

# MEPNN Supplier Scouting Opportunity Synopsis

Item Information	
Scouting Number	2023-079
Item to be Scouted	Shunt Reactor
Days to be scouted	30
Description	13.8 kV (line-to-line voltage rating) shunt reactors, 25 MVA 3-phase rating, and one support structure per reactor. These are dry type, air core, single-phase shunt reactors, suitable for outdoor use. Shunt Reactors are used widely in AC networks to limit overvoltage or shortcut current in power transmission. With a growing number of high-voltage overhead lines in a fast-changing energy environment, both shunt and series reactors play a key role in stabilizing network systems and increasing grid efficiency.
State item to be used in	Colorado

Contact Information	
Email	hammans@wapa.gov
First Name	Carol
Last Name	Hammans
Department / Company / MEP Center	Department of Energy, U.S.
Bureau / Division / MEP Center Regional Office	Western Area Power Administration/Rocky Mountain Region

Supplier Information	
Type of supplier being sought	Manufacturer
Reason	BABA

Summary of technical specifications and performance requirements	
Describe the manufacturing processes (elaborate to provide as much detail as possible)	<ul style="list-style-type: none"> <li>• Core: Cut silicon steel laminations to size and stack them together with an insulating material. Press and heat-treat the stack to create a solid core.</li> <li>• Wind the coils: Form copper or aluminum windings into coils and place them around the core. Insulate the coils from each other and from the core.</li> <li>• Pot the coils: Encase the windings in a resin to protect them from moisture and contaminants. This also helps to improve heat transfer.</li> <li>• Test the reactor: Verify the reactor's performance by testing its inductance, resistance, and capacitance.</li> </ul>
Provide dimensions / size / tolerances / performance specifications for the item	Quantity of 6: 13.8 kV, 25 MVA 3-phase rating, and one support structure per reactor. These are dry type, air core, single-phase shunt reactors, suitable for outdoor use. Additional specifications and drawings attached.
List required materials needed to make the product, including materials of product components	<ol style="list-style-type: none"> <li>1. Windings (copper)</li> <li>2. Insulators (porcelain)</li> <li>3. Bird Barriers</li> <li>4. Lighting Arresters</li> <li>5. Control panel (metal oxide)</li> <li>6. Support Structures and hardware (aluminum, stainless steel, nonferrous or fiberglass)</li> <li>7. Corona Rings</li> </ol>

Are there applicable certification requirements?	Yes
Certification(s) required	IEEE
Details	ANSI Standard C57.21 and International Standard IEC 289; shall meet the National Electrical Safety Code (NESC) heavy-loading zone criteria; shall meet the moderate seismic qualification level as stated in IEEE 693; See attached Specifications.
Are there applicable regulations?	Yes
Details	The BAA and implementing regulations in the FAR provide a two-part test for determining if a product qualifies as a domestic end product: (i) the item must be manufactured in the United States, and (ii) more than 60 percent of the cost of all the component parts are manufactured in the United States.
Additional Technical Comments	FAR provide a two-part test for determining if a product qualifies as a domestic end product: (i) must be manufactured in the United States, and (ii) more than 60 percent of the cost of all the component parts are US.

## Volume and Pricing

Estimated potential business volume	Six (6) each 13.8 kV, 25 MVA 3-phase rating Unknown about future requirements
Estimated target price / unit cost information (if unavailable explain)	Total \$400,000

## Delivery Requirements

When is it needed by?	Immediate
Describe packaging requirements	F.O.B. Destination, Within Consignee's Premises – unload the equipment to a ground level pad or to a specific location within the yard as directed by the Government. Crating/container with itemized packing list. Shall be packaged in accordance with standard packaging requirements for items of this nature, shipped by truck.
Where will this item be shipped?	Ault Substation, Near Ault, Colorado - Weld County

## Additional Comments

Is there other information you would like to include?	<p>An RFI was posted on sam.gov requesting information regarding domestic end products and no responses were received. It is the Government's assumption that shunt reactor components are manufactured in foreign countries. Based on the market research conducted, there are no known suppliers of domestic end products of Shunt reactors as described.</p> <p>FAR provide a two-part test for determining if a product qualifies as a domestic end product: (i) must be manufactured in the United States, and (ii) more than 60 percent of the cost of all the component parts are US.</p>
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# ATTACHMENT B

