COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

Electronic Application Of Kentucky Power Company	)	
For A Certificate Of Public Convenience And	)	
Necessity To Replace and Upgrade Portions of the	)	Case No. 2024-00343
Bellefonte Station In Boyd County, Kentucky	)	
(Bellefonte Station Upgrade Project)	)	

Application

Kentucky Power Company ("Kentucky Power" or the "Company") respectfully moves the Public Service Commission of Kentucky (the "Commission") pursuant to KRS 278.020(1), 807 KAR 5:001, Section 15, and all other applicable statutes and regulations for a Certificate of Public Convenience and Necessity to be issued **on or before February 13, 2025**, authorizing Kentucky Power to replace and upgrade portions of the Bellefonte Station in Boyd County, Kentucky, as described in more detail in this Application (the "Bellefonte Station Upgrade Project" or the "Project").

The Project at Bellefonte Station addresses both Baseline and Supplemental needs. Specifically, the Baseline scope of work will replace overloaded risers on Transformer #3 and six overdutied 69 kV circuit breakers at the Bellefonte Station. The Supplemental scope of work will address the remaining asset equipment condition, performance, and risk concerns on Transformer #2, the two remaining 69 kV circuit breakers, and Station reconfiguration and retirement.

Kentucky Power's compliance with the requirements of 807 KAR 5:001, Section 14, and 807 KAR 5:001, Section 15 is detailed in **EXHIBIT 1** to the Application.

Kentucky Power states in support of its application:

Applicant

1. Kentucky Power is a corporation organized on July 21, 1919 under the laws of the Commonwealth of Kentucky. The Company currently is in good standing in Kentucky.[1]

2. The post office address of Kentucky Power is 1645 Winchester Avenue, Ashland, Kentucky 41101. The Company's electronic mail address is kentucky_regulatory_services@aep.com.

3. Kentucky Power is engaged in the generation, purchase, transmission, distribution and sale of electric power. Kentucky Power serves approximately 164,000 customers in the following 20 counties of eastern Kentucky: Boyd, Breathitt, Carter, Clay, Elliott, Floyd, Greenup, Johnson, Knott, Lawrence, Leslie, Letcher, Lewis, Magoffin, Martin, Morgan, Owsley, Perry, Pike, and Rowan. Kentucky Power also supplies electric power at wholesale to other utilities and municipalities in Kentucky for resale. Kentucky Power is a utility as that term is defined in KRS 278.010.

4. Kentucky Power is a wholly owned subsidiary of American Electric Power Company, Inc. ("AEP"). AEP is a multi-state public utility holding company that includes utilities providing electric service to customers in parts of eleven states: Arkansas, Indiana, Kentucky, Louisiana, Michigan, Ohio, Oklahoma, Tennessee, Texas, Virginia, and West Virginia.

Background

5. The Project is located northwest of Ashland in Boyd County, Kentucky, with the exception of a nominal amount of remote end work to be performed in certain stations located in

[1] A certified copy of the Company's Articles of Incorporation and all amendments thereto was attached to the Joint Application in *In the Matter Of: The Joint Application Of Kentucky Power Company, American Electric Power Company, Inc. And Central And South West Corporation Regarding A Proposed Merger*, P.S.C. Case No. 99-149. The Company's November 14, 2024 Certificate of Existence is filed as **EXHIBIT 2** of this Application.

other counties in Kentucky and Ohio. The upgrade and replacement work associated with the Project will be performed entirely within Kentucky Power's existing right-of-way. The majority of the Project will be performed within the Bellefonte Station itself. The Project also includes a small portion of transmission line relocation outside the Station and limited remote end work at other stations.

6. The Bellefonte Station, originally built in 1954, consists of two yards: a 34.5kV yard and a shared 138/69kV yard. The 138/69kV yard is in a narrow, constrained space between U.S. Highway 23 and a large non-operational industrial complex adjacent to the Ohio River. The 138/69kV station is located in the load center related to the area's surrounding commercial and residential development and the large industrial facilities. It is a major hub with 12 transmission lines (one of which is no longer in operation), five power transformers, and four distribution circuits, and is a major source into the 69kV network that serves the northern part of AEP's service territory in Kentucky.

7. The 34.5kV yard's original purpose was to serve the blast furnace facility that was previously located adjacent to the site, but which is no longer in operation; for this reason, the 34.5kV yard facilities are proposed to be retired as part of the Project.

8. The Bellefonte Station currently serves two industrial customers and 3,570 distribution customers. The industrial customers served from transmission have a peak load of approximately 26.9 MW. The distribution customers served from Bellefonte Station have a peak load of approximately 17.5 MW.

9. Six of the 69 kV circuit breakers at the Station are overdutied for the fault current rating, meaning that the available fault current at the Station could exceed the breaker's

capabilities under certain fault conditions. This could result in a premature failure of the breaker, which puts other equipment and potential employees at the Station at risk of damage or failure.

10. The Station's 69kV underground power cables' ampacity also does not meet the necessary electric current rating requirements. Further, the current Station design is complex and tightly compact after many years of additions, which makes maintenance and any construction in its current configuration more difficult, expensive, and complex.

The Proposed Project

A. Project Baseline Components

11. The Project consists of the following Baseline components:

(a) Replace six 69kV breakers;

(b) Replace 69kV risers between Transformer #3 and the 69 kV bus #2; and

(c) Perform associated station remote end work at the Coalton Station, located in Kentucky, and the Pleasant Street Station, located in Ohio, to facilitate the upgrades at Bellefonte Station.

B. Project Supplemental Components

12. The Project consists of the following Supplemental components:

(a) Retire Transformer #1 and Transformer #5, and replacing Transformer #2;

(b) Replace two 69kV breakers;

(c) Install one 138kV circuit switcher;

(d) Replace underground cables with new overhead bus ties;

(e) Relocate the 69kV capacitor bank and upgrading the capacitor bank switcher to a capacitor bank breaker;

(f) Retire the 34kV yard and its supporting equipment, which includes two power transformers and the bus tie lines between the yards;

(g) Expand the 138/69kV yard by approximately 300 x 30 feet;

(h) Replace relays and two control buildings with a single Drop-In-Control Module ("DICM") in the expanded 138/69kV yard;

(i) Install two power potential transformers at Bellefonte Station; and

(j) Perform associated station remote end work at Raceland Station, located in Kentucky, to facilitate the upgrades at Bellefonte Station.

13. A list of the components of the Proposed Project and descriptions of their respective purposes is included as **EXHIBIT 3**.

14. The components of the Proposed Project described above are illustrated on a map in **EXHIBIT 4.**

15. Plans and specifications for each component of the Proposed Project are included as **EXHIBIT 5**.

C. Need for the Project

16. Generally, six of the circuit breakers at the Station are overdutied for the fault current rating, meaning that the available fault current at the station could exceed the breaker's capabilities under certain fault conditions. This could result in a premature failure of the breaker, which puts other equipment and potential employees at the Station at risk of damage or failure. Additionally, the Station's 69kV underground power cables' ampacity does not meet the necessary electric current rating requirements. The equipment is largely pre-1980's vintage and there are asset health concerns related to reliability. Further, the current Station design is

complex and tightly compact after many years of additions, which makes maintenance and any construction in its current configuration more difficult, expensive, and complex.

17. The Baseline needs will be addressed by replacing the overloaded and overdutied equipment. The risers on 138/69kV Transformer #3 are overloaded to 101%. The Project will increase the rating of the risers. The 69kV circuit breakers C, G, I, Z, AB, and JJ are overdutied to 115%. The Project will replace these circuit breakers with 40 kA circuit breakers.

18. The Supplemental equipment condition needs will be addressed by replacing 69kV circuit breakers H and T. The 138/69kV Transformer #2 will be replaced and a 138kV circuit switcher will be installed. The 69kV line to Raceland will be relocated from 69kV bus #2 to 69kV bus #1 and the 69kV capacitor bank KK will be moved from the Raceland line to 69kV bus #1. The 34.5 kV yard and equipment will be retired since it no longer serves any customers. This includes 138/34.5kV Transformer #5 and #1, and 34.5kV circuit breakers E, K, M, and F.

19. Company Witnesses Daniel T. Barr and Nicolas C. Koehler further describe the need for each of the Baseline and Supplemental components of the Project.

Electrical Alternatives Evaluated

A. Description of Project Alternative

20. The Company considered and rejected a more costly project alternative that would have resulted in wasteful duplication ("Project Alternative"). The Project Alternative would generally consist of building a completely new 69kV station as compared to the Proposed Project, which uses existing 69kV facilities.

21. Specifically, the Project Alternative would consist of rebuilding and relocating the existing Bellefonte 69kV Station facilities and seven existing transmission lines, plus two transformer feeds to the existing Bellefonte Station 34kV yard located to the north-west of the

existing 138/69kV yard (see Exhibit 6). The Project Alternative would consist of a 69kV ring bus configuration made up of nine 69kV breakers, and an additional breaker for the capacitor bank.

22. If the Company were to construct the Project Alternative, costly and extensive site grading and civil work would be necessary at the existing 34kV yard. The site is located in a 100-year floodplain, and due to permitting requirements, would involve significant additional fill to raise the yard elevation out of the floodplain and corresponding cut to prevent alteration to the extents of the floodplain, if a permit was approved. The new location would be separately fenced with a separate DICM and station service system.

23. Additionally, seven existing 69kV lines would be relocated to new dead-end structures on the ring and the two transformer feeds from the current 138/69kV yard would be extended to energize the ring bus. Moving seven transmission lines in this constrained space also would require significant work and costs and complex outage coordination and planning.

24. **EXHIBIT 6** provides a side-by-side comparison of the estimated cost and electrical components of the Proposed Project and the Project Alternative.

B. Estimated Project Alternative Cost

25. The estimated cost of the Project Alternative is $49.8 million.

26. The Project Alternative was rejected because it would cost significantly more to construct and would result in unnecessary investment compared to the Proposed Project, and therefore would result in wasteful duplication.

PJM Review

27. The Project is driven by baseline thermal and short circuit violations at the Bellefonte Station identified by AEP and PJM during the 2026 Regional Transmission

Expansion Plan ("RTEP"), as well as supplemental asset renewal needs identified by AEP within the Station.

28. During the 2026 RTEP planning process, an N-1-1 violation was identified on the station conductors ("risers") between 138/69 kV Transformer #3 and the 69kV causing a thermal overload due to loss of the 138/69kV transformer and associated buses at Kenova Station and the Bellefonte 138/69kV Transformer #2.

29. The baseline solution for the riser replacement was selected by PJM through the RTEP process on November 19, 2021. The baseline solution to replace the overdutied circuit breakers was selected by PJM through the RTEP process on January 21, 2022. The supplemental needs were presented on February 18, 2022, the Solution was presented on August 19, 2022 and the project was included into the Local Plan on January 10, 2023 through PJM's M-3 process.

Financial Aspects Of The Project

30. Neither AEP Kentucky Transmission Company, Inc., nor any successor entity, will own or invest in the Project. Kentucky Power will own the portion of the Project located in the Commonwealth in its entirety.

31. The Project is estimated to cost approximately $26.3 million. That sum comprises:

(a) approximately $4.5 million to replace the six 69kV breakers at the 69kV yard and the associated risers;

(b) approximately $1.5 million for the station remote end work at Pleasant Street Station and Coalton Station;

(c) approximately $17.2 million to retire Transformer #1 and Transformer #5, and replace Transformer #2, replace two 69kV breakers, install one 138kV circuit switcher, replace underground cables with new overhead bus ties, relocate the 69kV capacitor bank and upgrading the capacitor bank switcher to a capacitor bank breaker, retire the 34kV yard, expand the 138/69kV yard by approximately 300 x 30 feet, replace relays and two control buildings with a single Drop-In-Control Module ("DICM") in the expanded 138/69kV yard, and install two power potential transformers at Bellefonte Station; and

(d) approximately $2.6 million to replace underground cables with new overhead bus ties.

(e) approximately $0.6 million for the station remote end work at Raceland Station.

32. The above estimate represents the best engineering assessment of the costs as of the date of this Application. The exact cost will not be known until the Project is complete.

33. Kentucky Power anticipates funding the cost of the Project through its operating cash flow and other internally generated funds.

34. The Project does not involve sufficient capital outlay to materially affect the existing financial condition of Kentucky Power. Kentucky Power's assets, net of regulatory assets and deferred charges, as of September 2024, totaled $2,384,182,669. The cost of the Project thus represents an increase of approximately 1.1% percent in Kentucky Power's assets. The Project will not require the issuance of debt and will not affect the completion of any other capital project.

35. The costs of the Project will be allocated to the PJM zone. Kentucky Power will be allocated 5.619% based on its current 12 CP allocation and the costs will be recovered from other load serving entities.

36. Kentucky Power projects the Company's share of the annual operating cost will be approximately $40,000 for general maintenance and inspection.

37. The projected annual additional ad valorem taxes resulting from that portion of the Project located in the Commonwealth, and hence to be paid by Kentucky Power, are expected to total approximately $80,000 for the first year after the Project is placed into service. Taxes likely will decrease as the assets depreciate. The estimate does not take into account any portion of the existing Station that would be retired. This amount is a high level estimate which may be impacted by any changes to the Project plan.

Real Property And Right-Of-Way

38. No additional right-of-way will need to be acquired in connection with the Project. The upgrade and replacement work associated with the Project will be performed entirely within Kentucky Power's existing right-of-way. The majority of the Project will be performed within the Bellefonte Station itself. The Project also includes a small portion of transmission line relocation outside the Station and limited remote end work at other stations, which also will be performed within existing right-of-way.

Notices

39. Kentucky Power is not required to provide any notices in connection with this filing.

40. The Company did not hold public meetings regarding this Project because the Project will be performed entirely within Company property, does not require any expansion of right-of-way, and does not affect any outside landowners.

41. The Company, however, plans the following outreach activities before start of construction:

(a) develop a traffic plan and coordinate with local officials as necessary; and

(b) notify, as a courtesy, adjacent landowners of the planned construction activities and schedule.

Franchises And Permits

42. Kentucky Power is not required to obtain a franchise from any public authority. 807 KAR 5:001, Section 15(2)(b).

43. Kentucky Power will obtain all required environmental compliance permits and complete the required studies prior to beginning Project construction. A summary of the environmental surveys and permitting anticipated to be required is provided in Company Witness Barr's testimony.

44. Following receipt of the requested authority, and completion of final design, but prior to the beginning of construction, Kentucky Power will update or supplement the listing in Company Witness Barr's testimony of required environmental surveys or permitting, as necessary.

The Proposed Construction Is Required By The Public Convenience And Necessity

45. The Project is required by the public convenience and necessity.

46. The Project will not produce wasteful duplication. It will not result in an excess of capacity over need, and does not represent an excess of investment in relation to the productivity and efficiencies to be gained.

47. The Project addresses the PJM Baseline thermal violations at the Bellefonte Station in the event of an N-1-1 loss of 138kV sources from Kenova and loss of Bellefonte transformer. Failure to address the PJM Baseline thermal violations would result in the Company being required to drop load to avoid the thermal overload.

48. The Supplemental components are needed to address deteriorating infrastructure concerns that could potentially lead to failures and extended outages in the future if not addressed. By performing all this work together, the Company is better able to utilize available resources to complete the work instead of using a piecemeal approach to replacement.

49. Another alternative studied by Kentucky Power would cost substantially more than the proposed project and would result in wasteful duplication. The Project Alternative consists of building an entirely new 69kV station and incurring additional investment, while the Proposed Project uses the existing 69kV station and facilities to the extent practical. Moreover, the relocation of seven transmission lines to the newly constructed Station, as contemplated by the Project Alternative, also would result in a large, unnecessary expense. See **EXHIBIT 6** for the comparison of the Proposed Project to the Project Alternative.

50. The Project upgrades and addresses substantial deficiencies in existing Kentucky Power facilities beyond what could be provided through normal improvements in the ordinary course of business.

51. The work to be performed was identified through use of the "AEP Guidelines for Transmission Owner Identified Needs" ("AEP Guidelines"). A copy of the AEP Guidelines is attached as **EXHIBIT 7**.

52. The need for and benefits of the Project are further detailed in the testimony of Company Witness Koehler, **EXHIBIT 8** (the Baseline Project PJM Slides) and **EXHIBIT 9** (PJM RTEP Local Plan and Solution Slides). The need for the work, and the functions of the major Project components, are explained in further detail in **EXHIBIT 3**.

53. The Project is located entirely within Kentucky Power's certified territory and will not compete with any public utilities, corporations or persons.

Commencement Of Work And Anticipated In-Service Date

54. The Company anticipates beginning construction during the first quarter of 2025. Work is anticipated to be complete by fourth quarter 2026. The planned in-service date sequence is as follows:

1st Quarter 2025: Anticipated start of construction

3rd Quarter 2026: Project placed in-service

4th Quarter 2026: Construction Complete

Request for Order on or Before February 13, 2025

55. KRS 278.020(9) requires that the Commission issue a decision on applications filed pursuant to KRS 278.020 no later than 90 days after the application is filed, unless the Commission extends that period, for good cause, to 120 days. Given that the Project will be completed entirely within the Company's existing owned property and right-of-way, no other landowners' property will be affected, and the relatively limited scope of the Project, the Company respectfully requests that the Commission issue its final order within 90 days, or on or before February 13, 2025.

Exhibits And Testimony

56. The exhibits and testimony listed in the Appendix to this Application are attached to and made a part of this Application.

Communications

57. Kentucky Power respectfully requests that communications in this matter be addressed to the e-mail addresses identified on Kentucky Power's October 22, 2024 Notice of Election of Use of Electronic Filing Procedures.

WHEREFORE, Kentucky Power Company requests that the Commission issue an Order on or before February 13, 2025:

(1) Granting Kentucky Power a Certificate of Public Convenience and Necessity authorizing Kentucky Power to construct the Bellefonte Station Upgrade Project as described in the Company's Application; and

(2) Granting Kentucky Power such other relief as may be appropriate.

Respectfully submitted,

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COUNSEL FOR KENTUCKY POWER COMPANY

<u>EXHIBIT LIST</u>

Exhibit No.	Exhibit Name
1	Filing Requirements Checklist
2	Kentucky Power Company's November 7, 2024 Certificate of Existence
3	List of the major components of the Proposed Project and their purpose
4	Map of suitable scale illustrating the proposed Project
5	Plans and specifications for the Proposed Project
6	Comparison of Proposed Project and Project Alternative
7	Guidelines used by Kentucky Power to determine the need for supplemental projects ("AEP Transmission Planning Criteria And Guidelines for End-Of-Life and Other Asset Management Needs") (December 2020)
8	Baseline Project PJM Slides
9	PJM Local Plan and Solution

TESTIMONY

Direct Testimony of Daniel T. Barr

Direct Testimony of Nicolas C. Koehler

Direct Testimony of Tanner S. Wolffram

Application Filing Requirements Checklist

Requirement	Description of Requirement	Location(s) in Filing
General Application Requirements		
807 KAR 5:001		
Section 7(1)	The application and 10 copies.	Company is e-filing.
Section 4(3)	Paper signed by submitting party or attorney.	Application at p. 14.
Section 4(3)	Name, address, telephone number, fax number, and e-mail address of submitting party or attorney.	Application at p. 14.
Section 4(10)	Personal information must be redacted.	Complied.
Section 8(2)(a)	At least seven (7) days prior to the submission of its application, an applicant shall file written notice of its election to use electronic filing procedures using the Notice of Election of Use of Electronic Filing Procedures form.	Complied.
Section 8(4)(b)	E-filed documents must be .pdf files that: • are searchable and optimized for internet viewing; • have bookmarks distinguishing sections; • if scanned material, be at resolution of 300 DPI	Complied.
Section 8(5)(a)	Each electronic submission shall include an introductory file in portable document format that is named “Read1st” and that contains a general description of the filing.	Complied.
Section 8(5)(a)	Each electronic submission shall include an introductory file in portable document format that is named “Read1st” and that contains a list of all material to be filed in paper or physical medium but not included in the electronic submission, and a statement that the material in the electronic submission are a true representation of the materials in paper medium.	N/A

Section 8(5)(b)	The "Read1st" file and any other material that normally contains a signature shall contain a signature in the electronically submitted document.	Complied.
Section 14(1)	Full name, mailing address, and e-mail address of applicant.	Application at ¶ 2.
Section 14(1)	Facts on which application is based, with request for the order, authorization, permission, or certificate desired.	Application, introductory paragraph, *passim*; Direct Testimony of Tanner S. Wolffram; Direct Testimony of Daniel T. Barr; Direct Testimony of Nicolas C. Koehler.
Section 14(1)	A reference to the particular law requiring Commission approval.	Application at introductory paragraph.
Section 14(2)	If a corporation, the applicant shall identify in the application the state in which it is incorporated and the date of its incorporation, attest that it is currently in good standing in the state in which it is incorporated, and if it is not a Kentucky corporation, state if it is authorized to transact business in Kentucky.	Application at ¶ 1; Application Exhibit 2.
Section 14(3)	If a limited liability company, the applicant shall identify in the application the state in which it is organized and the date on which it was organized, attest that it is in good standing in the state in which it is organized, and, if it is not a Kentucky limited liability company, state if it is authorized to transact business in Kentucky.	N/A
Section 14(4)	If the applicant is a limited partnership, a certified copy of its limited partnership agreement and all amendments, if any, shall be annexed to the application, or a written statement attesting that its partnership agreement and all amendments have been filed with the commission in a prior proceeding and referencing the case number of the prior proceeding.	N/A
Applications for Certificates of Public Necessity		

Section 15(2)(a)	The facts relied upon to show that the proposed construction or extension is or will be required by public convenience or necessity.	Application, introductory paragraph, *passim*; Application Exhibits 6-9; Direct Testimony of - Tanner S. Wolffram; Direct Testimony of Daniel T. Barr; Direct Testimony of Nicolas C. Koehler.
Section 15(2)(b)	Copies of franchise or permits, if any, from the proper public authority for the proposed construction or extension, if not previously filed with the Commission.	N/A
Section 15(2)(c)	A full description of the proposed location, route, or routes of the proposed construction or extension, including a description of the manner of the construction and the names of all public utilities, corporations, or persons with whom the proposed construction or extension is likely to compete.	Application, ¶¶ 5, 6, 11, 12, 38; Application Exhibits 3 & 4; Wolffram Direct Test.; Barr Direct Test.; Koehler Direct Test.
Section 15(2)(d)(1)	One (1) copy in portable document format on electronic storage medium and two (2) copies in paper medium of: maps to suitable scale showing the location or route of the proposed construction or extension as well as the location to scale of like facilities owned by others located anywhere within the map area with adequate identification as to the ownership of the other facilities; and plans a specifications and drawings of the proposed plant, equipment, and facilities.	Application Exhibit 4.
Section 15(2)(d)(2)	One (1) copy in portable document format on electronic storage medium and two (2) copies in paper medium of: plans specifications and drawings of the proposed plant, equipment, and facilities.	Application Exhibit 5.
Section 15(2)(e)	The manner in detail in which the applicant proposes to finance the proposed construction or extension.	Application, ¶ 33; Wolffram Direct Test. at 7.

Section 15(2)(f)	An estimated annual cost of operation after the proposed facilities are placed into service.	Application, ¶ 36-37; Wolffram Direct Test. at 8.

Commonwealth of Kentucky
Michael G. Adams, Secretary of State

Michael G. Adams
Secretary of State
P. O. Box 718
Frankfort, KY 40602-0718
(502) 564-3490
http://www.sos.ky.gov

Certificate of Existence

Authentication number: 322852
Visit https://web.sos.ky.gov/ftshow/certvalidate.aspx to authenticate this certificate.

I, Michael G. Adams, Secretary of State of the Commonwealth of Kentucky, do hereby certify that according to the records in the Office of the Secretary of State,

KENTUCKY POWER COMPANY

KENTUCKY POWER COMPANY is a corporation duly incorporated and existing under KRS Chapter 14A and KRS Chapter 271B, whose date of incorporation is July 21, 1919 and whose period of duration is perpetual.

I further certify that all fees and penalties owed to the Secretary of State have been paid; that Articles of Dissolution have not been filed; and that the most recent annual report required by KRS 14A.6-010 has been delivered to the Secretary of State.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Official Seal at Frankfort, Kentucky, this 14th day of November, 2024, in the 233rd year of the Commonwealth.

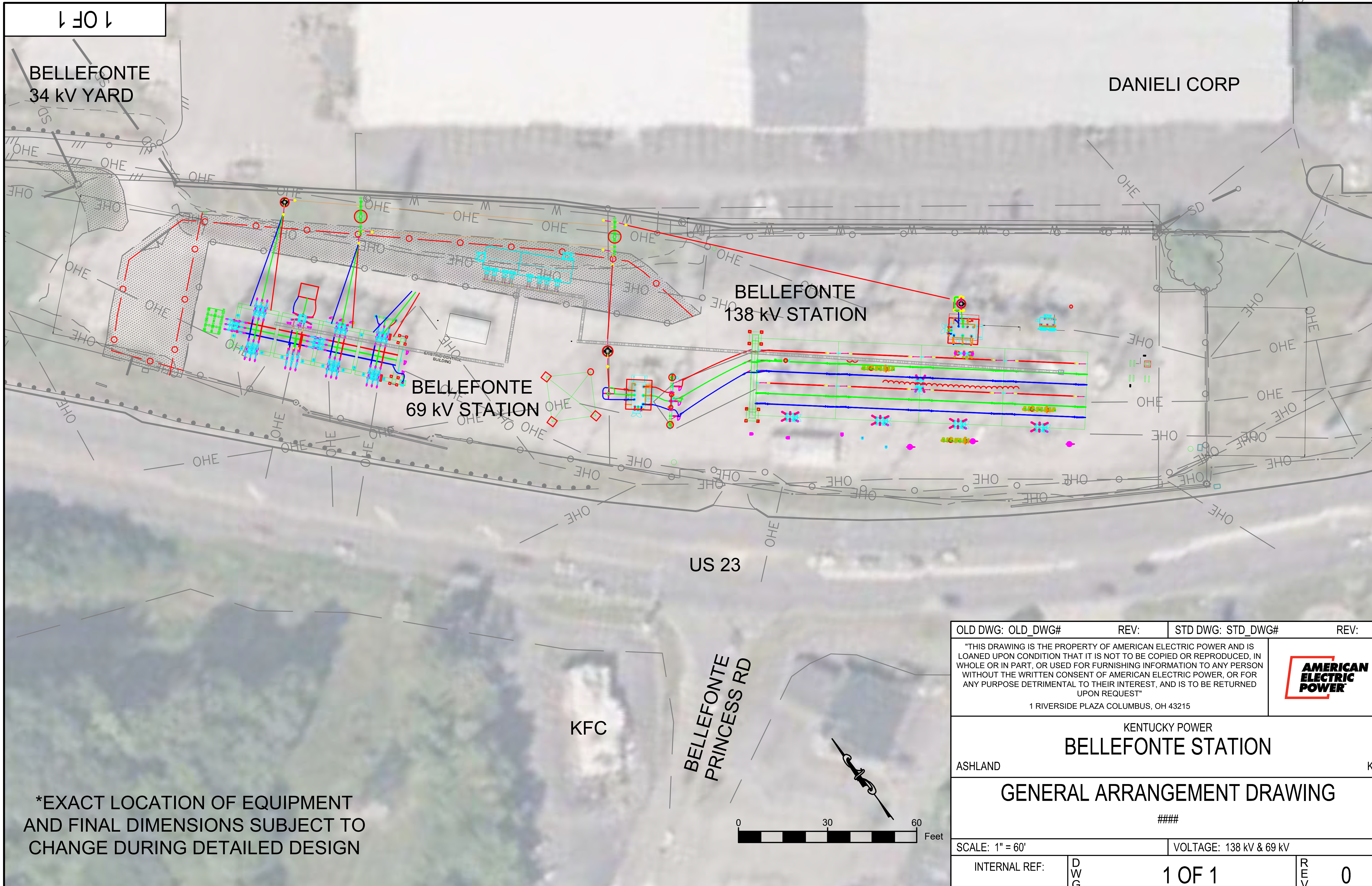
COMMONWEALTH OF KENTUCKY
OFFICE OF SECRETARY OF STATE

Michael G. Adams

Michael G. Adams
Secretary of State
Commonwealth of Kentucky
322852/0028317

Bellefonte Station Elements

Description	Purpose	Driver for Asset Replacement/Installation
Replacing (8) 69kV breakers	To prevent the interuption of fault current or load current on the 69 kv lines at Bellefonte station.	The identified baseline violoation for 6 of the breakers being overdutied in the future along with asset renewel needs.
Replacing 69kV risers and bus conductors and 138kV bus conductors	To increase the ratings on this branch of equipment.	To prevent the potential of a thermal overload on the equipment.
Retiring Transformer #1 and Transformer #5, and replacing Transformer #2	To minimize maintenance on equipment that is no longer utilized and addressing asset health needs on transformer #2. Transformer #2 needs to be replaced to convert 138 kV to 69 kV to support the 69 kV network in the area.	Tranformers #1 and #5 are no longer needed since Bellefonte Station does not serve anything at the 34.5 kV level. Transformer #2 needs to be replaced due to asset performance and risk.
Installing one 138kV circuit switcher on replaced Transformer #2	To provide high side protection for Transformer #2.	Transformer #2 currently lacks high-side proctection.
Replacing underground cables with new overhead bus ties	This equipment connects the 138/69 kV transformers from the 138 kV yard to the 69 kV yard.	Replace the current underground cables with new overhead bus ties to address asset health needs.
Relocating the 69kV capacitor bank and upgrading the capacitor bank switcher to a capacitor bank breaker	To provide voltage support at Bellefonte Station.	To provide protection of the 69 kV cap bank and address asset renewel concerns.
Retiring the 34kV yard	The 34.5 kV yard is no longer needed since it does not serve any customers and can be retired	The customers served out of the 34.5 kV yard are longer there. Therefore instead of addressing the asset health needs for the equipment it can be retired.
Expanding the 138/69kV yard by approximately 300 x 30 feet	To create room for the installation of a new DICM (Drop in Control Module).	There is not sufficient space to complete the current scope of work along with the installation of a new DICM.
Replacing relays and two control buildings with a single Drop-In-Control Module ("DICM") in the expanded 138/69kV yard	To control and monitor the currents, and report equipment status, record events, provide automatic, manual and remote (via SCADA) operation of the physical equipment as programmed.	The current relays are of electromechanical and static types are out of date and need to be replaced.
Installing two (2) power potential transformers at Bellefonte Station	To provide the required power to operate the Station.	PJM requires two sources of station service for a station of this size for reliability.
Associated station remote end work Coalton, Raceland and the Pleasant Street Stations	The communication between stations for protection related purposes.	To allow the station protection to coordinate between stations.



