

**JEA**

**Northside Generating Station**

**JACKSONVILLE, FLORIDA**

**JEA NGS N35  
Nonsegregated Phase Bus  
System – Inspection, Clean  
and Refurbishment**

**General Requirements and Scope of Work**

**PWO R12X30300 31569937**

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# General Requirements and Scope of Work

## 1.1 Overall Site Description

The Northside Generating Station (NGS) is located North of downtown Jacksonville on 4377 Heckscher Drive, Jacksonville, FL 32226, in Duval County. JEA's NGS has four GE 7B combustion turbines (CT's) (Units N33, N34, N35, and N36) that have been in service since 1974 and operate with legacy Calvert / GE Non-Segregated phase bus systems. These units operate at 13.8kV with a bus rating of 3000A.

## 1.2 Contractor's Scope of Work

This scope of work includes inspecting, cleaning, and refurbishment of the GE 7B "N35" non-segregated phase bus system components identified in this Scope of Work, and making repair recommendations for any as-found out of scope work items. The bus system includes the nonsegregated phase bus (Nonseg) located on top of the turning gear compartment (enclosure section) as well as the switchgear compartment and exciter compartment at the bus termination points indicated in this specification. JEA is requesting a turnkey proposal for all labor, equipment, materials and incidentals to complete the scope of work detailed below. The Contractor is to verify all quantities related to this project. This includes but not limited to all LF of bus refurbishment, bolting, hardware, insulators and connection points. JEA will provide crane support for only the bus duct enclosure section removal, placement on stands for the initial Contractor's inspection, load/offload transport for offsite refurbishment and re-installation. Daily meetings with the Contractor shall be completed with the JEA PM and/or Engineer to go over any safety issues, discovery work, project status, and project schedule.

Electrical Testing – The bus was designed by Calvert Circa 1970. It is a 3 phase, 13.8kV, 60Hz, 3kA bus system.

- The three phase system inside of the switchgear compartment is approximately **33** feet in length with most sections having 2 bars per phase, making this approximately **170** feet of bus.
- The Nonseg section is to be visually inspected after **an initial 5kV megger**. The megger (**MIT515 or equivalent**) used by the contractor shall be able to measure in the Giga-Ohm magnitude. The megger plan shall be prepared by the contractor and shared with the JEA PM for approval prior to testing.
- All measurements will be shared with the JEA PM and are to be included in the final report.
- While each phase is under test, both phases not under test shall be grounded.
- A DLRO tester shall be used to verify the resistance across the bolted connections **as-left**.
- Both ends of each busbar, flex links, and PTs shall be disconnected from the bus bar to conduct the DLRO to guarantee that there are no additional impedances effecting test data.
- Electrical testing results will be used to verify the bus is suitable for service.
- DLRO measurements in theory, should be within 2% of each other. The megger results could be higher or lower at the beginning or end of the work, depending on humidity.
- A **final 5kV megger** will be performed **prior to making final termination connections**.
- A final 24 kV hi-pot shall be performed on the system as JEA does not have a BIL for the system.
- Either the JEA Engineer or PM shall be present for all electrical testing.
- It is JEA's standard procedure for the bus to be grounded with spider grounds in the transformer CT cabinet during outages. If this is inadequate for the Contractor, a grounding isolation plan specific to this scope of work shall be agree upon prior to the mobilization.
- Contractor to provide a testing schedule to satisfy the scope of work.

## Nonsegregated (Nonseg) Phase Bus System Refurbishment –

The N35 bus system refurbishment will include the Nonseg bus duct which connects the switchgear, collector, and excitation enclosures, through the roof of the switchgear, to the generator terminals, and to the excitation enclosure roof. Cable terminations for the station service transformer in the CT and breaker compartments will be disconnected. Cable terminations to the bus in the PT compartment will also be disconnected. The breaker will be in the open position. On the line side of the breaker, there is a horizontal run of busbar to the rear of the breaker compartment, and this is where the switchgear bus bolts to the non-seg that is flown off and staged on scaffolding. The horizontal bar located right above the PPT transformer in the excitation enclosure, will be the boundary for refurbishment inside of the exciter enclosure. The Nonseg bus enclosure will be craned off and staged on the ground for the Contractor to inspect and test with a 5kV megger. The Nonseg enclosure shall be inspected by removing covers and or with a borescope to document deficiencies communicated with the JEA PM and Engineer. After the visual inspection and cleaning is complete, electrical isolation will be re-verified between the generator, the Nonseg, GSU & Station Service transformers and PTs in the center cabinet inside the switchgear. The **initial 5kV megger** will be conducted to have an as-found resistance recorded and to see if there are any points of electrical tracking.

All seals, insulators, bushings, capacitors, surge arrestors, bus, and connections shall be visually inspected and cleaned. It is expected that any existing damage, corrosion or any other issue(s) that might affect unit reliability be brought to the attention of the PM and/or Engineer immediately.

General scope for enclosure refurbishment is below:

- Ship non-seg enclosure on truck to shop for refurbishment
- Remove bolted covers and unload the conductor from the non-seg enclosure
- Remove the 2" 33 tape and Noryl sleeve insulation from all conductors
- Clean and silver plate the conductor ends – 6" X 4" – all six bar segments
- Insulate the conductors with powder coated epoxy **or** 20kV Insulboot, 3M or Raychem heat shrink
- Remove the fiberglass support GPO blocks
- Build new top cover aluminum sheet metal including new cover joiner channels, overlapping the vertical panels to prevent water intrusion
- Hi-pot all the insulators in the bus to 24kV
- Replace all hardware with 316SS
- Clean the enclosure by sandblasting and or buffing with a soft wheel
- Strip and repaint bus enclosure completely inside and outside with two-part epoxy paint (Federal Standard Color No. 14491 – Green)
- Re-install and functionally test existing bus duct strip heaters
- Re-assemble the conductor in the enclosure with insulators and GPO blocks, re-seal with insulative varnish
- Ship back to site
- Install bus and bolt to generator, switchgear, and exciter. JEA will provide crane support.

Any out-of-scope work found during the inspection shall be discussed in detail with the JEA PM and Engineer prior to commencing any repairs. All bolts shall be torqued to the manufacturer's specification and shall be agreed upon by the JEA PM or Engineer. The existing drawings shall be printed out and red-lined for JEA to create as-built drawings to document any repairs. The redlines shall include the Numbering Convention for Hardware – location and name/description/dimension of each connector, insulator, welded joint, flex link, and conductor.

The PM and/or Engineer shall give permission to start the final 5kV Megger once bus repairs are complete. If the electrical test results show that the bus is ready to be put back in service, the remaining links shall be installed above the breaker, and the access points shall be properly closed. If there are questionable results, it will be expected to isolate the problem area and correct the issue before the job is complete. All testing shall be done with either the PM and/or Engineer present.