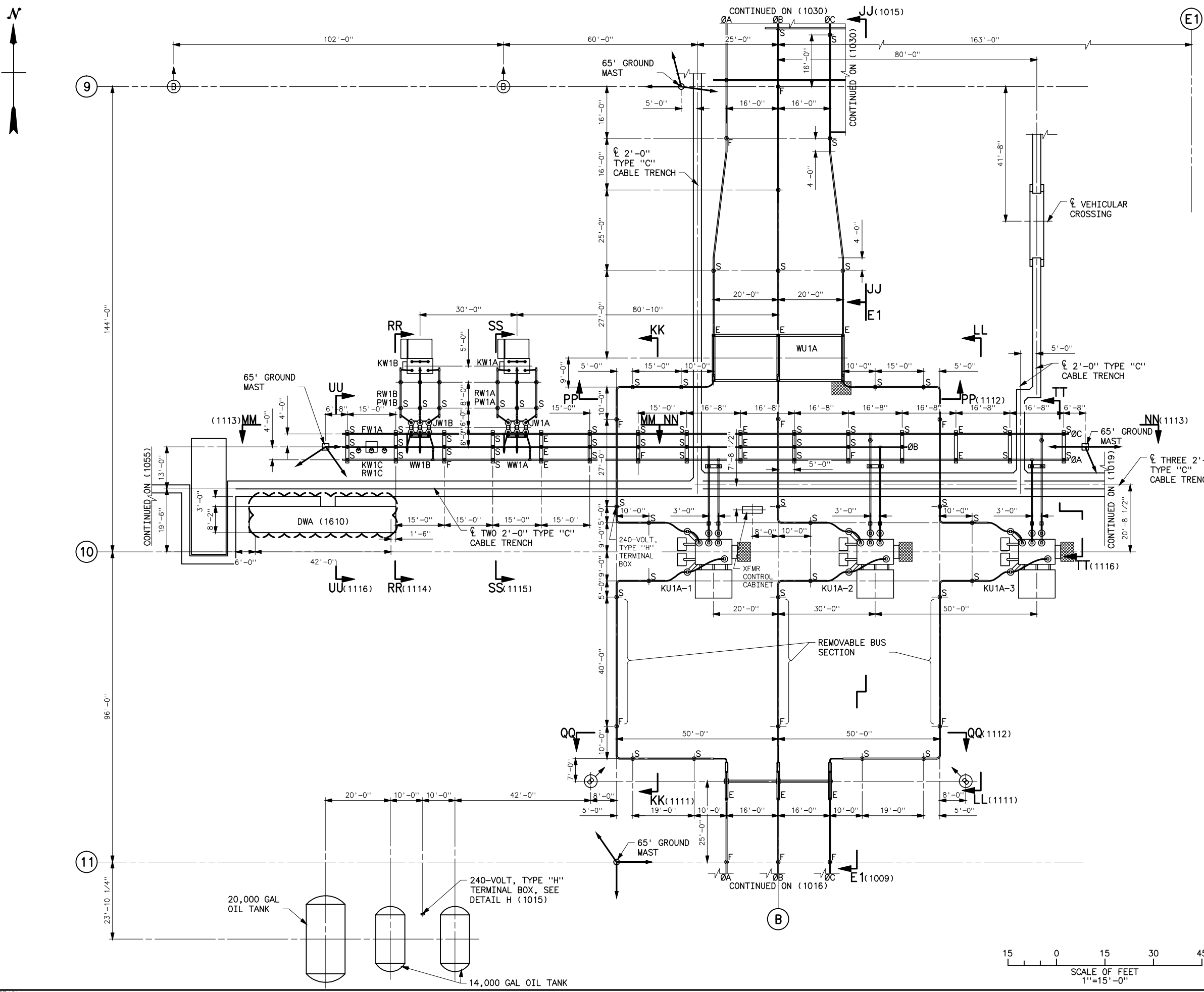
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Reference Drawings – KW1A  
and KW1B Shunt Reactors for  
Ault Substation

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Plotted By: lampan Jun 28, 2016 9:24am  
 S:\projects\Substations\Ault\Ault\_StationService\2016\Drawings\DesignDrawings\DrawingsReadyForFinal\Scr\p1.s.dwg Last Saved By: Lampan, Eva (CONTR) on 6/28/2016 9:23 AM

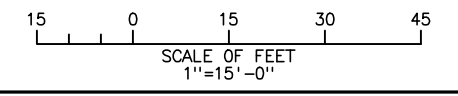
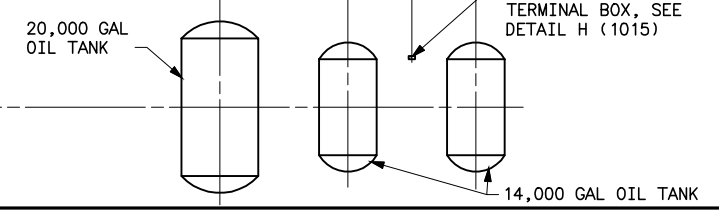


**EXPLANATION**  
 E --- EXPANSION FITTING  
 F --- FIXED FITTING  
 S --- SLIP FITTING  
 (B) --- TYPE "B" LIGHTING UNIT, ARROW INDICATES THE AXIS OF BEAM.  
 (Cloud symbol) INDICATES STATION SERVICE REPLACEMENT

**NOTES**  
 1. CONTRACTOR SHALL FURNISH AND INSTALL THE CONNECTIONS FROM THE CIRCUIT BREAKERS BUSHINGS TO THE BUS.  
 2. MINIMUM BENDING RADIUS FOR 5-INCH ALUMINUM TUBING SHALL BE 40-INCHES.