OLD DWG: OLD_DWG# REV:	STD DWG: STD_DWG# REV:
"THIS DRAWING IS THE PROPERTY OF AMERICAN ELECTRIC POWER AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE COPIED OR REPRODUCED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF AMERICAN ELECTRIC POWER, OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST" 1 RIVERSIDE PLAZA COLUMBUS, OH 43215	AMERICAN ELECTRIC POWER

KENTUCKY POWER

BELLEFONTE STATION

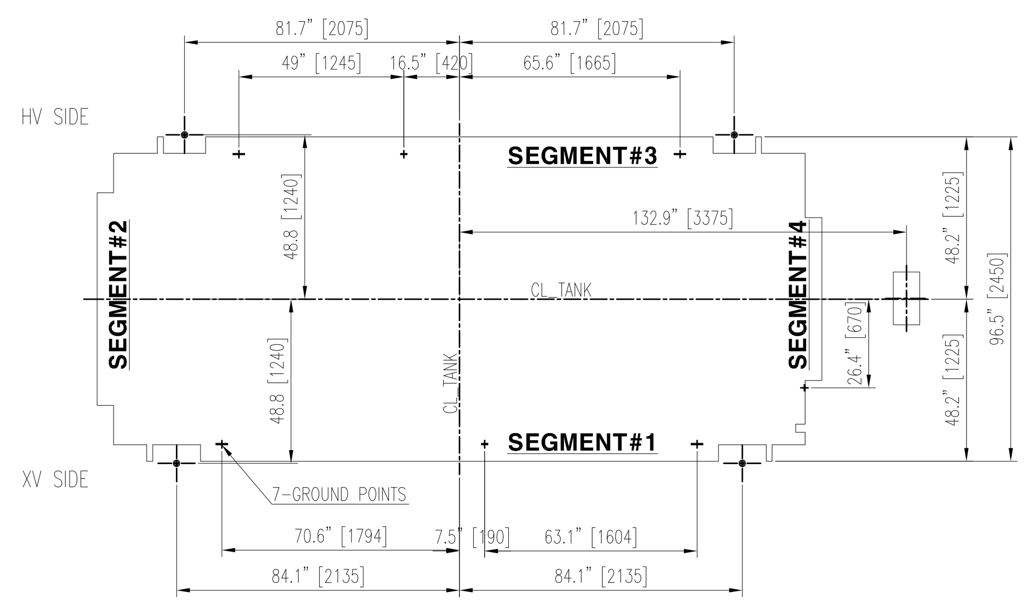
ASHLAND KY

GENERAL ARRANGEMENT DRAWING

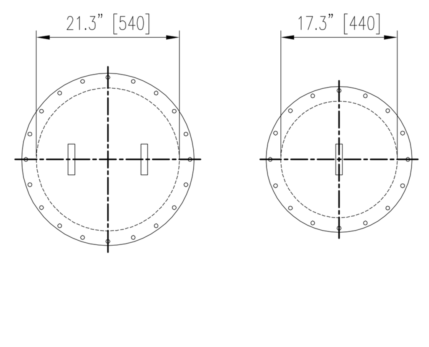
####

SCALE: 1" = 60'	VOLTAGE: 138 kV & 69 kV
INTERNAL REF:	DWG 1 OF 1 REV 0

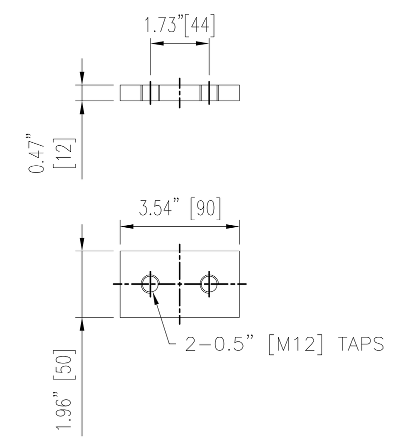
BY: JUSTIN M STCLAIR AT: 3:20:26 PM PLOTTED DATE: 11/13/24



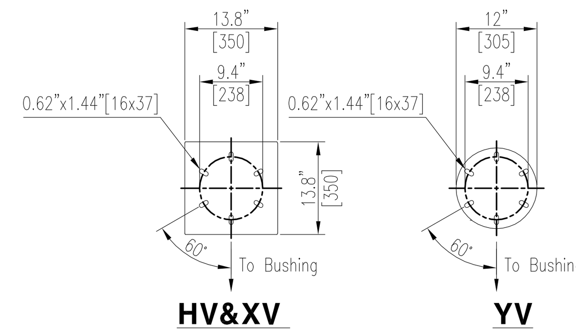
FOUNDATION



MANHOLE & HANDHOLE (ITEM. 11)



DETAIL OF GROUND PAD
(MATERIAL : STAINLESS STEEL)



DETAIL OF ARRESTER MOUNTING PLATE

PART LIST

ITEM	DESCRIPTION	SPECIFICATION	Q'TY	REMARK
1	H.V BUSHING	POC650G1216MS 138kV, 650 BIL, 1200A, BOTTOM CONNECTION	3 EA	*
2	X.V BUSHING	069Z3000AX 69kV, 350 BIL, 3000A, INBOARD END	3 EA	*
3	Y.V BUSHING	034Z2000AQ 34.5kV, 200 BIL, 2000A, INBOARD END	3 EA	*
4	H0X0 BUSHING	B88823-70 34.5kV, 200 BIL, 2000A, BOTTOM CONNECTION	1 EA	*
5	HICO MARK	STAINLESS STEEL	1 EA	*
6	NAME PLATE	STAINLESS STEEL	1 EA	
7	VALVE LOCATION NAMEPLATE	STAINLESS STEEL	1 EA	
8	OIL LEVEL TEMPERATURE CURVE PLATE	STAINLESS STEEL	1 EA	
9	JACKING PAD	–	4 EA	
10	LIFTING BOLLARD FOR MAIN TANK	–	4 EA	
11	MANHOLE & HANDHOLE	–	1 LOT	
12	LOCAL CONTROL PANEL	OUTDOOR	1 SET	
13	PRESSURE RELIEF DEVICE FOR MAIN TANK	LPRD SERIES	1 EA	
14	BUCHHOLZ RELAY	26-1.28.33.44-0455	1 EA	*
15	DE-ENERGIZED TAP CHANGER	A TYPE	1 EA	
16	ELECTRONIC TEMPERATURE MONITOR	IED509-00007520	1 SET	
17	RTD FOR ETM	103-022-01 (Cu 10 Ohm)	1 EA	
18	GROUNDING BUSHING FOR END FRAME	20098	1 EA	
19	GROUNDING BUSHING FOR CORE	20098	1 EA	
20	GROUNDING TERMINAL	–	7 EA	
21	COOLING RADIATORS	–	6 EA	*
22	FAN WITH MOTOR	F26X-14712	12 EA	*
23	JUNCTION BOX FOR COOLING FANS	–	2 EA	*
24	CONSERVATOR FOR MAIN TANK WITH AIR CELL	'RB-4000A'	1 EA	*
25	OIL LEVEL GAUGE FOR MAIN CONSERVATOR	042 SERIES DIAL TYPE	1 EA	*
26	BRETHER FOR MAIN CONSERVATOR	SILICA GEL	1 EA	*
27	FALL PROTECTION SAFETY DEVICE	AS PER SPECIFICATION	2 EA	
28	SUPPORT FOR MULTI-AXIS IMPACT RECORDER	ANALOG TYPE	1 EA	
29	SUPPORT FOR MULTI-AXIS IMPACT RECORDER	DIGITAL TYPE	1 EA	
30	ARRESTER BRACKET FOR H.V	–	1 SET	*
31	ARRESTER BRACKET FOR X.V	–	1 SET	*
32	ARRESTER BRACKET FOR Y.V	–	3 EA	*
33	BUS BAR FOR H.V ARRESTER	COPPER BUS BAR (1/4" x 2")	1 SET	*
34	BUS BAR FOR X.V ARRESTER	COPPER BUS BAR (1/4" x 2")	1 SET	*
35	BUS BAR FOR Y.V ARRESTER	COPPER BUS BAR (1/4" x 2")	1 SET	*
36	BUS BAR FOR NEUTRAL GROUNDING	COPPER BUS BAR (1/4" x 4")	1 SET	*
70	OIL INLET VALVE FOR DISSOLVED GAS MONITOR	2" GATE VALVE W/PLUG	1 EA	
71	OIL OUTLET VALVE FOR DISSOLVED GAS MONITOR	2" GATE VALVE W/PLUG	1 EA	
72	LOWER FILTER & DRAIN VALVE WITH SAMPLING DEVICE	2" GATE VALVE	1 EA	
73	UPPER FILTER VALVE	2" GATE VALVE	1 EA	
74	VACUUM VALVE FOR MAIN TANK	3" GATE VALVE	1 EA	
75	INLET AND OUTLET VALVE FOR RADIATOR	3" BUTTERFLY VALVE	12 EA	
76	CONNECTING VALVE FOR CONSERVATOR	3" GATE VALVE	1 EA	
77	BUCHHOLZ RELAY ISOLATION VALVE	3" GATE VALVE	2 EA	*
78	VACUUM VALVE FOR CONSERVATOR	1" GATE VALVE	1 EA	*
79	EQUALIZING VALVE FOR CONSERVATOR	1" GATE VALVE	1 EA	*
80	DRAIN VALVE FOR CONSERVATOR WITH SUMP	1" GATE VALVE	1 EA	*
81	AIR RELEASE PLUG FOR CONSERVATOR	AIR VENT VALVE	2 EA	*
82	AIR RELEASE PLUG FOR RADIATOR	M16	6 EA	*
83	DRAIN PLUG FOR RADIATOR	M16	6 EA	*
84	GAS SAMPLING DEVICE FOR B-H RELAY	–	1 EA	

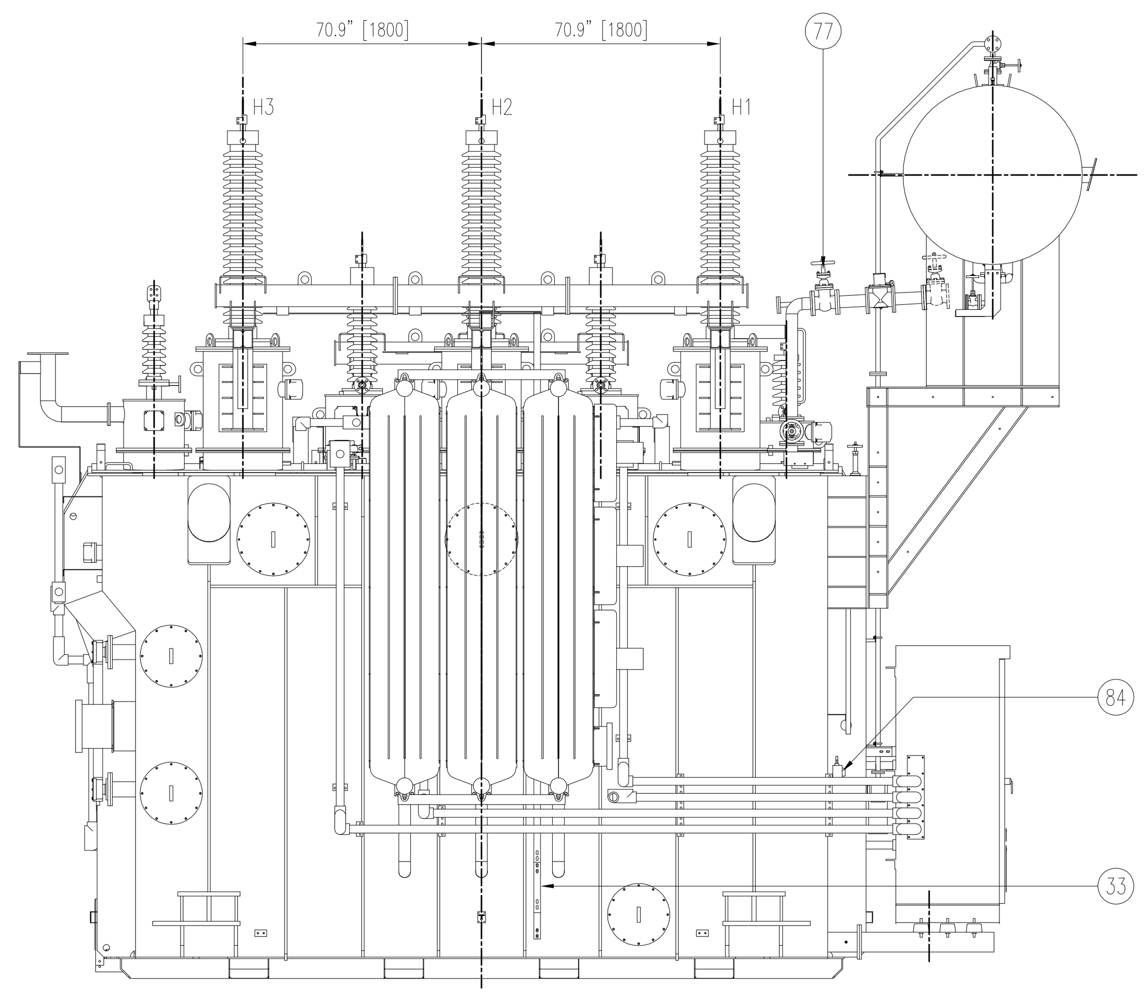
[NOTE]
1. ALL DIMENSIONS ARE IN INCHES [MILLIMETER].
   (SHIPPING DIMENSION TOLERANCE : 0 ~ −5%)
2. MARK : CENTER OF GRAVITY FOR COMPLETE UNIT.
3. PARTS REMOVED FOR TRANSPORT SHALL BE INDICATED BY AN ASTRIST (*).
4. DIMENSION TOLERANCE : ±2%
5. COLOR OF PAINT : LIGHT GRAY (ANSI 70)

APPROXIMATE WEIGHTS

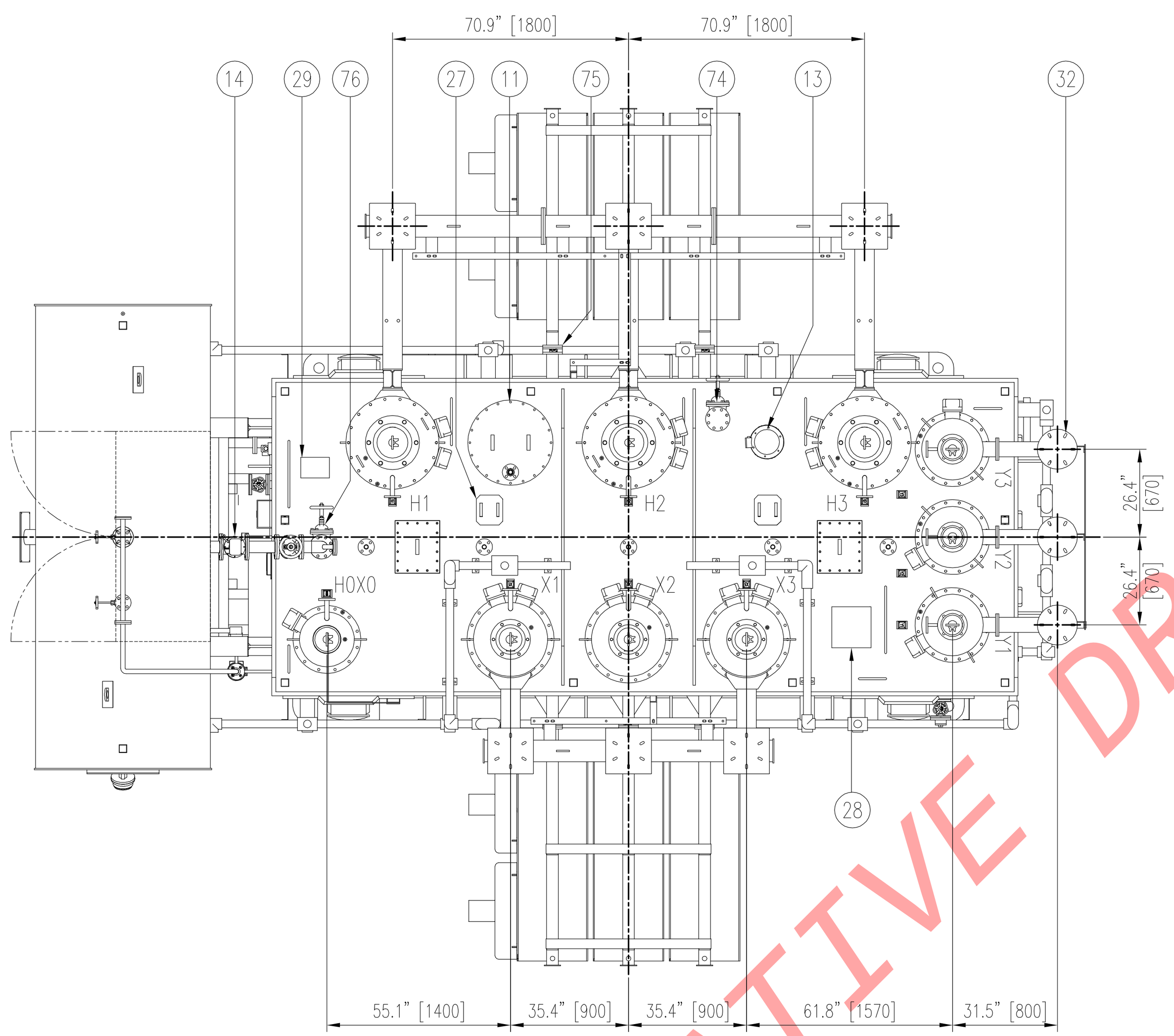
TOTAL WEIGHT OF ASSEMBLED TRANSFORMER	296,076 LBS	134,300 KG
UNTANKING WEIGHT	176,808 LBS	80,200 KG
CORE & COIL WEIGHT	168,210 LBS	76,300 KG
WEIGHT (AT 25°C) OF OIL (TOTAL)	68,342 LBS	31,000 KG
VOLUME (AT 25°C) OF OIL (TOTAL)	9,113 GAL	34,494 L
WEIGHT (AT 25°C) OF OIL IN RADIATORS	3,800 LBS	1,724 KG
VOLUME (AT 25°C) OF OIL IN RADIATORS	507 GAL	1,916 L
WEIGHT OF INSULATION	12,983 LBS	5,889 KG
WEIGHT OF EACH RADIATOR(WITHOUT OIL)	2,084 LBS	945 KG
WEIGHT (AT 25°C) OF OIL IN CONSERVATOR	3,254 LBS	1,476 KG
VOLUME (AT 25°C) OF OIL IN CONSERVATOR	434 GAL	1640 L

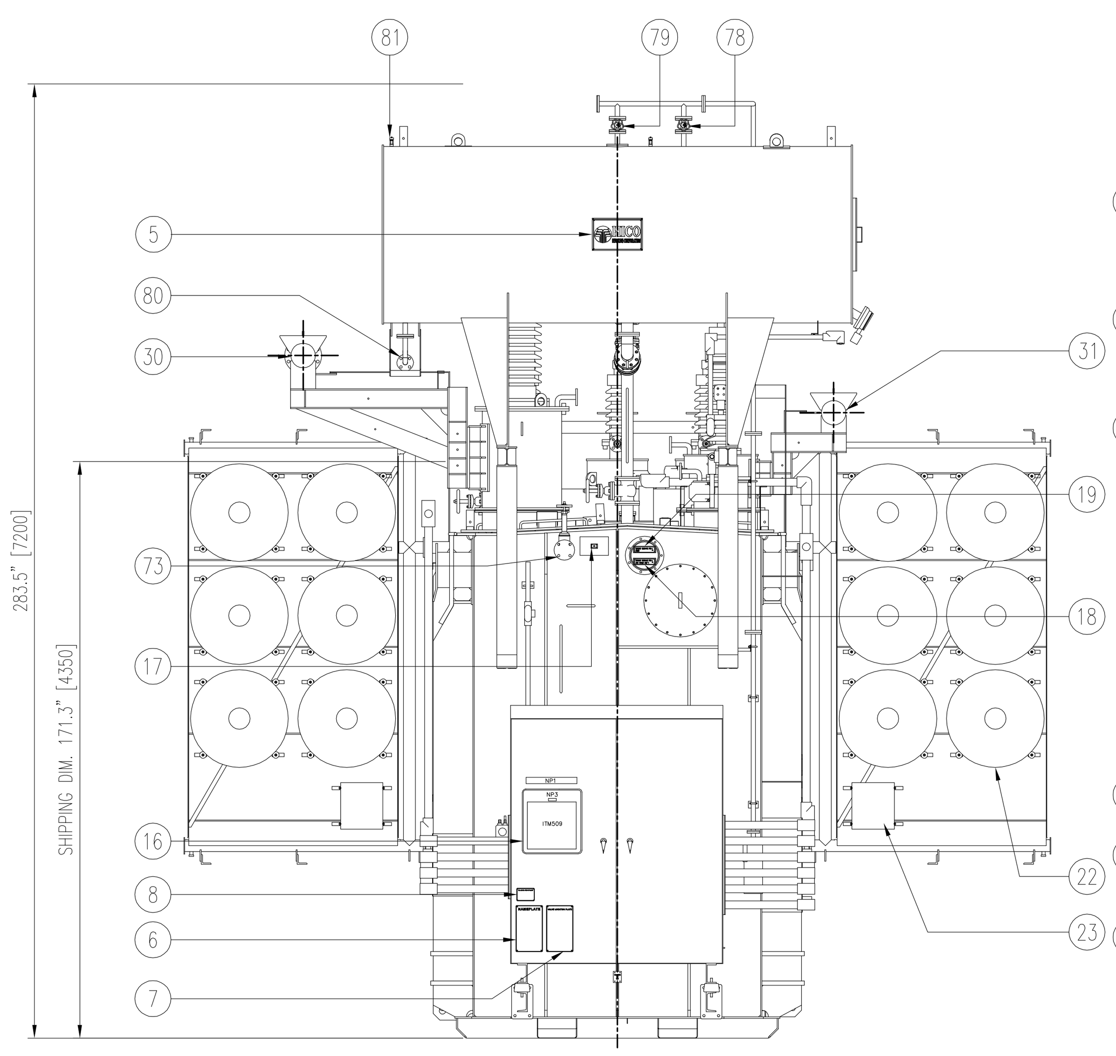
TABLE OF MINIMUM STRIKE DISTANCE

NOMINAL SYSTEM VOLTAGE	METAL-METAL BETWEEN LIVE PART AND GROUND		METAL-METAL BETWEEN LIVE PARTS OF DIFFERENT PHASES	
(kV)	(IN)	(MM)	(IN)	(MM)
138	37	939	49	1245
69	23	585	25	635
46	15	381	17	432



SEGMENT#3 (HV)





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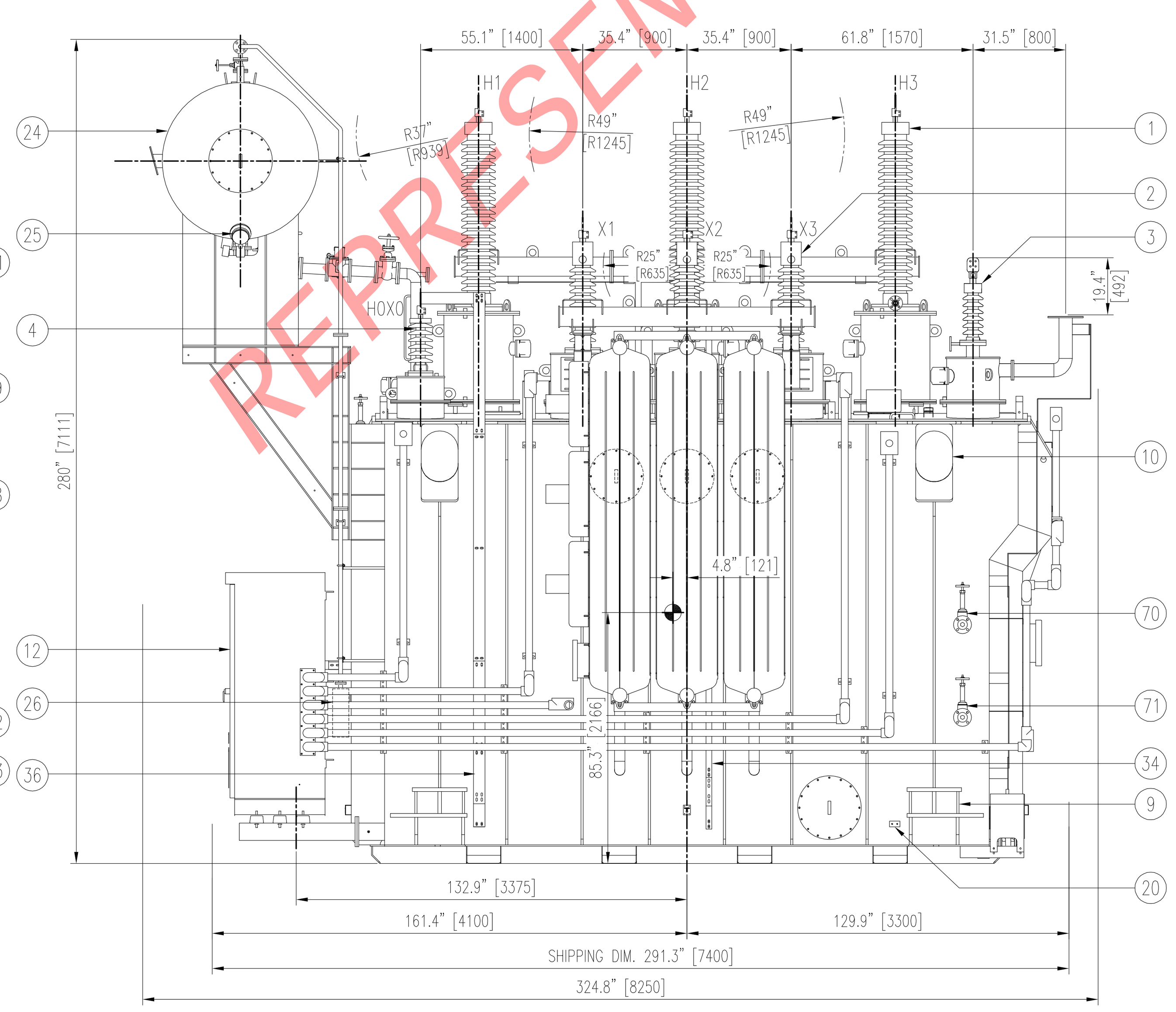
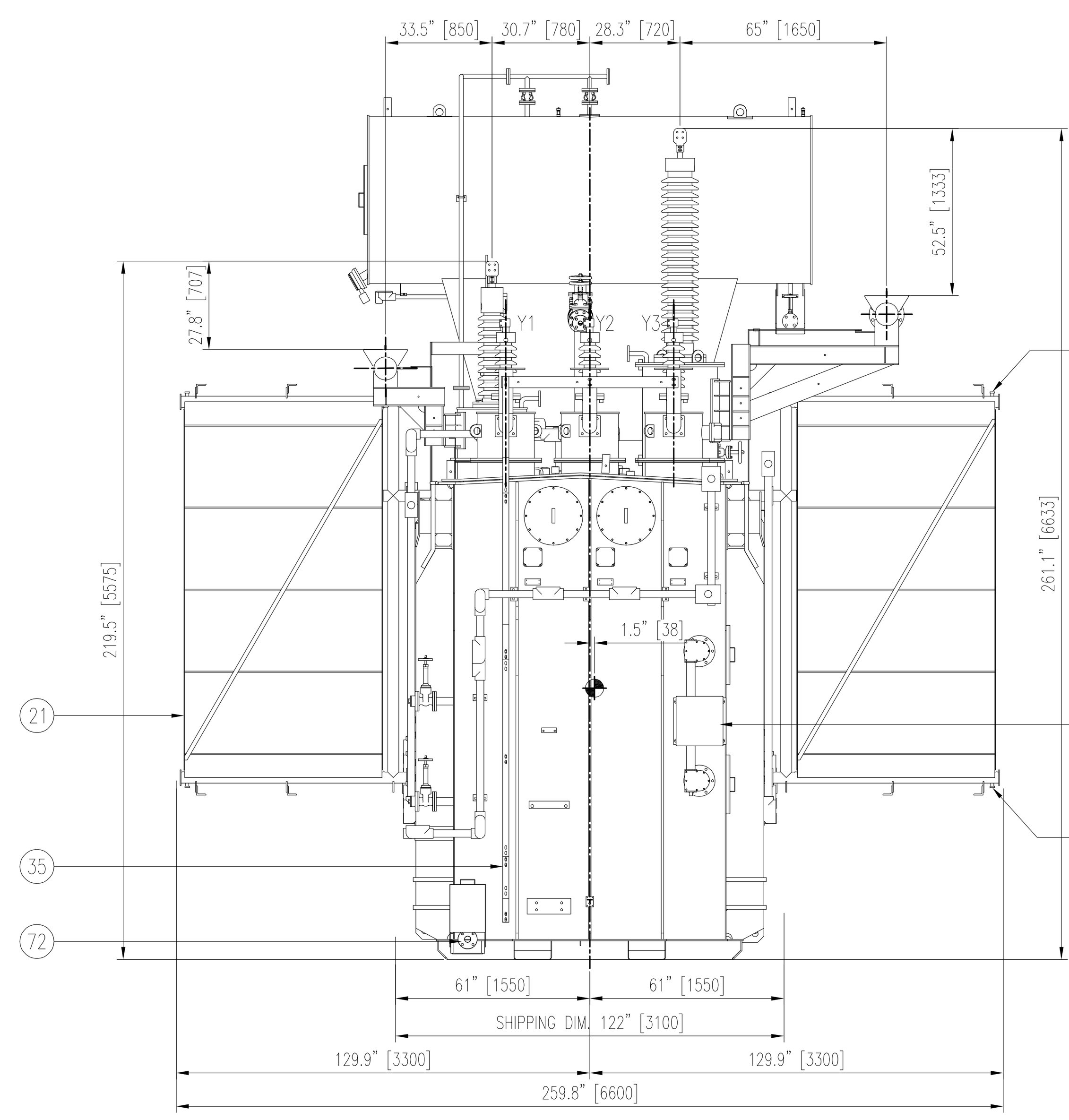


SEGMENT#1 (XV)



SEGMENT#4

REV. NO.	DATE	DESCRIPTION	PREPARED	REVIEWED	CHECKED	APPROVED
0	AUG.31.2016	ORIGINAL ISSUED	M.J. DO	M.S. SON	J.H. PARK	K.T. JEONG

AMERICAN ELECTRIC POWER

HICO
HYOSUNG CORPORATION

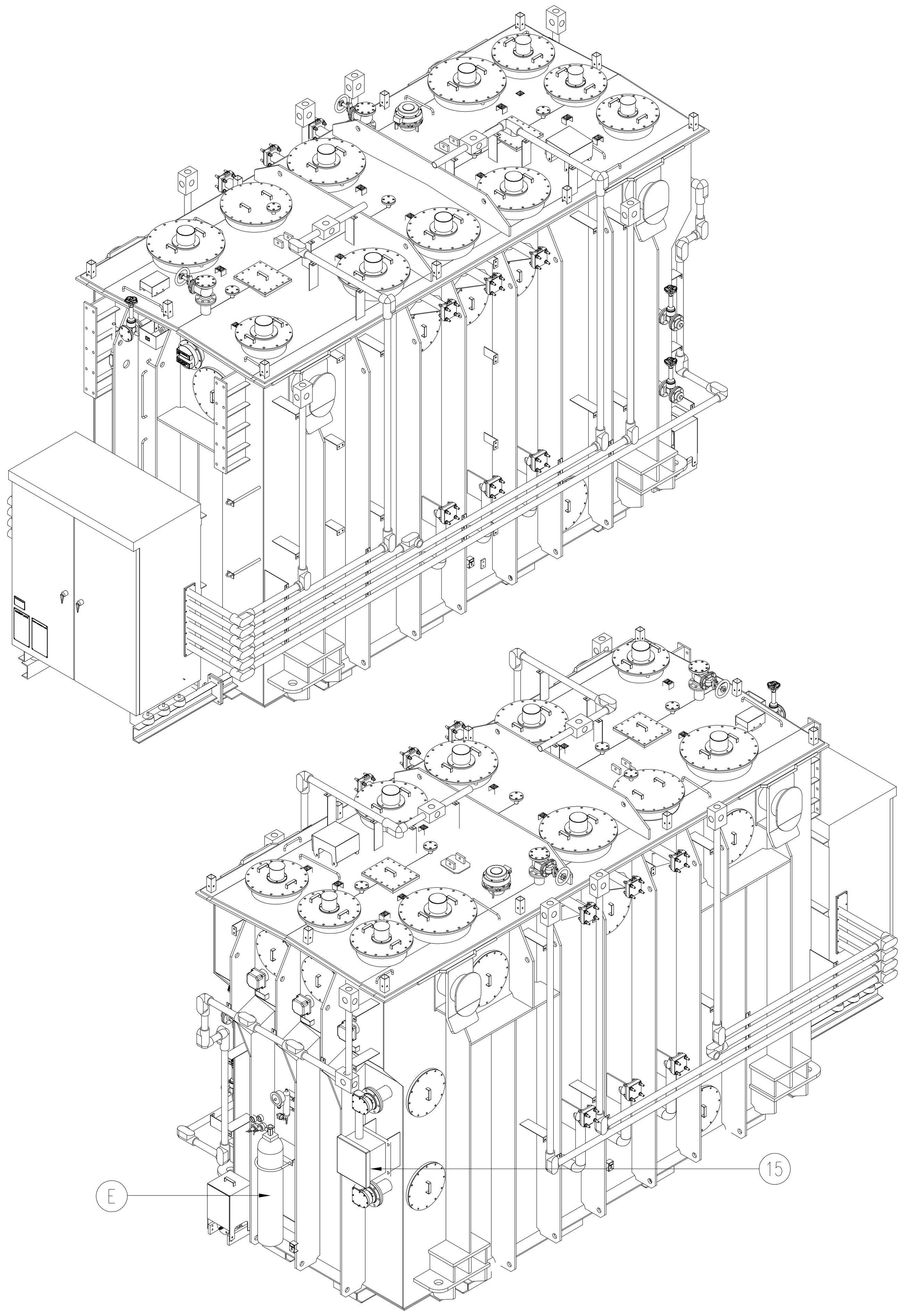
RATING :
3ø 60Hz 138/70.5/36.2 kV 120/160/200MVA
AUTO TRANSFORMER ONAN/ONAF/ONAF w/DETC

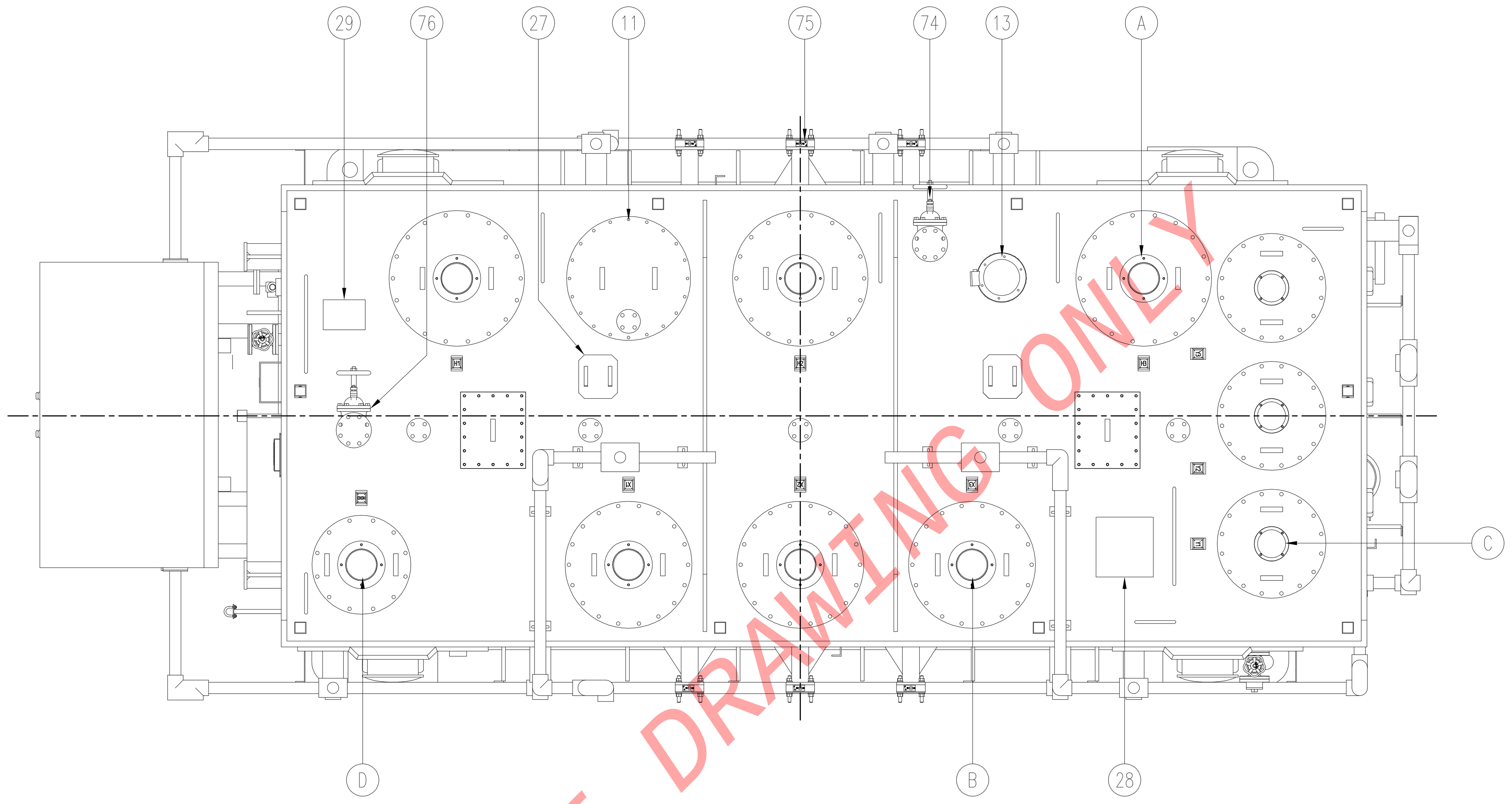
ORDERING SPECIFICATION :
SXA9_200_138_69_34.5_60