### Bolted Connections -

- Approximately sixty locations with bolted connections have been wrapped with alpha tape and duct seal has been used as a filler material around the bolted connections. This filler material will be removed and cleaned with denatured alcohol.
- The bolted connections shall be wrapped with copper or aluminum mesh and then, with 3M 130C electrical tape stretching from black to gray, two full laps overlapping one half, and then wrapped with 33 two full laps and overlapping one half lap.
- All removed hardware will be replaced with new.

Equipment List – The equipment list is intended to be a partial list with special notes on the scope of work. It is not intended to provide an exhaustive list.

1. Access hatches and gaskets - All access panels (12) are to be removed. The panels will be placed back into position at the end of each day, shift or in the event of expected precipitation. This is to prevent wildlife from taking shelter inside of the switchgear and to prevent foreign material from entering the system. Each panel shall be labeled top or bottom with an identifying letter for phase and an identifying number per location. The Numbering Convention for Hardware shall be discussed and agreed upon with the JEA PM and/or Engineer prior to any work.

It is considered critical by JEA that the access panels and all associated hardware go back into the exact position and orientation that they were found in. This will mitigate pieces not fitting together correctly saving time and money. All hardware will be replaced with 316 stainless steel supplied by the contractor and verified with neodymium magnet with PM present.

2. Porcelain – The insulators (12), bushings (28), lightning arrestors (3), capacitors (3), and any other porcelain shall be wiped down with a microfiber cloth and denatured alcohol applied to the rag first and then wiped on the porcelain. The denatured alcohol will dry out existing cable insulation and make it brittle as it is hygroscopic. The Contractor shall find any damage using a bore scope and/or a camera. Each insulator shall be assigned nomenclature per the Numbering Convention for Hardware and referred to as such in photos for as-found and as-left reporting.
3. Nonseg Bus – The current carrying conductors are wrapped aluminum bar that has a red Noryl type plastic insulation. In certain places, the Noryl is cracking and flaking. This electrical bus and the inside of the surrounding enclosure is to be thoroughly cleaned using lint free rags, foxtail brooms, microfiber rags, and or vacuum cleaners to remove all foreign matter where accessible from the access hatches. The bolted connections are wrapped with duct seal and tape. This shall be removed and restored with aluminum mesh and 130C and 33.
4. Grounding Connections – All Ground connections shall be checked and torqued.
5. 13.8 kV Connections – All electrical bolted connections in the switchgear enclosure are silver plated aluminum. The plating shall be completed offsite at a qualified plater such as, Accurate Precision Plating in Houston, Process Engineering Company in Pearl Mississippi, or Monti Inc in Greenwood South Carolina. The finished plated surface should appear to be a homogenous layer of semi polished silver such as by using ASTM B700 Type 1, Grade B as the standard or JEA approved equivalent. The new silver shall overlap the location of electrical conductivity (bolted surface contact area) no more than half an inch to minimize cost. The process by which the silver is applied shall be by submersion and not brushed to yield a shiny metallic finish and to have a uniform appearance of quality surface finish. The company used to perform the plating shall be approved by the JEA Engineer and or Project Manager.  
There are approximately 75 pieces of bus bar inside of the switchgear, all of which are less than five feet long, and most of which are less than four feet long. Most of the bar is 6" X 0.5".  
The bars inside of the non-seg that is craned off the enclosures is 6" X 0.5", two per phase, and is welded together, there are no bolts.  
There are copper bars inside of the excitation enclosure that terminate to the Non-Seg. This point of contact will be the last location to silver plate and the rest of the excitation system is outside of this scope of work.

6. New Insulation - Shall be powder coated fluidized epoxy on the copper/aluminum bars **or** 20kV Insulboot, 3M or Raychem heat shrink. Special care shall be taken not to overlap the epoxy or shrink on top of a conducting surface of the bars. Overlapping bus bars shall be marked up and indexed on a document before disassembly for the purpose of being able to reconstruct the bus in the exact configuration that it was in before disassembly. This means that each bar shall go back in the exact location and orientation that it was removed from.
7. Torque All Bolts – After inspection and upon reassembly, all bolts that are used for the 13.8 kV electrical connections will be re-torqued to manufacturer recommendations. All bolts shall be checked for proper torque. All conical washers and hardware to be replaced with 316 stainless steel. In the absence of any manufacture recommendations:

5/8" 55Ft-lbs  
1/2" 45Ft-lbs

8. Grounding – The enclosure of the switchgear has one bolted ground that shall be torqued.
9. Cleaning – All insulators, bushings and connections shall be wiped down and cleaned to remove all FME (foreign material). The inside of the bus duct that can be reached by hand and with vacuums from the access hatches shall also be cleaned. Sufficient cleanliness shall be defined as the inability to wipe dust or debris off a surface before any access point is closed.

For the final cleaning, the contractor shall supply and use the following product to wipe down the insulators and bushings:

- Denatured Alcohol

10. Welding – It shall be expected that the Contractor has welded bus and bus duct in the past and currently has an established procedure in place to safely perform the welds. The Contractor shall possess the AWS D1.2/D1.2M certification for welding aluminum and provide the certificate and resume belonging to the employee who would do the work.
11. Electrical work such as connections for heaters and/or fabricated connections for temporary lighting circuits or any other electrical job shall be performed by a licensed journeyman electrician.

Preliminary Reports – During the cleaning and initial inspection, the contractor shall keep JEA informed of any damaged equipment and repair processes.

Material Certifications – shall be provided for all repairs and replacement parts

Final Report – The contractor shall prepare a final written report that includes a copy of the photos and picture log. The pictures shall include typical insulators as found, all cleaned insulators and all equipment identified as having flaws before and after. This report shall have all electrical testing results, a detailed redlined drawing that references repairs, insulators and bolted connections.

Extra work – It is anticipated that repair work will be necessary. The contractor shall provide unit costs for each of the following items:

1. Clean electrical connections (6 inch by 3 inch X 6 – 108 square inches) with denatured alcohol. This is three phases in one location, both sides of the connection.
2. Silver plating of copper/aluminum connections (6 inch by 3 inch X 6 – 108 square inches)
3. Silver plating of copper/aluminum electrical connections. (6 inch by 4 inch X 6 – 144 square inches)
4. Replace damaged or missing 13.8kV connections – three half inch bolts, two Belleville's, two flats and nuts 1/2" (316 SS, **not** 304).
5. Replace cracked or damaged insulator – typical 15kV Meister.
6. Replace insulator hardware.

### 1.3 Site Conditions

The Contractor acknowledges that it has investigated prior to bidding and satisfied itself as to the conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, roads, or storage areas. The Contractor is to verify all quantities related to this project. This includes but not limited to all LF of bus refurbishment, bolting, hardware, insulators and connection points. Any failure by the Contractor to acquaint itself with the available information will not relieve them from responsibility for estimating properly the difficulty or cost of successfully performing the scope of work. JEA assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by JEA. Site parking will be available on the property in an area designated by the JEA PM. Site access will be available 7 days per week. Site water and power are available for cleaning. Contractor must provide their own telephone services, office spaces and/or portable restroom facilities. Any staging areas or work areas that are required to be created due to the existing conditions are the responsibility of the Bidder. Access to work areas may require ladders or JEA provided scaffolding. The scaffolding will be staged per the contractor's direction one week before the start of the project.