**REFERENCE DRAWINGS**

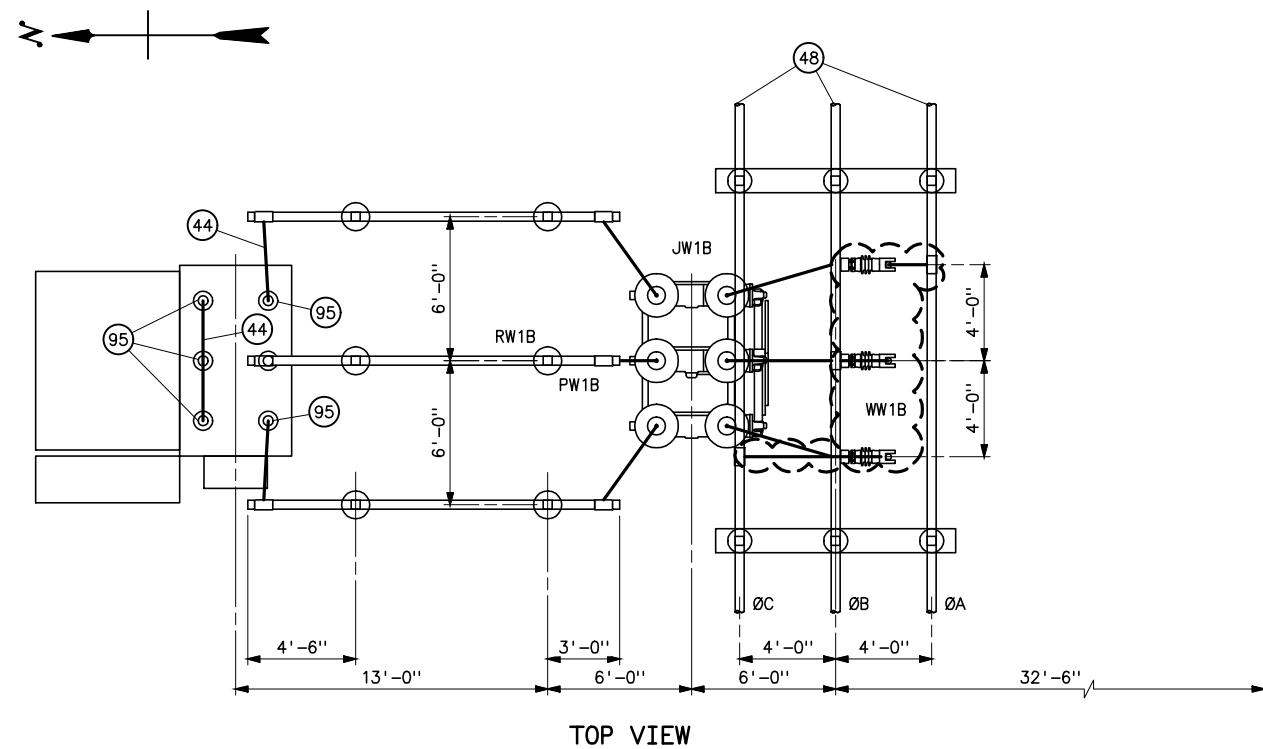
345KV, 13.8KV, TRANSFORMER & STATION SERVICE AREA SWITCHING DIAGRAM	----- AU 0001-1
GENERAL ARRANGEMENT PLAN	----- AU 1000
TRANSFORMER KU1A SECTIONS E1-E1 AND F1-F1	----- AU 1009
345KV BUS STRUCTURE SECTIONS HH-HH, JJ-JJ & DETAILS	----- AU 1015
230KV BUS STRUCTURE PLAN BAY U1 TO BAY V4	----- AU 1016
TRANSFORMER KU1B - 345KV & 13.8KV- BUS STRUCTURES PLAN - BAY U1	----- AU 1019
345KV CAPACITOR AREA PLAN- BAY POSITIONS U2 & U4	----- AU 1031
TRANSFORMER KU1C PLAN	----- AU 1055
TRANSFORMER KU1A - 230KV, 345KV & 13.8KV- BUS STRUCTURES - SECTIONS KK-KK & LL-LL	----- AU 1111
TRANSFORMER KU1A - 230KV & 345KV- BUS STRUCTURES - SECTIONS PP-PP & QQ-QQ	----- AU 1112
TRANSFORMER KU1A - 13.8KV BUS STRUCTURES- SECTIONS MM-MM & NN-NN	----- AU 1113
TRANSFORMER & REACTOR AREA- 13.8KV BUS STRUCTURES-	----- AU 1114
SECTION RR-RR	----- AU 1115
SECTION SS-SS	----- AU 1116
SECTION TT-TT & UU-UU	----- AU 1116
UNIT SUBSTATION DWA	----- AU 1610
WIRING DIAGRAM	----- AU 1610



H	6-28-16 A7-KV	REDRAWN, REVISED TITLE BLOCK FOR STATION SERVICE REPLACEMENT
SUPERSEDES DWG NO. E864-D-5442		
UNITED STATES DEPARTMENT OF ENERGY WESTERN AREA POWER ADMINISTRATION HEADQUARTERS - LAKEWOOD, COLORADO		
AULT SUBSTATION COLORADO		
TRANSFORMER KU1A 230KV, 345KV, & 13.8KV BUS STRUCTURES PLAN - BAY U1		
DESIGNED BUREC		APPROVED BUREC
XR	C/A	JUNE 29, 1979
		AU
		1032