DRAWING NAME	HICO DRAWING NO.
OUTLINE	ET1A104630
MFR'S SHOP ORDER NO.	HTA03050000233

SERIAL NO.	P.O. No	SCALE	REV.
10068971_0001	384028489510001	N S	00

Drawing represents past orders. Repeat orders will be similar, but with some differences





PART LIST

ITEM	DESCRIPTION	SPECIFICATION	Q'TY	REMARK
6	NAME PLATE	STAINLESS STEEL	1 EA	
7	VALVE LOCATION NAMEPLATE	STAINLESS STEEL	1 EA	
8	OIL LEVEL TEMPERATURE CURVE PLATE	STAINLESS STEEL	1 EA	
9	JACKING PAD	–	4 EA	
10	LIFTING BOLLARD FOR MAIN TANK	–	4 EA	
11	MANHOLE & HANDHOLE	–	1 LOT	
12	LOCAL CONTROL PANEL	OUTDOOR	1 SET	
13	PRESSURE RELIEF DEVICE FOR MAIN TANK	LPRD SERIES	1 EA	
15	DE-ENERGIZED TAP CHANGER	A TYPE	1 EA	
16	ELECTRONIC TEMPERATURE MONITOR	IED509-00007520	1 SET	
17	RTD FOR ETM	103-022-01 (Cu 10 Ohm)	1 EA	
18	GROUNDING BUSHING FOR END FRAME	20098	1 EA	
19	GROUNDING BUSHING FOR CORE	20098	1 EA	
20	GROUNDING TERMINAL	–	7 EA	
27	FALL PROTECTION SAFETY DEVICE	AS PER SPECIFICATION	2 EA	
28	SUPPORT FOR MULTI-AXIS IMPACT RECORDER	ANALOG TYPE	1 EA	
29	SUPPORT FOR MULTI-AXIS IMPACT RECORDER	DIGITAL TYPE	1 EA	
70	OIL INLET VALVE FOR DISSOLVED GAS MONITOR	2" GATE VALVE W/PLUG	1 EA	
71	OIL OUTLET VALVE FOR DISSOLVED GAS MONITOR	2" GATE VALVE W/PLUG	1 EA	
72	LOWER FILTER & DRAIN VALVE WITH SAMPLING DEVICE	2" GATE VALVE	1 EA	
73	UPPER FILTER VALVE	2" GATE VALVE	1 EA	
74	VACUUM VALVE FOR MAIN TANK	3" GATE VALVE	1 EA	
75	INLET AND OUTLET VALVE FOR RADIATOR	3" BUTTERFLY VALVE	12 EA	
76	CONNECTING VALVE FOR CONSERVATOR	3" GATE VALVE	1 EA	
84	GAS SAMPLING DEVICE FOR B-H RELAY	–	1 EA	
A	HV SFRA TEST COVER	–	3 EA	
B	XV SFRA TEST COVER	–	3 EA	
C	YV SFRA TEST COVER	–	3 EA	
D	H0X0 SFRA TEST COVER	–	1 EA	
E	DRY AIR EQUIPMENT FOR SHIPPING	–	1 EA	

TRANSPORT DIMENSIONS

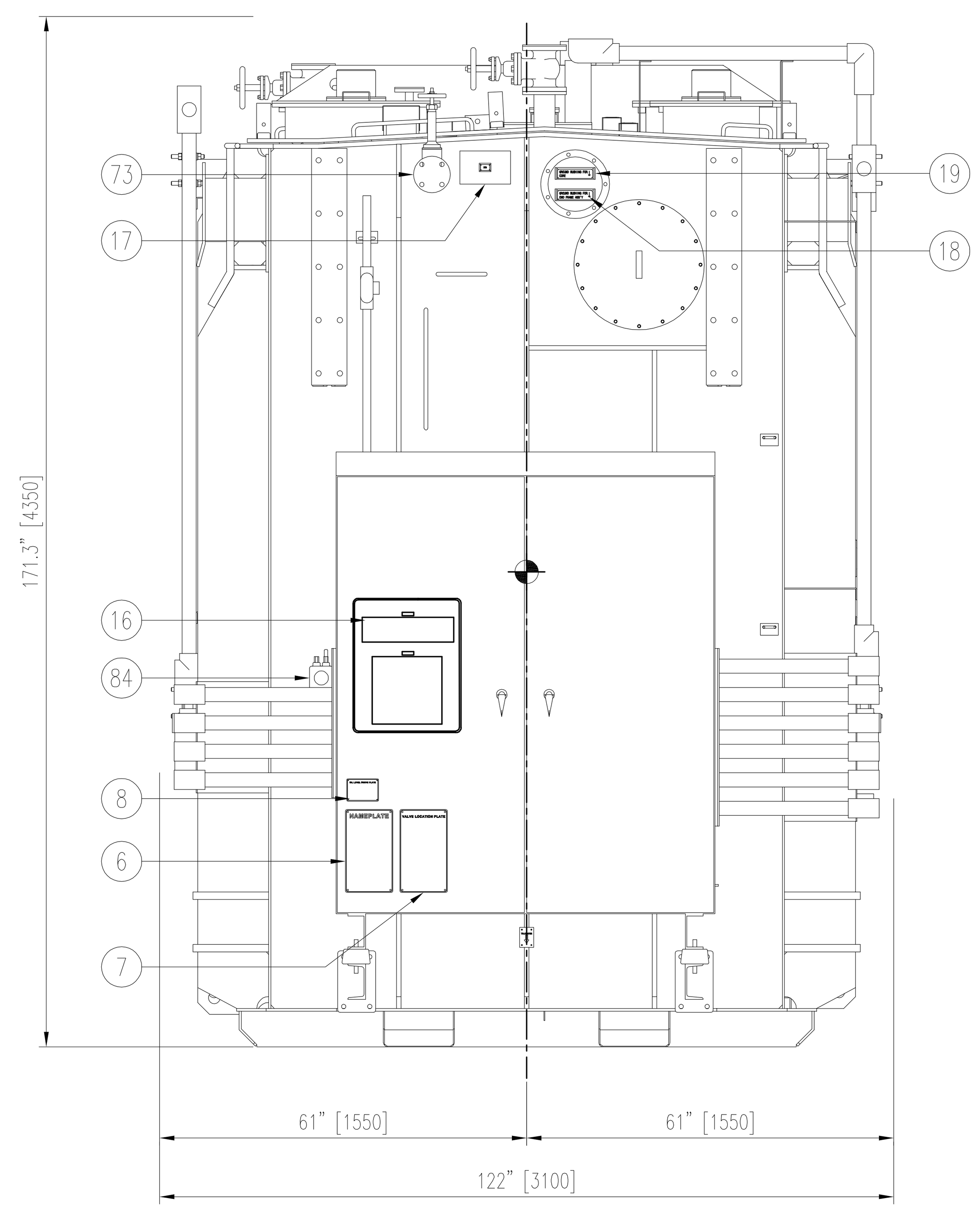
291.3"[7400](LG)x122"[3100](WD)x171.3"[4350](HT)

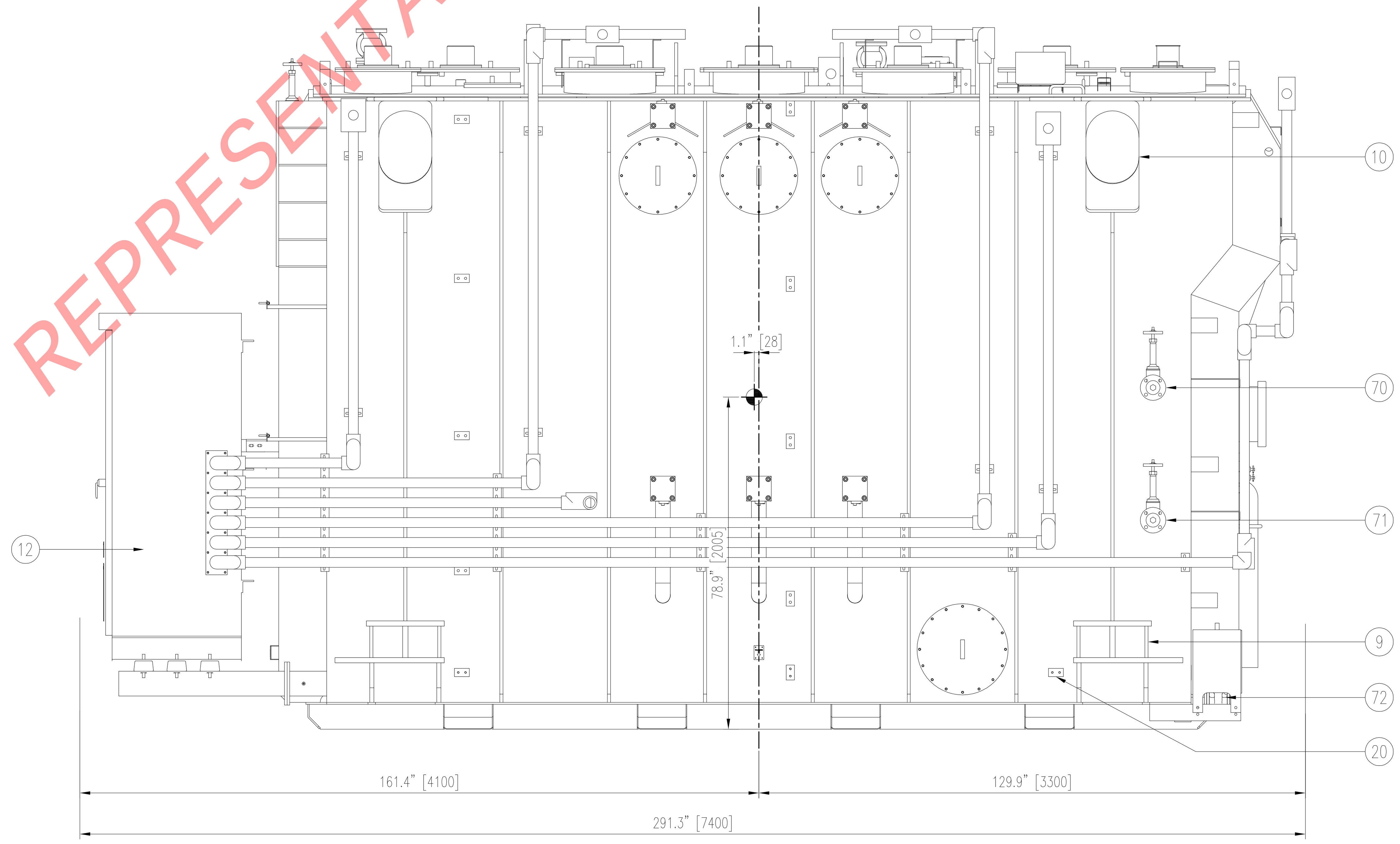
SHIPPING WEIGHT

WITHOUT OIL : 213,404 lbs (96,800 kg)

[NOTE]

1. ALL DIMENSIONS ARE IN INCHES [MILLIMETER].
2. ⌖ SHIPPING CENTER OF GRAVITY.
3. TRANSPORT CONDITION : THE TRANSFORMER TANK IS FILLED DRY AIR.
4. DIMENSION TOLERENCE : 0~-5%





0	AUG.31.2016	ORIGINAL ISSUED	M.J. DO	M.S. SON	J.H. PARK	K.T. JEONG
REV. NO.	DATE	DESCRIPTION	PREPARED	REVIEWED	CHECKED	APPROVED

AEP AMERICAN ELECTRIC POWER

HICO HYOSUNG CORPORATION

RATING :
3Ø 60Hz 138/70.5/36.2 kV 120/160/200MVA
AUTO TRANSFORMER ONAN/ONAF/ONAF w/DETC

ORDERING SPECIFICATION :
SXA9_200_138_69_34.5_60

DRAWING NAME	HICO DRAWING NO.
TRANSPORT OUTLINE	ET1A104631
MFR'S SHOP ORDER NO.	HTA03050000233

SERIAL NO.	P.O. No	SCALE	REV.
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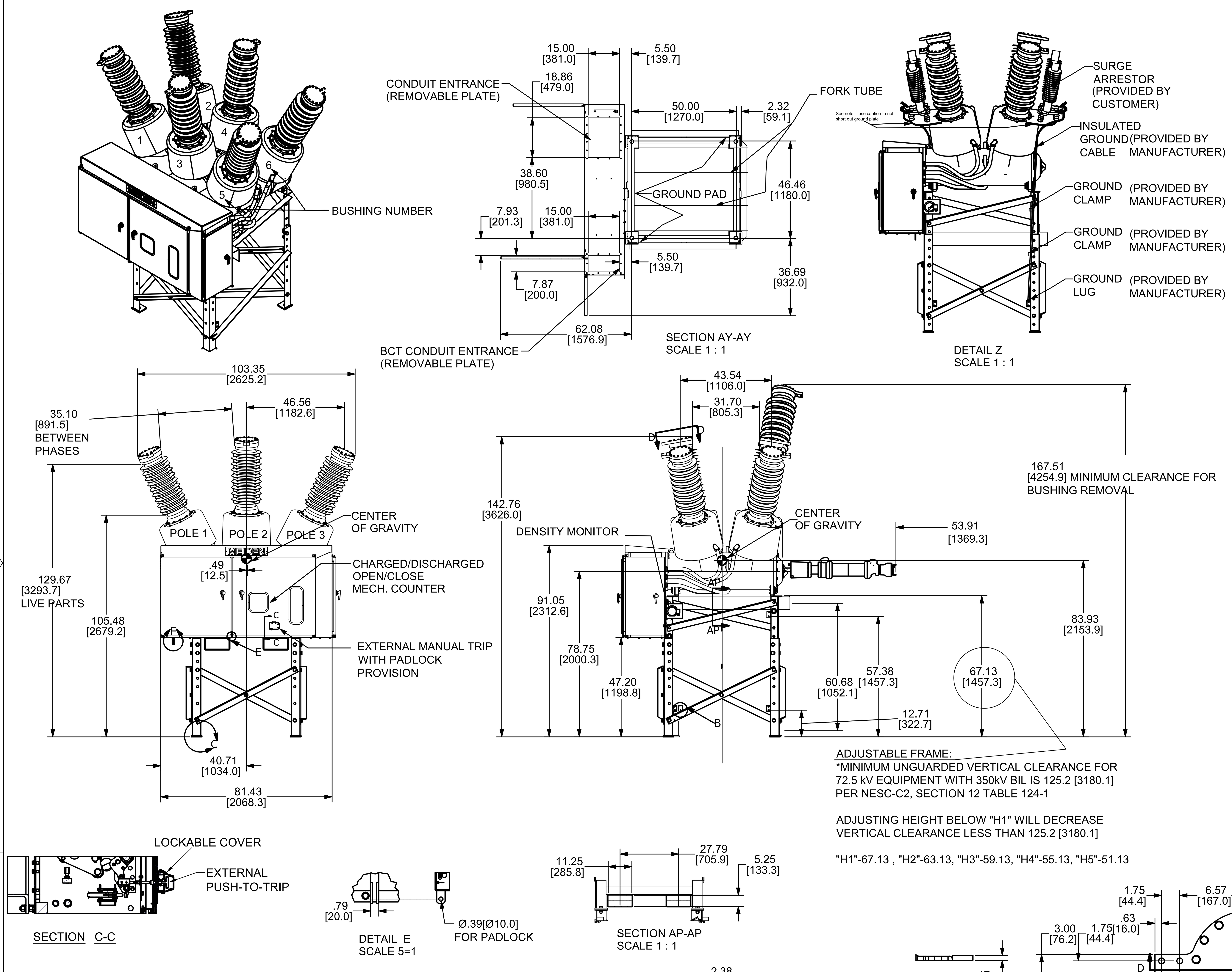
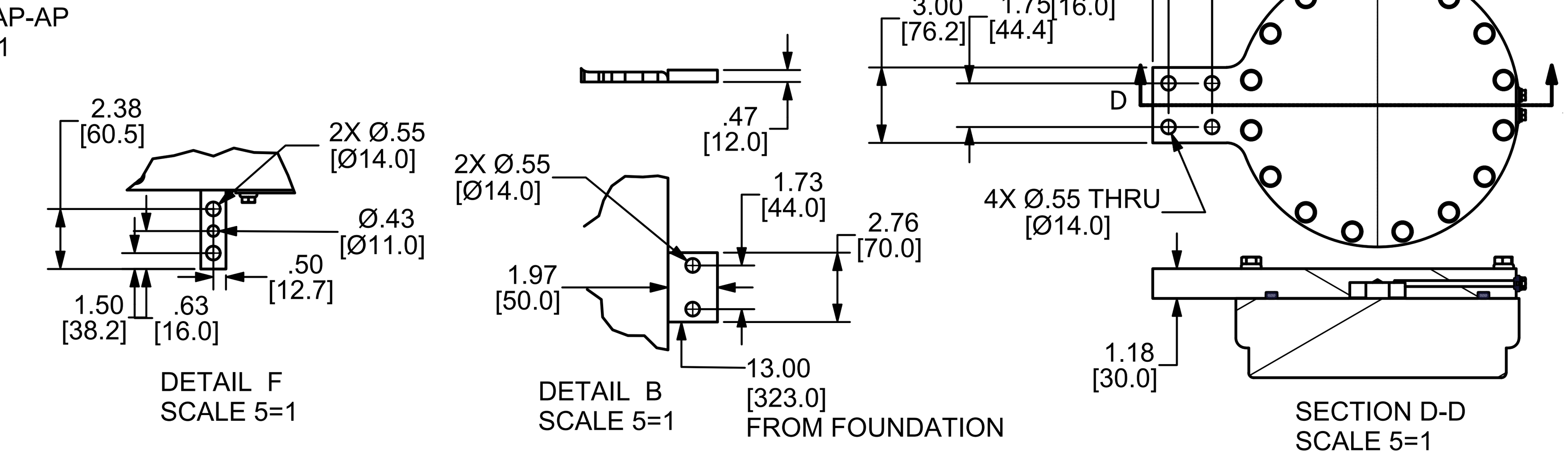
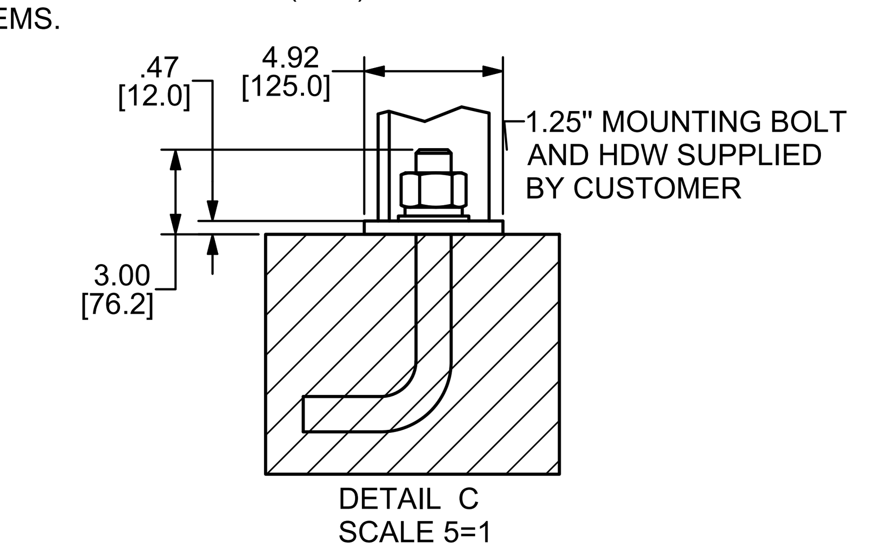
Drawing represents past orders. Repeat orders will be similar, but with some differences







NOTES:

1. TOTAL BREAKER WEIGHT = SEE TABLE
2. TOTAL DRY AIR WEIGHT = 12 LBS
3. RATINGS

RATED MAXIMUM VOLTAGE	72.5kV
RATED CONTINUOUS CURRENT	3000A
RATED SHORT CIRCUIT CURRENT	40kA
RATED POWER FREQUENCY WITHSTAND VOLTAGE	160 kV
RATED FULL WAVE IMPULSE WITHSTAND VOLTAGE	350kV
RATED DRY AIR PRESSURE AT 20 DEGREE C	72.5 psig
RATED TEMPERATURE RANGE OF OPERATION	-50 C TO +50 C

4. DIMENSIONS [ ] ARE IN INCHES
5. BUSHING DATA:
   CREEPAGE = 89.37 IN
   STRIKE = 28.74 IN
   HEIGHT = 32.7 IN
6. SURFACE TREATMENTS

SUPPORT STRUCTURE:	HOT DIP GALVANIZED PER ASTM A123
CONTROL HOUSING:	UNPAINTED ALUMINUM
MECHANISM COMPONENTS:	PAINT ANSI 70 GRAY
DRY AIR ENCLOSURE:	UNPAINTED ALUMINUM
COMPOSITE:	ANSI N0.70 LIGHT GRAY

7. MECHANICAL LOADING
   WIND LOAD: 135 MILES/HOUR
   ICE LOAD: 0.79 INCHES
   TERMINAL LOAD:
   STATIC HORIZONTAL LONGITUDINAL FORCE: 169 LBS.
   STATIC HORIZONTAL TRANSVERSE FORCE: 112LBS.
   STATIC VERTICAL FORCE: 169LBS.
8. OPTIONAL EQUIPMENT
   ADJUSTABLE FRAME ASSEMBLY

SEISMIC QUALIFICATION	N/A
ADJUSTMENT INCREMENT	4" (SEE NOTE)
FORK LIFT TUBE	SECTION AP-AP
SURGE ARRESTOR BRACKETS	DETAIL "Z"

-72.5kV VCB COMPLIES TO RATINGS OF IEEE C37.04 WITHOUT SURGE ARRESTORS. VCB BAY BE SUPPLIED WITH SURGE ARRESTORS MOUNTING BRACKETS BY CUSTOMER REQUEST.

-MEIDEN WILL PROVIDE SURGE ARRESTER BRACKETS, ARRESTER SUB-BASE INSULATORS, AND GROUNDING DOWN THE LEG OF BREAKER ON BOTH SIDES OF THE BREAKER AS SHOWN ON THIS DRAWING. (STANDARD TO ALL BREAKERS)

-AEP HAS THE OPTION TO USE THE SURGE ARRESTER BRACKETS OR NOT ON THIS BREAKER.

-SURGE ARRESTORS PROVIDED BY CUSTOMER (AEP)

-CLEARANCES OF ARRESTER TO BREAKER BUSHING ETC.. ARE CALCULATED ASSUMING AEP STANDARD ARRESTER WILL BE USED FOR 48KV MCOV DESIGN (69KV OPERATION). IF SHORTER ARRESTERS ARE USED CONSULT AEP CIRCUIT BREAKER SME (SUBJECT MATTER EXPERT) (AEP STANDARD ARRESTERS WITH ABB (HITACHI ENERGY USA) ARE SAME PHYSICAL SIZE FROM 29KV MCOV TO 48KV MCOV RATING. THUS, NO CALCULATION IS NECESSARY ASSUMING ABB ARRESTER IS USED BETWEEN THESE VOLTAGE RATINGS.

-DURING ASSEMBLY MAKE SURE THE INSULATED GROUND CABLE DOES NOT SHORT OUT TO ARRESTER SUB-BASE INSULATOR GROUNDING PLATE. THIS MAY CREATE AN "ARTIFICIAL GROUND LOOP" THAT WILL SHORT OUT THE BUSHING CURRENT TRANSFORMERS (BCT) AND CAUSE PROTECTION AND CONTROL PROBLEMS.

AEP CID	CTL. (VDC)	BCT	WEIGHT	BCT DWG	NP DWG
9900117348	48	1200:5, C800 PER BUSHING, TRF = 3	6450 lbs	MAS31C0009-2	MAS31N0009-48
9900117351	48	2000:5, C800 @ 1200:5 PER BUSHING, TRF = 3	6750 lbs	MAS31C0009	MAS31N0009-48
9900117352	125	1200:5, C800 PER BUSHING, TRF = 3	6450 lbs	MAS31C0009-2	MAS31N0009-125
9900114602	125	2000:5, C800 @ 1200:5 PER BUSHING, TRF = 3	6750 lbs	MAS31C0009	MAS31N0009-125
9900114604	125	3000:5, C800 @ 2000:5 PER BUSHING, TRF = 3	5550 lbs	MAS31C0009-1	MAS31N0009-125
9900117353	250	3000:5, C800 @ 2000:5 PER BUSHING, TRF = 3	5550 lbs	MAS31C0009-1	MAS31N0009-250

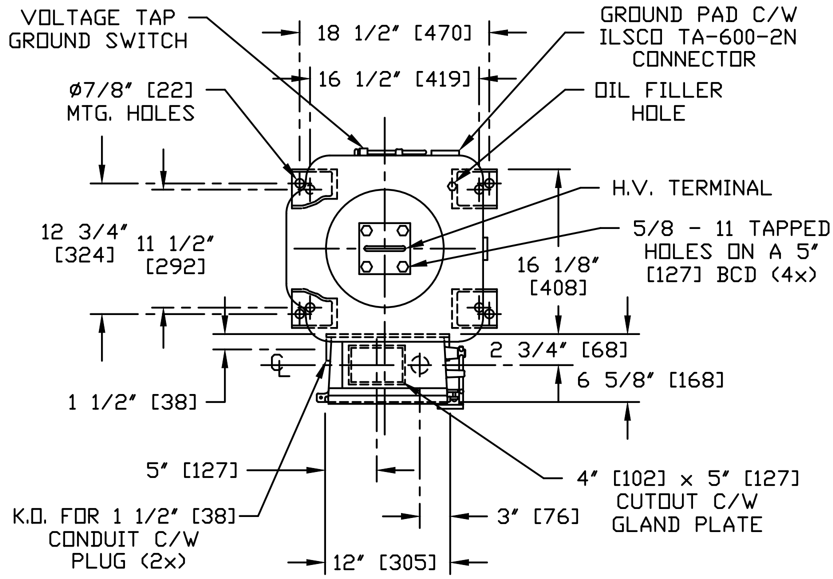
MEIDEN AMERICA SWITCHGEAR

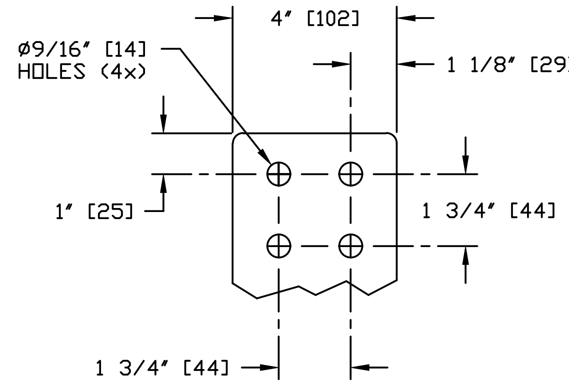
72.5-VCB-40-3000A
OUTLINE DIAGRAM

SCALE 1=25 SIZE D
DR BY A.REXROAD DATE 04-21
CHKD BY Y.TAKESHITA DATE 04-21

MEIDEN

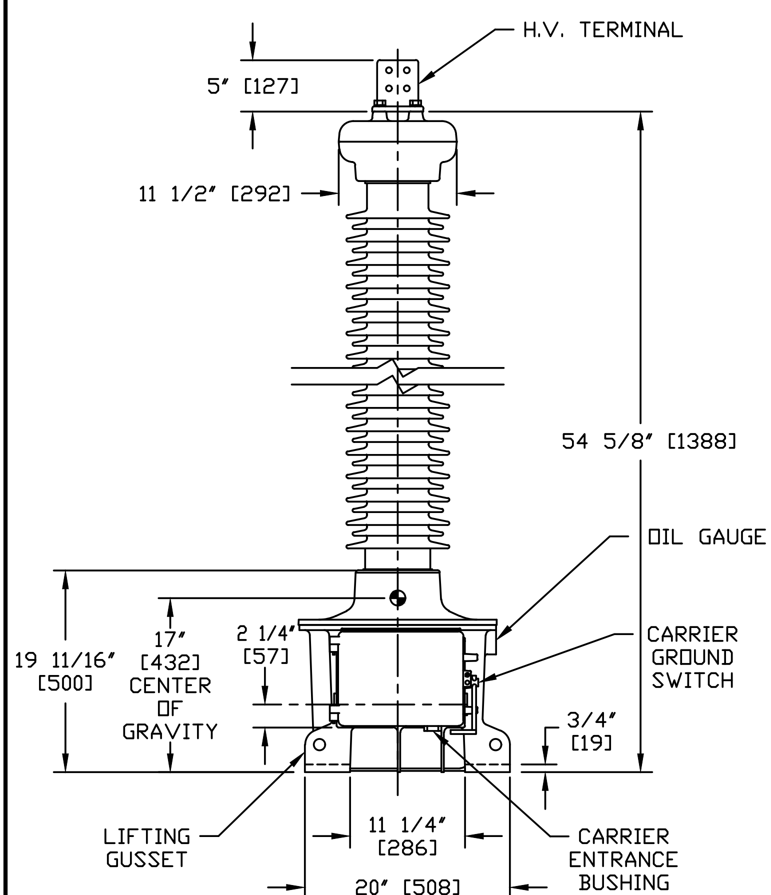
DWG NO MAS31000009-RC REVISION 00

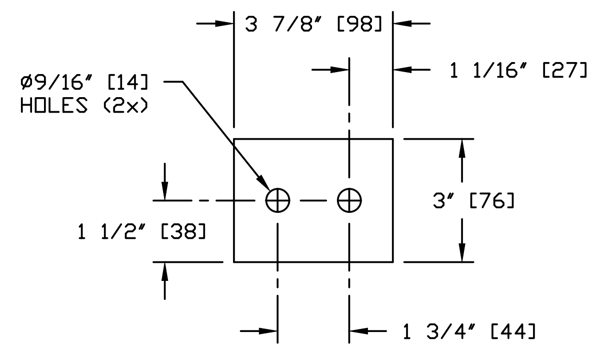




H.V. TERMINAL DETAIL

MATERIAL: 1/2" [13] THICK ALUMINUM
TIN PLATED ALUMINUM PROCESS





GROUND PAD DETAIL

MATERIAL: 1/2" [13] THICK ALUMINUM
TIN PLATED ALSTAN PROCESS

NOTES:

1. ALL DIMENSIONS ARE IN INCHES AND [MILLIMETERS]
2. INSULATOR COLOR: GREY
3. BASE HOUSING CAST ALUMINUM
4. BIL: 350 kV
5. CREEPAGE DISTANCE: 72" [1820]
6. CAPACITANCE: 10000 pF
7. MAX. HORIZ. TERM. PULL: 1394 LBS 6.2 kN @ 100 mph [160 km/h] WIND SPEED.
8. INSULATOR TYPE: F72.5
9. TOTAL WEIGHT: 410 LBS 185 kg

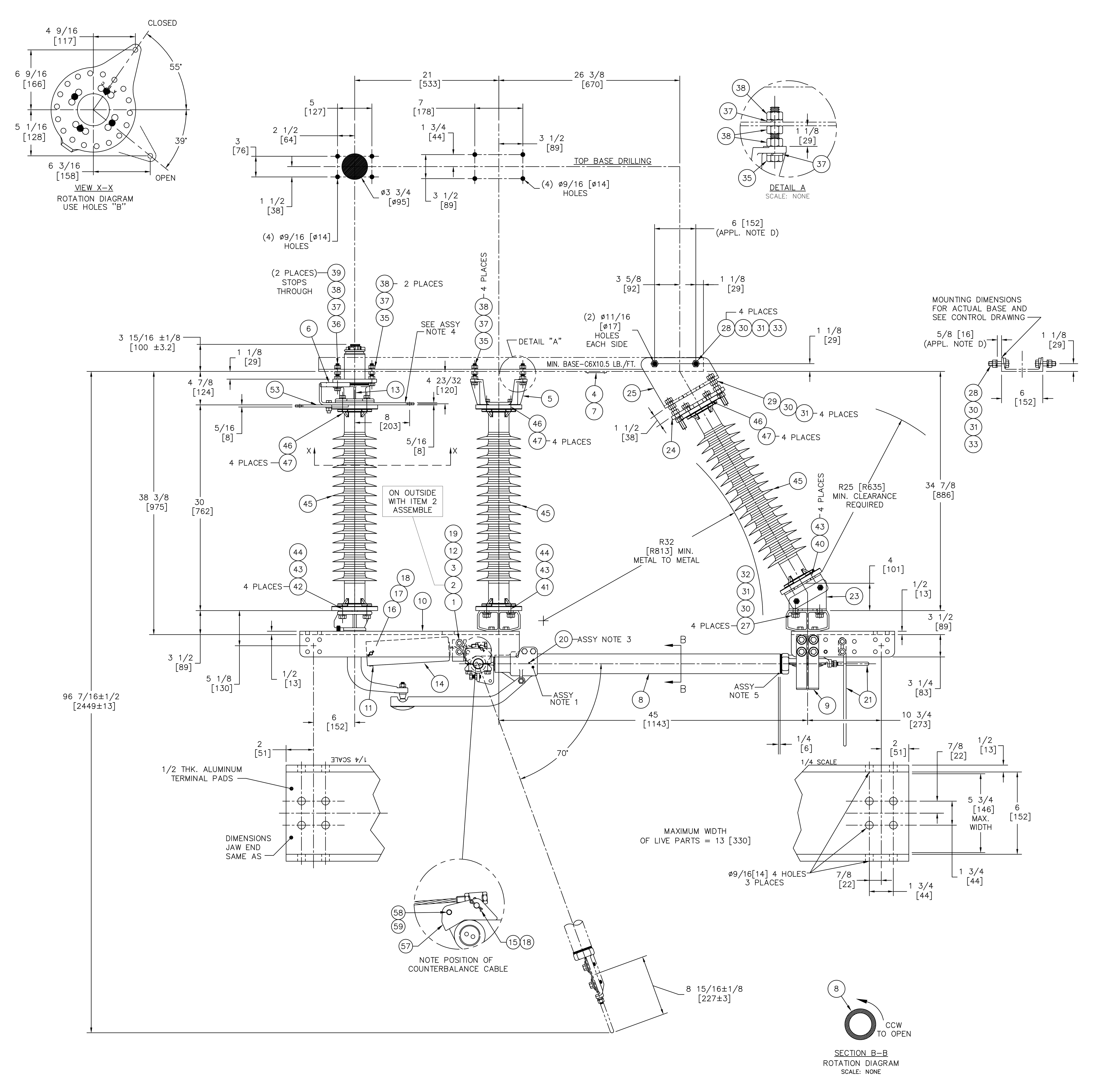
AEP CATALOG ID# 0710059390

TOLERANCES UNLESS OTHERWISE SPECIFIED	REVISION No.	REVISION DESCRIPTION	TRENCH LIMITED
0-12"[305]±1/32"[0.8] 12"[305]-24"[610]±1/16"[1.6] 24"[610]-36"[914]±3/32"[2.4] 36"[914]-48"[1219]±1/8[3.2] 48"[1219] AND UP ±3/16"[4.8] WEIGHT±10% ANGULAR±2°			CAPACITOR VOLTAGE TRANSFORMER TYPE TEVF 72.5

TRENCH

DESG.	DRN.	APPD.	DATE	SCALE	W.O.
	C. J.		SEP. 01/2020	1=18	

AMERICAN ELECTRIC POWER CO. | DWG. TEVF72.5



REF–20286511, 20289141

TYPE EV–2SV MFR.DATE ___ J.O. ___ FREQ.60HZ
VOLTAGE 69 MAX 72.5 kV BIL 350 kV 2000 AMP.CONT.
AMP. 3 SEC. 63 kA ASYM 100 kA 164 PEAK kA
STYLE 20286512 SERIAL NO. ___
P.O. ___
CID NO. ___ ACCC D06
WARRANTY EXPIRATION ___
MAX. ALLOW. TEMP. RISE 53 °C
Southern States
30 GEORGIA AVENUE
HAMPTON, GA 30228
(770) 946–4562
161

WEIGHT TABLE (ONE POLE)		
72.5 kV 350 BIL	[lb]	[kg]
LIVE PARTS	115	52.2
BRG, ARMS & ADAPTERS	45	20.4
BASE	45	20.4
*POST INSULATORS	159	72.1
TOTAL WEIGHT	364	165.1

*WEIGHT BASED ON MACLEAN NAA100XH16S0

SPECIAL FOR AMERICAN ELECTRIC POWER (AEP)

THIS DRAWING HAS BEEN PREPARED FOR AMERICAN ELECTRIC POWER (AEP) AND IS NOT TO BE USED FOR ANYONE ELSE. IT MUST BE RESUBMITTED FOR APPROVAL TO AMERICAN ELECTRIC POWER (AEP) WHENEVER CHANGES ARE MADE.

