Appendix 2
to BOT Scope Book

High Voltage Overhead Transmission

Rev. 1

June 6, 2024

REVISION RECORD			
Revision No.	Approval Date	Section / Page Revised	Reason / Description of Change
0	9/14/2023	All	Initial Issue
1	6/6/24	9.3.8.1	Updated maximum wind speed to 150 mph

APPENDIX 2

TO BOT SCOPE BOOK

HIGH VOLTAGE OVERHEAD TRANSMISSION

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Appendix 2: High Voltage Overhead Transmission

1 INTRODUCTION

1.1 Purpose

This Appendix 2 to the Scope Book (this “Appendix 2”) provides design requirements and reference material for the design of the high voltage (“HV”) (69 kV and above) overhead transmission lines that will be built and/or connected to the Entergy transmission system by or for Seller as part of the Project (“Transmission Lines”). This document pertains to the transmission line between the collector substation and the deadend structure delivered by the GIA. This document is intended to provide to Seller and others acting at Seller’s request requirements, recommendations, and guidance in the planning, design, construction, asset management, use, and operation of the Transmission Lines.

1.2 Scope

This Appendix 2 applies to all Transmission Lines.

This Appendix 2 primarily describes technical requirements, both performance-based and prescriptive for the design and installation of the Transmission Lines. Refer to the Scope Book and other parts of the Agreement for information regarding project sequencing and milestones, the project execution plan, project schedule and schedule management, project controls reporting, health and safety information, factory acceptance tests, training, required submittals, design reviews, equipment records, specified deliverables, project documentation, and other relevant matters not covered by this Appendix 2.

1.3 General Data

This Appendix 2 addresses aspects of the Work relating to the Transmission Lines. It is not intended to be, and shall not be construed to be, a comprehensive list of each and every element or other requirement applicable to the Work and shall in no way limit Seller’s obligations under the Agreement or any Ancillary Agreement. Without limiting the other terms of the Agreement or any Ancillary Agreement, in performing the Work relating to the Transmission Lines, Seller shall comply with, and cause its Contractors and Subcontractors to comply with, the terms of this Appendix 2, all Laws (including codes) and applicable Permits.

This Appendix 2 provides the minimum functional specification (“MFS”) for the Transmission Lines, including scope and design requirements. In addition to the requirements set forth in the Agreement (including the Scope Book), the Transmission Lines shall comply with all requirements specified in the GIA or any other Required Deliverability Arrangement.

This Appendix 2 is part of the Scope Book.

Article, Section, Table, Figure, and Attachment references in this Appendix 2 are to this Appendix 2 unless otherwise provided or the context otherwise requires.

1.4 Deviations

Any deviations from the MFS for the Transmission Lines or the terms of this Appendix 2 shall require Buyer’s prior approval and will be subject to the terms of the Agreement.

2 DEFINITIONS

2.1 Definitions

BIL - Basic Lightning Impulse Insulation Level is a reference insulation level in terms of the crest voltage of a standard lightning impulse.

Conductor Displacement - With respect to clearances, conductor displacement is the conductor movement, including the effects of insulator swing and structure deflection, due to a prescribed ice, wind, or thermal load case. With respect to right-of-way (“ROW”) determinations, conductor displacement is the maximum horizontal conductor displacement from its initial unloaded position, including the effects of insulator swing and structure deflection due to the extreme wind load case. See also (WCD) in Figure 6.3.4.1-3.

Conductor Movement Envelope - With respect to clearances, the conductor movement envelope is the full range of conductor positions in the prescribed ice, wind, or thermal load cases. With respect to ROW determinations, the conductor movement envelope is the full range of conductor movement, including the effects of insulator swing and structure deflection due to the extreme wind load case applied from both directions, and including the initial effective structure width. See also (WCME) in Figure 6.3.4.1-3.

Designer – Individual (in-house or contractor) responsible for analyzing and selecting transmission line components, structures, or foundations.

Effective Structure Width – the width between a structure’s outboard conductors (e.g., for an H-frame configuration, it is twice the phase spacing, and for a vertical conductor configuration it is effectively zero). See also (wS) in Figure 6.3.4.1-3.

LIDAR (Light Detection and Ranging) – A method of detecting and determining the position, velocity, or other characteristics of distant objects by analysis of pulsed laser light reflected from the surfaces of such objects.

Meridian – Electronic document management system used to archive transmission standards and documents and track revisions.

PLS-CADD – A software package used during optimization of pole spotting, design analysis, and the development of material lists.

Vegetation Management Width – Right of way width outside of the conductor movement envelope, purchased solely for establishment of a vegetation management cycle. See (WVM) in Figure 6.3.4.1-1 and Figure 6.3.4.1-2.