### 1.4 Safety, Health, and Accident Prevention

Contractor shall take all JEA required Contractor Safety and Site Specific Safety Training. These are two separate power point presentations. The Contractor Safety Training is expected to be completed off site prior to starting work and can be reviewed with the JEA PM prior to starting onsite work to address any questions.

All JEA contractors, and their subcontractors performing safety sensitive work on our projects will adhere to our safety practices and guidelines. All personnel on JEA projects are expected to follow these practices to ensure their personal safety as well as the safety to other onsite personnel or in the nearby community.

Contractors must be safety qualified **before** their bid will be accepted for this scope of work. **Safety qualification is necessary** for contractors and subcontractors for this project.

JEA Safety Qualification information can be found by going to:

[https://www.jea.com/About/Procurement/Contractor\\_Safety/Qualification\\_Requirements/](https://www.jea.com/About/Procurement/Contractor_Safety/Qualification_Requirements/)

Each accessible location where it is possible for physical contact with the bus, shall be either manned with an employee, or protected with red danger tape and a barricade information tag that states the hazard information and the Contractor shall be in constant communication with the testing engineer.

The Contractor shall walk down the clearance with the PM to gain an understanding of JEA's Lock Out Tag Out (LOTO) and to ensure safety prior to starting work.

The bus shall be grounded with spider grounds in the transformer CT cabinet.

### 1.5 Forced Shutdown

JEA reserves the right to shut down the activities at no additional cost to JEA due to one or more of the following conditions:

- Potential safety concerns due to the Contractor
- The need to terminate or re-schedule the unit outage at anytime

### 1.6 Site Security

Site security is provided by JEA on a 24 hour, 7day per week basis. All contractor employees will pass thru security and vehicle inspections may occur.

## 1.7 Schedule

This work is to be performed in parallel with a separate project, the upcoming N35 Major Inspection Project from **3/1/26 – 4/29/26**. Typically, the Major Inspection Contractor can have the Non-seg bus enclosure removed and staged on stands for the Bus Contractor to inspect within one week. Due to discovery work during the Major Inspection, it is anticipated that the reassembly schedule will have a potential to be delayed. The Bus Contractor is to coordinate with the JEA PM regarding final reassembly schedule and make necessary schedule adjustments as needed.

The Contractor shall not commence any work until a notice to proceed is received. A project schedule for this Contract shall be prepared and maintained by the Contractor to provide coordination, to establish the basis for measuring and monitoring Contractor progress and to detect problems for the purpose of taking corrective action. Contractor shall provide JEA with daily updates. These updates shall include the following:

- Current status of the job progress
- Two Week Look-Ahead Schedule
- Report the planned and actual progress of the current day
- Report the planned work that is to be accomplished during the following day
- Changes in the Work Schedule
- Safety and Quality Control issues
- Problem areas or concerns

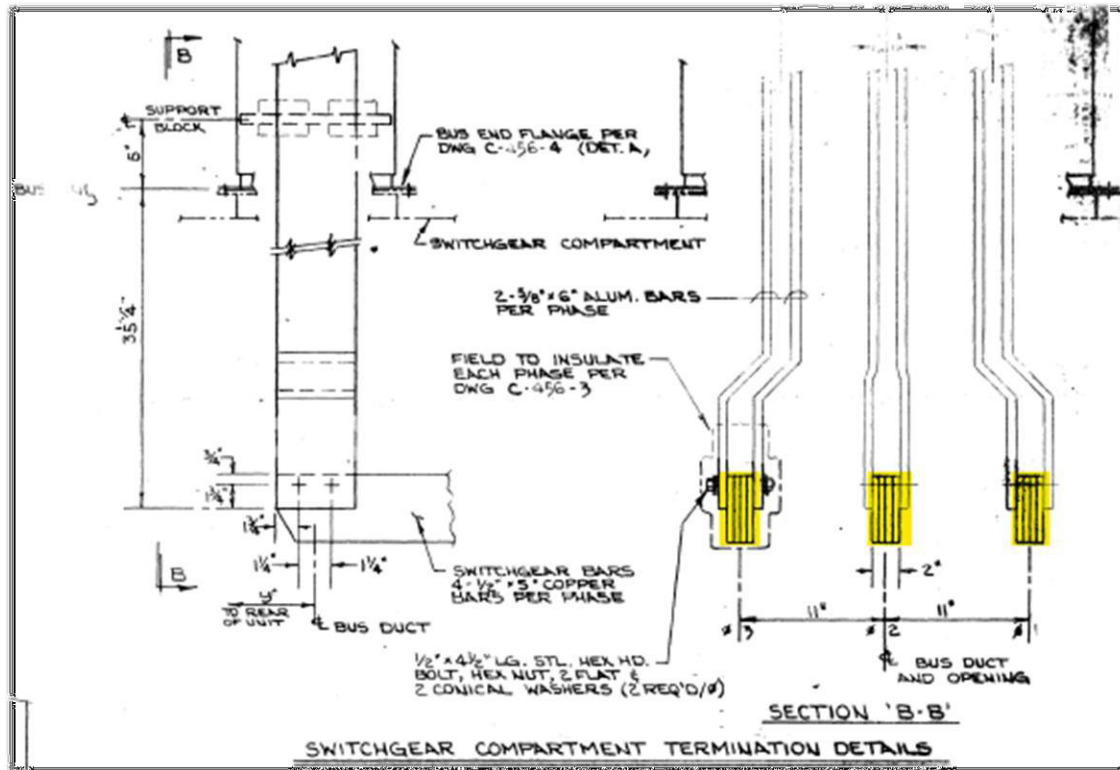
## 1.8 Minimum Qualifications

- Each Bus Duct Contractor Employee Shall have three (3) previous job experiences with Isolated Phase Bus Work within the past 3 years.
- Three previous similar projects valued at \$100,000 or more with reference phone numbers and email addresses. A similar project is defined as an industrial three phase bus refurbishment greater than 11 kV.
- Resumes shall be provided for each employee.
- Welder Resume required to have D1.2 Aluminum certification.
- Any previous work done for JEA shall qualify as a reference regardless of project value.