D–20286512 BILL OF MATERIAL

EV–2SV 72.5kV 2000A 350kV BIL
SLANTED UNDERHUNG MOUNTING
5" [127] B.C. POLYMER INSULATORS
D06 100kA MOMENTARY AEP

	ITEM	DESCRIPTION	DWG SIZE	PART NO.	QUANTITY –
	1	3/8 ST. STL HEX NUT		01173120	6
	2	3/8 ST. STL. PLAIN WASHER		01183124	6
	3	3/8 ST. STL. LOCK WASHER		01183340	6
	4	NAMEPLATE	B	01450161	4
	5	ADAPTER (5"BC)	C	03172946	3
	6	STOP (5"BC)	B	04172904	6
	7	ST. STL. METAL TACK	A	01299056	6
	8	BLADE ASSEMBLY	C	08124676	3
	9	JAW ASSEMBLY	D	08124241	3
	10	HINGE ASSEMBLY	D	08125565	3
***	11	ARCING HORN ASSEMBLY	B	08124683	3
	12	HINGE STOP BRACKET (OPEN POS.)	A	01705782	3
	13	BEARING ASSEMBLY (5"BC)	C	08160374	3
	14	COUNTERBALANCE ASSEMBLY	B	08124728	3
	15	ø 3/8 x 2 1/4 ST. STL. CLEVIS PIN	A	01279034	3
	16	COUNTERBALANCE PIVOT SHAFT	A	01560085	3
	17	COUNTERBALANCE END PLUG	A	01705783	3
	18	ø 3/32 x 3/4 ST. STL. COTTER PIN		01191292	9
	19	3/8 X 1 1/2 ST. STL. HEX BOLT		01043024	6
	20	ø 1/4 x 7/8 ST. STL. ROLL PIN	A	01276414	3
	21	#6 x 5/16 ST. STL. DRIVE SCREW		01150187	6
	23	INSULATOR ADAPTER BRACKET	B	08136617V01	3
	24	INSULATOR MTG. PLATE	B	15014790	3
	25	BASE ADAPTER BRACKET	B	15427517	3
	27	5/8 x 1 1/2 GALV. STL. BOLT		01056024	12
	28	5/8 x 2 1/2 GALV. STL. BOLT		01056040	12
	29	5/8 x 4 1/2 GALV. STL. BOLT (FT)		01059026	12
	30	5/8 GALV. STL. LOCK WASHER		01186280	48
	31	5/8 GALV. STL. HEX NUT		01176080	60
	32	5/8 GALV. STL. PLAIN WASHER		01186057	12
	33	5/8 GALV. STL. BEVEL WASHER		01186420	12
	34	1/2 x 1 1/4 GALV. STL. BOLT		01055020	12
	35	1/2 x 3 GALV. STL. BOLT (FT)		01059032	18
	36	1/2 x 3 1/2 GALV. STL. BOLT (FT)		01059034	6
	37	1/2 GALV. STL. LOCK WASHER		01185280	48
	38	1/2 GALV. STL. HEX NUT		01175080	72
	39	1/2 GALV. STL. PLAIN WASHER		01185064	6
**	51	SWITCH ARM 8" 5BC NB		15427520	2
**	52	AUX ARM MTG 8" 5BC NB		15427521	1
**	53	AUX ARM ASSY 8" 5BC NB		08136616	1
	57	COUNTERBALANCE BRACKET		04178977	3
	58	3/8 ST. STL. ESPW		01183200	6
	59	3/8 X 1 ST. STL. HEX BOLT		01043016	6
				CONTROL COUNT	43
		DO NOT REQUISITION ITEMS BELOW:			
*	60	#6 x 5/16 ST. STL. DRIVE SCREW		01150187	2
		LIVE PARTS MOUNTING HARDWARE:			
	40	5/8 x 1 GALV. STL. BOLT		01056016	12
	41	5/8 x 1 1/4 GALV. STL. BOLT		01056020	12
	42	5/8 x 1 1/2 GALV. STL. BOLT		01056024	12
	43	5/8 GALV. STL. LOCK WASHER		01186280	36
	44	5/8 GALV. STL. FLAT WASHER		01186057	24
		INSULATOR & MOUNTING HARDWARE:			
	45	TR–278 5" B.C. POLYMER INSULATOR		10129580	9
	46	5/8 x 1 1/4 GALV. STL. BOLT		01056020	36
	47	5/8 GALV. STL. LOCK WASHER		01186280	36

CUSTOMER NOTES:

*** 1. UNDERHUNG MOUNTED SWITCHES NORMALLY SUPPLIED WITHOUT ARCING HORNS.
2. INSULATORS LISTED IN THE ABOVE BILL OF MATERIAL ARE AS SPECIFIED BY ANSI STANDARD C29.9. CUSTOMER REQUIREMENTS FOR INSULATORS OTHER THAN THESE WILL BE FURNISHED AS SPECIFIED ON PURCHASE ORDER OR IN CUSTOMER SPECIFICATIONS.
3. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED. DIMENSIONS SHOWN IN BRACKETS "[ ]" ARE IN MILLIMETERS.
* 4. ITEM 60 (NOT SHOWN) IS FOR FIELD USE WITH NAMEPLATE (ITEM 4).

APPLICATION NOTES:

** A. APPLICATION ENGINEERING TO IDENTIFY ITEMS 51, 52 AND 53 ON OP. MECH. DRAWING AS BUBBLES A, B AND C (RESPECTIVELY).
B. MAXIMUM TORQUE PER UNIT = 1320 LB–IN [149 N.m] AT 15° FROM THE CLOSED POSITION.
*** C. DELETE ARCING HORNS (ITEM 11) WHEN NOT REQUIRED BY CUSTOMER.
D. OP. MECH. TO PROVIDE 1/4" SPACER ON EACH SIDE OF THE CHANNEL BASE (BETWEEN BASE AND BASE ADAPTER BRACKET (ITEM 25)).
E. WHEN C9X13.4 SWITCH BASE IS REQUIRED, SUBSTITUTE 15427649 FOR ITEM 25 (15427517).

ASSEMBLY NOTES:

1. WIRE BRUSH THE PORTION OF THE BLADE THAT GOES INTO THE BLADE SOCKET AND APPLY "NO–OX–ID" SPECIAL ELECTRICAL JOINT COMPOUND TO THAT AREA. WIRE BRUSH THROUGH THIS COATING IMMEDIATELY BEFORE ASSEMBLY. (REFER TO SSI SPECIFICATION M–4031).
2. OPERATING EFFORT TO BE ADJUSTED ON UNIT ASSEMBLIES BETWEEN 1130 AND 1320 IN–LB [128–149 N.m] USING YOKE ADJUSTMENT STUDS.
3. DRILL ø 1/4" [6.4] HOLE FOR ROLL PIN (ITEM 20) AFTER FINAL ASSEMBLY.
** 4. REFER TO OPERATING MECHANISM DRAWING FOR THE POSITIONING OF ARMS 51 (OP. MECH. BUBBLE A), 52 (OP. MECH. BUBBLE B) AND 53 (OP. MECH. BUBBLE C).
5. DRILL ø 1/4" [6.4] DRAIN HOLE IN BLADE AT SHOWN LOCATION.
6. INVERT INSULATORS AS SHOWN.

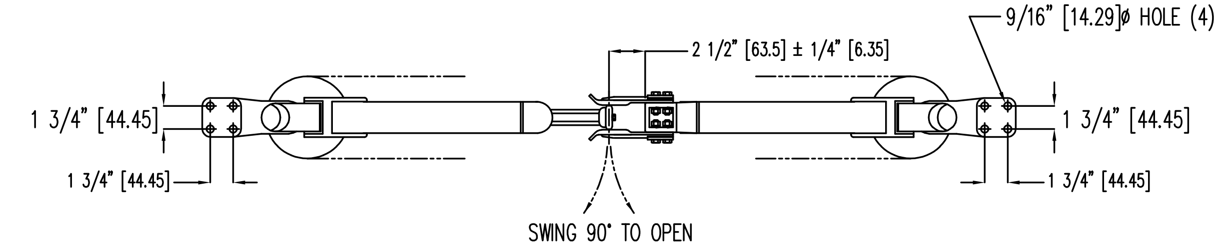
REVISE ON CAD SYSTEM ONLY

NO.	DATE	BY	REVISION
4	01/18/22	BD	IT–12 WAS 01705775, QTY–3. ECN–39344.
3	01/13/22	BD	ADDED AP. NOTE E. ECN–39330.
2	11/19/21	BD	EV–2SV WAS EV–2. ECN–39134
1	10/26/21	BD	ISSUE. ECN–38952.

Southern States
30 GEORGIA AVENUE
HAMPTON, GEORGIA 30228–2199
TELEPHONE: (770) 946–4562
FAX: (770) 946–8106

EV–2SV 72.5kV 2000A 350kV BIL
SLANTED UNDERHUNG MOUNTING
5" [127] B.C. POLYMER INSULATORS
D06 100kA MOMENTARY AEP

DRAWN:	10/26/21	BD	APPROVED CHIEF ENG.
CHECKED:	10/26/21	BD	SHEET NO. 1 OF 1 SHEETS
SCALE:	1:8		
J.O.	P.O.	D–20286512	REV. 4

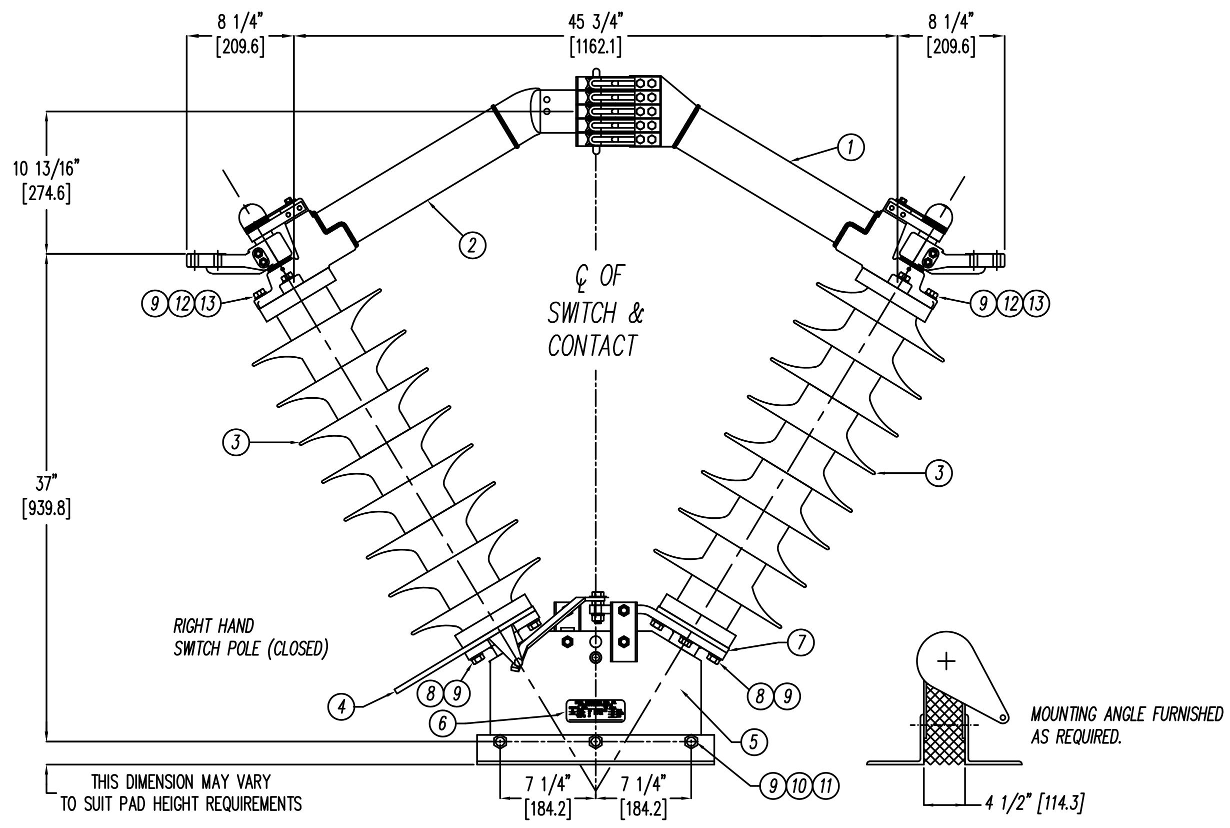


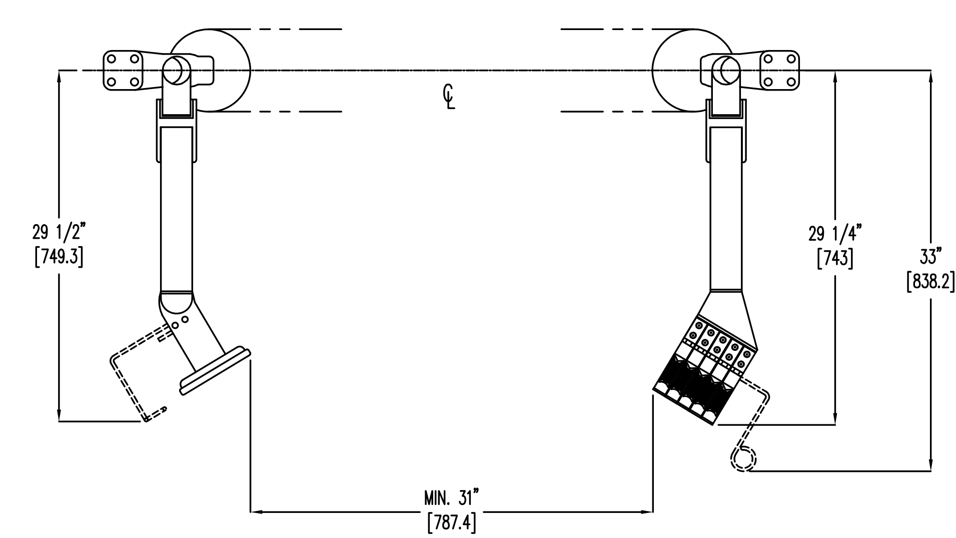
WEIGHT TABLE
S.P.A. W/O MOUNTING ANGLES = 196 LBS. / 88.9 KG
TR-278 INSULATOR = 35 LBS. / 15.9 KG
LIVE PARTS = 46 LBS. / 20.9 KG
BASE W/O MOUNTING ANGLES = 80 LBS. / 36.3 KG

* ALL WEIGHTS LISTED ARE APPROXIMATE *

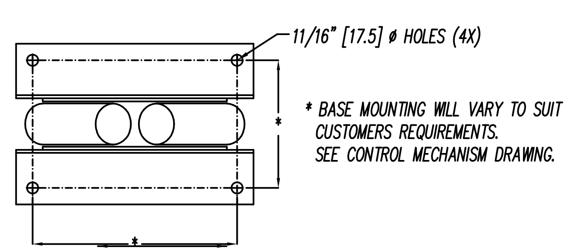
NOTE:
METRIC DIMENSIONS SHOWN IN [ ].

BILL OF MATERIAL		B-4239-AEP-NP-V		
NO.	DESCRIPTION	PART NO.	QTY	CHK'D
1	CONTACT BLADE ASSEMBLY	B-4234-E	1	
2	PLUG BLADE ASSEMBLY	B-4233-E	1	
3	INSULATOR 350KV BIL POST	INSTR278NPP	2	
4	LEVER	B-117-A	1	
5	BASE ASSEMBLY WITH SCREEN	A-7030	1	
6	NAMEPLATE ASSY	N08537-1	1	
7	5" B.C. SPACER	A-2501-C	1	
8	HEX BOLT 5/8-11NC X 2"	G63200H	8	
9	LOCKWASHER 5/8"	GL63	20	
10	HEX NUT 5/8-11NC	GN6311H	6	
11	HEX BOLT 5/8-11NC X 1 1/2"	G63150H	6	
12	FLATWASHER 5/8"	GF63125	6	
13	HEX BOLT 5/8-11NC X 1 3/4"	G63175H	6	





ROYAL SWITCHGEAR MFG. CO.
3995 PINE LANE SE BESSEMER ALABAMA 35022
CATALOG NO. AV6920AEP100. TYPE AV6920
69 KV NOM. 72.5 KV MAX. DESIGN 350 KV BIL
2000 A CONT.* 63 KA 3-SEC. 100 KA MOM.
*BASED ON 53 °C RISE F06 ACCC
S.O. # XXXXX S/N: XXXX



* BASE MOUNTING WILL VARY TO SUIT CUSTOMERS REQUIREMENTS.
SEE CONTROL MECHANISM DRAWING.

ROYAL SWITCHGEAR MANUFACTURING CO.
3995 PINE LANE S.E., BESSEMER, ALABAMA 35022

FOR:
THIS DRAWING SUPERSEDES B4239-AEP-NP-V, ISSUE 03 DATED 11-17-08

NO.	DATE	REVISION RECORD	BY	CHK	ENG
04	12-15-11	EC121511.1	RMB		
03	11-17-08	EC111408.1	JA		
02	06-17-08	EC061708.2	DH		

MAT: SEE BOM
FIN: SEE BOM
TOLERANCE UNLESS SPEC'D: 1 PLC DEC +/- 0.015"; 2 PLC DEC +/- 0.010"; 3 PLC DEC +/- 0.005"; FRACTIONS +/- 1/16"; DEGREES +/- 2°

TITLE: SINGLE POLE ALUM. V-SW ASSY. 5" B.C. 72.5KV (69KV) - 2000A - 100KA VERTICAL MOUNTED

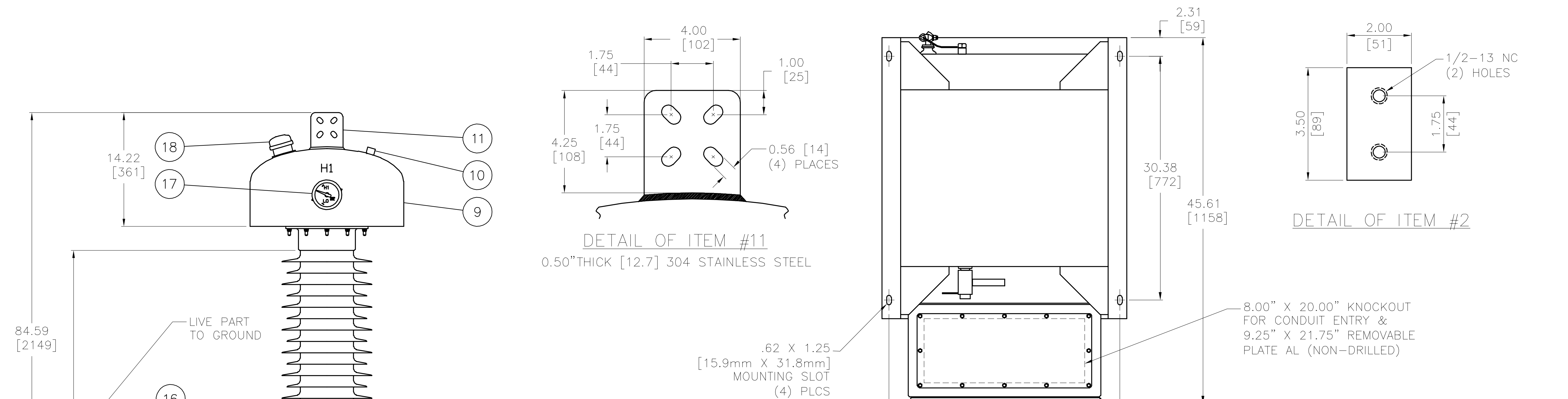
DRAWN: D HUHGLEY DATE: 08-22-07 | CHECKED: | DATE:
SCALE: NTS | ENGINEER: | DATE:

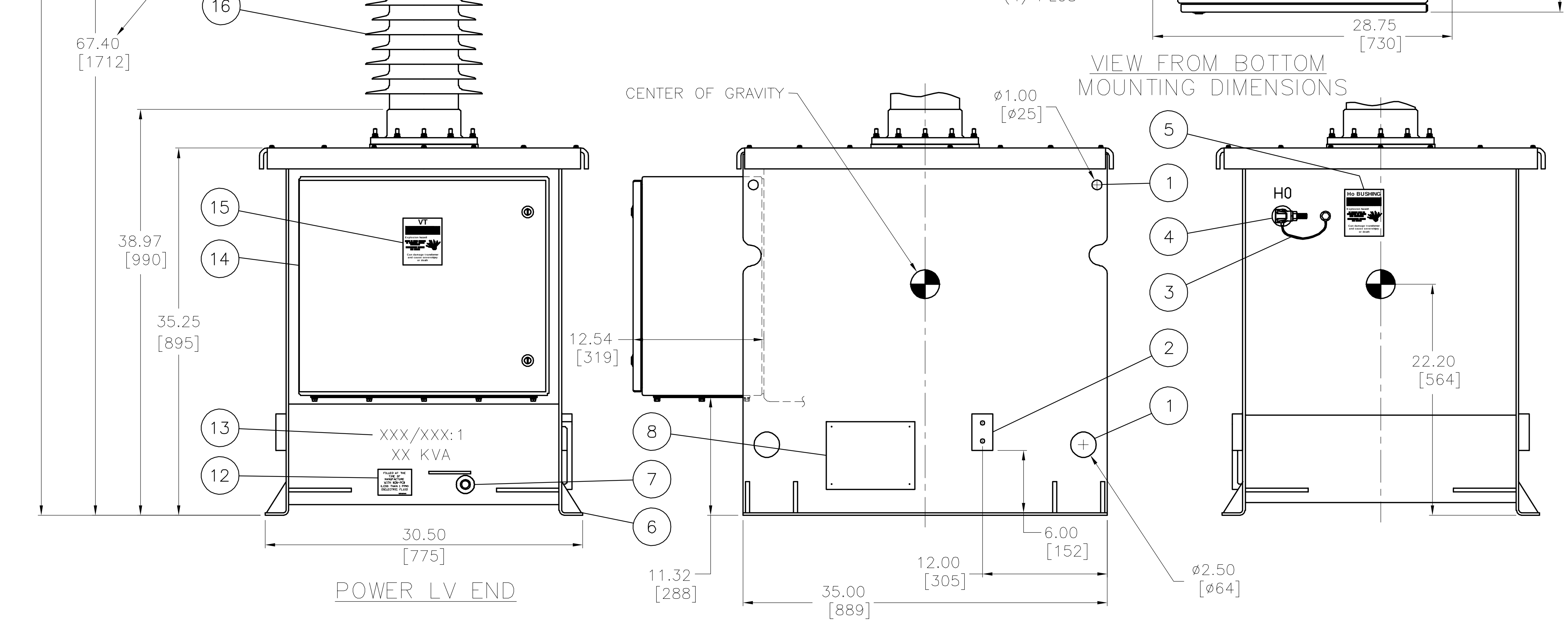
SIZE	PART DRAWING NUMBER	ISSUE
B	4239-AEP-NP-V	4

FILE: G:\DRAWINGS\RSGDWGB\B4239-AEP-NP-V-4.DWG

STATION NAME CITY, STATE CID#: W.O. #: PVID #: BPID #: REFERENCED EQUIPMENT: REFERENCED DRAWING:

DWG. NO. 469-5146-127





NOTES:

1. TANK AND DOME COATED WITH POLYESTER POWDER.
2. ALL HARDWARE STAINLESS STEEL.
3. METRIC DIMENSIONS SHOWN IN "[ ]".
4. SEE LV CONNECTOR DRAWING FOR TERMINAL BOX LAYOUT.

SPECIFICATIONS:

1. WEIGHT ---------------- 2470 LB (1120 kg)
2. OIL VOLUME ------------ 75 GAL (284 l)
3. BUSHING STRIKE DISTANCE --- 29.52" [750] MIN
4. BUSHING LEAKAGE DISTANCE-- 93.50 [2375] MIN
5. SEISMIC RATING ---------- IEEE-STD-693-2005 HIGH SEISMIC QUALIFICATION LEVEL

ITEM	DESCRIPTION	QTY
18	CAP, FILL PLUG, 3/4" NPT + GAS PRESSURE VALVE	1
17	OIL LEVEL GAUGE, MAGNETICALLY COUPLED	1
16	350kV BIL PRIMARY BUSHING, COMPOSITE POLYMER TUBE	1
15	WARNING DECAL, "DANGER HIGH VOLTAGE"	1
14	LOW-VOLT TERMINAL BOX WITH HINGED COVER, STAIN STEEL	1
13	STENCIL RATIO AND KVA	1
12	NON-PCB OIL DECAL	1
11	PRIMARY TERMINAL, NEMA, 1/2" THICK S/S	1
10	PRESSURE RELIEF VALVE	1
9	19" DIA DOME, NITROGEN BLANKET, STAINLESS STEEL	1
8	BAR CODED NAMEPLATE, STAINLESS STEEL	1
7	1/2" NPT DRAIN VALVE, BALL TYPE, PLUGGED	1
6	BASE TANK, STAINLESS STEEL	1
5	DECAL, "HO MUST BE CONNECTED TO GND WHEN ENERGIZED"	1
4	HO BUSHING, 5KV	1
3	GROUND STRAP, REMOVABLE	1
2	TANK GROUND PAD, NEMA 2-HOLE, 1.0" THICK, S/S	2
1	LIFTING POINT	8

REV	REVISION	DATE	BY	REV	REVISION	DATE	BY

ABB INSTRUMENT TRANSFORMER DIVISION
101 KUHLMAN DR. CRYSTAL SPRINGS, MS 39059

TITLE SSVT OUTLINE DRAWING, 250/350 BIL, NON-METERING 25/50/100 KVA W/POLYMER HV BUSHING, FOR AEP

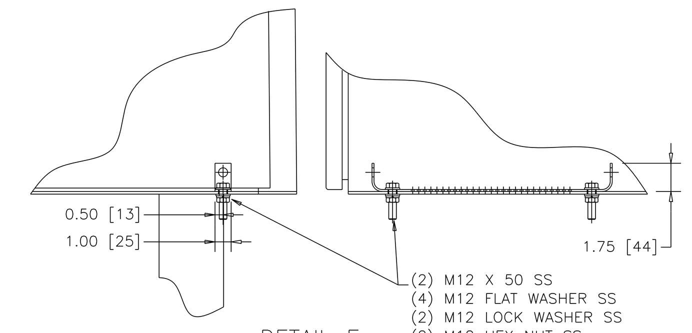
DRWG NO	SH	OF	REV
469-5146-127	1	1	0

DRWN/APPD	DATE
D SHAFER	6/13/2017

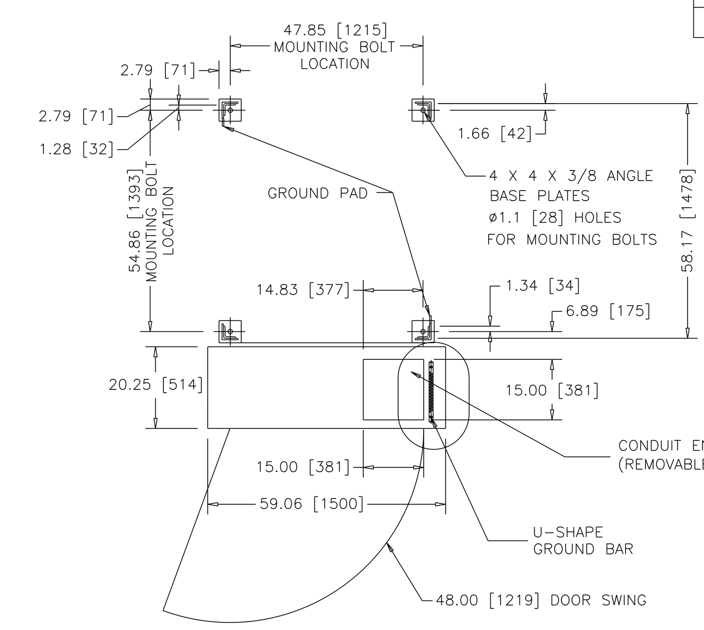
TOLERANCES EXCEPT WHERE NOTED: FRACT ±1/4, DEC ±0.25, ANG ±1° — SCALE NTS

DWG. NO. E-2261

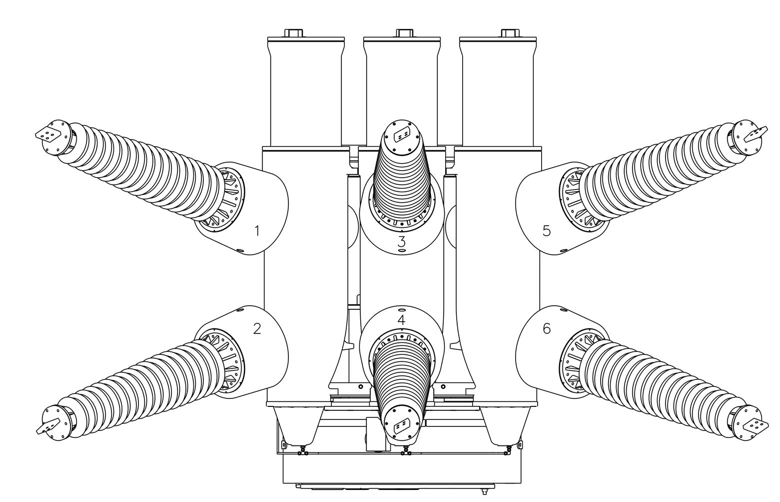
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

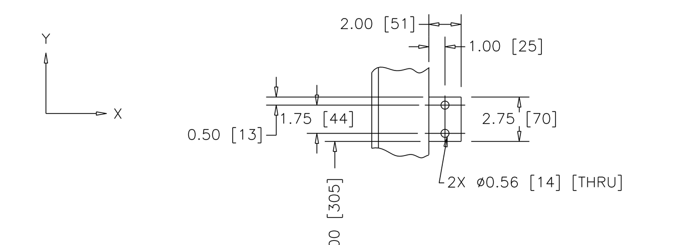


DETAIL E
COPPER GRD. BAR

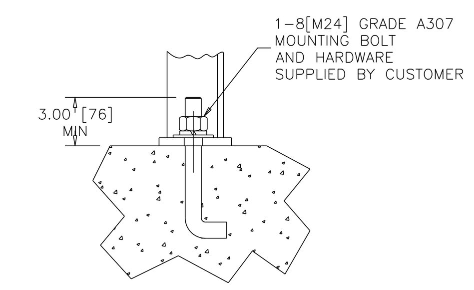


SECTION A–A

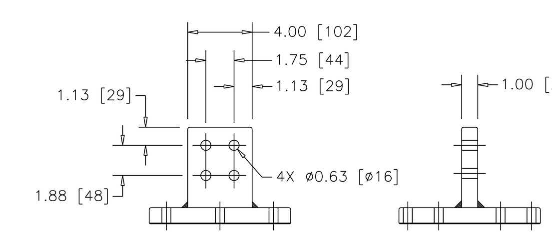




DETAIL B
GROUND PAD



DETAIL C
TYP. (4) PLCS.



