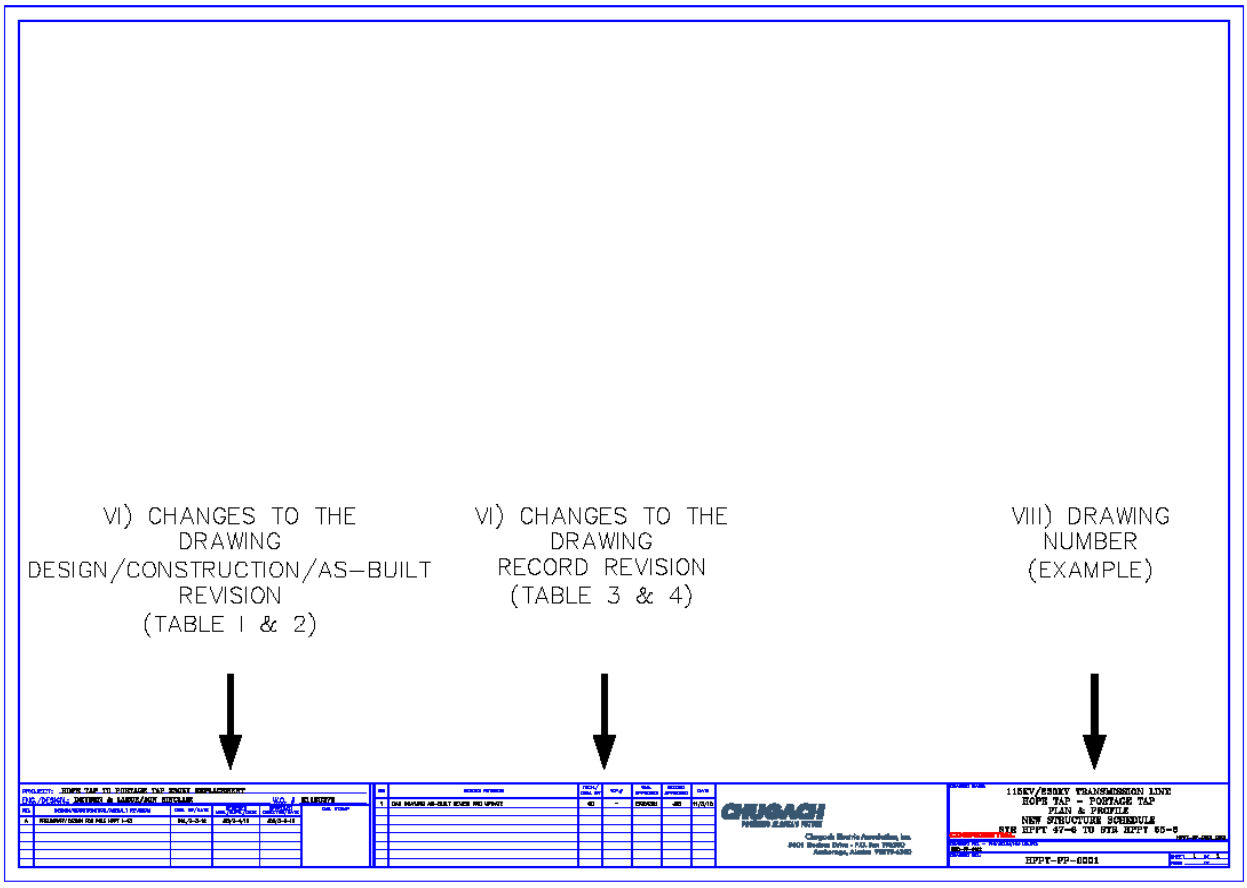
14. Verify all viewports and/or text in the LAYOUT will plot at the appropriate font size (the same font size of other elements) on the plotted drawing sheet AND use the same font type for similar items in the layout. The layout should look "balanced".

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				gr...	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



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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.*

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Table of Contents

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.

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 (0.0174532925199433295)
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.

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.

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.**

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

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.

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.