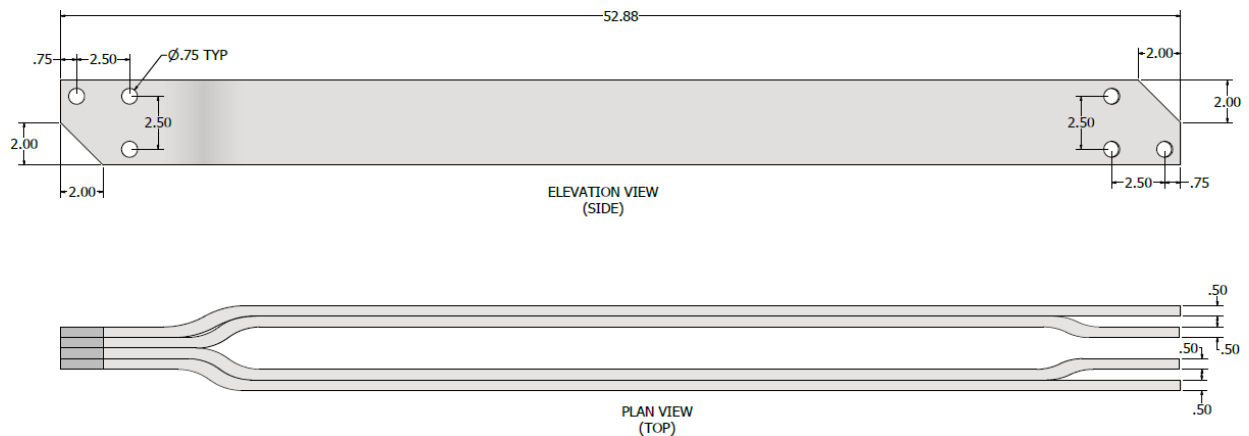
## 1.9 Codes and Standards used for Engineering and or Maintenance decisions:

- C37.23-2015 – IEEE Standard for Metal-Enclosed Bus (24kV as Hi-pot in absence of BIL).
- NEC 2023 Article 368
- NEC 2023 Article 424.66 & 110.26





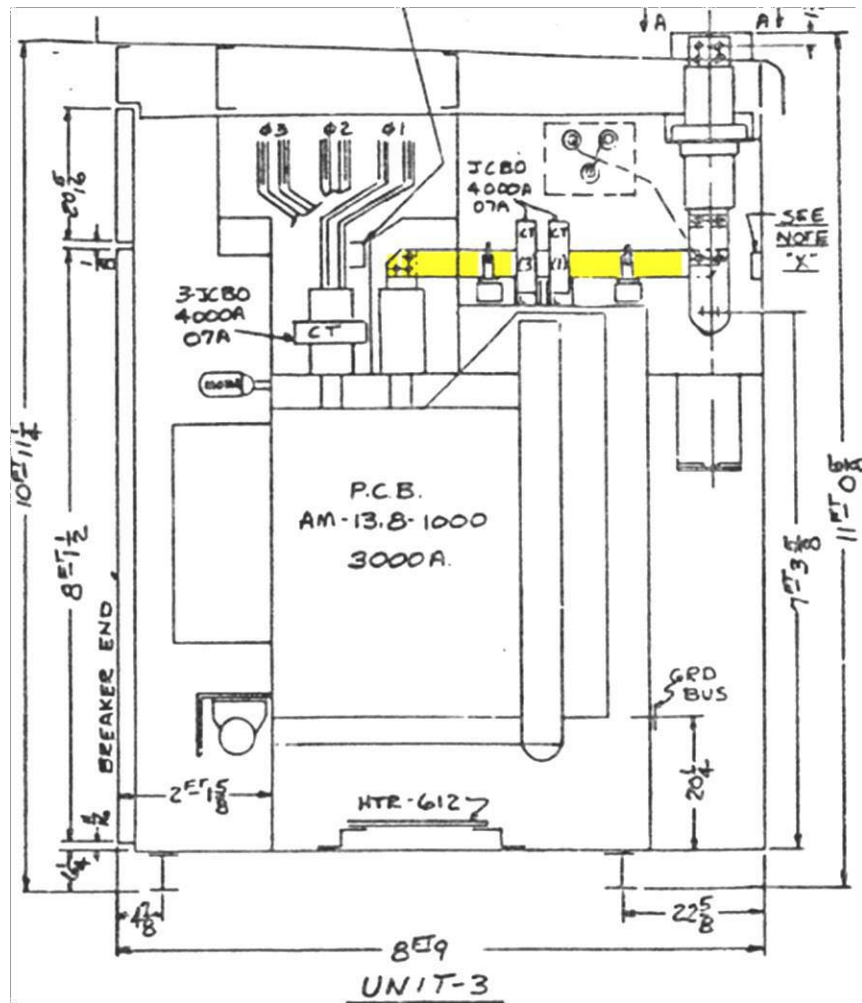
View of Non-Segregated Phase Bus above Main Breaker.



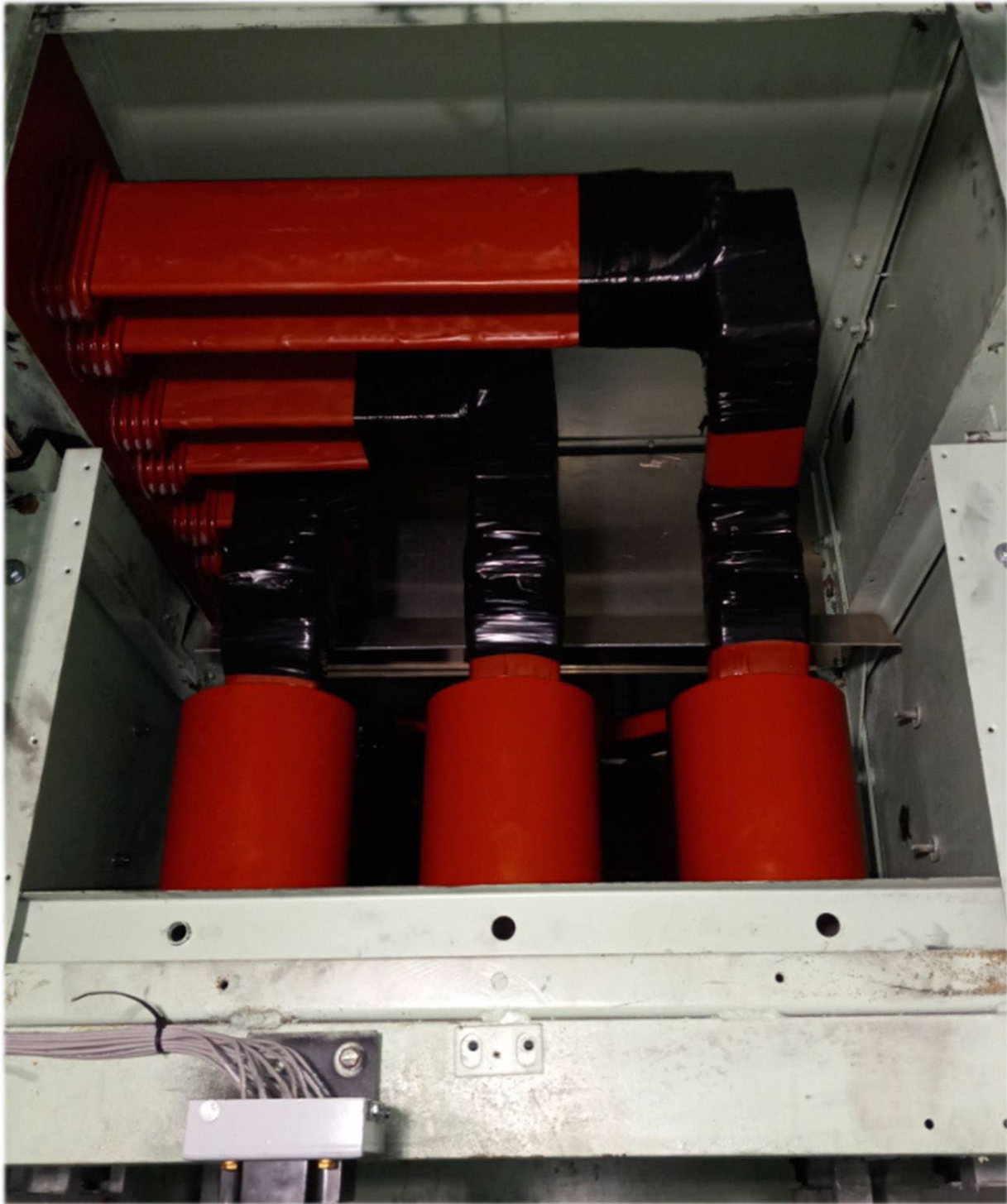
Drawing of North phase above breaker.