DETAIL D
TYP. (6) PLCS.

NOTES

1. TOTAL BREAKER WEIGHT = 7000 lbs [3175 kg]
1.1 WEIGHT OF CT'S (6)3000:5 630lbs [286 kg], 1200:5 1410 [640 kg]
2. TOTAL SF6 WEIGHT = 150 LBS. [68 kG]
2.1 TOTAL SF6 WEIGHT AT 5PSI = 25 LBS. [11.33 kG]
3. DIMENSIONS IN [ ] ARE IN MILLIMETERS
4. ⊕ INDICATES CENTER OF GRAVITY.
5. RATINGS:
   - RATED MAXIMUM VOLTAGE: 145 kV
   - RATED CONTINUOUS CURRENT: 3000 A
   - RATED SHORT–CIRCUIT CURRENT: 45 kA
   - RATED LOW FREQUENCY WITHSTAND VOLTAGE (60–50 Hz): 310 kV
   - RATED FULL WAVE IMPULSE WITHSTAND VOLTAGE: 650 kV
   - RATED GAS PRESSURE AT 20°C [68°F]: 552 kPa [80 psig]
6. BUSHING DATA:
   - CREEPAGE = MIN. 153.78 IN [3906 MM]
   - STRIKE = 51.77 IN [1315 MM]
   - HEIGHT = 59.06 IN [1500 MM]
7. SURFACE TREATMENTS
   - SUPPORT STRUCTURE: HOT DIP GALVANIZED PER ASTM A123
   - CONTROL HOUSING: UNFINISHED ALUMINIUM
   - MECHANISM COMPONENTS: PAINT ANSI 70 LIGHT GRAY
   - SF_6 GAS ENCLOSURE: UNFINISHED ALUMINIUM
   - BCT COVER: UNFINISHED ALUMINIUM
   - BUSHING: POLYMER ANSI NO.70 LIGHT GRAY
8. MECHANICAL LOADING
   - WIND LOAD: ⩽ 135 miles/hr [60 m/s]
   - ICE LOAD: ⩽ 0.79 INCHES [20 mm]
   - SEISMIC LOAD: ⩽ 0.5 G HORIZONTAL
   - HIGH SEISMIC QUALIFICATION LEVEL (0.5g) PER IEEE 693, D6.2, 1997
   - TERMINAL LOAD:
     - STATIC HORIZONTAL LONGITUDINAL FORCE: ⩽ 280 LBS. [1250N]
     - STATIC HORIZONTAL TRANSVERSE FORCE: ⩽ 169 LBS. [750N]
     - STATIC VERTICAL FORCE: ⩽ 225 LBS. [1000N]
9. FOUNDATION LOADS:
   - MAXIMUM REACTION PER LEG @ BASE: 1.36K [6.05kN] SHEAR(X) 2.28K [10.14kN] SHEAR(Y) 13.8K [61.39kN] UPLIFT 18.33K [81.55kN] DOWN(Y)
10. STANDARD RESISTANCE VALUE: 150 OHMS
11. CIRCUIT BREAKER PARTS LIST & MECHANISM PARTS LIST CAN BE FOUND IN INSTRUCTION BOOK NUMBER 99–0145–40HSR

THIS GCB MEETS THE REQUIREMENTS OF IEEE, ANSI, IEC, NEMA AND NESC

SIGNATURES		DATE
DRAWN BY:	R.KHANDAKER	3/31/17
CHECKED		
ENGRD BY:		
APPROVALS		

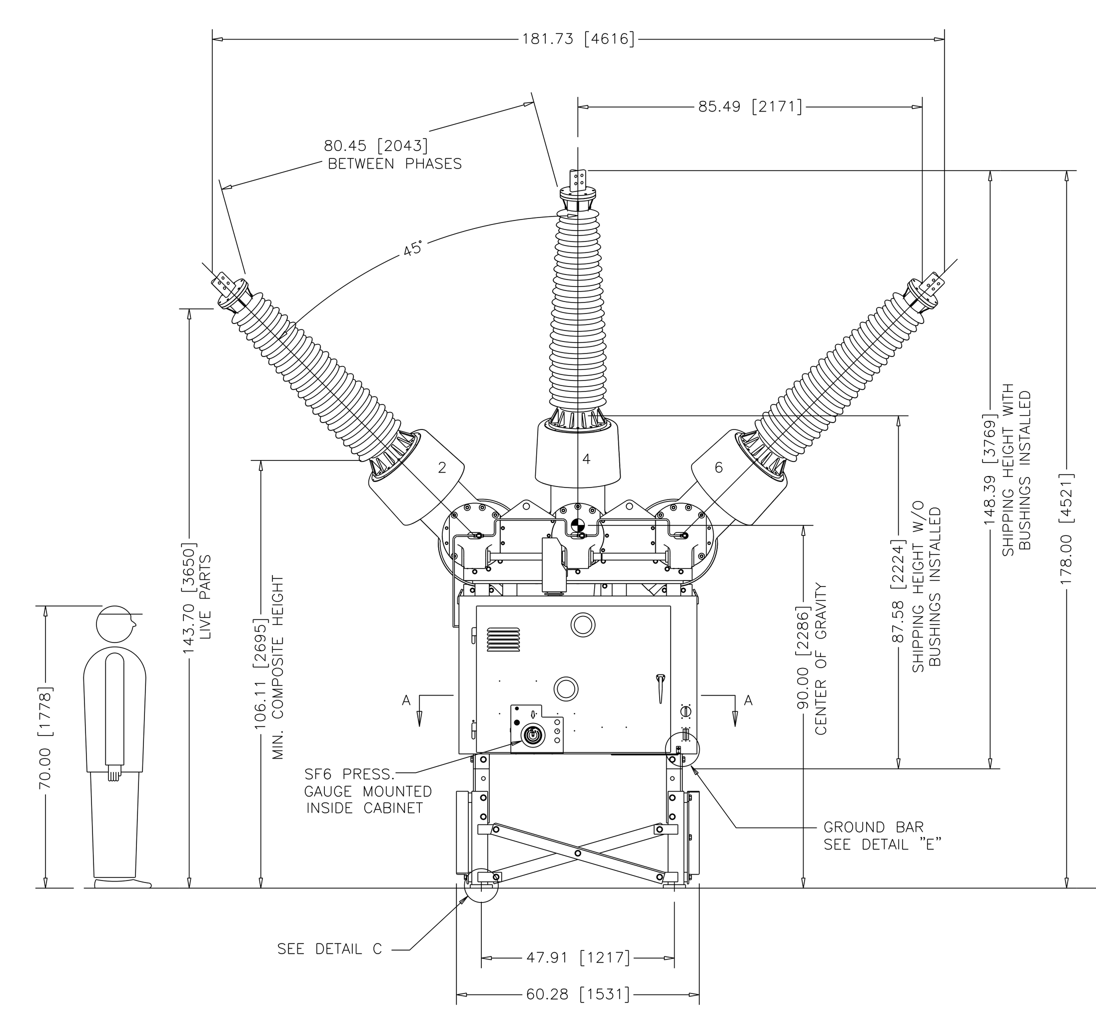
Hitachi T&D Solutions, Inc.
Suwanee, GA

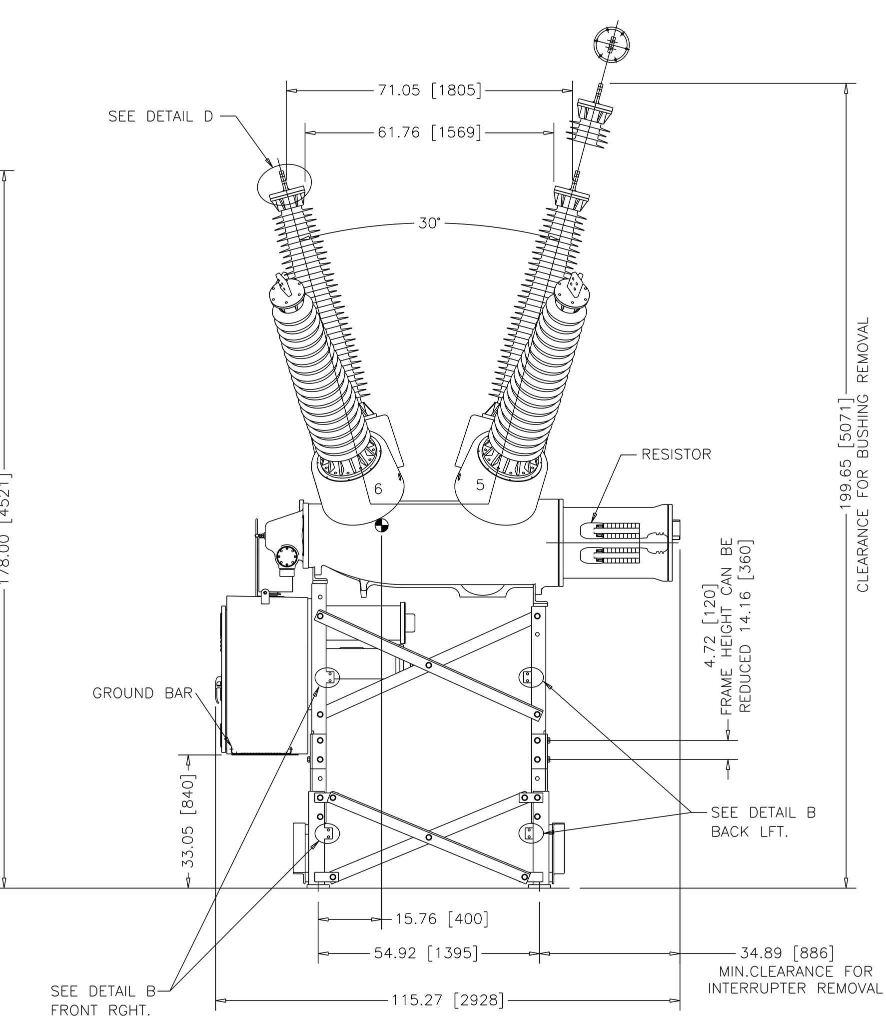
TITLE: OUTLINE
145kV/45kA/3000A (CLOSING RES.)

CUSTOMER: AEP
CUST. P.O: N/A
HTDS SO: N/A
SUBSTATION: N/A

SIZE: B | FSCM NO. | DWG. NO. AEP2CB145HSR6 | REV. 0
SCALE: NTS | CONT. ON SHT. 2 | SHT NO. 1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED





HEIGHT OPTIONS	HEIGHT OF LOWEST UNGROUNDED PART OF INSULATOR	HEIGHT BELOW NESC
178"	106.11"	0
173.28"	101.39"	4.72"
168.56"	96.67"	9.44"
163.84"	91.95"	14.16"

HSR 145 B 40
SPRING /SPRING MECHANISM
XTRA HIGH CREEP COMPOSITE

SIGNATURES		DATE
DRAWN BY:	R.KHANDAKER	3/31/17
CHECKED		
ENGRD BY:		
APPROVALS		

Hitachi T&D Solutions, Inc.
Suwanee, GA

TITLE: OUTLINE
145kV/45kA/3000A (CLOSING RES.)

CUSTOMER: AEP
CUST. P.O: N/A
HTDS SO: N/A
SUBSTATION: N/A

SIZE: B | FSCM NO. | DWG. NO. AEP2CB145HSR6 | REV. 0
SCALE: NTS | CONT. ON SHT. END | SHT NO. 2

145KV CIRCUIT BREAKER
(CS-93)

CAP SWITCHING BREAKER

NO	DATE	REVISION DESCRIPTION	APPR	DR	ENG	CK	ISSUE#

OLD DWG #: | STD DWG #:

OHIO TRANSMISSION COMPANY
LICK STATION
JACKSON OHIO

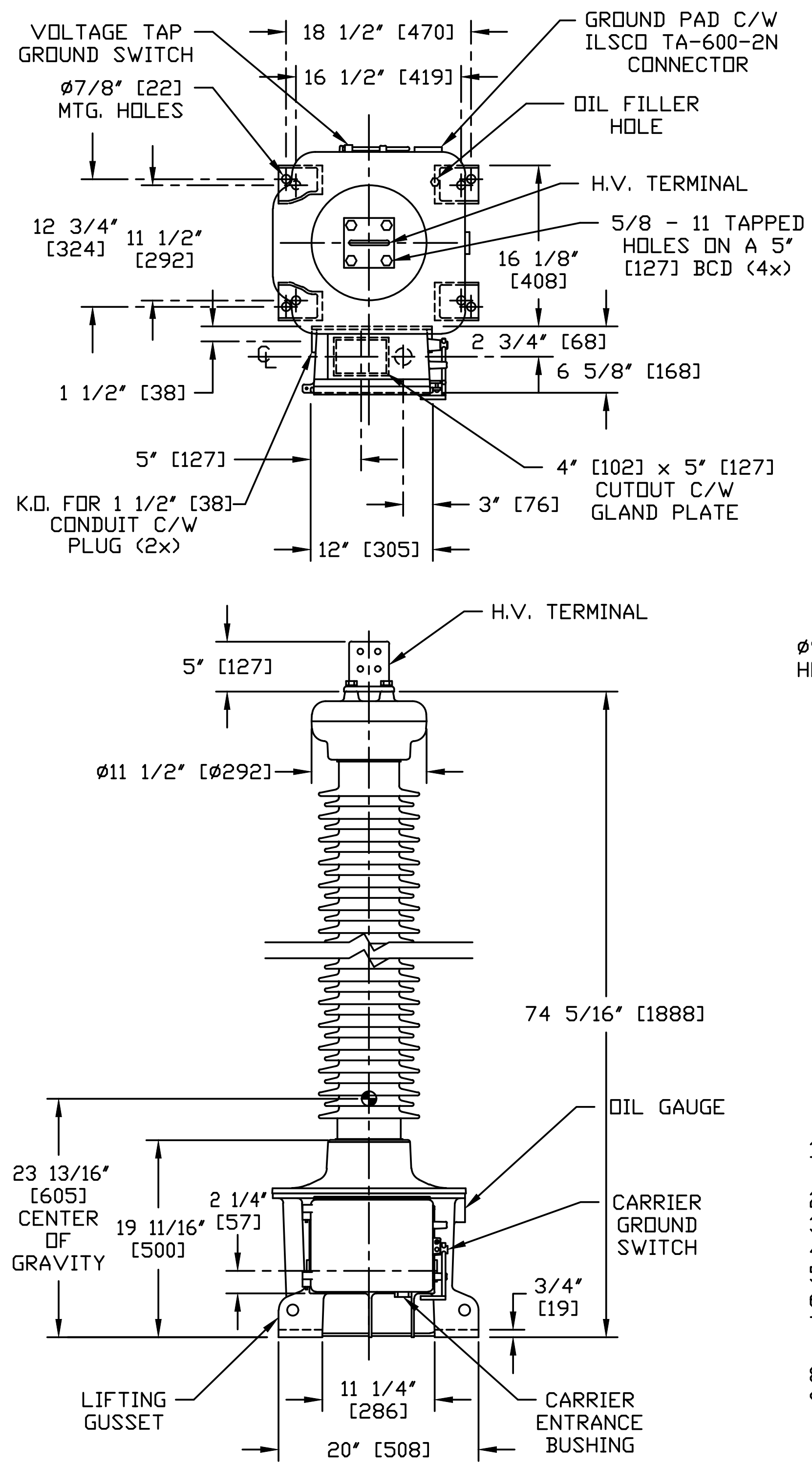
138KV
MANUFACTURER'S DRAWING
145KV 3000A CIRCUIT BREAKER, CAP SWITCHING CS-93 (CID#0710056111)

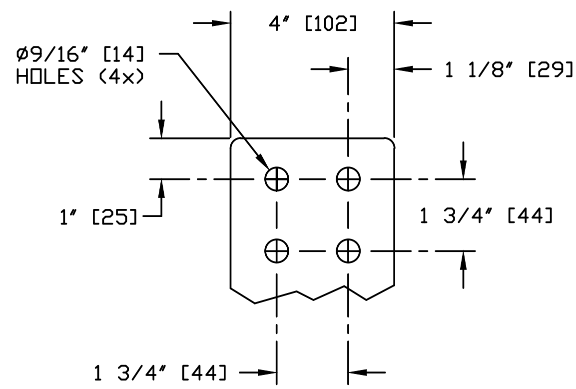
SCALE: NONE	DR: JSP	ENG: MBS	CH: AJB
AMERICAN ELECTRIC POWER	WO#: 42987364C1	APPD: IRV	DATE: 7/23/2021
	1 RIVERSIDE PLAZA COLUMBUS, OH 43215	DWG. NO. E-2261	REV 0

D:\ics_workingdir\7\20587_4271\E2261.dgn

CM 1 2 3 4 5 6 7 | 1/16 INCH 4 8 12 16 | TENTHS 10 20 30 | INCHES 1 2 3

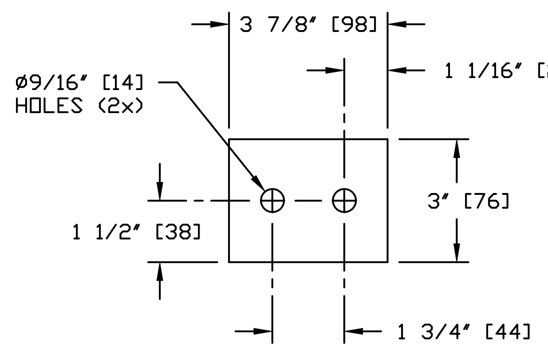
STATION ENGINEERING AT 4:55:29 PM 7/23/2021 PLOTTED BY MNALDCAS147 ON AEP G (30 X 46)





H.V. TERMINAL DETAIL

MATERIAL: 1/2" [13] THICK ALUMINUM
TIN PLATED ALSTAN PROCESS



GROUND PAD DETAIL

MATERIAL: 1/2" [13] THICK ALUMINUM
TIN PLATED ALSTAN PROCESS

NOTES:

1. ALL DIMENSIONS ARE IN INCHES AND [MILLIMETERS]
2. INSULATOR COLOR: GREY
3. BASE HOUSING CAST ALUMINUM
4. BIL: 650 kV
5. CREEPAGE DISTANCE: 148" [3750]
6. CAPACITANCE: 5000 pF
7. MAX. HORIZ. TERM. PULL: 899 LBS 4.0 kN @ 100 mph [160 km/h] WIND SPEED.
8. INSULATOR TYPE: F145
9. TOTAL WEIGHT: 475 LBS 215 kg

AEP CATALOG ID# 0710059392

TOLERANCES UNLESS OTHERWISE SPECIFIED	REVISION No.	REVISION DESCRIPTION	TRENCH LIMITED
0-12"[305]±1/32"[0.8] 12"[305]-24"[610]±1/16"[1.6] 24"[610]-36"[914]±3/32"[2.4] 36"[914]-48"[1219]±1/8[3.2] 48"[1219] AND UP ±3/16"[4.8] WEIGHT±10% ANGULAR±2°			CAPACITOR VOLTAGE TRANSFORMER TYPE TEVF 145

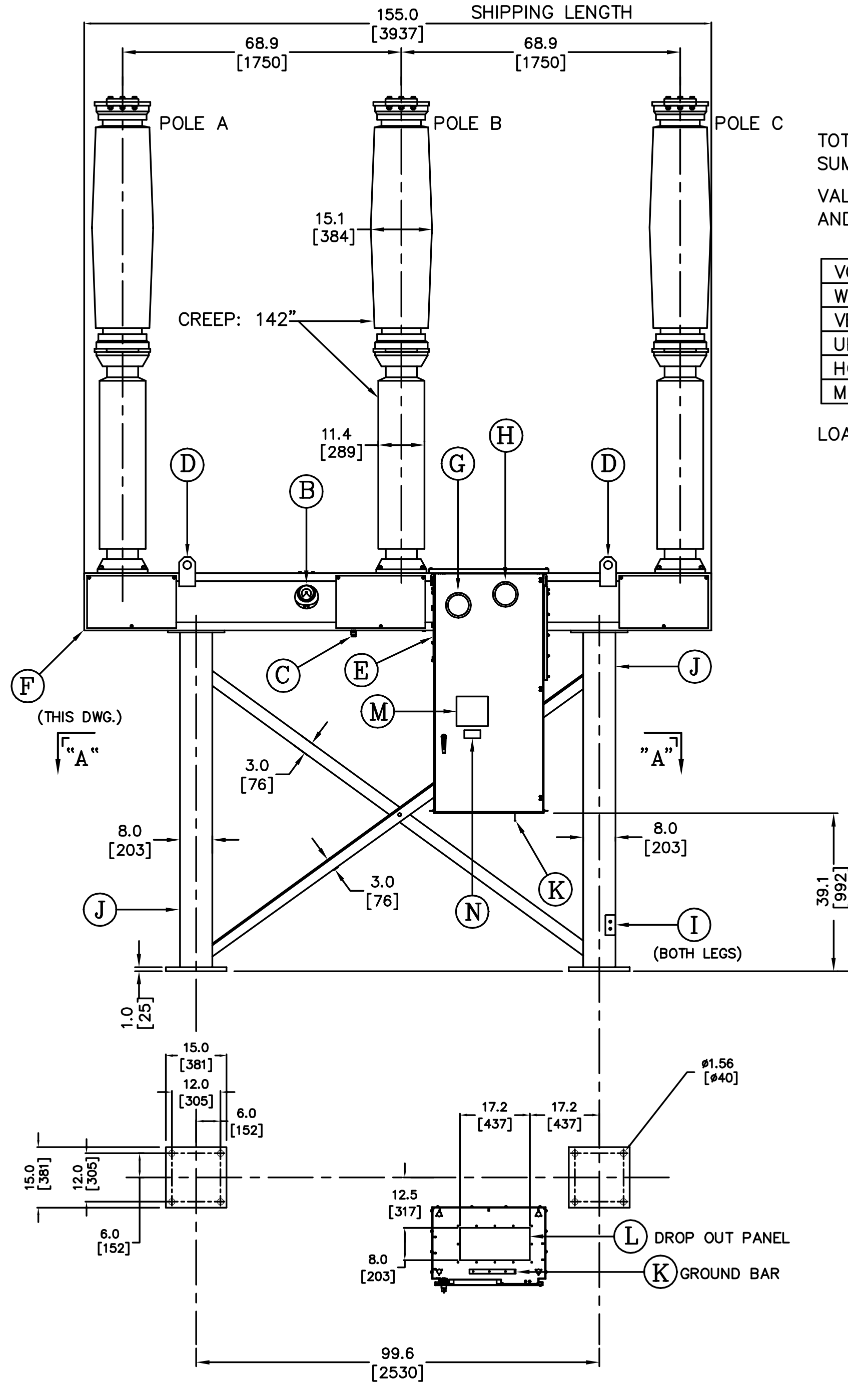
TRENCH

DESG.	DRN.	APPD.	DATE	SCALE	W.O.
	C. J.		SEP. 01/2020	1=18	

AMERICAN ELECTRIC POWER CO.

DWG. TEVF145

Designed for up to 135 mph



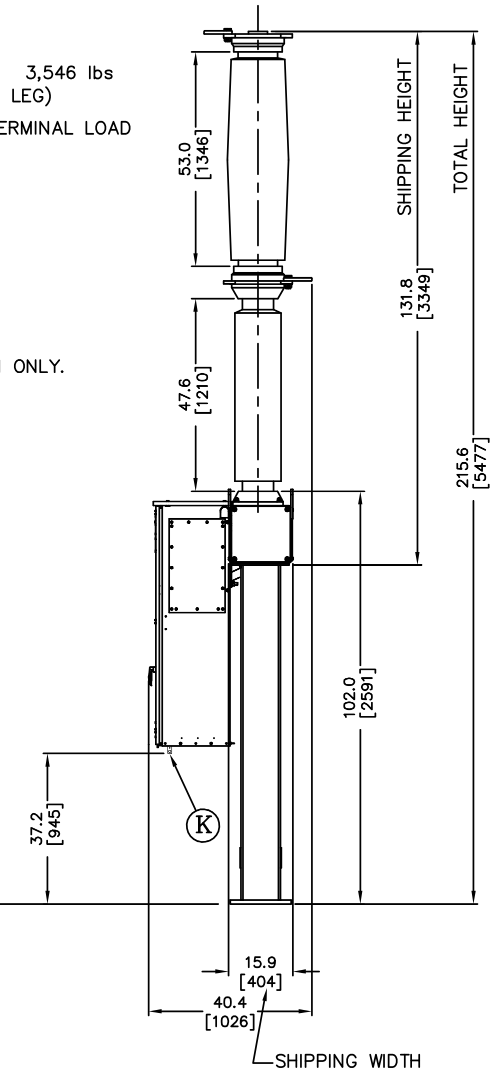
SECTION "A–A"

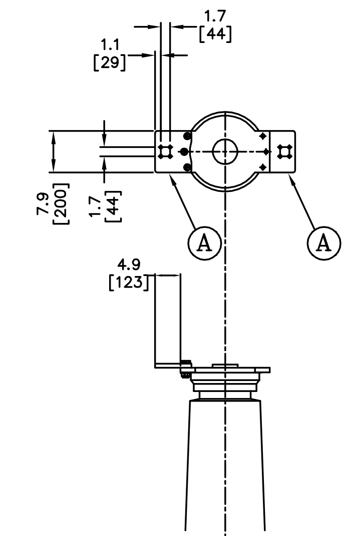
TOTAL WEIGHT OF CIRCUIT SWITCHER & STRUCTURE: 3,546 lbs
SUMMARY OF LOADS FOR FOUNDATION DESIGN (PER LEG)

VALUES LISTED ARE COMBINED FOR WIND, STATIC TERMINAL LOAD AND CIRCUIT SWITCHER OPERATION

VOLTAGE	145 kV	
WIND SPEED	90 mph	135 mph
VERTICAL DOWN	5.4k	5.4k
UPLIFT	2.7k	2.7k
HORIZONTAL	2.5k	4.1k
MOMENT	25k–ft	38k–ft

LOADS ARE FACTORED (ULTIMATE) FOR FOUNDATION ONLY.





HIGH VOLTAGE TERMINALS:
ALUMINUM NEMA 4 HOLE PADS

TERMINAL CAN BE PLACED ON EITHER SIDE

NOTES:

1) EIGHT 1.25 INCH (32 mm) FOUNDATION BOLTS REQUIRED.
2) ANCHOR BOLTS MINIMUM ASTM A36.
3) MINIMUM 6 INCH (152 mm) PROJECTION ABOVE FOUNDATION.
4) FRAME SUITABLE FOR USE w/ LEVELING NUTS.
5) CUSTOMER RESPONSIBLE FOR ANCHORING DESIGN.
6) IF CIRCUIT BREAKER IS EQUIPPED WITH FORKLIFT PROVISIONS CAREFULLY READ AND COMPREHEND ALL INSTRUCTIONS OUTLINED IN IB–GL–LIFT–FORK–ADDENDUM, BEFORE LIFTING OR MOVING THE PRODUCT
7) FORKLIFT PROVISIONS MUST BE REMOVED PRIOR TO CABINET INSTALLATION AND COMMISIONING OF THE CIRCUIT BREAKER.

LEGEND

A – HIGH VOLTAGE TERMINALS (ALUMINUM)
B – SF6 DENSITY MONITOR
C – SF6 FILLING CONNECTION
D – LIFTING LUG
E – MECHANISM
F – HOT DIP GALVANIZED BASE FRAME
G – STORED ENERGY INDICATOR
H – POSITION INDICATOR
I – NEMA TWO HOLE GROUND PAD
J – HOT DIP GALVANIZED STEEL SUPPORTS
K – GROUND BAR
L – DROP OUT PANEL
M – RATINGS NAMEPLATE
N – CUSTOMER BARCODE (IF APPLICABLE)
P – FORKLIFT PROVISION ASSEMBLY

	DO NOT REVISE UNLESS APPROVED BY AEP			
8	ADDED FORKLIFT PROVISIONS	L. PANOS	R. ARZENTI	03/26/2024
REV.	DESCRIPTION	DRAWN	CHECKED	DATE
	OUTLINE DRAWING	W. HOLT	D. MUETZEL	06/01/2007
		DRAWN	CHECKED	DATE

CUSTOMER: AMERICAN ELECTRIC POWER
STANDARD AGREEMENT DRAWING – 145kV CIRCUIT SWITCHER

MATERIAL ID: CCGL312P

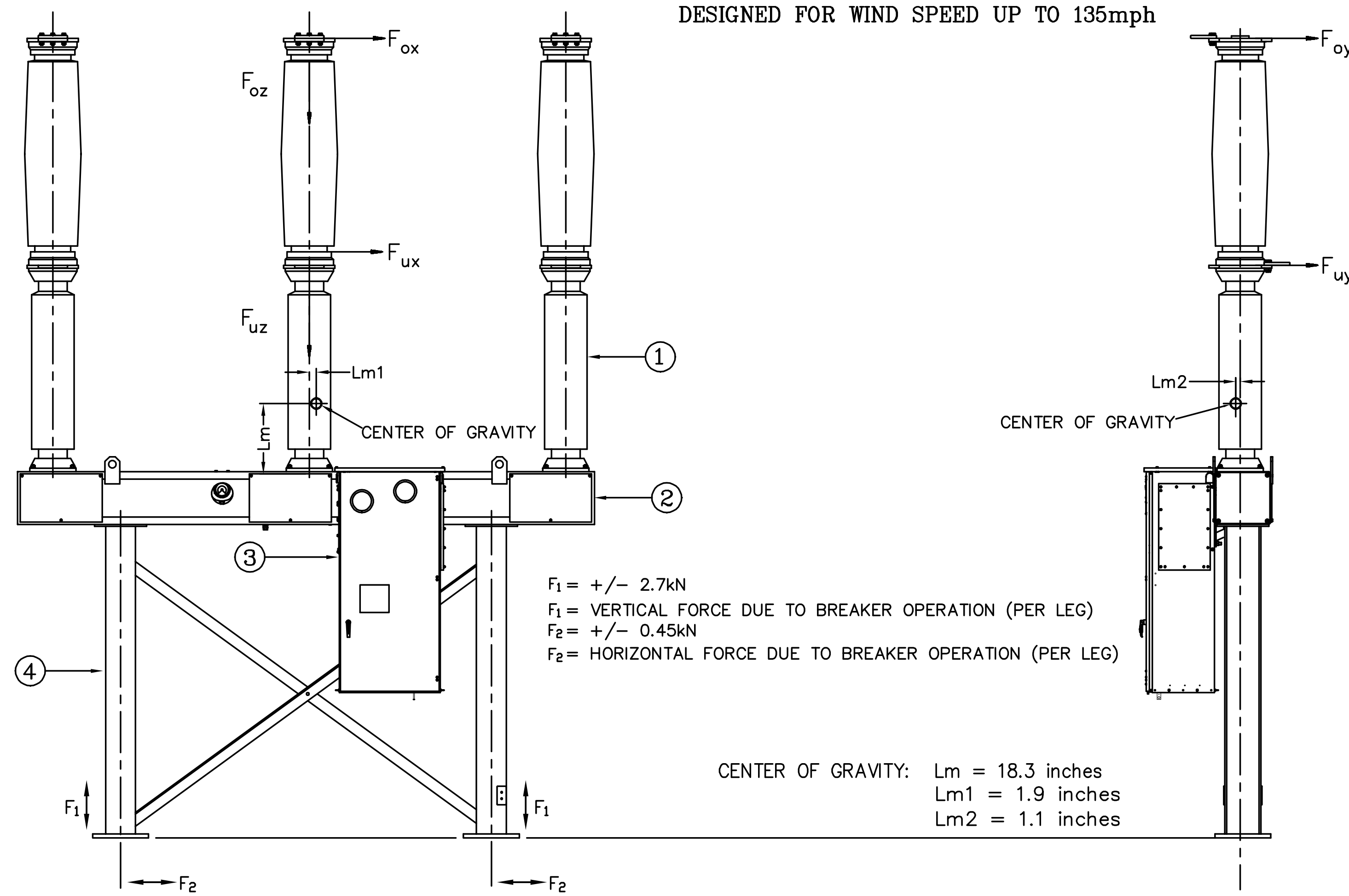
ORDER No. (SEE MASTER EQUIP. LOG)