EXPLANATION

- INDICATES STAGE 01
- ◇ INDICATES STAGE 04



TOP VIEW

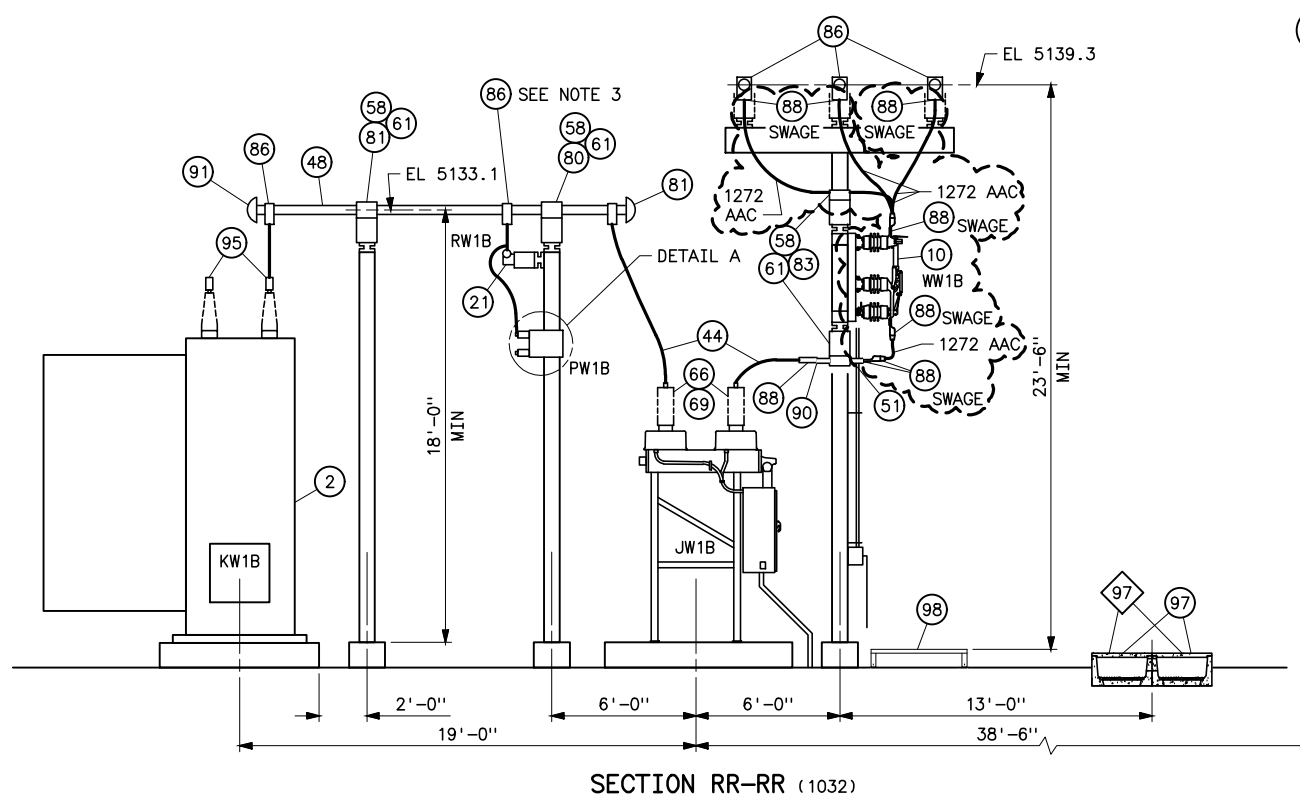
10

NOTES

1. INSULATING MATERIALS SHALL BE:  
 MICARTA - GRADE 221 PLATE, LINEN BASE OR GRADE 400 PLATE, ASBESTOS BASE.  
 - GRADE 97 TUBING, LINEN BASE OR GRADE 93 TUBING, ASBESTOS BASE.
2. GROUND ALL CONDUIT.
3. COPPER CONDUCTOR IN CONTACT WITH THE CONNECTORS SHALL BE TINNED.
4. INSULATORS SHALL BE FURNISHED WITH MOUNTING BOLTS.

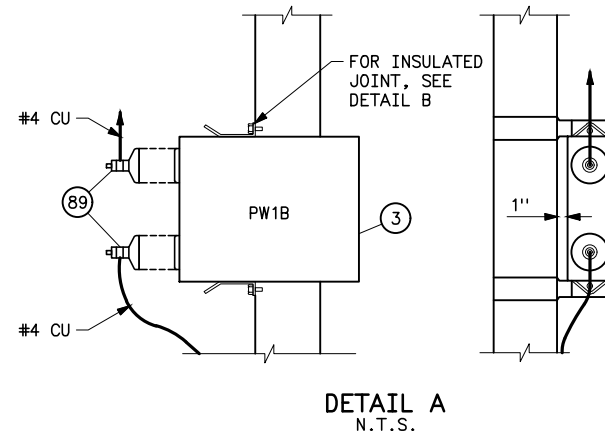
REFERENCE DRAWINGS

- 230KV & 345KV GENERAL ARRANGEMENT \_\_\_\_\_ AU 1000
- TRANSFORMER KU1A 230KV, 345KV & 13.8KV BUS STRUCTURES PLAN - BAY U1 \_\_\_\_\_ AU 1032
- EQUIPMENT AND MATERIAL INDEX \_\_\_\_\_ AU 1100

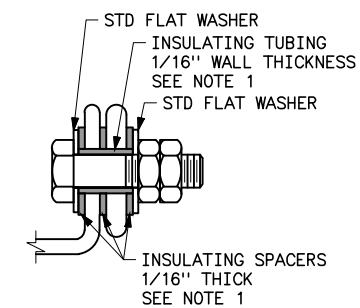


SECTION RR-RR (1032)

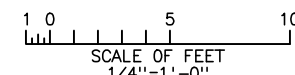
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DETAIL A  
N.T.S.