**CT6 View of Bus Bar above Breaker. Looking East.  
Six Stainless Steel Hex Head Bolt, 1/2"-13  
Thread Size, 5"**



**Drawing of Breaker Compartment. Viewing from North to South.**

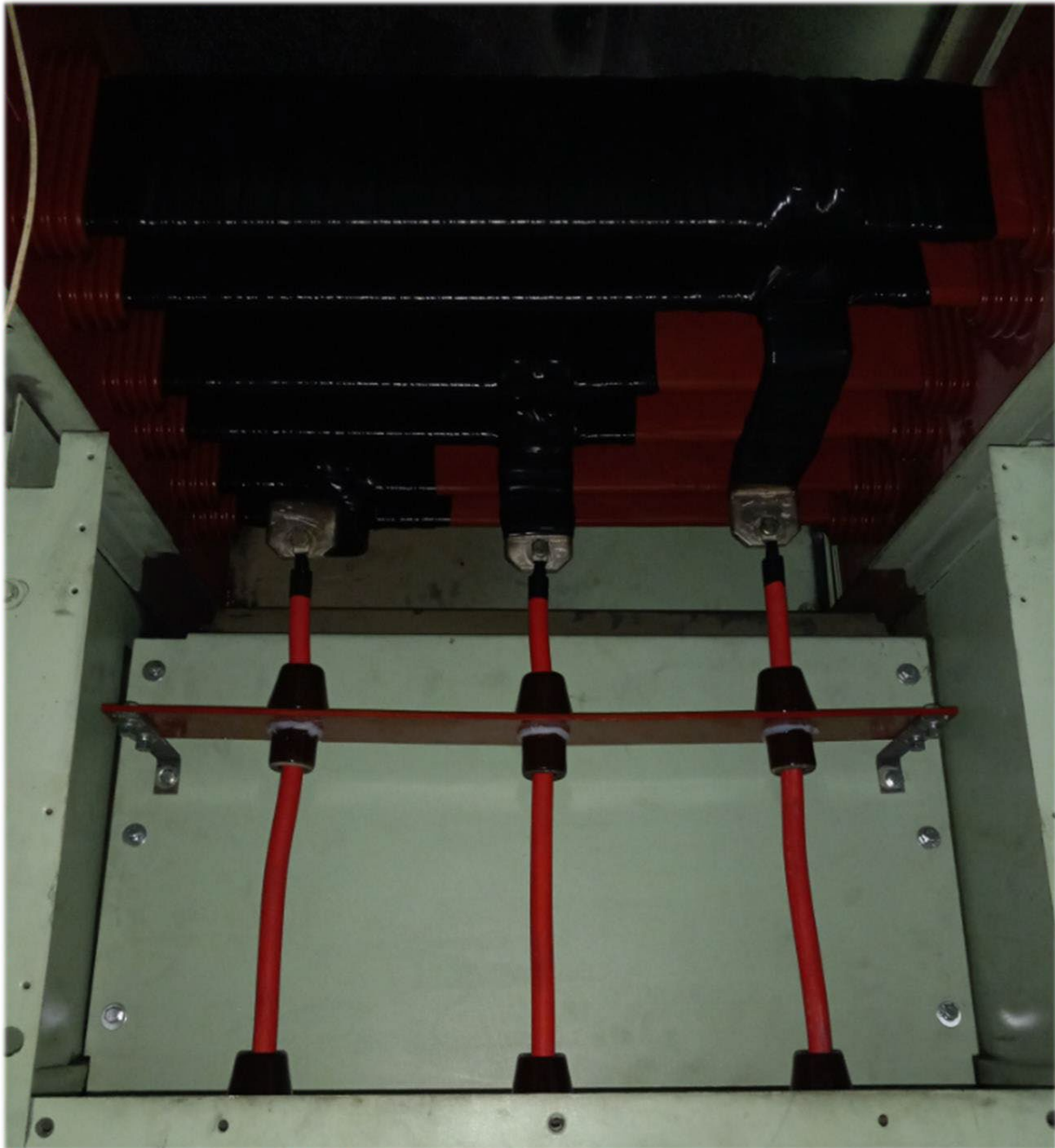


**Breaker Compartment from Inside of CT3's Refurbished Switchgear.  
12 Stainless Steel Hex Head Bolt, 5/8"-11  
Thread Size, 5-1/2"**





**Breaker Compartment Inside of CT3's Refurbished Switchgear.  
Bus Bars Connect to Bottles above  
Breaker. Stainless Steel Hex Head Bolt,  
1/2"-13  
Thread Size, 2-1/2" Qty: 12 - (Note: Two of the bars above only have two holes per end.)**



**PT Compartment from Inside CT3's Refurbished Switchgear.**



**PT Compartment from Inside CT3's Refurbished Switchgear Showing Bolting.  
Bus Bar Connections: Stainless Steel Hex Head Bolt, 1/2"-13 Thread Size, 2-1/2"  
PT Connections: Stainless Steel Hex Head Bolt, 1/2"-13 Thread Size, 1"**





Leaving Transformer CT Compartment going to CT3's Refurbished PT Compartment.  
Stainless Steel Hex Head Bolt, 1/2"-13 Thread Size, 2-1/4"