Grid Solutions
One Power Lane
Charleroi, PA 15022

DRAWING No.: GL12C1004

SHT 1 OF 2

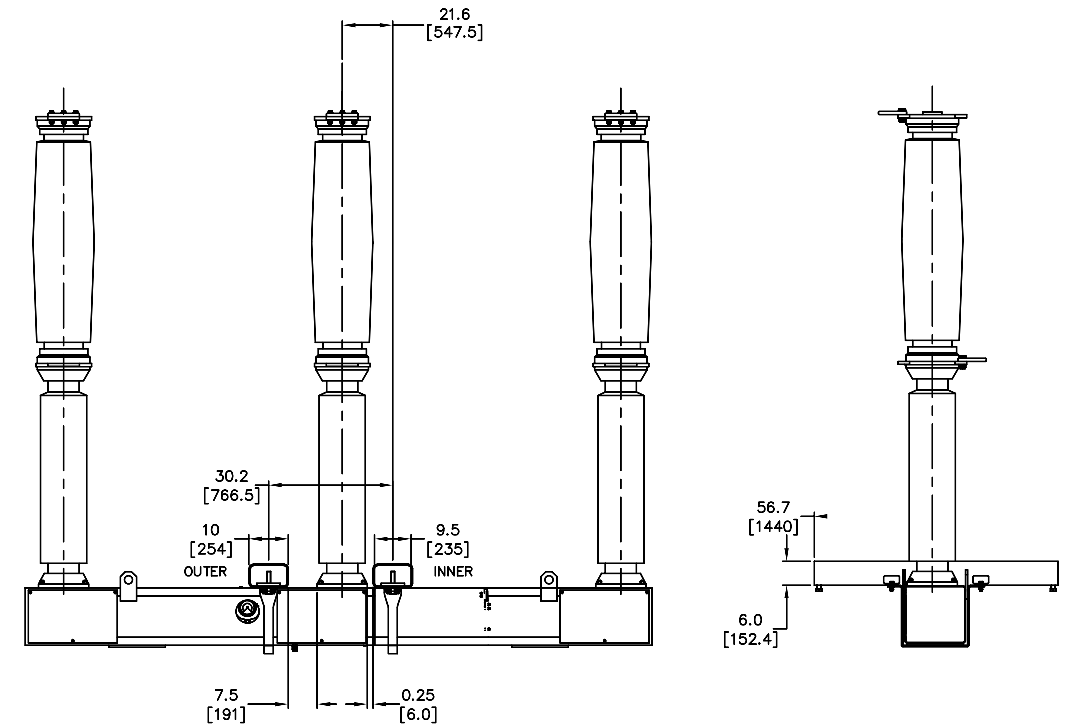
DESIGNED FOR WIND SPEED UP TO 135mph

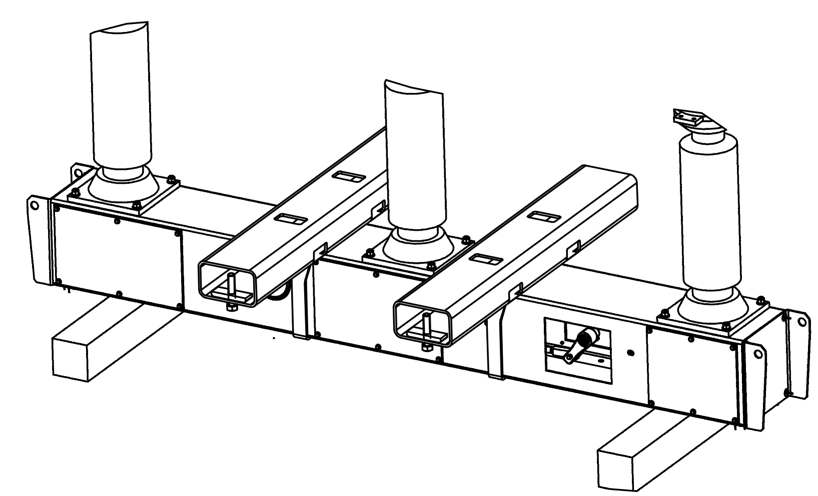


F_1 = +/− 2.7kN
F_1 = VERTICAL FORCE DUE TO BREAKER OPERATION (PER LEG)
F_2 = +/− 0.45kN
F_2 = HORIZONTAL FORCE DUE TO BREAKER OPERATION (PER LEG)

CENTER OF GRAVITY: Lm = 18.3 inches
Lm1 = 1.9 inches
Lm2 = 1.1 inches

GL312 VIEW SHOWING FORKLIFT PROVISION ATTACHMENT TO BREAKER





1 POLE COLUMN	2 BASE FRAME	3 MECHANISM	4 STEEL STRUCTURE	SF6 GAS	TOTAL WEIGHT
3 X 650 lbs	439 lbs	367 lbs	763 lbs	27 lbs	3,546 lbs

ALLOWABLE FORCES ON TERMINALS	STATIC	STATIC + DYNAMIC
$\lvert F_{ox} \rvert$	≤ 167 lbf	≤ 675 lbf
$\lvert F_{ux} \rvert$	≤ 167 lbf	≤ 675 lbf
$\lvert F_{oy} \rvert$	≤ 225 lbf	≤ 1125 lbf
$\lvert F_{uy} \rvert$	≤ 225 lbf	≤ 1125 lbf
$\lvert F_{oz} \rvert$	≤ 225 lbf	≤ 675 lbf
$\lvert F_{uz} \rvert$	≤ 225 lbf	≤ 675 lbf
$\sqrt{(2.1 \times F_{oy} \times F_{uy}^2) + (2.1 \times F_{ox} \times F_{ux}^2)}$	≤ 675 lbf	≤ 1125 lbf

REV.	DESCRIPTION	DRAWN	CHECKED	DATE
	DO NOT REVISE UNLESS APPROVED BY AEP			
8	ADDED FORKLIFT PROVISIONS	L. PANOS	R. ARZENTI	03/26/2024

OUTLINE DRAWING

DRAWN	CHECKED	DATE
W. HOLT	D. MUETZEL	06/01/2007

CUSTOMER: AMERICAN ELECTRIC POWER
STANDARD AGREEMENT DRAWING – 145kV CIRCUIT SWITCHER

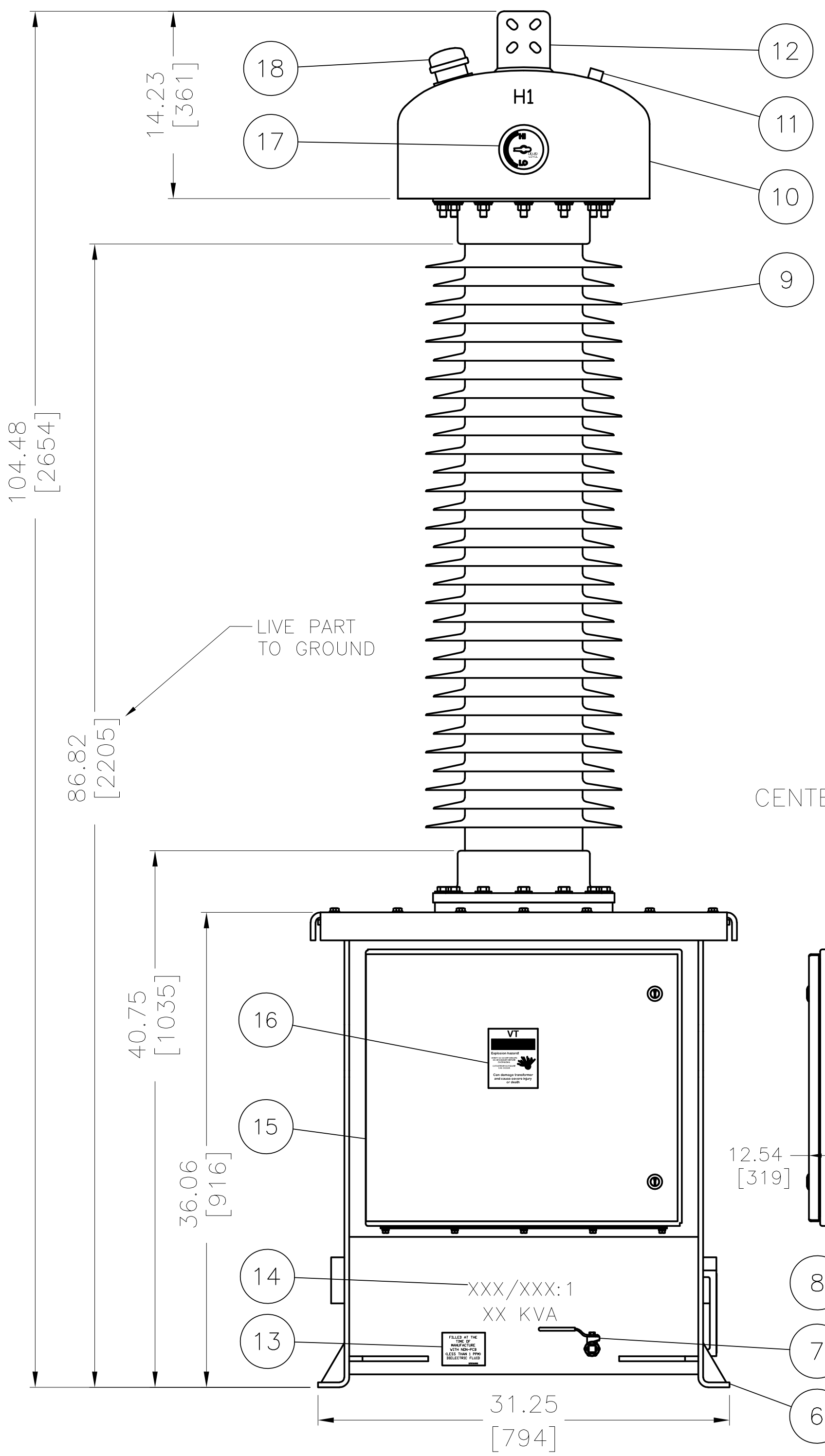
MATERIAL ID:
CCGL312P

ORDER No.
(SEE MASTER EQUIP. LOG)

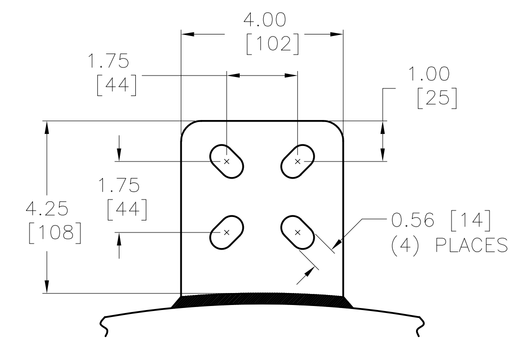
Grid Solutions
One Power Lane
Charleroi, PA 15022

DRAWING No.: GL12C1004

SHT 2 OF 2

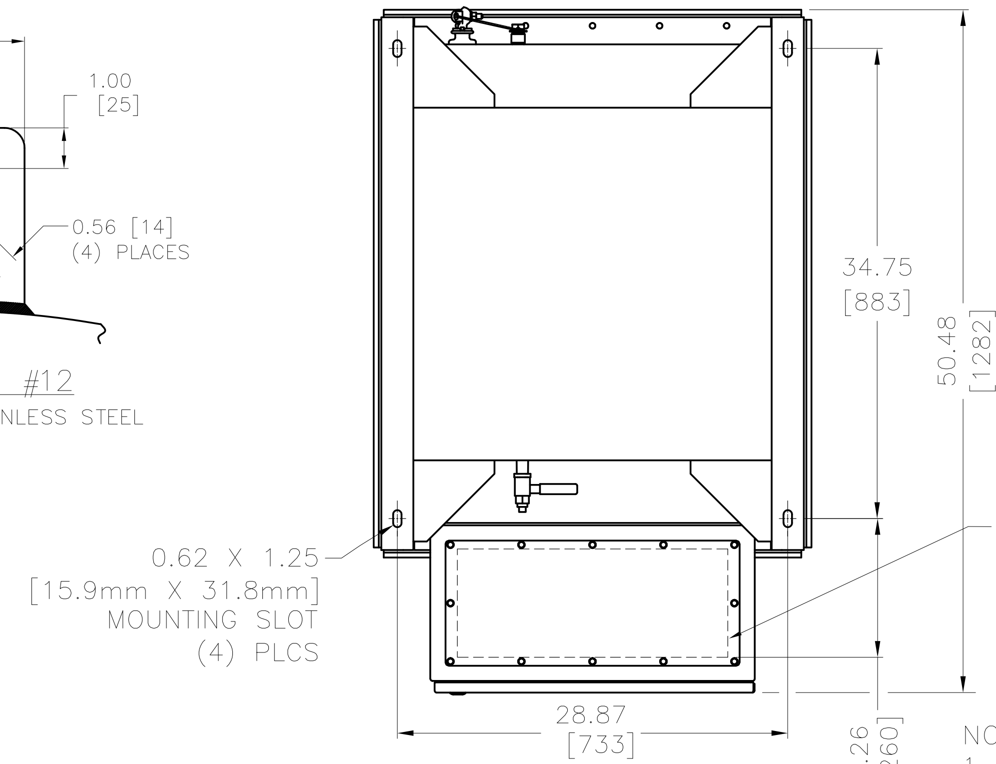


POWER LV END

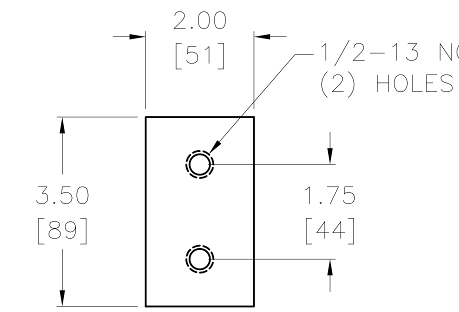


DETAIL OF ITEM #12

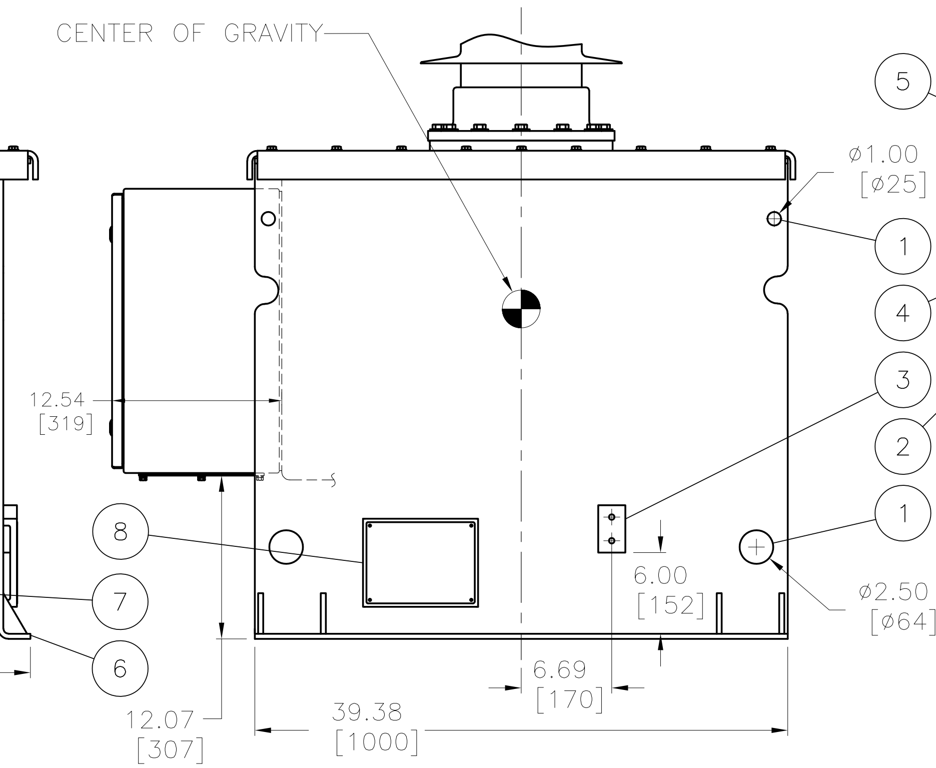
0.50"THICK [12.7] 304 STAINLESS STEEL

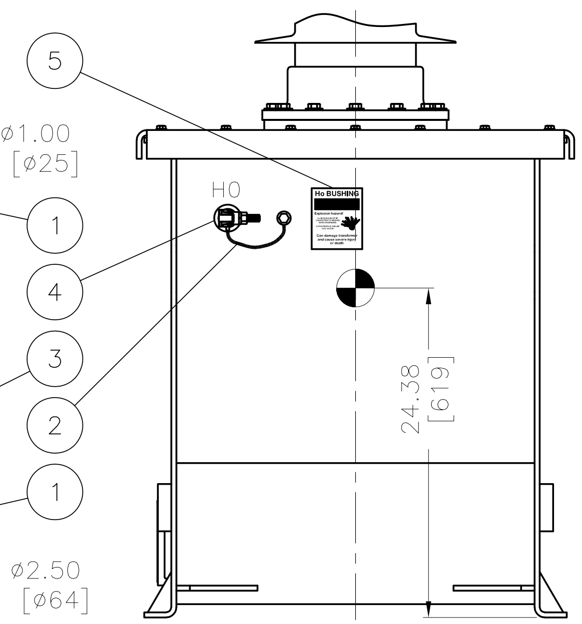


VIEW FROM BOTTOM
MOUNTING DIMENSIONS



DETAIL OF ITEM #3





NOTES:
1. TANK AND DOME COATED WITH POLYESTER POWDER.
2. ALL HARDWARE STAINLESS STEEL.
3. METRIC DIMENSIONS SHOWN IN "[ ]".
4. SEE LV CONNECTOR DRAWING FOR TERMINAL BOX LAYOUT.

SPECIFICATIONS:
1. WEIGHT ---------------- 3300 LB (1497 kg)
2. OIL VOLUME ------------- 105 GAL (397 l)
3. BUSHING STRIKE DISTANCE --- 48.50" (1232 mm) MIN
4. BUSHING LEAKAGE DISTANCE-- 192.52" (4890 mm) MIN
5. SEISMIC RATING ----------- IEEE-STD-693-2005 HIGH SEISMIC QUALIFICATION LEVEL

ITEM	DESCRIPTION	QTY
18	CAP, FILL PLUG, 3/4" NPT + GAS PRESSURE VALVE	1
17	OIL LEVEL GAUGE, MAGNETICALLY COUPLED	1
16	WARNING DECAL, "DANGER HIGH VOLTAGE"	1
15	LOW-VOLT TERMINAL BOX, HINGED COVER, STAINLESS STEEL	1
14	STENCIL RATIO AND KVA	1
13	NON-PCB OIL DECAL	1
12	PRIMARY TERMINAL, NEMA, 4-SLOTS, 1/2" THICK S/S	1
11	PRESSURE RELIEF VALVE	1
10	19" DIA DOME, NITROGEN BLANKET, STAINLESS STEEL	1
9	650kV BIL PRIMARY BUSHING, COMPOSITE POLYMER TUBE	1
8	BAR CODED NAMEPLATE, STAINLESS STEEL	1
7	DRAIN VALVE, BALL TYPE, PLUGGED, SAMPLE PORT AVAIL.	1
6	BASE TANK, STAINLESS STEEL	1
5	DECAL, "HO MUST BE CONNECTED TO GND WHEN ENERGIZED"	1
4	HO BUSHING, 5KV	1
3	TANK GROUND PAD, NEMA 2-HOLE, 1.0" THICK, S/S	2
2	GROUND STRAP, REMOVABLE	1
1	LIFTING POINT	8

REV	REVISION	DATE	BY	REV	REVISION	DATE	BY

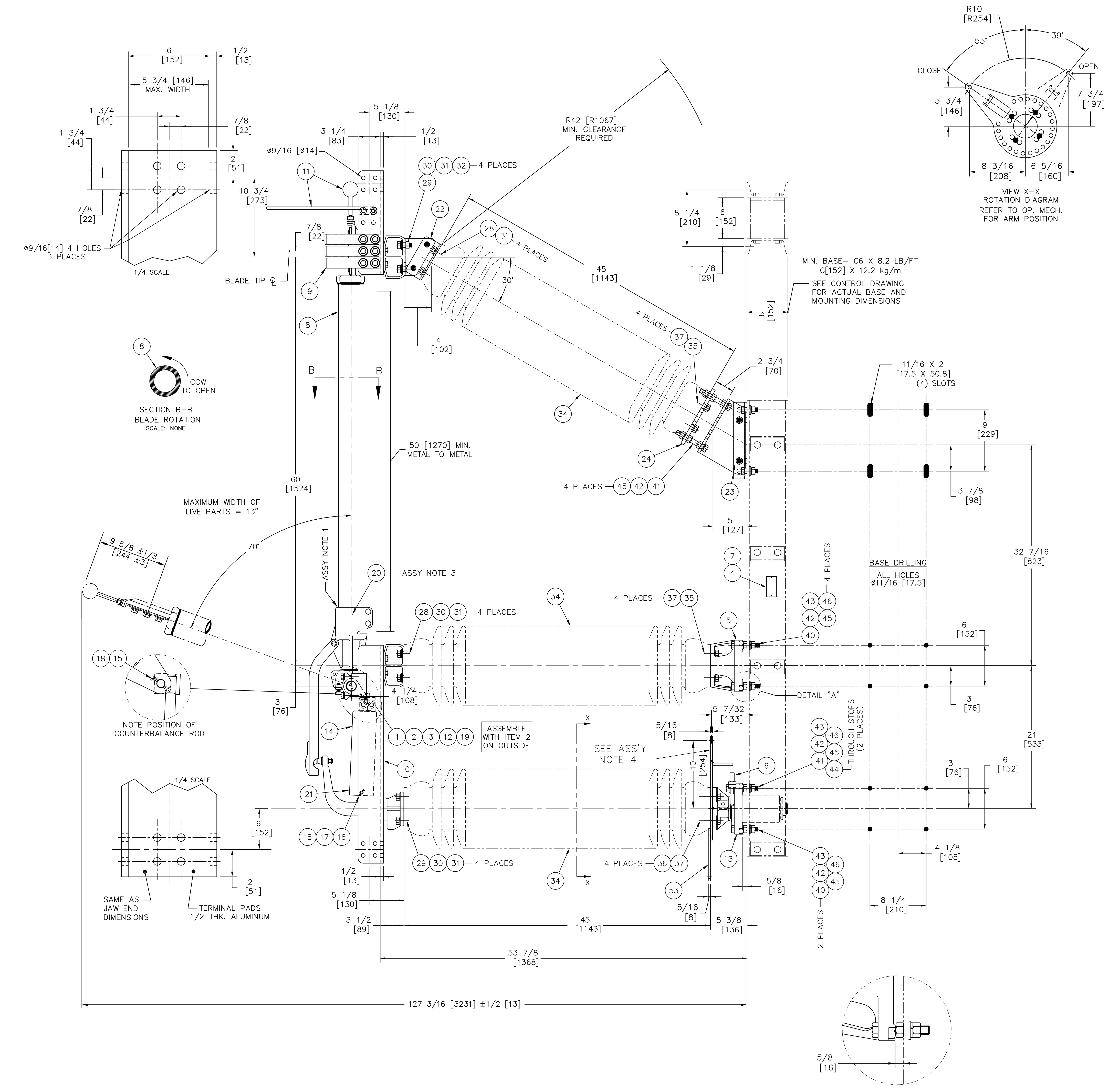
ABB INSTRUMENT TRANSFORMER DIVISION
101 KUHLMAN DR. CRYSTAL SPRINGS, MS 39059

TITLE SSVT OUTLINE DRAWING, 650kV BIL, NON-METERING 25/50/100 KVA, W/POLYMER BUSHING, FOR AEP

DRWG NO	SH	OF	REV
469-5146-340	1	1	0

DRWN/APPD: D SHAFER — DATE: 6/14/2017

TOLERANCES EXCEPT WHERE NOTED: FRACT ±1/8 DEC ±0.12 ANG ±1° — SCALE: NTS



REF–20295002

TYPE EV–2SV	MFR.DATE	J.O.		FREQ.60HZ	
VOLTAGE 138	MAX 145 kV	BIL 550 kV	3000	AMP.CONT.	
AMP. 3 SEC. 75 kA	ASYM 120 kA		195	PEAK kA	
STYLE 20290451	SERIAL NO.				
P.O.					
CID NO.	ACCC D06				
WARRANTY EXPIRATION					
MAX. ALLOW. TEMP. RISE 53 °C					

Southern States, 30 GEORGIA AVENUE, HAMPTON, GA 30228, (770) 946-4562 161

WEIGHT TABLE (ONE POLE)	TR–286		TR–287	
145 kV 550 BIL	[lb]	[kg]	[lb]	[kg]
LIVE PARTS	126	57.2	126	57.2
BRG, ARMS & ADAPTERS	78	35.4	78	35.4
BASE	118	53.5	118	53.5
*POST INSULATORS	483	219.1	639	289.8
TOTAL WEIGHT	805	365.2	961	435.9

*WEIGHT BASED ON LAPP INSULATOR TR–286/TR287

SPECIAL FOR AMERICAN ELECTRIC POWER (AEP)

THIS DRAWING HAS BEEN PREPARED FOR AMERICAN ELECTRIC POWER (AEP) AND IS NOT TO BE USED FOR ANYONE ELSE. IT MUST BE RESUBMITTED FOR APPROVAL TO AMERICAN ELECTRIC POWER (AEP) WHENEVER CHANGES ARE MADE.

D–20290451 BILL OF MATERIAL

EV–2SV 145kV 3000A 550kV BIL
SLANTED VERTICAL MOUNTING
5" [127] B.C. POST INSULATORS
D06 120kA MOMENTARY AEP

	ITEM	DESCRIPTION	DWG SIZE	PART NO.	QUANTITY –
	1	3/8 ST. STL HEX NUT		01173120	6
	2	3/8 ST. STL. PLAIN WASHER		01183124	6
	3	3/8 ST. STL. LOCK WASHER		01183340	6
	4	NAMEPLATE	B	01450161	4
	5	ADAPTER	C	03172950	3
	6	STOP	B	04172919	6
	7	ST. STL. METAL TACK	A	01299056	6
	8	BLADE ASSEMBLY	C	08124383	3
	9	JAW ASSEMBLY	D	08124365	3
	10	HINGE ASSEMBLY	D	08124389	3
***	11	ARCING HORN ASSEMBLY	B	08124360	3
	12	HINGE STOP BRACKET (OPEN POS.)	A	01705775	3
	13	BEARING ASSEMBLY	C	08160090	3
	14	COUNTERBALANCE ASSEMBLY	B	08124403	3
	15	ø 3/8 x 2 1/4 ST. STL. CLEVIS PIN	A	01279034	3
	16	COUNTERBALANCE PIVOT SHAFT	A	01560085	3
	17	COUNTERBALANCE END PLUG	A	01705783	3
	18	ø 3/32 x 3/4 ST. STL. COTTER PIN		01191292	9
	19	3/8 X 1 1/2 ST. STL. HEX BOLT		01043024	6
	20	ø 1/4 x 7/8 ST. STL. ROLL PIN	A	01276414	3
	21	#6 x 5/16 ST. STL. DRIVE SCREW		01150187	6
	22	JAW ADAPTER ASSY	B	08136617V01	3
	23	BASE ADAPTER ASSY	B	08136625	3
	24	INSULATOR MOUNTING PLATE	B	15014799	3
**	51	SWITCH ARM 10" 5BC NB	C	15421646	2
**	52	AUX ARM MTG 10" 5BC NB	C	15421648	1
**	53	AUX ARM ASSY 10 5BC NB	B	08132739	1
		DO NOT REQUISITION ITEMS BELOW:		CONTROL COUNT	27
*	25	#6 x 5/16 ST. STL. DRIVE SCREW		01150187	2
		LIVE PARTS MOUNTING HARDWARE:			
	28	5/8 x 1 1/4 GALV. STL. BOLT		01056020	24
	29	5/8 x 1 1/2 GALV. STL. BOLT		01056024	24
	30	5/8 GALV. STL. FLAT WASHER		01186057	36
	31	5/8 GALV. STL. LOCK WASHER		01186280	48
	32	5/8 GALV. STL. HEX NUT		01176080	12
		INSULATOR & MOUNTING HARDWARE:			
	34	TR–286 OR TR–287 5" B.C. POST INS.		———————	9
	35	5/8 x 1 1/2 GALV. STL. BOLT		01056024	24
	36	5/8 x 1 1/2 GALV. STL. BOLT		01056024	12
	37	5/8 GALV. STL. LOCK WASHER		01186280	36
		BEARING/ADAPTER MTG. HARDWARE:			
	40	5/8 x 3 3/4 GALV. STL. HEX BOLT FT		01059025	18
	41	5/8 x 4 1/2 GALV. STL. BOLT FT		01059026	18
	42	5/8 GALV. STL. HEX NUT		01176080	96
	43	5/8 GALV. STL. SQUARE NUT		01176160	24
	44	5/8 GALV. STL. PLAIN WASHER		01186057	6
	45	5/8 GALV. STL. LOCK WASHER		01186280	60
	46	5/8 GALV. STL. BEVEL WASHER		01186420	24

CUSTOMER NOTES:

2. INSULATORS LISTED IN THE ABOVE BILL OF MATERIAL ARE AS SPECIFIED BY ANSI STANDARD C29.9. CUSTOMER REQUIREMENTS FOR INSULATORS OTHER THAN THESE WILL BE FURNISHED AS SPECIFIED ON PURCHASE ORDER OR IN CUSTOMER SPECIFICATIONS.
3. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED. DIMENSIONS SHOWN IN BRACKETS "[ ]" ARE IN MILLIMETERS.
* 4. ITEM 25 (NOT SHOWN) IS FOR FIELD USE WITH NAMEPLATE (ITEM 4).

APPLICATION NOTES:

** A. APPLICATION ENGINEERING TO IDENTIFY ITEMS 51, 52 AND 53 ON OP. MECH. DRAWING AS BUBBLES A, B AND C (RESPECTIVELY).
B. MAXIMUM TORQUE PER UNIT = 1320 LB–IN [149 N.m] AT 15° FROM THE CLOSED POSITION.
C. WHEN QUICK BREAK ARCING HORNS (CLASS II OR ABOVE), LLS–I, LLS–II, HSW, JOSLYN OR TECO–RUPTERS ARE REQUIRED, NO SUBSTITUTION OF COUNTERBALANCE ASSEMBLY IS REQUIRED.
*** D. DELETE ARCING HORNS (ITEM 11) WHEN NOT REQUIRED BY CUSTOMER.

ASSEMBLY NOTES:

1. WIRE BRUSH THE PORTION OF THE BLADE THAT GOES INTO THE BLADE SOCKET AND APPLY "NO–OX–ID" SPECIAL ELECTRICAL JOINT COMPOUND TO THAT AREA. WIRE BRUSH THROUGH THIS COATING IMMEDIATELY BEFORE ASSEMBLY. (REFER TO SSI SPECIFICATION M–4031).
2. OPERATING EFFORT TO BE ADJUSTED ON UNIT ASSEMBLIES BETWEEN 1130 AND 1320 IN–LB [128–149 N.m] USING YOKE ADJUSTMENT STUDS.
3. DRILL ø 1/4" [6.4] HOLE FOR ROLL PIN (ITEM 20) AFTER FINAL ASSEMBLY.
** 4. REFER TO OPERATING MECHANISM DRAWING FOR THE POSITIONING OF ARMS 51 (OP. MECH. BUBBLE A), 52 (OP. MECH. BUBBLE B) AND 53 (OP. MECH. BUBBLE C).

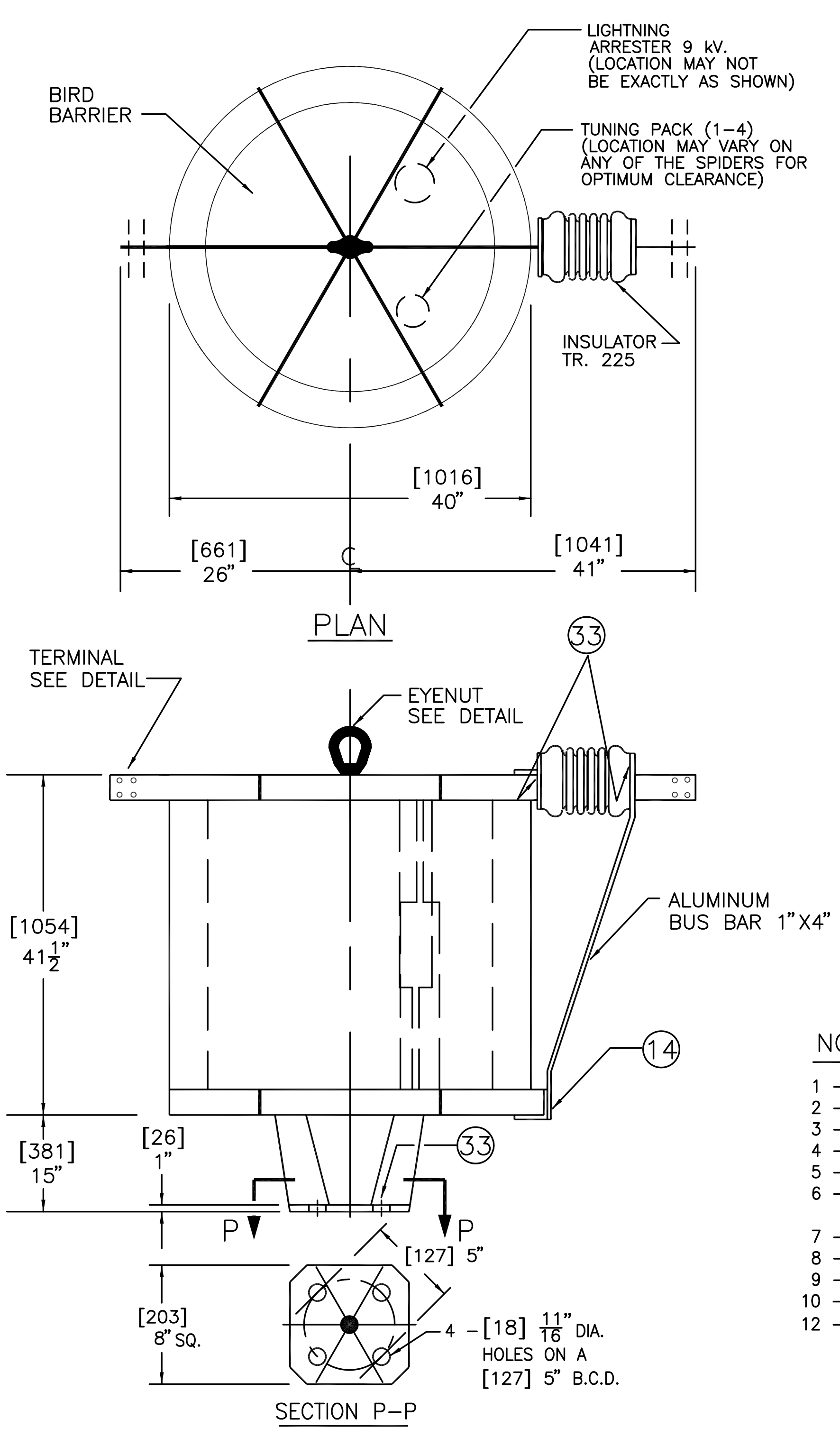
REVISE ON CAD SYSTEM ONLY

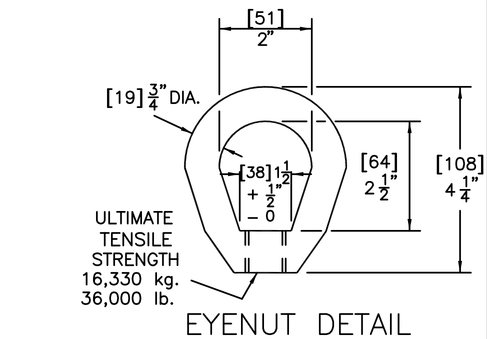
NO.	DATE	BY	REVISION
3	01/05/22	BEF	REMOVED CUSTOMER NOTE 1 & APP NOTE "E". ECN# 39289.
2	11/19/21	BD	EV–2SV WAS EV–2. ECN–39134
1	10/29/21	BD	ISSUE. ECN–38952.