2.2 Acronyms and Abbreviations

ACAR Aluminum Conductor Alloy Reinforced

ACCC Aluminum Conductor Composite Core

ACCR Aluminum Conductor Composite Reinforced

ACSR Aluminum Conductor Steel Reinforced

ACSS Aluminum conductor Steel Supported

BIL Basic Lightning Impulse Insulation Level

EPRI Electric Power Research Institute

FAA Federal Aviation Administration

FAD Foundation Analysis & Design

GFD Ground Flash Density

IEEE Institute of Electrical and Electronics Engineers

LIDAR Light Detection and Ranging

MFAD Moment Foundation Analysis & Design

MVATD Minimum Vegetation Action Threshold Distance

MVCD Minimum Vegetation Clearance Distance

NESC National Electrical Safety Code

OCF Overload Capacity Factor

ROW Right of Way

SRF Strength Reduction Factor

UBS Ultimate Breaking Strength

3 REFERENCES AND DOCUMENTS

3.1 Industry Standards

The following Industry Standards are referenced in this Appendix 2:

ASCE MOP 91	Design of Guyed Electrical Transmission Structures
ASCE MOP 123	Prestressed Concrete Transmission Pole Structures
ASCE 48	Design of Steel Transmission Pole Structures

ASCE 74	Guidelines for Electrical Transmission Line Structural Loading
ANSI C2	National Electric Safety Code (NESC)
IEEE Std 80	IEEE Guide for Safety in AC Substation Grounding
IEEE Std 524	Guide to the Installation of Overhead Transmission Line Conductors
IEEE Std 738	Standard for Calculating the Current-Temperature of Bare Overhead Conductors
IEEE Std 1313.2	Guide for the Application of Insulation Coordination
IEE Std 1542	Guide for Installation, Maintenance, and Operation of Irrigation Equipment Located Near or Under Power Lines
APLIC 2012	Reducing Avian Collisions with Power Lines – State of the Art– 2012
APLIC 2006	Suggested Practices for Avian Protection on Power Lines
NACE RP0177	Mitigation of Alternating Current and Lightning Effects of Metallic Structures and Corrosion Control System
OSHA Std 2207, Part 1926	Safety and Health Regulations for Construction
IEEE 738	Standard for Calculating Current-Temperature Relationship of Bare Conductors
IEEE Std. 1243-1997	Guide for Improving the Lightning Performance of Transmission Lines
EPRI	Handbook for Improving Overhead Transmission Line Lightning Performance
EPRI	AC Transmission Line Reference Book - 200kV and Above
EPRI	Guide for Transmission Line Grounding
EPRI	Outline of Guide for Application of Transmission Line Surge Arrestors – 42 to 765 kV
	Pre-stressed Concrete Institute Guide Specifications
	FAA Advisory Circular AC 70/7460-1K, Obstruction Marking and Lighting

The latest issued Standards and Codes at the issuance of the effective date of the Agreement shall be used. Earlier editions are not allowed unless specifically identified in this Appendix 2.

If a revision to a standard or code is issued, it is not required to be implemented unless the Authority Have Jurisdiction (AHJ) has adopted it, in which case, Seller is obligated to any increased compliance above what is required by the Standards and Codes at the effective date of the Agreement. This risk is borne by Seller.

3.1.1 Materials

Seller shall use the descriptions of materials set out in the standard drawings provided in Attachment 1 along with the Approved Vendor List in Attachment 5 to procure the equipment, materials, systems, and other items required for the development, engineering, design, procurement, construction, testing, commissioning, use, and operation of the Transmission Lines in accordance with the terms of the Agreement.

4 SAFETY AND ENVIRONMENT

4.1 Safety

The safety of individuals, the Project, and other life or property in the development, engineering, design, procurement, construction, testing, commissioning, use, and operation shall be the Designer's highest priority.

4.2 Avian Design

The primary issues to consider for avian protection on transmission lines are clearances, marking, and nests. Transmission clearances for all voltages shall exceed the established minimums, shown in Attachment 2. Where Entergy standard structure configurations, shown in Attachment 1, are used, the design will meet the guidelines. Marking of wires is addressed in Section 7.13.4 and is to be done only in areas where such marking is required by authorized wildlife agencies, Laws, or applicable Permits.

4.3 Future Impacts

Proper consideration shall be given to working space and access during siting to address direct impacts on both work safety and the need for environmental remediation. Similarly, proper consideration shall be given to the ability to re-conductor a line vs. rebuilding to address the potential considerable ecological benefits.