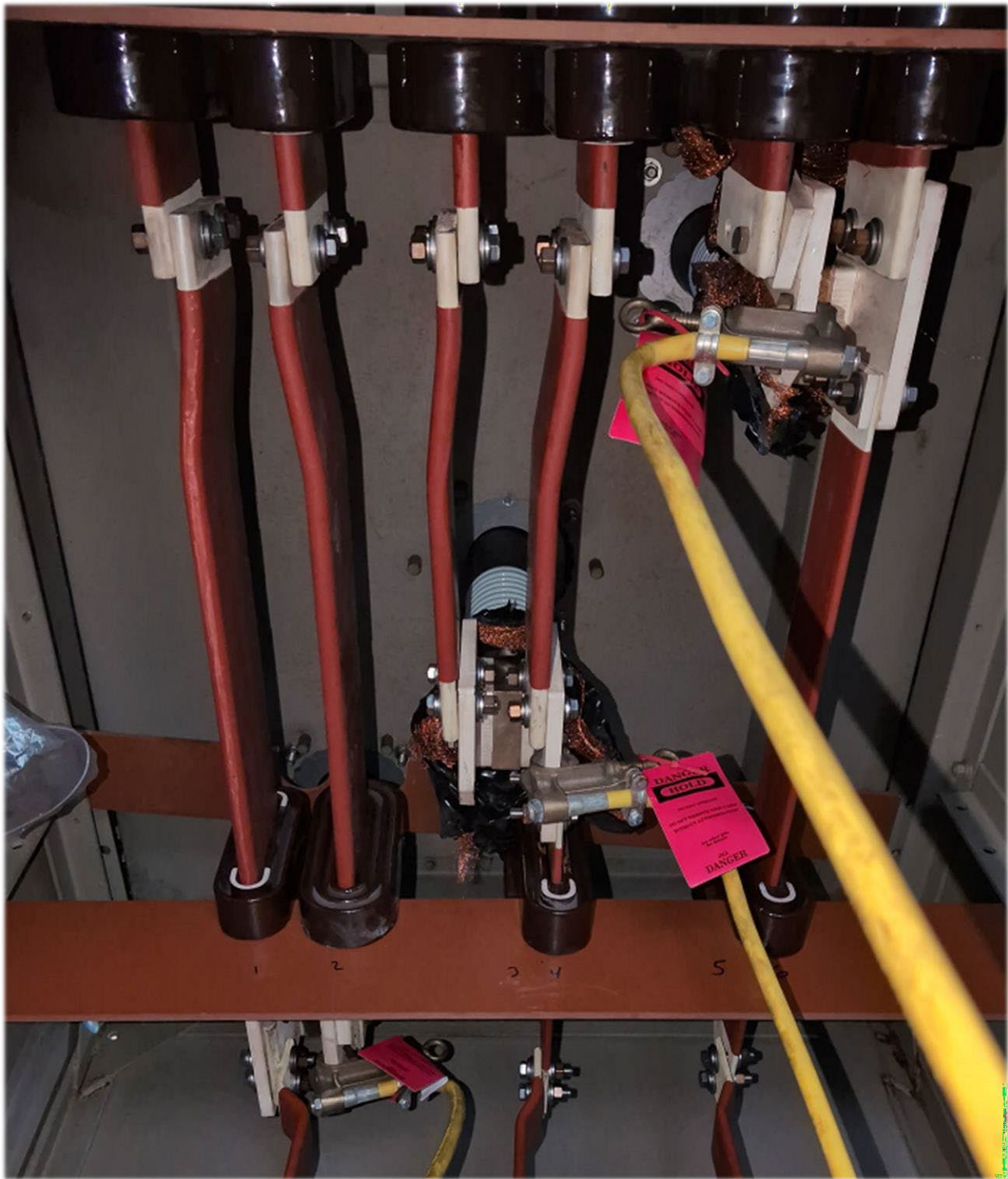




Leaving Transformer CT Compartment going to CT6's Refurbished PT Compartment.



**Transformer CT Compartment from Inside Switchgear.**



**Transformer CT Compartment from Inside Switchgear Showing Bolting at Bushings  
Stainless Steel Hex Head Bolt, 1/2"-13 Thread Size, 2-1/4"**





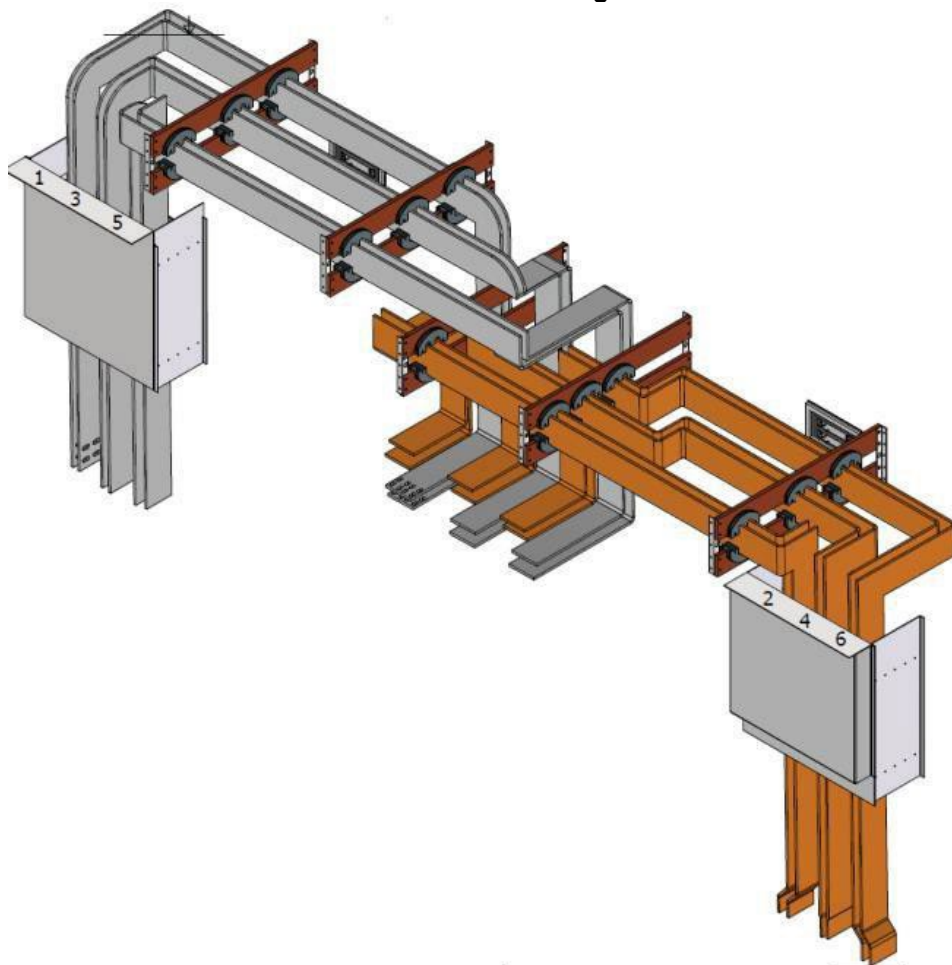
**Transformer CT Compartment from Inside Switchgear.**



**Bus Bar Below CT's Without Insulation Showing Bolting.  
Stainless Steel Hex Head Bolt, 1/2"-13 Thread Size, 2-1/4"  
Stainless Steel Hex Head Screw, 1/2"-13 Thread Size, 1" Qty:18 Attaches the bars to the insulators**