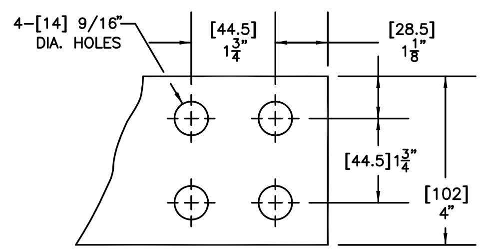
Southern States
30 GEORGIA AVENUE
HAMPTON, GEORGIA 30228–2199
TELEPHONE: (770) 946–4562
FAX: (770) 946–8106

EV–2SV 145kV 3000A 550kV BIL
SLANTED VERTICAL MOUNTING
5" [127] B.C. POST INSULATORS
D06 120kA MOMENTARY AEP

DRAWN:	10/29/21	BD	APPROVED CHIEF ENG.	
CHECKED:	10/29/21	BD	SHEET NO. 1 OF 1	SHEETS
SCALE:	1:8		D–20290451	REV. 3
J.O.	P.O.			







TERMINAL DETAIL

TO NEMA SPEC.SG.1

MATERIAL – [25] 1" THICK ALUMINUM "NICKEL" PLATED

TERMINALS ARE COATED WITH GREASE FOR PROTECTION DURING TRANSPORTATION. REMOVE EXCESS GREASE BEFORE APPLYING JOINT COMPOUND.

33	5/8"–11X1 3/4" ST.STL. BOLTS C/W LOCKWASHERS. QTY. 12
14	1/2"–13X2 1/2" ST.STL. BOLTS C/W LOCKWASHERS AND NUTS. QTY. 4

NOTES

1 – 63.0 kA. THERMAL FOR 2 SEC.
2 – 160.65 kA. MECHANICAL PEAK.
3 – DIMENSIONS ARE IN [MILLIMETERS] AND INCHES.
4 – ALUMINUM CONDUCTOR
5 – UNIT FINISH LIGHT GREY No. ASA 70.
6 – UNIT SUITABLE FOR VERTICAL PEDESTAL MOUNTED ON AN INSULATOR OR C.V.T. WITH 5" B.C.D.
7 – BIRD BARRIERS AT TOP AND BOTTOM OF UNIT.
8 – UNIT BUILT TO ANSI C93.3 1995 SPECIFICATIONS.
9 – MAX. WEIGHT 480 kg. 1058 lbs.
10 – TUNING: FREQ. AS SPECIFIED ON ORDER.
12 – MTG. HARDWARE SUPPLIED BY TRENCH

Catalog ID #0079893430
Catalog ID #0079893440

TOLERANCES UNLESS OTHERWISE SPECIFIED	REVISIONS No.	DESCRIPTION	TRENCH LIMITED
0–6" [152] ±1/16" [1.6]	1	NOTE #6 MODIFIED AND OVERALL HEIGHT CORRECTED. CAT ID No. 0079893430 REMOVED. MARCH 30/16. S.I.	AIR CORE LINE TRAP
6" [152]– 12" [305] ±1/8" [3]	2	CAT ID No. 0079893430 ADDED. MAY 17/16–M.D	2000 A, 0.265 mH, 138 kV, 60 Hz.
12" [305]– 36" [914] ±1/4" [6]			DRN. S.I. · APPD. · DATE 11/23/09 · SCALE N.T.S. · W.O.
36" [914]– 80" [2032] ±1/2" [13]			AEP FILE No. 3822–2000–138 · DWG. 1–15836–1 · REV. 2
80" [2032] AND UP ±3/4" [19]			
ANGULAR 2 DEGREES			

TRENCH

STATION NAME CITY, STATE CID#: W.O. #: PVID #: BPID #: REFERENCED EQUIPMENT: REFERENCED DRAWING:

Comparison Between Proposed Solution and Electrical Alternative Solution

	Proposed Solution	Alternative Solution
Total Project Cost (Supplemental and Baseline)	The estimated cost of the proposed Project is $26.3 million.	The estimated cost of the Alternative Solution is $49.8 million.
Supplemental Components	The Supplemental Components of the Proposed Project consist of the following: - Retiring the 34kV yard; - Retiring Transformer #1 and Transformer #5, and replacing Transformer #2; - Installing one 138kV circuit switcher; - Replacing underground cables with new overhead bus ties; - Relocating the 69kV capacitor bank and upgrading the capacitor bank switcher to a capacitor bank breaker; - Expanding the 138/69kV yard by approximately 300 x 30 feet; - Install (2) 69kV breakers; - Replacing relays and two control buildings with a single Drop-In-Control Module ("DICM") in the expanded 138/69kV yard; and - Installing two (2) power potential transformers at Bellefonte Station. - Associated station remote end work at the Raceland Station, located in Kentucky	The Supplemental Components of the Project Alternative consist of the following: - Retiring the 34kV yard; - Retiring Transformer #1 and Transformer #5, and replacing Transformer #2; - Installing one 138kV circuit switcher; - Replacing underground cables with new overhead bus ties; - Install a new 69kV capacitor bank and breaker; - Relocation of the existing 69kV transmission lines to the relocated 69kV yard, including construction of new dead-end structures; - Construction of a new DICM in the existing 138/69kV yard; - Install (3) 69kV breakers and associated line exits; - Reconductor 138kV bus #1 and #2; - Install two (2) power potential transformers at the existing 138/69kV yard; and - Install two (2) power potential transformers at the new 69kV yard.

	Proposed Solution	**Alternative Solution**
Baseline Components	The Baseline components of Proposed Project consist of the following: - Replacing (6) 69kV breakers; - Replacing 69kV risers and bus conductors; and - Associated station remote end work at the Coalton Station, located in Kentucky, and the Pleasant Street Station, located in Ohio to facilitate these upgrades at Bellefonte Station.	The Baseline components of the Project Alternative Solution consist of the following: - Rebuilding the 69kV assets in the current yard to a new yard that would be in the current location of the to-be retired 34kV yard, this includes all assets related to the (6) baseline 69kV breakers; - Site preparation and civil engineering necessary to raise the 34kV yard above the 100 year flood plain in which it is currently located; and - Construction of new facilities including a DICM, fencing and other site improvements in new 69kV yard.

AEP Transmission Planning Criteria and Guidelines for End-Of-Life and Other Asset Management Needs

December 2020

Document Control

Document Review and Approval

Action	Name(s)	Title
Prepared by:	Jomar M. Perez	Manager, Asset Performance and Renewal
Approved by:	Nicolas Koehler	Director, East Transmission Planning
Approved by:	Wayman L. Smith	Director, West Transmission Planning
Approved by:	Kamran Ali	Managing Director, Transmission Planning

Review Cycle

Quarterly	Semi-annual	Annual	As Needed
			X

Revision History

Version	Revision Date	Changes	Comments
1.0	01/04/2017	N/A	1st Release
2.0	1/18/2018	Format Update	2nd Release
3.0	11/09/2018	Content Additions	3rd Release
4.0	12/14/2020	End-Of-Life Criteria	4th Release

Table of Contents

1.0 Introduction

The American Electric Power (AEP) transmission system consists today of approximately 40,000 miles of transmission lines, 3,600 stations, 5,000 power transformers, 8,000 circuit breakers, and operating voltages between 23 kV and 765 kV in three different RTOs – the Electric Reliability Council of Texas (ERCOT), the PJM Interconnection (PJM), and the Southwest Power Pool (SPP), connecting over 30 different electric utilities while providing service to over 5.4 million customers in 11 different states.

AEP's interconnected transmission system was established in 1911 and is comprised of a very large and diverse combination of line, station, and telecommunication assets, each with its own unique installation date, design specifications, and operating history. As the transmission owner, it is AEP's obligation and responsibility to manage and maintain this diverse set of assets to provide for a safe, adequate, reliable, flexible, efficient, cost-effective and resilient transmission system that meets the needs of all customers while complying with Federal, State, RTO and industry standards. This requires, among other considerations, that AEP determine when the useful life of these transmission assets is coming to an end and when the capability of those assets no longer meets current needs, so that appropriate improvements can be deployed. AEP refers to these issues as transmission owner identified needs that address condition, performance and risk. AEP identifies these needs through the transmission planning criteria and guidelines outlined in this document. Specifically, this document constitutes the AEP transmission planning criteria and guidelines for End-Of-Life and other asset management needs as required in the FERC-approved Attachment M-3 to the PJM Tariff. AEP does not address any End-Of-Life or other asset management needs through the baseline planning criteria AEP files with its FERC Form 715.

AEP's transmission owner identified needs must be addressed to achieve AEP's obligations and responsibilities. Meeting these obligations requires that AEP ensures the transmission system can deliver electricity to all points of consumption in the quantity and quality expected by customers, while reducing the magnitude and duration of disruptive events. Given these considerations, criteria and guidelines are necessary to identify and quantify needs associated with transmission facilities comprising AEP's system. AEP identifies the needs and the solutions necessary to address those needs on a continuous basis using an in-depth understanding of the condition of its assets, and their associated operational performance and risk, while exercising engineering judgment coupled with Good Utility Practices [1].

Whereas the End-Of-Life needs, as defined in the FERC-approved Attachment M-3 to the PJM Tariff, are limited to transmission facilities rated above 100 kV, these criteria and guidelines apply to all transmission voltages that comprise the AEP transmission system, including those defined as End-Of-Life needs in the FERC-approved Attachment M-3 to the PJM Tariff. In addition, projections of candidate End-Of-Life needs that result from the process outlined in these AEP criteria and guidelines will be provided to PJM in accordance with the provisions in the FERC-approved Attachment M-3 to the PJM Tariff. Current End-Of-Life and other asset management needs will be vetted with stakeholders in accordance with the provisions in the FERC-approved Attachment M-3 to the PJM Tariff.

Addressing these owner identified transmission system asset management needs, as they pertain to condition, performance and risk, will result in the following benefits to customers:

- Safe operation of the electric grid.
- Reduction in frequency of outage interruptions.
- Reduction in duration of outage interruptions.
- Improvement in service reliability and adequacy to customers.
- Reduction of risk of service disruptions (improved resilience) associated with man-made and environmental threats.
- Proactive correction of reliability constraints that stem from asset failures.
- Effective utilization of resources to provide efficient and cost-effective service to customers.

2.0 Process Overview

AEP's transmission owner needs identification criteria and guidelines are used for projects that address equipment material conditions, performance, and risk. AEP uses the three-step process shown in Figure 1 and discussed in detail in this document to determine the best solutions to address the transmission owner identified needs and meet AEP's obligations and responsibilities. This process is completed on an annual basis. In developing the most efficient and cost-effective solutions, AEP's long-term strategy is to pursue holistic transmission solutions in order to reduce the overall AEP transmission system needs.

Figure 1 – AEP Process for Identifying and Addressing Transmission Asset Condition, Performance and Risk Needs

3.0 Step 1: Needs Identification

Needs Identification is the first step in the process of determining system and asset improvements that help meet AEP's obligations and responsibilities. AEP gathers information from many internal and external sources to identify assets with needs. A collective evaluation of these inputs is conducted and considered, and thus, individual thresholds do not apply. In addition, factors can change over time. A sampling of the inputs and data sources is listed below in Table 1.

Table 1 – Inputs Considered by AEP to Identify Transmission System Needs

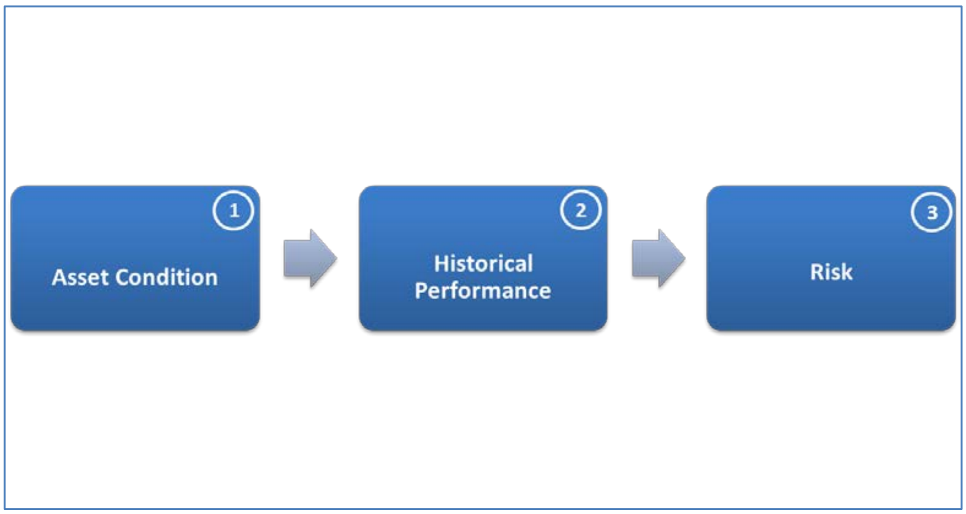
Internal, External, or Both	Inputs	Examples
Internal	Reports on asset conditions	Transmission line and station equipment deterioration identified during routine inspections (pole rot, steel rusting or cracking)
	Capabilities and abnormal conditions	Relay misoperations; Voltage unbalance
	Legacy system configurations	Ground switch protection schemes for transformers;; Transmission Line Taps without switches (hard taps); Equipment without vendor support
	Outage duration and frequency	Outages resulting from equipment failures, misoperations, or inadequate lightning protection
	Operations and maintenance costs	Costs to operate and maintain equipment
External	Regional Transmission Operator (RTO) or Independent System Operator (ISO) issued notices	Post Contingency Local Load Relief Warnings (PCLLRWs) issued by the RTO that can lead to customer load impacts
	Stakeholder input	Input received through stakeholder meetings, such as PJM's Sub Regional RTEP Committee (SRRTEP) meetings or through the AEP hosted Annual Stakeholder Summits
	Customer feedback	Voltage sag issues to customer delivery points due to poor sectionalizing; frequent outages to facilities directly affecting customers
	State and Federal policies, standards, or guidelines	NERC standards for dynamic disturbance recording
Both	Environmental and community impacts	Equipment oil/gas leaks; facilities currently installed at or near national parks, national forests, or metropolitan areas
	Standards and Guidelines	Minimum Design Standards, Radial Lines, Three Terminal Lines, Overlapping Zones of Protection
	Safety risks and concerns	Station and Line equipment that does not meet ground clearances; Facilities identified as being in flood zones; New Occupational Safety and Hazards Administration (OSHA) regulations

These inputs are reviewed and analyzed to identify the transmission assets that are exhibiting unacceptable condition, performance and risk, and thus, must be addressed through the FERC-approved Attachment M-3 planning process.

3.1 Methodology and Process Overview

The AEP transmission system is composed of a very large number of assets that provide specific functionality and must work in conjunction with each other in the operation of the grid. These assets have been deployed over a long period of time using engineering principles, design standards, safety codes, and Good Utility Practices that were applicable at the time of installation and have been exposed to varying operating conditions over their life. The Needs Identification methodology is shown below in Figure 2. AEP addresses the identified needs considering factors including severity of the asset condition and overall system impacts. These are subsequently evaluated versus constraints such as outage availability, siting requirements, availability of labor and material, constructability, and available capital funding in determining the timing and scope of mitigation.

Figure 2 – Needs Identification Methodology



It is AEP's strategy and goal to develop and provide the more efficient, cost-effective, safe, reliable, resilient, and holistic long-term solutions for the identified needs.

3.2 Asset Condition (Factor 1)

The Asset Condition assessment gathers a standard set of physical characteristics associated with an asset or a group of assets. The set of data points recorded is determined based on the asset type and class. Information assembled during the Asset Condition assessment is used to show the historical deterioration, current condition, and future expectation of the asset or group of assets on the AEP system.

AEP annually assembles a list of reported condition issues for all of its assets in its system. A detailed follow-up review is conducted to determine if a transmission asset is in need of upgrade and/or replacement. Additionally, this Asset Condition review is used to determine an adequate scope of work required to mitigate the risk associated with a facility's performance and its identified issues. This level of risk is determined through the Future Risk assessment (Factor 3).

Beyond physical condition, AEP's ability to restore the asset in case of a failure is also considered. This is referred to as the future probability of failure adder. Typically, assets that are no longer supported by manufacturers or lack available spare parts are assigned a higher probability of failure adder.

To perform condition assessments, AEP classifies its Transmission assets in two main categories: Transmission Lines and Substations.

3.2.1 Transmission Line Considerations

Design Portion

A. Age (Original Installation Date)
B. Structure Type (Wood, Steel, Lattice)
C. Conductor Type (Size, Material & Stranding)
D. Static Wire Type (Size & Material)
E. Foundation Type (Grillage, Direct Embed, Caisson, Guyed V, Drilled Pier etc.)
F. Insulator Type (Material)
G. Shielding and Grounding Design Criteria (Ground Rod, Counterpoise, "Butt Wrap" etc.)
H. Electrical Configuration
    a. Three Terminal Lines
    b. Radial Facilities
I. NESC Standards Compliance
    a. Structural Strength (NESC 250B, 250C & 250D Compliance)
    b. Clearances (TLES-047 Compliance)

J. Easement Adequacy (Width, Encroachments, Type; etc.)

Physical Condition

A. Open Conditions (existing and unaddressed physical conditions associated with a Transmission Line component)
B. Closed Conditions (previously addressed physical conditions associated with a Transmission Line component)
C. Emergency Fixes (History of emergency fixes)
D. Accessibility (Identified areas of difficult access)

3.2.2 Substation Considerations

A. Transformers
   a. Manufacturer
   b. Manufacturing Date
   c. In Service Date
   d. Load Tap Changer Type & Operation History (if applicable)
   e. Dissolved Gas Analysis
   f. Bushing Power Factor
   g. Through Fault Events (Duval Triangles)
   h. Moisture Content (Oil)
   i. Oil Interfacial Tension
   j. Dielectric Strength
   k. Maintenance History
   l. Malfunction Records
B. Circuit Breakers
   a. Manufacturer & Type
   b. Manufacturing Date
   c. In Service Date
   d. Interrupting Medium
   e. Fault Operations
   f. Switched Operations

g. Spare Part Availability
h. Maintenance History
i. Malfunction Records
j. Breaker Type Population

C. Secondary/Auxiliary Substation Equipment*

a. Station Batteries
b. Control House
c. Station Security
d. Station Structures
e. Capacitor Banks
f. Bus, Cable and Insulators
g. Disconnect Switches
h. Station Configuration
i. Station Service
j. Relay Types
k. RTU Types
l. Voltage Sensing Devices

**AEP substation inspections include assessments of secondary/ancillary equipment. If needed, upgrades to these components are typically included in the scope of projects addressing major equipment and may not necessarily drive stand-alone projects.*

3.3 Historical Performance (Factor 2)

AEP's Historical Performance assessment quantifies how an asset or a group of assets has historically impacted the Transmission system's reliability and Transmission connected customers, helps identify the primary contributing factors to a facility's performance, and baselines the outage probability used in our Future Risk analysis. The metrics used as part of this historical performance assessment include:

A. Forced Outage Rates
B. Manual Outage Rates
C. Outage Durations (Forced Outage Duration in Hours)
D. System Average Interruption Indices (T-SAIDI, T-SAIFI, T-SAIFI-S, T-MAIFI)

E. Customer Minutes of Interruption (CMI)

F. Customer Average Interruption Indices (IEEE SAIDI, CAIDI & SAIFI)

G. Number of Customers Interrupted (CI)

AEP utilizes this standard set of metrics as a means to quantify the historical performance of an asset. These historical performance metrics allow AEP to further investigate assets that have historically impacted customers the most.

Due to the vast size of the AEP operating territory covering 11 states, AEP segments its needs into seven distinct operating company regions and six voltage classes. This segmentation ensures that variations in geography with respect to vegetation, weather patterns, and terrain can be accounted for within the process of identifying needs for each operating company area. In addition to customers of AEP operating companies, consideration for retail customers that are served at non-AEP wholesale customer service points is also included. In order to account for customers served behind wholesale meter points, AEP gathers information from the parent wholesale provider or in its absence, applies a surrogate customers per MW ratio to estimate the number of customers served by a wholesale power provider's delivery point. This customer count is used to calculate the individual metrics above.

AEP's standard approach is to annually review the historical performance of its assets based on a rolling three-year average, but in some cases AEP may extend the review period beyond three years. AEP classifies all transmission asset outage causes into the following five categories to conduct this review: Transmission Line Component Failure, Substation Component Failure, Vegetation (AEP), Vegetation (Non-AEP), and External Factors. Each transmission asset and its associated performance is quantified and compared against corresponding system totals to determine its percentage contribution to aggregated system performance. An evaluation of outage rates is also performed for Transmission line assets. The observed performance of the assets in any of these categories can point to a need that may need to be addressed.

3.4 Future Risk (Factor 3)

AEP reviews the associated risk exposure (future risk) inherent with each identified asset to determine an asset's level of risk. This risk exposure is quantified assuming the probability of an outage scenario and is based on the reported condition of the asset and the severity of that condition and what the impact could be to customers or to the operation of AEP's Transmission system. Some of the key items to assess these impacts included in the risk criteria are:

A. Number of Customers Served
B. Load Served
C. Operational Risks
    a. Post Contingency Load Loss Relief Warnings (PCLLRW's)
    b. History of Load Shed Events
    c. Stations in Black Start Paths

In addition to the future risk calculation performed through this process, AEP is systematically reviewing its system to identify and remediate equipment and practices that have resulted in operational, restoration, environmental, or safety issues in the past that cannot be directly quantified, but that remain as acknowledged risks in the AEP Transmission system. These include:

A. Wood pole construction
B. Pilot wire protection schemes
C. Oil circuit breakers
D. Air Blast circuit breakers
E. Pipe type oil filled cables
F. Electromechanical relays
G. Legacy system configurations
    a. Missing or inadequate line switches (e.g., hard-taps)
    b. Missing or inadequate transformer/bus protection
    c. Three-terminal lines
    d. Overlapping zones of protection
H. Non-Standard Voltage Classes
I. Poor Lightning & Grounding Performance
J. Radial Facilities
K. Public vulnerability

These items as described above are reviewed on a case by case basis and considered when holistic system solutions are being developed.

4.0 Step 2: Solution Development

The development of solutions for the identified needs considers a holistic view of all of the needs in which several solution options are developed and scoped. AEP applies the appropriate industry standards, engineering judgment, and Good Utility Practices to develop these solution options. AEP solicits customer and external stakeholder input on potential solutions through the Annual Stakeholder Summits hosted by AEP and also through the PJM Project Submission process. This ensures that input from external stakeholders on identified needs can be received and considered as part of the solution development process.

Solution options consider many factors including, but not limited to, environmental conditions, community impacts, land availability, permitting requirements, customer needs, system needs, and asset conditions in ultimately identifying the best solution to address the identified need. Once the selected solution for a need or group of needs is defined, it is reviewed using the current RTO provided power-flow, short circuit, and stability system models (as needed) to ensure that the proposed solution does not adversely impact or create baseline planning criteria violations on the transmission grid. Finally, AEP reviews its existing portfolio of baseline planning criteria driven reliability projects and evaluates opportunities to combine or complement existing baseline planning criteria driven reliability projects with the transmission owner needs driven solutions developed through this process. This step ultimately results in the implementation of the more efficient, cost-effective, and holistic long-term solutions. Stand-alone projects are created to implement the proposed solution where transmission owner needs driven solutions cannot be integrated into existing projects.

5.0 Step 3: Solution Scheduling

Once solutions are developed to address the identified needs, the scheduling of the solutions will take place. As mentioned in the previous section, if opportunities exist to combine or complement existing baseline planning criteria driven reliability projects with the needs driven solutions developed through this process, the scheduling will be aligned to the extent possible. In all other situations, AEP will schedule the implementation of the identified solutions in consideration of various factors including severity of the asset condition, overall system impacts, outage availability, siting requirements, availability of labor and material, constructability, and available capital funding. AEP uses its discretion and engineering judgment to determine suitable timelines for project execution.

6.0 Conclusion

This document outlines AEP's criteria and guidelines for transmission owner identified needs that address equipment material conditions, performance, and risk. It outlines the sources and methods considered by AEP to identify assets with needs on a continuous basis and it outlines how solutions are developed and scheduled. AEP will review and modify these criteria and guidelines as appropriate based upon our continuing experience with the methodology, acquisition of data sources, deployment of improved performance statistics and the receipt of stakeholder input in order to provide a safe, adequate, reliable, flexible, efficient, cost-effective and resilient transmission system that meets the evolving needs of all of the customers it serves.

7.0 References

[1] FERC Pro Forma Open Access Transmission Tariff, Section 1.14, Definition of "Good Utility Practice".
Link: https://www.ferc.gov/legal/maj-ord-reg/land-docs/rm95-8-0aa.txt

[2] AEP Transmission Planning Documents and Transmission Guidelines.
Link: http://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/

AEP Transmission Zone: Baseline Bellefonte 69kV breakers

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2023 short circuit RTEP case

Proposal Window Exclusion: Below 200 kV Exclusion and Immediate Need Exclusion

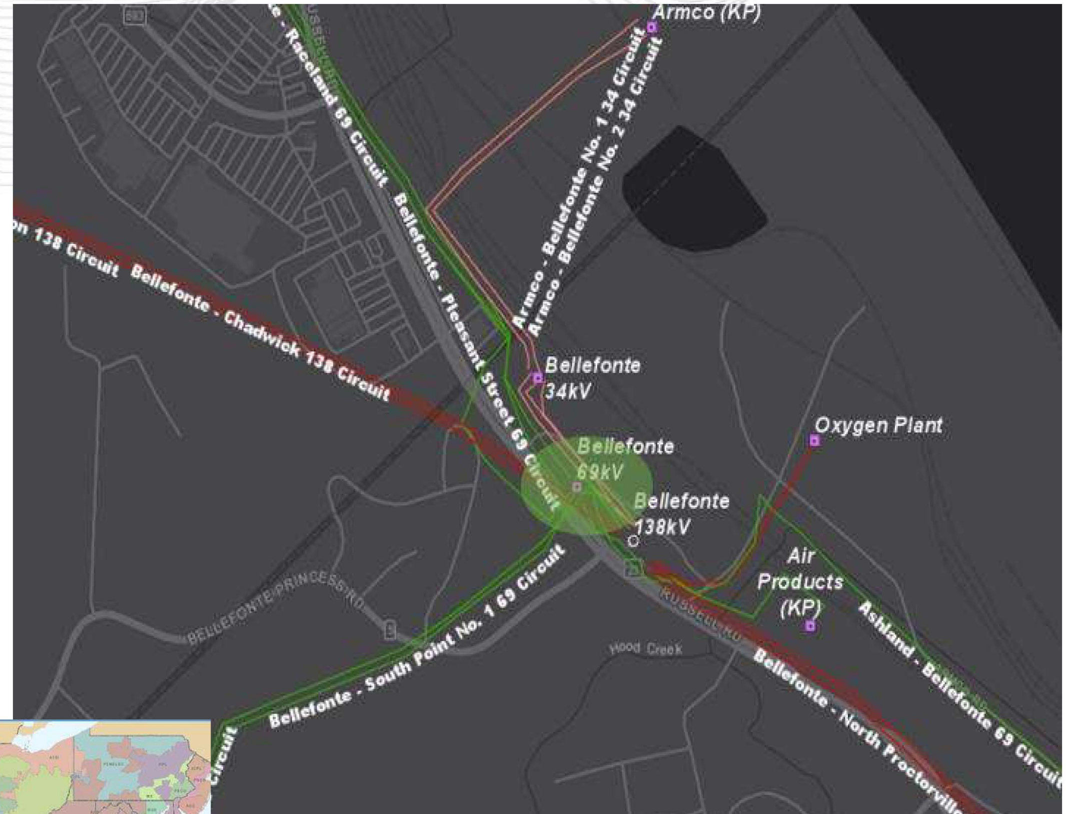
Problem Statement:

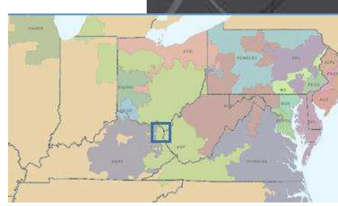
FG: AEP-SC1, AEP-SC2, AEP-SC3, AEP-SC4, AEP-SC5, AEP-SC6

In 2023 RTEP short circuit case, Bellefonte 69kV breakers JJ, C, I, AB, Z and G are overdutied.

Existing Facility Rating:

Breaker	KA
BELLEFNT 69kV Breakers: C, G, I, JJ, I, AB, Z	27





AEP Transmission Zone: Baseline Bellefonte 69kV breakers

Recommended Solution:

Replace overdutied 69kV breakers C, G, I, Z, AB and JJ in place. The new 69kV breakers to be rated at 3000 A 40kA breakers. (**B3350.1**)

Transmission Estimated Cost: $2.0M

Remote end relaying at Point Pleasant, Coalton and South Point 69KV substations (**B3350.2**)

Transmission Estimated Cost: $0M

Distribution Estimated Cost: $1.52M

Preliminary Facility Rating:

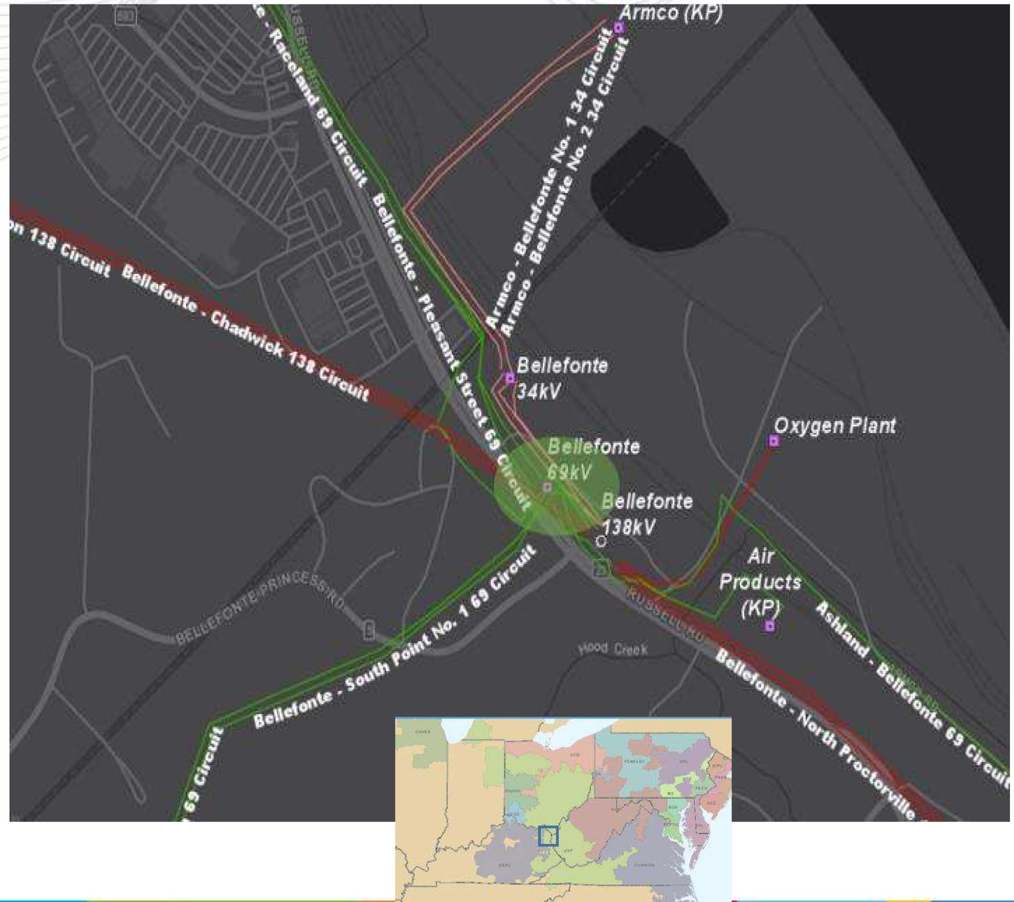
Breaker	KA
BELLEFNT 69kV Breakers: C, G, I, JJ, I, AB, Z	40

Ancillary Benefits: Breakers C, G, I, Z, AB and JJ are Oil Circuit Breakers without oil containment. Oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require. Spare parts for these units are difficult to impossible to procure, and this model type is no longer vendor supported.