5 LOAD COMBINATIONS

5.1 Loading Combinations

This section covers the transmission line load cases and load case combinations to be used in the design of the Transmission Lines for the Project. It also includes the Overload Capacity Factors ("OCF") and Strength Reduction Factors ("SRF") used to calculate forces on the individual components of each structure within the Transmission Lines. The load combinations below are consistent with the loading requirements of NESC Rule 250; however, the boundaries for loading areas have been shifted from those in NESC Rule 250. All references to NESC 250B, 250C, and 250D refer to the District Loading, Extreme Wind, and Concurrent Ice and Wind as modified based on these shifts in loading areas.

5.1.1 District Maps

Based on the NESC figures, districts were established along county and parish boundaries which envelope the NESC requirements. These boundaries were further modified to address other commitments and past operating experience. Notably: several coastal parishes and counties have design wind speeds increased to 150 mph to address hardening study recommendations and other commitments; roughly the NW half of Arkansas has been treated as NESC Heavy rather than NESC Medium based upon past operating experience and design practice; and the 1” ice loading was extended throughout Arkansas and much of northern Mississippi based on extensive damage from past ice storms. They are collectively presented as **Error! Reference source not found.** illustrating the enveloping districts as follows:

Transmission Line Designers shall use the most conservative loading requirements required along the entire line if the line crosses several counties or parishes requiring different loadings. Exception to this requirement may be taken where a containment structure is placed at the district boundary.

5.1.2 Load Cases - Summary

Table 5.1.2 summarizes the various load cases used to design and analyze structures.

Table 5.1.2 – Structural Load Cases

Description	Wind Loading	Ice Loading	Temperature	NESC Ref.
NESC 250B District Loading				
Heavy	4 psf	0.50 in.	0°F (-20°C)	250B, Table 250-1
Medium	4 psf	0.25 in.	15°F (-10°C)	250B, Table 250-1
Light	9 psf	0.00 in.	30°F (-1°C)	250B, Table 250-1
NESC 250C Extreme Wind				
100 mph	25.6 psf	0.00 in.	60°F (15°C)	250C, Table 250-1
110 mph	31.0 psf	0.00 in.	60°F (15°C)	250C, Table 250-1
125 mph	40.0 psf	0.00 in.	60°F (15°C)	250C, Table 250-1
140 mph	50.2 psf	0.00 in.	60°F (15°C)	250C, Table 250-1
150 mph	57.6 psf	0.00 in.	60°F (15°C)	250C, Table 250-1
NESC 250D Concurrent Ice and Wind				
0.5 in.	2.3 psf	0.50 in.	15°F (-10°C)	250D, Table 250-1
0.75 in.	2.3 psf	0.75 in.	15°F (-10°C)	250D, Table 250-1
1.0 in.	2.3 psf	1.00 in.	15°F (-10°C)	250D, Table 250-1
Cold Case – Uplift	0 psf	0.00 in.	0°F (-20°C)	
Every Day – Deflection	0 psf	0.00 in.	60°F (15°C)	
Unbalanced	See Section 5.1.4	See Section 5.1.4	60°F (15°C)	See Section 5.1.4

5.1.3 Loads – Structure Analysis

In addition to the cases in Table 5.1.2, the following load cases shall be used in the analysis and structure design of all Transmission Line structures.

5.1.4 Stringing Loads on Custom Davit and Cross Arms

For arms, the everyday load case shall include a vertical load of 5000 lbs. suspended from the ends of each arm (to address vertical construction loads). The described vertical load is an allowance for steep stringing angles and other construction loads.

5.1.5 NESC Load Cases with OCF = 1.0

In addition to the standard NESC Overload Capacity Factors, all concrete structures shall have loads applied for NESC Load Cases with OCF = 1.0.

5.1.6 Special Load Cases - Structure Analysis

The following load cases shall be used in the analysis and structure design of the following structure types.

5.1.7 Single Dead-End and Failure Containment (Dead-End Structures)

All wires up, One Side Only Loading, Initial or Final Condition using the Structural Load Cases in Table 5.1.2.

5.1.8 Stringing Longitudinal Unbalanced Load (Tangents & Run. Angles)

0 mph Wind & 0” Ice, 60°F (15°C), Initial (Everyday Loads) with 3000 lb. Longitudinal Force (1000 lb. per phase) or with 2000 lb. Longitudinal Force per conductor (H-Frames only).

5.1.9 Pole without Conductors (NESC 261A1c) (Guyed Poles)

Extreme Wind applied on pole in any direction.

5.1.10 Stringing loads on Dead-Ends

Everyday loads on one side only (0 mph wind, 0” ice, 60F (15C), Initial.