DETAIL B  
N.T.S.



EXPLANATION

- ☁ INDICATES 15KV SWITCH REPLACEMENT

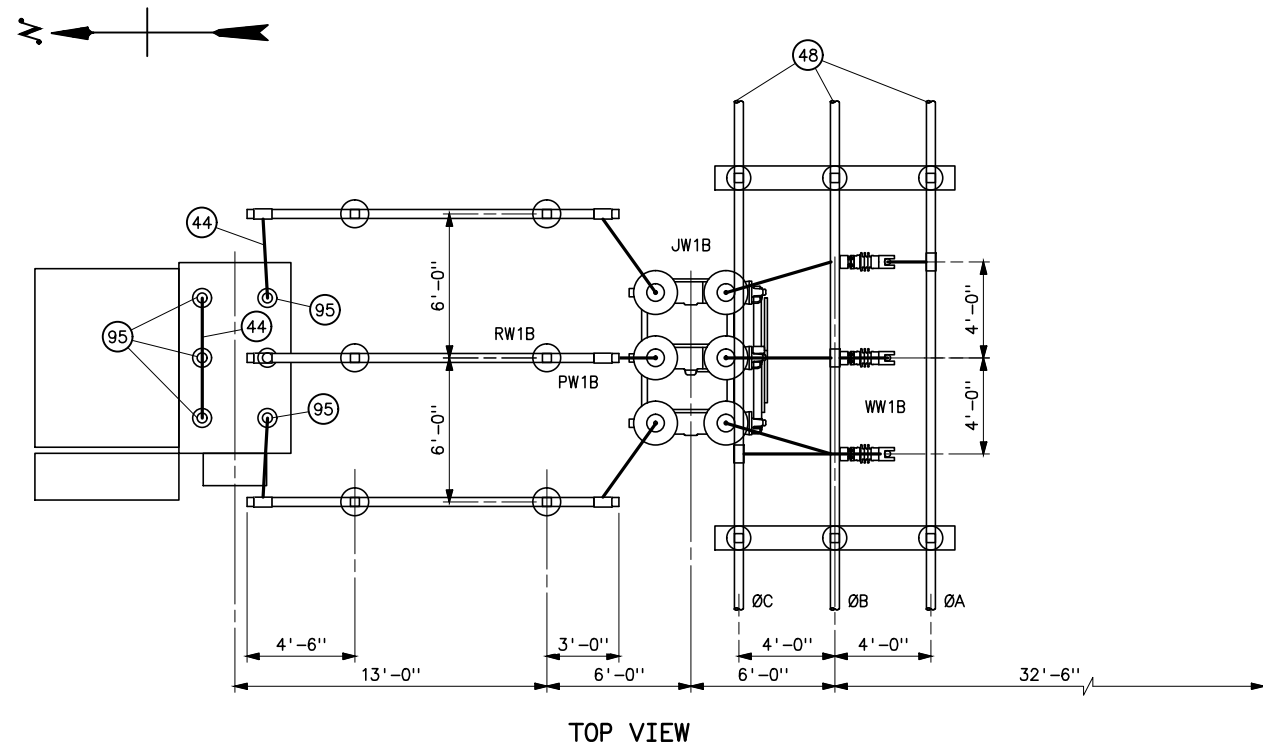
NOTE: CONTRACTOR SHALL FURNISH AND INSTALL THE CONNECTIONS FROM THE CIRCUIT BREAKERS BUSHINGS TO THE BUS

**APPROVED**  
By Kyle Vaughn at 3:22 pm, Oct 05, 2022

XREF(S) = ALL9502	D	10-2-20 A7-KV	REVISED AND REDRAWN FOR 15KV SWITCH REPLACEMENT.
	UNITED STATES DEPARTMENT OF ENERGY WESTERN AREA POWER ADMINISTRATION HEADQUARTERS - LAKEWOOD, COLORADO		
	AULT SUSTATION COLORADO TRANSFORMER AND REACTOR AREA 13.8KV BUS STRUCTURES SECTION RR-RR		
DESIGNED FRANK PREST		APPROVED R.R. FELLENEY ELECTRICAL ENGINEERING MANAGER	
JUNE 20, 1986		AU 1114	