**CT6 Calvert Nonseg.**

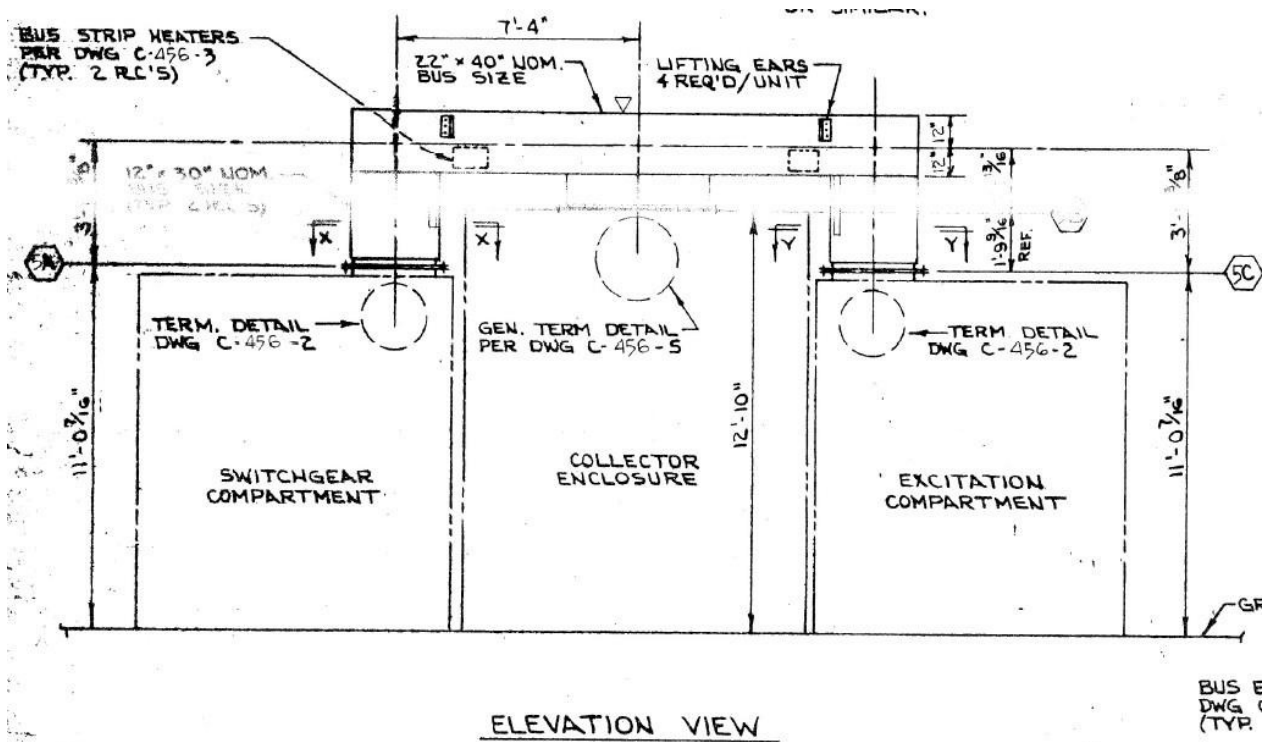


**Concept Drawing of Calvert Nonseg.**

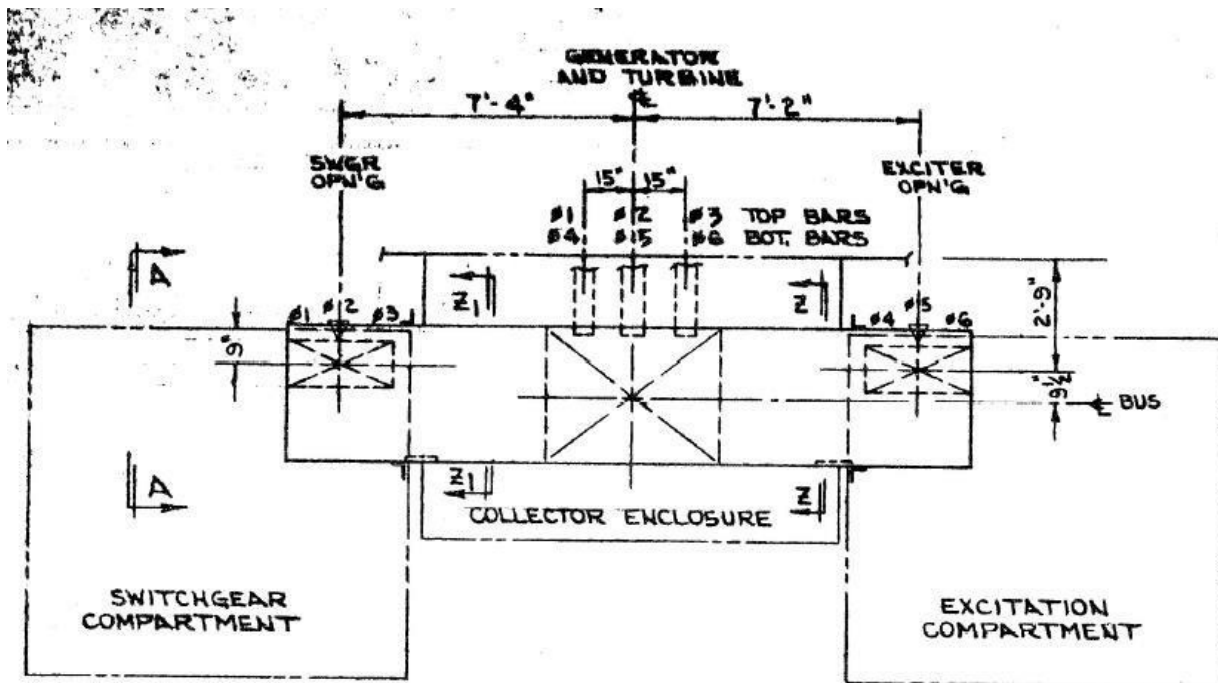




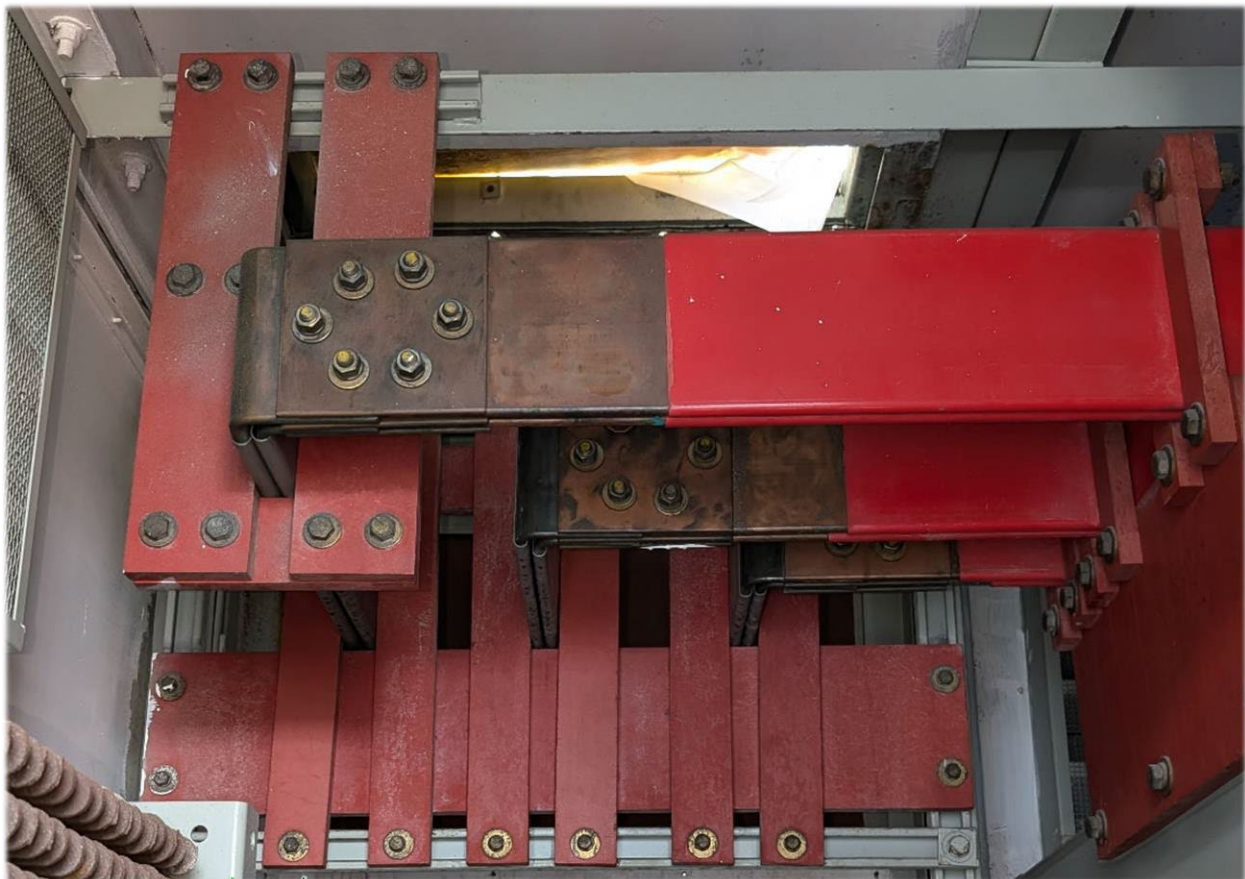
13.8 Switchgear on Left, Non-Seg Above Gen Removed, Excitation on Right.



Calvert Elevation View DWG. JEA Control Number 008789



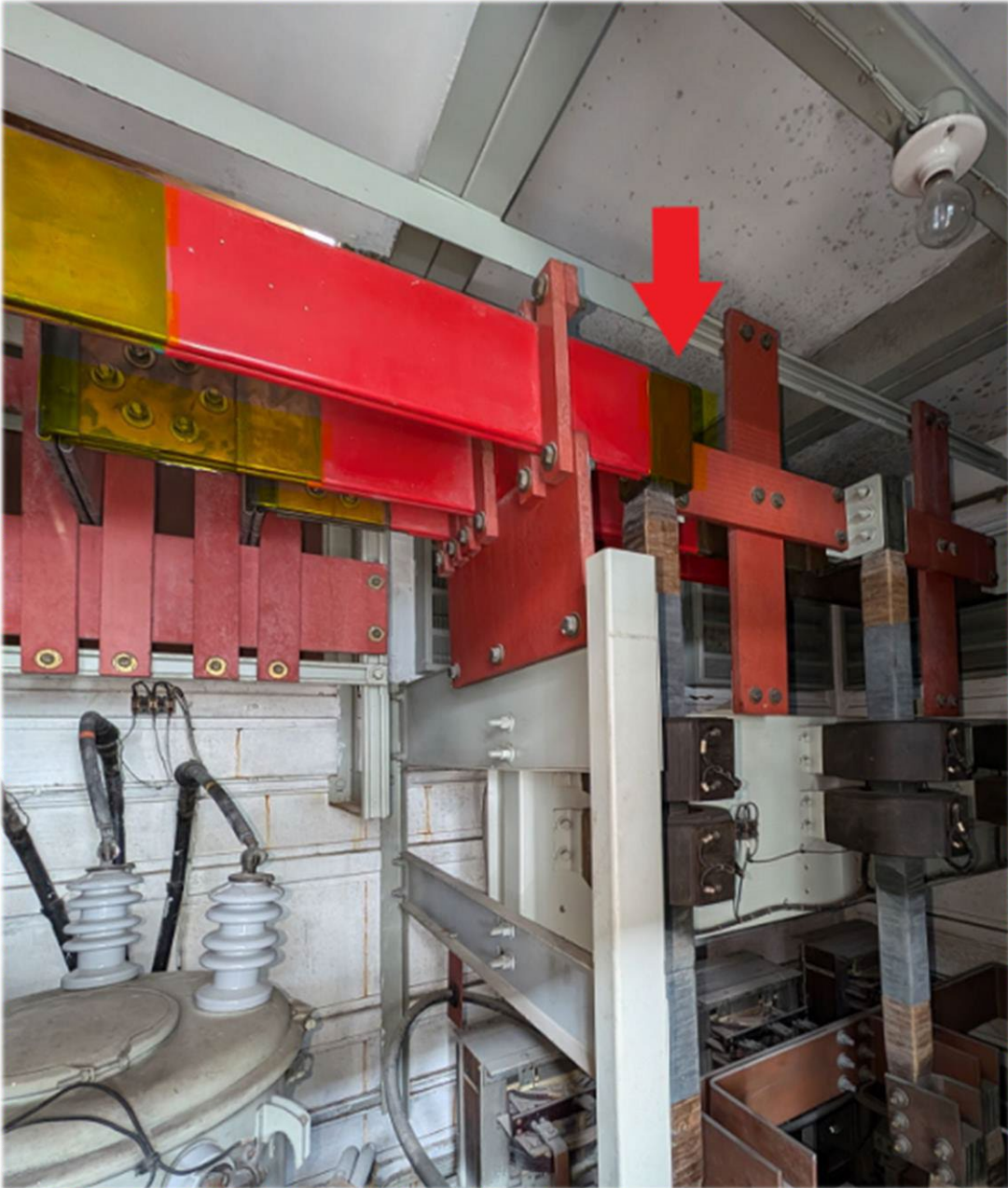
Calvert Plan View DWG. JEA Control Number 008789



Excitation Compartment and Boundary for Inspection of Silver Plating. Stainless Steel Hex Head Bolt, 1/2"-13 Thread Size, 2-1/2" Qty: 18



### Excitation Compartment.



- The Boundary for inspection and Silver Plating shall be the horizontal run to the right above the EX System (shown above).