5.1.11 PLS Wind Direction for Structure Loading

Designers shall conservatively use wind applied normal to all spans simultaneously when selecting structures for new designs.

5.2 Load Cases – Clearance Verification

The following clearance load cases shall be included to check vertical and horizontal clearances. "Line Design Clearances" are shown in Attachment 2.

Table 5.2.1 – Clearance Load Cases

Description	Wind Loading	Ice Loading	Temp.	NESC Ref.	Condition	Clearance Check
Max. Temp. (ACSR)	0 psf	0 in.	212°F (100°C)	232A	Final	Vertical Clearance
Max. Temp (ACSS & ACCC)	0 psf	0 in.	347°F (175°C)	232A	Final	Vertical Clearance
Max. Temp (ACAR)	0 psf	0 in.	176°F (80°C)	232A	Final	Vertical Clearance
NESC Zone						
Heavy	4 psf	0.5 in.	0°F (-20°C)	230B, Table 230-1, Table 230-2	Final	
Heavy Ice	0 psf	1.0in	32°F (0°C)	232A	Final	Vertical clearance to ground, other conductors, and structures
Medium Wind	6 psf	0 in.	60°F (15°C)	234A2	Initial and Final	Horizontal clearance to ground, other conductors and structures.
High Wind (ROW)	Extreme Wind from Table 5.1.2	0.0 in.	60°F (15°C)		Final	Horizontal Clearance to Edge of Right-of-Way
High Wind (Horizontal. Clearance)	100 mph	0.0in.	60°F (15°C)		Final	Insulator swing and Conductor movement (See Section 6.3.3 for more information)
No Wind	0 psf	0.00 in.	60°F (15°C)		Initial and Final	Horizontal clearance to ground, other

Description	Wind Loading	Ice Loading	Temp.	NESC Ref.	Condition	Clearance Check
						conductors and structures.

5.3 Load Cases – Wire Stringing

The following load cases shall be used to calculate stringing tensions for conductors and shield wires.

Conductor & Shield Wire Stringing Tensions

0 mph Wind, 0” Ice, 60°F (15°C), Initial & Final Stringing Temperature – 10 to 120°F (-12 to 49°C)

5.4 Load Factor and Strength Reduction

Overload Capacity Factors (OCF) shall be coordinated with the appropriate Strength Reduction Factors (SRF) and confirm that material strengths are presented as ultimate or working material strengths.

Table 5.4A – NESC & Entergy Design Overload Capacity Factors (OCF)

LOAD CASE	VERT (OCF)	WIND (OCF)	TENSION (OCF)	CODE REF.
Structural Analysis				
NESC Zone Loading (Intact)	1.5	2.5	1.65	253-1
Extreme Wind - (Intact)	1	1	1	
Concurrent Ice & Wind – (Intact)	1	1	1	
Unbalanced – (Intact)	1	1	1	
Single DE NESC Failure Containment	1.5	2.5	1.65	
Single DE Extreme Wind & Heavy Ice	1	1	1	
Cold Case – for Uplift	1	1	1	
Every Day Loads – for Deflection	1	1	1	
Clearance Calculations				
Clearance – Vertical – Heavy Ice (NESC)	1	1	1	232A3
Clearance – Vertical – Max. Temp. (NESC)	1	1	1	232A2
Clearance – Vertical – Static (NESC)	1	1	1	
Clearance – Horizontal Med. Wind – (NESC)	1	1	1	234A2
Clearance – Horizontal R/W – Entergy Max. Wind	1	1	1	

Table 5.4B - Strength Reduction Factors (SRF)

Structure Component	SRF NESC Loads (250B)	SRF Extreme Wind and Ice Loads (250C & 250D)	NESC Code Reference
Steel & Pre-stressed Concrete Structures	1.0	1.0	Rule 261-A, Table 261-1
Foundation & Guy Anchors	1.0	1.0	Rule 261-B, Table 261-1
Guys & Guy Insulator	0.9	0.9	Rule 261-C& 264, Tab. 261-1
Steel Crossarms & Braces	0.9	0.9	Rule 261-D1, Table 261-1
DE Fittings, Splices & Hardware(3)	1.0	0.8	Rule 261-H2C
Support Hardware(2)	1.0	1.0	Rule 261-D-1, Table 261-1
Insulators – Suspension	0.50	0.65	Table 277-1(4)
Insulators – Post	0.50	0.50	Table 277-1(4)
Conductor & Shield Wire	(1)	(1)	Rule 261-H1

(1) Conductor and shield wire maximum wire tensions are taken from NESC Code Section 261- H1.