EXPLANATION

- INDICATES STAGE 01
- ◇ INDICATES STAGE 04



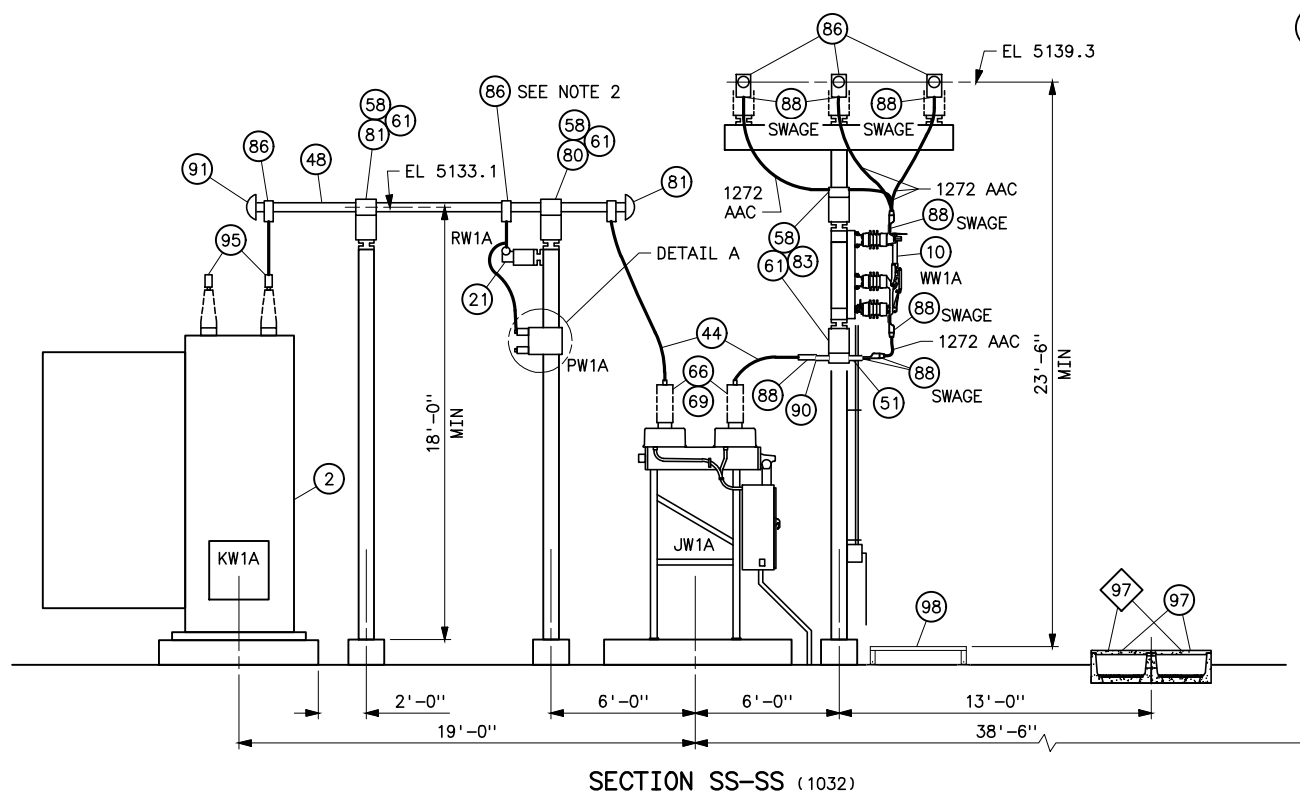
TOP VIEW

NOTES

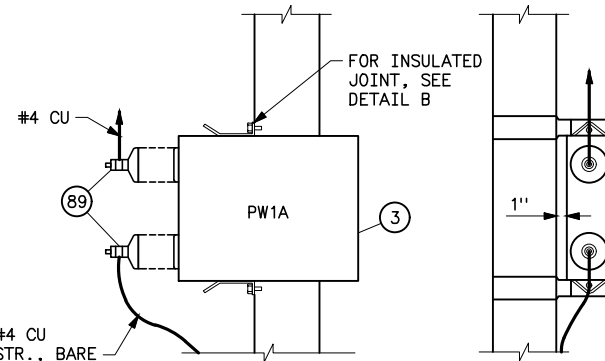
1. INSULATING MATERIALS SHALL BE:  
 MICARTA - GRADE 221 PLATE, LINEN BASE OR GRADE 400 PLATE, ASBESTOS BASE.  
 - GRADE 97 TUBING, LINEN BASE OR GRADE 93 TUBING, ASBESTOS BASE.
2. COPPER CONDUCTOR IN CONTACT WITH THE CONNECTORS SHALL BE TINNED.
3. GROUND ALL CONDUIT.
4. INSULATORS SHALL BE FURNISHED WITH MOUNTING BOLTS.

REFERENCE DRAWINGS

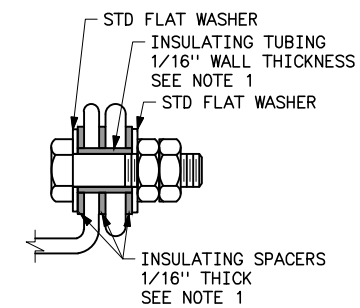
- 230KV & 345KV GENERAL ARRANGEMENT \_\_\_\_\_ AU 1000
- TRANSFORMER KU1A 230KV, 345KV & 13.8KV BUS STRUCTURES PLAN - BAY U1 \_\_\_\_\_ AU 1032
- EQUIPMENT AND MATERIAL INDEX \_\_\_\_\_ AU 1100



SECTION SS-SS (1032)



DETAIL A  
N.T.S.

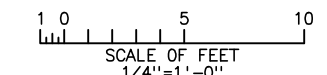


DETAIL B  
N.T.S.

NOTE: CONTRACTOR SHALL FURNISH AND INSTALL THE CONNECTIONS FROM THE CIRCUIT BREAKERS BUSHINGS TO THE BUS

E	7/11/23 A7-KV	AS-BUILT.
D	10-2-20 A7-KV	REVISED AND REDRAWN FOR 15KV SWITCH REPLACEMENT.