Required IS date: 6/1/2023

Projected IS date: 6/1/2023

Previously Presented: 12/17/2021



AEP Transmission Zone: Baseline Bellefonte 69kV Riser

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2026 RTEP cases

Proposal Window Exclusion: Below 200 kV Exclusion

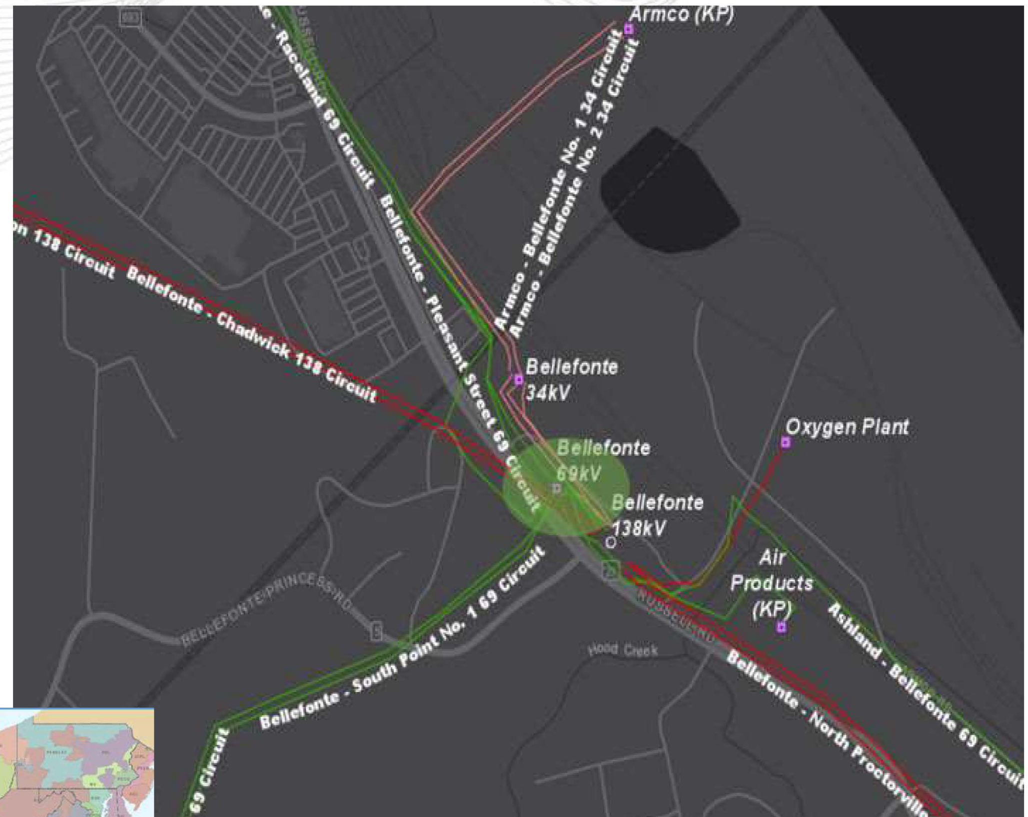
Problem Statement:

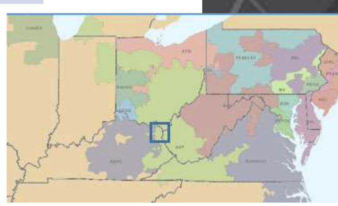
FG: AEP-T29, AEP-T30, AEP-T31, AEP-T32

In 2026 Summer RTEP case, the 69kV risers between 69kV Bus #2 and 69kV winding of TR#3 are overloaded for multiple N-1-1 contingencies.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05 BELLF2 - 05BELLEFNT 138/69 kV	143/168/182/200





AEP Transmission Zone: Baseline Bellefonte 69kV Riser

Recommended Solution:

Replace Bellefonte 69kV risers on the section between Bellefonte TR#3 and 69kV Bus #2. (**B3349**)

Total Estimated Cost: $0.54 M

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05 BELLF2 - 05BELLEFNT 138/69 kV	179/210/227/250

Required IS date: 6/1/2026

Projected IS date: 4/30/2026

Previously Presented: 10/15/2021

AEP Transmission Zone M-3 Process
Johnson County, Kentucky

Need Number: AEP-2022-AP005

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

Previous Stage:
Solution Meeting 08/19/2022
Needs Meeting 02/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

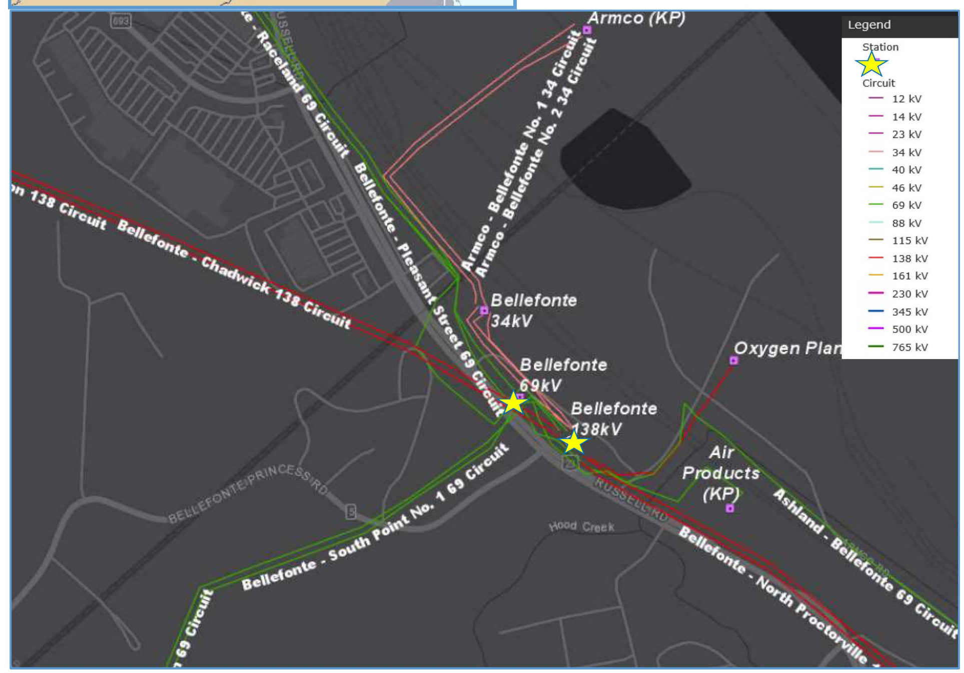
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Bellefonte 138kV Yard:

- 138/34kV 45MVA Bank #1:
  - 1950s Vintage, originally manufactured in 1951,
  - The dielectric strength of the overall insulation system (oil and paper) is in poor condition, which impairs the unit's ability to withstand electrical faults.
  - The rising and elevated levels of carbon dioxide, indicate increased decomposition of the paper insulation materials. The presence of carbon dioxide indicates decomposition of the increasingly brittle, non-thermally upgraded paper insulation that impairs the unit's ability to withstand future short circuit or through fault events.
  - The high side bushings have seen increased capacitance, indicative of capacitive layer deterioration. The low side bushings lack sufficient dielectric testing data and were commissioned in 1996. The low side bushings are on the recommended replacement list due to the population being advanced in age and degradation, leading to high risk of violent failures from arcing through the ground sleeve.
  - The majority of this family of bushings were manufactured pre-1952. As a bushing ages, O-rings, gaskets, and seals may become more brittle, which may result in moisture ingress. The change in high side bushing dielectric data, the low side bushing type, and the age of all the bushings indicates these bushings are at a greater risk of failure. Failure of a bushing may cause a failure or loss of service of the transformer.
  - Active Oil leaks.
- 138/69-34kV 196 MVA Bank #2:
  - 1970s Vintage, originally manufactured in 1970,
  - Low side bushings have Capacitive layer deterioration.
  - This unit has severe nitrogen leaks. There are racks installed with manifolds in order to keep the nitrogen pressure on this transformer. This unit also has active oil leaks. One third of the fans on this unit have failed.



AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

AEP Transmission Zone M-3 Process
Johnson County, Kentucky

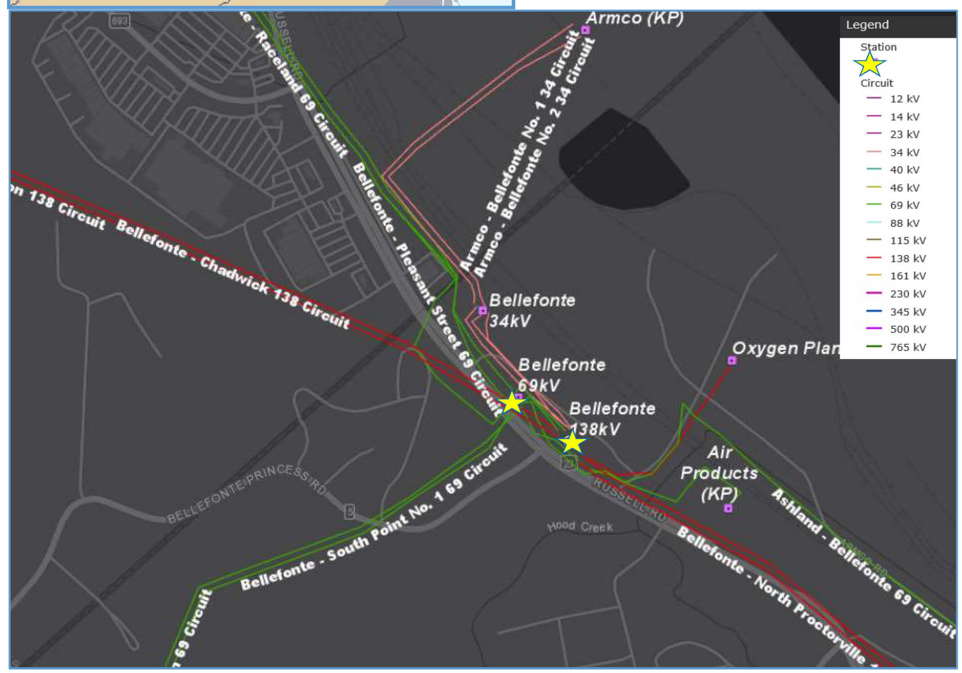
Need Number: AEP-2022-AP005

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

Problem Statement Continued:

Bellefonte 138kV Yard (cont):

- 138/69-34kV 115MVA Bank #5:
  - 1960s Vintage, originally manufactured in 1961,
  - Unit's paper insulation and lack of thermally upgraded paper insulation indicate higher Short circuit. As the insulating paper materials age, they become brittle. This increasingly brittle, non-thermally upgraded paper insulation impairs the unit's ability to withstand future short circuit or through fault events.
  - Elevated levels of acetylene indicates increased decomposition of the paper insulating materials. The presence of acetylene indicates electrical discharge faults of low energy have occurred within the main tank causing electrical breakdown of the unit.
  - This unit has severe nitrogen leaks. There are racks installed with manifolds in order to keep the nitrogen pressure on this transformer. This unit also has active oil leaks.
- 138/12kV 20MVA Bank #6:
  - 1970s Vintage, originally manufactured in 1971,
  - Unit's paper insulation and lack of thermally upgraded paper insulation indicate higher Short circuit. As the insulating paper materials age, they become brittle. This increasingly brittle, non-thermally upgraded paper insulation impairs the unit's ability to withstand future short circuit or through fault events.
  - There is an upward trend in the insulation power factor indicating an increase in particles within the oil. The overall dielectric strength of the insulation system (oil and paper) is in declining health, which impairs the unit's ability to withstand electrical faults.
  - This unit has active oil leaks. One quarter of the fans on this unit have failed.
- Relaying 138 kV Yard:
  - 97 of the 110 (88%) relays at the 138kV yard station are in need of replacement.
  - 76 are electromechanical, 3 are static and 18 relays are microprocessor type.
  - The electromechanical type and Static type relays that have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack vendor support. Where as the microprocessor relays that are of legacy design and/or utilize legacy firmware



AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

AEP Transmission Zone M-3 Process
Johnson County, Kentucky

Need Number: AEP-2022-AP005

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

Problem Statement Continued:

Bellefonte 69kV Yard:

69kV circuit breakers AB, C, G, I, JJ and Z are FK type oil filled breaker, without oil containment.

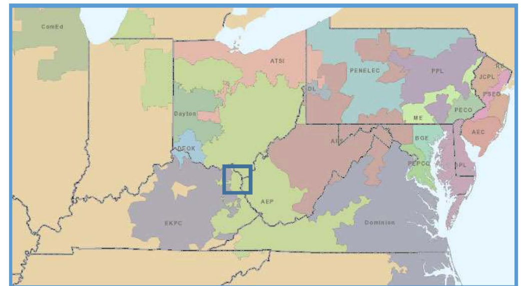
- As of May 25, 2021, there are 20 remaining FK-72.5-27000-10 circuit breakers on the AEP System, including the 6 at this station. GE provides no support for this fleet of circuit breakers and spare parts are increasingly more difficult to obtain; components are often taken from out of service units with remaining usable parts. Oil filled breakers need more maintenance due to the oil handling required.
- A common failure mode documented in AEP malfunction records are compressor failures and valve defects, which cause low pressure and oil leaks. Another failure mode includes trip or reclose failures, caused primarily by spring latching and charging motor component failures. In addition, these oil breakers have a lot of oil contamination from aging gaskets allowing moisture and other particle ingress.
- Circuit Breakers AB, C, G, I, JJ, and Z are 1970s vintage, manufactured in 1971, with Fault Ops: 1, 23, 8, 60, 57, 17 respectively

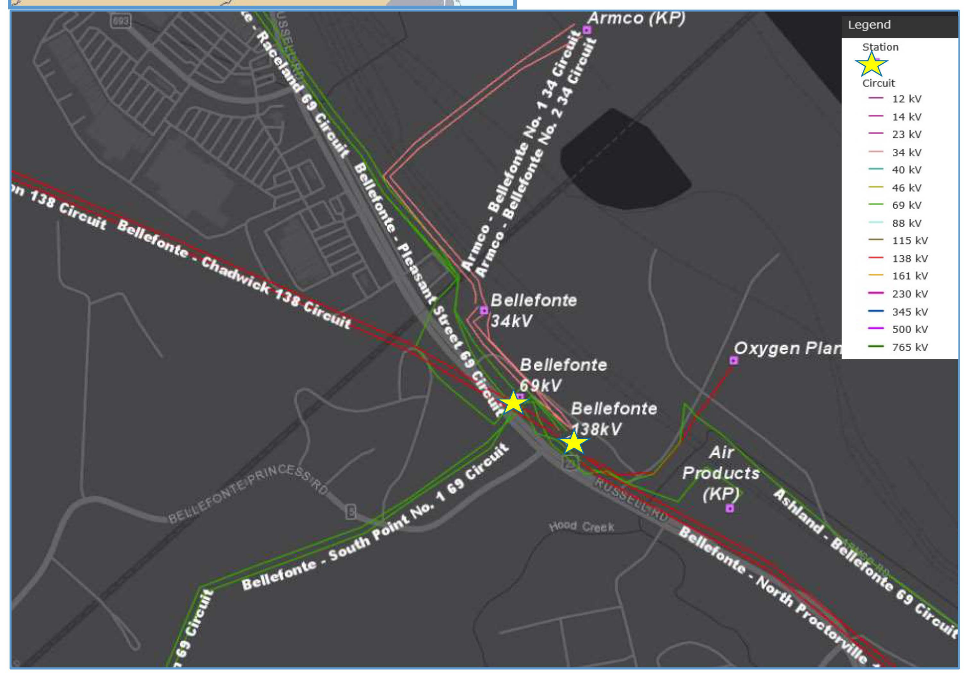
69kV circuit breakers H and T CF-48-69-2500 type oil filled breaker, without oil containment.

- Bus Tie Breaker H: 1960s vintage, Manufactured in 1965, Type: Oil , Fault Ops: 3,
- Circuit Breaker T: 1960s vintage, Manufactured in 1967, Type: Oil , Fault Ops: 1,

- There is no vendor support for this family of circuit breakers and spare parts are increasingly more difficult to obtain.
- This model family has experienced major malfunctions associated with their OA-3 hydraulic mechanism, which includes low-pressure readings, hydraulic leaks, pump lockouts, and failure to shut off. These mechanism malfunctions have led to several failures to close and other types of mis-operations across the AEP fleet.

69kV circuit switcher KK is a Mark V type , without gas monitor. The neutral shift device is heavily corroded.





AEP Transmission Zone M-3 Process
Johnson County, Kentucky

Need Number: AEP-2022-AP005

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

Problem Statement Continued:

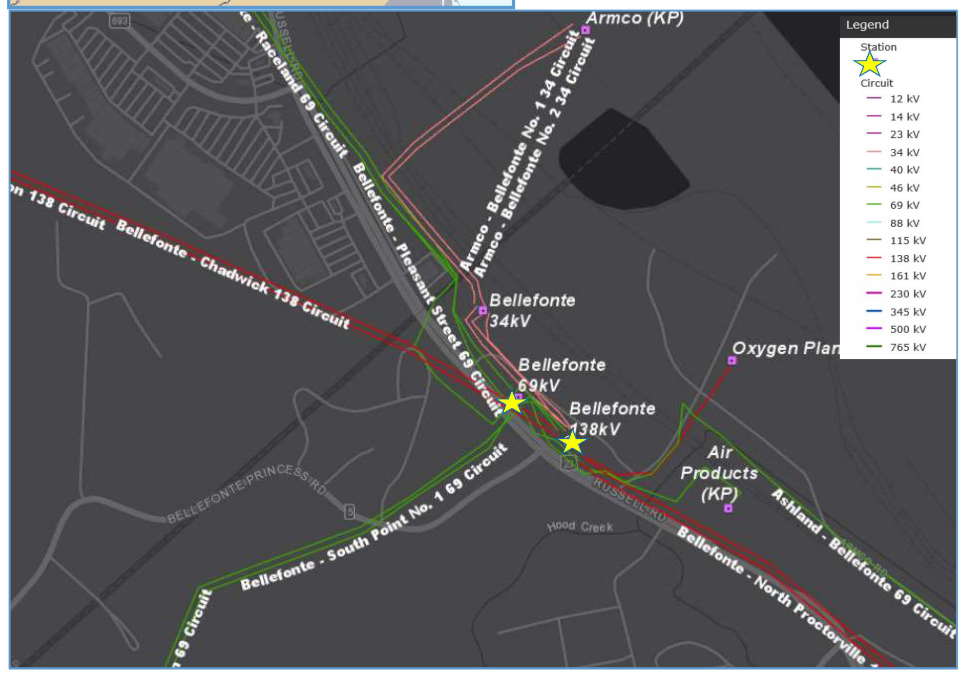
Bellefonte 69kV Yard (cont):

Relaying:

- 44 of the 52 (85%) relays at the 69kV yard station are in need of replacement.
- 41 are electromechanical, 2 are static and 1 relay is microprocessor type.
- The electromechanical type and Static type relays that have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack vendor support. Where as the microprocessor relays that are of legacy design and/or utilize legacy firmware

Others:

- Flooding occurs frequently during heavy rains at the 138kV and 69kV control houses.
- Transite (asbestos) paneling is present on the interior walls of the control house.
- The HVAC Systems are inadequate for providing proper air circulation for the relays, batteries, and chargers inside the buildings. Free standing space heaters are used.
- Cable entrances are at full capacity.
- The perimeter fences and gates are in need of replacement due to excessive corrosion.
- The two legacy 138kV bus PTs for Buses #1 and #2 have elevated PCB concentrations. These PTs are leaking oil.
- The 69kV capacitor Bank KK is installed on the Raceland 69kV line instead of the 69kV Bus.



AEP Transmission Zone M-3 Process
Johnson County, Kentucky

Need Number: AEP-2022-AP005

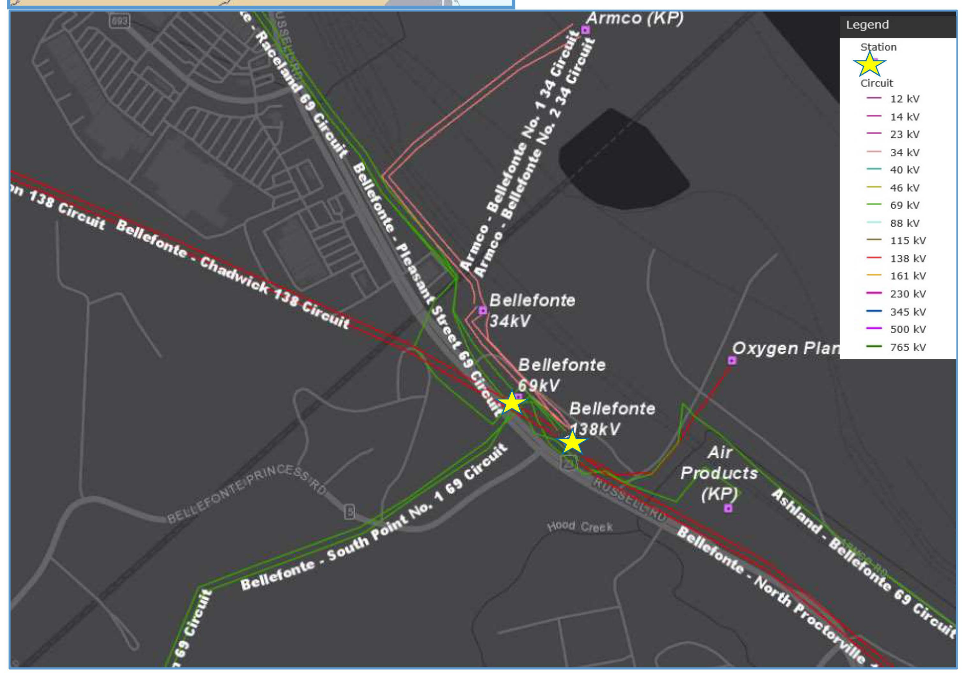
Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

Problem Statement Continued:

Bellefonte 34kV Yard:

- 34.5kV Circuit Breakers E, F, K, M:
  - The four 34.5kV transmission owned circuit breakers E, F, K, and M are FK-family model type, oil filled breakers. These breakers are of 1950's and 1970's vintages. These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, vacuum counterparts do not require.
  - As of October 7, 2021, there are 13 remaining FK-339-34.5-2500 circuit breakers on the AEP System, including the 3 (E, F, & K) at this station. Also as of October 7, 2021, there are 8 remaining FKA-38-22000-5Y circuit breakers on the AEP System, including the 1 (M) at this station. There is no vendor support for this fleet of circuit breakers and spare parts are increasingly more difficult to obtain; components are often taken from out of service units with remaining usable parts.
  - A common failure mode documented in AEP malfunction records are compressor failures and valve defects, which cause low pressure and oil leaks. Another failure mode includes trip or reclose failures, caused primarily by spring latching and charging motor component failures. In addition, the oil breakers have a lot of oil contamination from aging gaskets allowing moisture and other particle ingress.
  - Circuit Breaker E: 1950s vintage, Manufactured in 1953, Type: Oil , Fault Ops: 3, Circuit Breaker F: 1950s vintage, Manufactured in 1953, Type: Oil , Fault Ops: 3, Bus Tie circuit Breaker K: 1950s vintage, Manufactured in 1952, Type: Oil , Fault Ops: 7, Bus Tie circuit Breaker M: 1970s vintage, Manufactured in 1971, Type: Oil , Fault Ops: 2,

- Relaying:
  - 34 of the 34 relays at the station are in need of replacement
  - All 34 relays are electromechanical type which have significant limitations with regards to fault data collection and retention.
  - The existing RTU installed at Bellefonte 34.5kV Metering Station is a legacy TLG DOS unit which has high failure and malfunction rates, lacks telecom infrastructure compatibility, lacks software compatibility, lacks vendor support, lacks spare parts availability, lacks vendor supplied training, lacks an active warranty, and has poor RTU resource utilization. This particular unit has experienced 5 recorded malfunction over its in-service life including loss of communication and being down.



AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

AEP Transmission Zone M-3 Process Johnson County, Kentucky

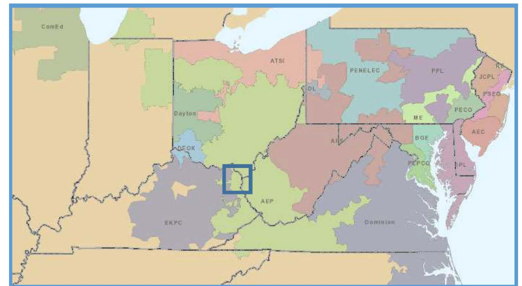
Need Number: AEP-2022-AP005

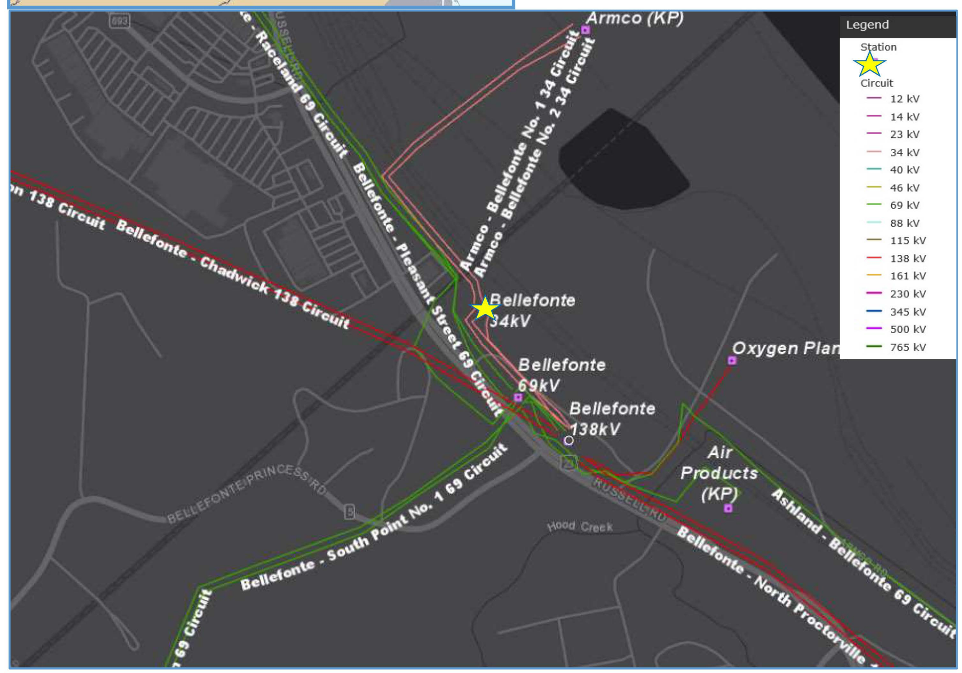
Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

Problem Statement Continued:

Bellefonte 34kV Yard (cont):

- 34.5/2.5kV kV Grounding Transformer #7:
  - 1950s Vintage, originally manufactured in 1951,
  - Increased decomposition of the paper insulation materials. Electrical discharges of high energy have occurred within the main tank. The low and declining levels of IFT (interfacial Tension) indicates that sludge has formed and is hardening and layering; in addition, this indicates that the insulation is shrinking and weakening.
  - Oil interfacial tension is strongly indicating an aged oil with polar contaminants and oxidation byproducts. This is a contaminated oil favoring accelerated aging of the insulation and formation of sludge which will impair proper oil circulation. Dielectric strength levels are also low and declining.
  - The presence of acetylene confirms the insulation system (oil and paper) is in poor condition and also indicates electrical discharge faults of high energy have occurred within the main tank causing electrical breakdown of the unit.
- 34.5/2.5kV kV Grounding Transformers #8 (three single phase units):
  - 1950s Vintage, originally manufactured in 1945,
  - The low and declining levels of IFT (interfacial Tension) indicates that sludge is dissolved in Oil (phase #1) or that the sludge is in the radiator, core and coil (for phase #2 & Phase #3).
  - Oil interfacial tension is strongly indicating an aged oil with polar contaminants and oxidation byproducts. This is a contaminated oil favoring accelerated aging of the insulation and formation of sludge which will impair proper oil circulation. Dielectric strength levels are also low and declining.
  - The presence of acetylene in GRD Bank-8 300 (phase #1) confirms the insulation system (oil and paper) of that unit is in poor condition and also indicates mixtures of electrical and thermal faults have occurred within the main tank causing electrical breakdown of the unit.
  - The presence of acetylene in GRD Bank-8 300 (phase #1) indicate increased decomposition of the paper insulation materials.
  - The lack of thermally upgraded paper insulation. As the insulating paper materials age, they become brittle. These characteristics of brittleness and lack of a thermal upgrade diminishes of the unit's ability to withstand future short circuit or through fault events due to the state of the paper insulation.
- 34.5/2.5kV kV Grounding Transformer #9:
  - 1980s Vintage, originally manufactured in 1984,
  - The elevated levels of carbon dioxide and carbon monoxide indicate excessive decomposition of the paper insulating materials. The presence of carbon dioxide and carbon monoxide indicate decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events.





AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

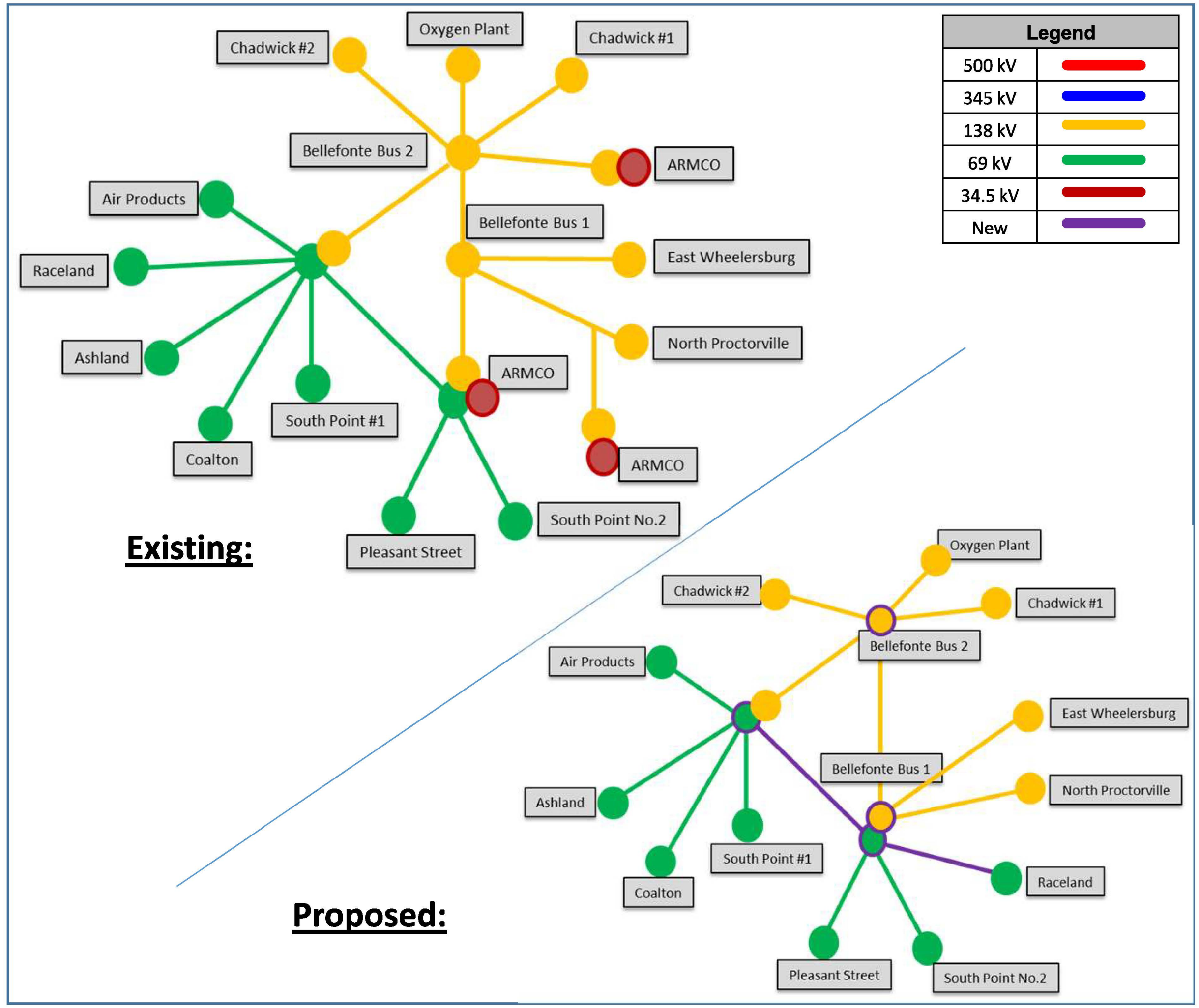
AEP Transmission Zone M-3 Process
Johnson County, Kentucky

Need Number: AEP-2022-AP005

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

Solution:

- Replace XFR #2 with a 200MVA Auto unit and retire XFR #1 & #5. The U/G feeder for XFR #3 69kV riser is getting reconductored under B3349. Reconductor sections of 138kV Bus #1 and 138kV Bus #2. Replace remaining oil PTs connected to Bus #1 and Bus #2. Upgrade Primary and back up station service.
- Replace 69kV bus tie breaker H. Replace the hook stick disconnects switches for the tie breaker H and 69kV tie breaker location will be relocated one bay south of the existing location and 69kV buses will be reconfigured. Replace the hook stick disconnects switches for Raceland breaker D. Relocate the Raceland feeder to bus #1 after extending the 69kV bus #1. The cap bank switcher/moab Mark 5 combo unit will get replaced with 69kV breaker and set of breaker disconnects and relocated to bus #1. 69kV breaker is needed instead of circuit switcher due to the high fault current. Relocate the cap bank to bus #1 after extending the 69kV bus #1. 69kV Air Products line MOABs will be replaced with 2000A SW. Replace hook-stick switches for Oil CB – AB, JJ, I, G, Z, T and C. These Breakers are replaced as part of B3350. Install 16'x48' DICM for 69kV Yard and a 16'x48' DICM for the 138kV Yard. Replace cable trench, single phase AC system & cable work, entire fence replacement and ground grid extension for 100'X10' expansion toward the Northwest of the 69kV yard. Both 138kV and 69kV control house will be retired. **Estimated Cost: $12.59 M (s2814.1)**



AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

AEP Transmission Zone M-3 Process
Johnson County, Kentucky

Need Number: AEP-2022-AP005

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

Solution (Cont.):

- The customer served out of 34.5 kV Yard has plans for demolition of their facilities. Retire entire 34kV Yard, contingent on the timing of the customer being removed from service. **Estimated Cost: $2.67 M (s2814.2)**
- Retirement of the Bellefonte 34.5kV Bus Tie Line that connects the Bellefonte 138kV Station to the Bellefonte 34kV Station. This removal involves removing 3- Double Circuit Lattice Towers, 1-Triple Circuit Lattice Towers, and 1 Single Wood Pole Structure. **Estimated Cost: $0.46 M (s2814.3)**
- Retire the existing Bellefonte – Armco 34.5kV operated line. The major removal work involves removing 4 lattice steel towers, 1 H-Frame wood structure, and 2 single wood poles. The line being removed is approximately 0.55 miles long. **Estimated Cost: $1 M (s2814.4)**
- Remote end relaying at Raceland substation to install 2 new CCVTs on a custom two-phase single column stand for the Bellefonte 69kV line exit. The existing CCVT mounted on a single phase CCVT stand will be reused and will remain as it is. **Estimated Cost: $0.37 M (s2814.5)**
- Provide 0.2 miles of fiber from Distribution structures outside the station to the new DICMs. **Estimated Cost: $0.49 M (s2814.6)**

Total Estimated Transmission Cost: $17.58 M

Supplemental Project ID: s2814.1-.6