UNITED STATES DEPARTMENT OF ENERGY  
 WESTERN AREA POWER ADMINISTRATION  
 HEADQUARTERS - LAKEWOOD, COLORADO  
**AULT SUSTATION**  
 COLORADO  
**TRANSFORMER AND REACTOR AREA**  
 13.8KV BUS STRUCTURES  
 SECTION SS-SS



DESIGNED FRANK PREST APPROVED R.R. FELLENEY  
 ELECTRICAL ENGINEERING MANAGER

XR	JUNE 20, 1986	AU	1115
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Plotted By: denton Jul 11, 2023 - 7:39am  
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 IMAGES:  
 XREF(S) = AU\_9502

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# ATTACHMENT A

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Specification – KW1A and KW1B  
Shunt Reactors for Ault  
Substation

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23WA148618

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## **Technical Specifications for Air Core Shunt Reactors**

1. **General:** The Contractor shall furnish Item No. 0001 shunt reactors as described in this section. These specifications provide the minimum electrical and mechanical requirements for dry type, air core, single-phase shunt reactors, suitable for outdoor use. The shunt reactors shall be in accordance with the latest revision of the Industry Standards stated, including ANSI Standard C57.21 and International Standard IEC 289 as applicable, except for any deviations from the Industry Standard as described in these specifications. In the event of contradictory requirements between Industry Standards and these specifications, the terms and requirements of these specifications shall have precedence over the Industry Standards. Each reactor shall be equipped with suitable attachments for lifting and shall be designed for installation outdoors and to be impervious to moisture and other weather hazards. Only new equipment of current and present day manufacture shall be furnished. Each shunt reactor shall be suitable for base mounting, furnished with a supporting structure and hardware to connect reactors to support structures, and be suitable for daily switching. In addition, each reactor shall be Class AA type self-cooled, and suitable for operation at a nominal frequency of 60 hertz.

The maximum average temperature rise of the windings, as determined by the change in the measured value of dc resistance (hot or cold), shall be based on limits set down in ANSI C57.21.

2. **Material:** The shunt reactors shall have the following ratings and features as listed below in the following subsequent stated requirements:

- Accepted Manufacturers: Coil Innovation, General Electric or Trench (or equivalent)
- Minimum self-cooled rating at rated system  
Voltage per phase/three phase.....8.33 MVA/25 MVA
- Rated system voltage (line to line).....13.8-kV
- Maximum Operating System Voltage.....14.77-kV
- Basic Lightning-Impulse Insulation Level  
of Shunt Reactor Windings and Insulators.....150-kV
- Minimum Continuous Duty rating.....107% of Rated Voltage & Current
- Temperature Rise As per ANSI C57.21 Standard and Contractor To Determine
- Continuous Current at Rated Voltage  
With Minimum self-cooling.....1,046 Amps
- The reactors will be connected to 13.8-kV (line-to-line) nominally rated, ungrounded system supplied from an autotransformer tertiary.

3. **Unusual Service Conditions:** The shunt reactors shall be suitable for operation under the conditions as listed below in the following subsequent stated requirements:



- Service connection.....Grounded wye
- Minimum ambient temperature.....- 30° C
- Maximum ambient temperature.....+ 40° C
- Maximum 24 hour average ambient Temperature.....+35° C

4. The shunt reactors will operate at the following elevations:

- Suitable For Operation at an Elevation Above Sea-Level of.....5,110 Feet

5. **Additional Requirements For Shunt Reactors:** The shunt reactors shall be supplied by these specifications to satisfy the following additional requirements as listed below in subsequent paragraphs:

- a. The Contractor or manufacture shall determine the reactor impedance based on the above electrical ratings as stated. Impedance tolerance shall be in accordance with ANSI C57.21. However, reactor impedance shall remain constant within 2% of impedance of rated voltage from 0 to 120% of rated voltage.
- b. **Insulating Material:** Insulating material used in the reactors shall be such as to prevent cracking or spalling of material. Shunt reactor construction shall be with epoxy impregnated, fiberglass encapsulated windings. Aluminum conductors shall be welded at all current carrying terminations. The reactors shall use weatherproof synthetic resin and glass fibers for encapsulation. The reactors shall be designed with sufficient strength to withstand, without damage or loss of life, the mechanical forces while in operation and during installation. The loads considered in the design shall include those generated by electromagnetic forces, wind, snow, ice loading, seismic effects and forces due to expansion and contraction caused by ambient temperature and load variation.
- c. **Insulators:** Porcelain post-type insulators with nonmagnetic caps and base and all hardware necessary to mount the reactors shall be furnished by the Contractor to insulate the reactors from ground and support and mount the shunt reactors on the support structures. All insulators shall be ANSI 70 gray in color, solid-core-construction, and in accordance with the latest revision of ANSI C29.9. The shunt reactor supplier shall furnish, if required, a nonmagnetic stainless steel or other nonmagnetic type of material for a base adapter to raise and mount reactors on the support structures to provide the required clearances to prevent heating due to circulating currents. Shunt reactor support insulators are required for to meet the size and technical characteristics of TR 227 insulators. The insulators shall be wet-process, homogeneous, and free from cavities and other flaws. The glazing shall be uniform in color and free from blisters, burns, and other defects.
- d. **Nameplate:** Each shunt reactor shall have a nameplate that conforms to the requirements of IEC 289 and shall contain the following information:

- Apparatus type (shunt reactor)
  - Manufacturer's name
  - Serial number
  - Rated current
  - Rated impedance
  - Lightning impulse withstand voltage (BIL)
  - Temperature class
  - Year of manufacture
  - Weight
  - Altitude rating
  - Seismic rating
- e. **Electrical Terminals:** Each shunt reactor shall be equipped with aluminum NEMA standard line 4 hole terminal pads conforming to the requirements of NEMA CC1.
- f. **Bird Barriers:** Each of the shunt reactors shall be furnished with a bird barrier.
- g. **Protection:**  
The shunt reactor shall be provided with an internally mounted metal oxide lightning arrester appropriately rated for the connection voltage for over-voltage protection of the equipment connected across the shunt reactor windings and protect for lightning surges. The shunt reactor manufacturer shall determine the electrical ratings for this lightning arrester.
- h. **Installation Configuration:** Three single-phase shunt reactors will be used for each complete three-phase bank installation. Three reactors will make one three-phase bank installation. The manufacturer shall make a reasonable effort to provide reactors that will fit in the configuration shown on attached WAPA drawing. Shunt reactors will be switched with a power circuit breaker on the line side, approximately 365 times per year. Shunt reactors will be connected in a wye configuration on the neutral-side.
- i. **Support Structures:** Each shunt reactor shall be furnished complete with a support structure. Each reactor shall be mounted and supported by its own support structure. The minimum overall mounting height shall provide a distance of 8 feet 6 inches from the support structure base plate up on top of the concrete foundations to the upper point of unguarded potential which is usually the lowest skirt on the support insulator. The prior stated distance must therefore comply with the latest version of the National Electrical Safety Code (NESC), Table 124-1 of the latest ANSI/IEEE C2. Single piece support structures may be made of fiberglass. If multiple pedestals are used to support individual shunt reactors, then these support structures shall be made of aluminum, stainless steel, non-ferrous material, or fiberglass material. All hardware shall be made of non-ferrous nuts, washers, and bolts to eliminate localized hot spots and heating. The Contractor shall give complete information on the drawings submitted, showing all anchor bolt or embedded material details, so Western's design staff can complete the final installation design for the equipment. Western will supply the additional anchor bolts or embedded materials needed for connecting the supports structures to the foundations.
- j. **Corona Rings:** Each shunt reactor shall be furnished with a corona ring, suitable for operation at the elevations shown elsewhere in these specifications.

- k. **Painting And Color:** After fabrication, the manufacturer shall clean and paint the equipment with the manufacturer's standard cleaning and painting system. Paint and coated surfaces shall be protected from abrasion or other damage at all times. The shunt reactors finish and all associated components shall be light Grey, No. ANSI 70. Electrical connections and other parts not intended to be painted shall be masked and protected so no paint is applied to these parts. All steel not painted is to be galvanized in accordance with ASTM Standard A 123.
- l. **Noise Level:** Each shunt reactor shall have a maximum noise level of 70 decibels.
- m. **Installation:** The shunt reactor supplier is not responsible for the installation of the equipment furnished by these specifications. Western or another Contractor employed by Western will accomplish final installation and completion of all work to make the equipment ready for normal commercial operation.
- n. **Seismic Requirements for Shunt Reactors:** The Contractor shall furnish shunt reactor equipment which meets the seismic requirements and qualification levels of IEEE Standard 693, with the required qualification level as stated below. The term "equipment" for this Paragraph 5 includes the shunt reactors, supporting structures, and anchorage assemblies. All design, calculations, submittal of required data, and required testing shall be in accordance with IEEE 693, except when the qualification method can be by dynamic analysis (computer analysis) or time history shake-table testing. The equipment shall resist wind loads calculated in accordance with American Society of Civil Engineers (ASCE) ASCE-7, using an importance factor of 1.15, and a minimum basic wind velocity of 100 miles per hour. This wind velocity includes height and gust factors. The equipment shall be designed to withstand wind loads in combination with dead and operating wire tensions, mechanical, and short circuit forces loads. The seismic requirements and the wind load forces shall be considered separately with the result being that the equipment shall sustain no damage or impairment of operation due to the seismic or wind loads that the equipment might experience.

Stresses in steel shall not exceed those as specified in the American Institute of Steel Construction Manual, latest edition. Stresses in aluminum shall not exceed those as specified in the Aluminum Construction Manual. Stresses in ceramic shall not exceed 50 percent of the ultimate mechanical strength for seismic load combinations and 40 percent of the ultimate mechanical strength for other load conditions.

- o. **National Electrical Safety Code (NESC) Loading Design:** The equipment shall meet the NESC heavy-loading zone criteria. The equipment shall be designed to withstand NESC heavy loads in combination with dead and operating loads, including wire tensions, mechanical, and short circuit forces.
- p. **Required Seismic Qualification Level for The Equipment:** The shunt reactor equipment must meet the moderate seismic qualification level as stated in IEEE 693. The Contractor shall submit three copies of reports which contain all required calculations and test data as required by IEEE 693 for the moderate seismic qualification level and mail the reports to the address as given in Paragraph 9 (d) below.

- 6. Tests:** Routine tests shall be made in accordance with the latest version of ANSI C57.21 and shall include the following:
- a. D.C. resistance measurement on each reactor furnished
  - b. Impedance measurement at 60Hz on each reactor furnished
  - c. Total loss measurement on each reactor furnished, losses may be determined from impedance bridge measurements
  - d. Turn-to-turn test for each reactor furnished
  - e. Tests to determine actual kVA rating at rated voltage
- 7. Warranty:** Shall be warranted to be free of defect in workmanship and material at a minimum of five years (60 months) from the date of delivery.