(2) Support hardware includes bolts and plates supporting davit arms, braced post and post insulators, brackets, suspension tees and other miscellaneous supports not supporting conductor or shield wire dead-ends. The reduction factors shown are multiplied by the ultimate strength of the part as indicated by the manufacturer.

(3) Dead-end fittings include bolts and dead-end tees used to dead-end conductors and shield wires. The manufacturer generally gives the ultimate strength of the tees. This value is then reduced by the reduction factor shown. The “minimum tensile strength” shown for bolts by the Vendor is the allowable tensile load that shall be used on the bolt without the combined load of shear produced in a guyed structure. These loads are not reduced by the reduction factor; however, the shear values given shall be reduced depending on the actual tensile stress, in accordance with the interaction equation.

(4) NESC 2017

6 CLEARANCE AND RIGHT OF WAY REQUIREMENTS

This section covers vertical and horizontal clearance requirements for the Transmission Lines, which include NESC vertical and horizontal clearance requirements from Section 23 of the 2017 Code or counterpart for subsequent codes for HV transmission lines in Entergy’s Service Area plus an added safety buffer, as described below.

6.1 Vertical Clearance – Over Ground

NESC and Entergy vertical clearances over various ground surfaces are shown in Attachment 2. These clearances are based on the 2017 Code, Table 232-1, with the voltage adder defined in Rule 232C1a, using the sags calculated under Rules 232A2 and 232A3.

See Section **Error! Reference source not found.** for Clearance Load Cases.

The actual clearance to ground shall be based on the measurement to ground at the low point in the line as determined when the line is at maximum sag. For purposes of determining the required clearance for the Transmission Lines,

NESC Clearance = Table 232-1 Clearance + Voltage Adder (.4”/kV in excess of 22kV)

Entergy-Required Minimum Clearance = NESC Clearance + Safety Buffer

NESC provides consideration for clearances over water surfaces, including floodwaters. Footnotes 17-21 to Table 232-1 shall be carefully considered when determining necessary clearances. For flood-prone areas that do not typically have standing surface water and are not subject to USACE or other permits, the normal flood level (10-year flood level) shall be considered along with required clearances for areas not suitable for boating. For most spans over such areas, clearances that consider or are based on vehicle access with un-flooded ground surfaces will continue to apply. Lines leading into generating facilities, EHV interconnections, or other lines where increased reliability is desired shall consider less frequent flood events (e.g., 50-year floods or 100 year floods) to avoid potential service interruptions. Such lines shall be designed to higher flood levels where the incremental costs are justified and will generally be compared to NESC requirements for water surface not suitable for sailboats.

6.2 Other Vertical Clearances

6.2.1 Supply Conductors (69 kV and above)

NESC and Entergy vertical clearances between various electricity supply lines and non-current carrying wires are also shown in Attachment 2. These clearances are based on the 2017 Code, Table 233-1, with the voltage adder defined in Rule 233C2a, using the sags calculated under Rules 233A1a (3)(b) and 233A1a (3)(c).

The design clearance shall be measured as the distance between the field measured existing line and the design maximum sag.

The Entergy-Required Minimum Clearance: NESC Clearance + Safety Buffer

Attachment 2 shows the minimum vertical clearances over various ground surfaces and uses.

The line Designer shall establish “Prohibitive Zones” with the appropriate Design Clearances on the plan profiles within PLS-CADD in the areas where these considerations occur. Considerations could be but not limited to environmental, archaeological, landowner constraints, etc.

6.2.2 Substations

Transmission line vertical clearances inside substations shall meet the vertical clearance requirements shown in Attachment 2.

6.2.3 Miscellaneous

To every extent possible, ROW shall be selected, and ROW agreements written, to preclude structures, signage, and other miscellaneous items from being located beneath the transmission circuits. To the extent such items cannot be so precluded, the vertical clearances for the Transmission Line shall meet the basic

NESC clearance requirements for each applicable clearance set forth in Attachment 2, plus an additional 4.5 feet.

6.3 Horizontal Clearance

All horizontal clearances shall include the deflection of the structure and the displacement of the conductor added to the clearance requirements defined below. Clearances per Section 6.3.1 and Section 6.3.2 shall be based on the development of the clearance envelopes shown in the NESC for each situation plus 4.5 feet at a minimum. Basic NESC clearances, including horizontal clearances, are summarized in Attachment 2.

6.3.1 Adjacent Supply Lines

Horizontal clearances to adjacent supply lines shall be calculated using loads described in Section **Error! Reference source not found.**. This clearance is based on an envelope as shown in NESC Figures 233-1, 2&3 and using the following loadings:

The horizontal movement shall be calculated using the medium wind defined under Rule 233A1a(1&2) using (1) a 6 lb/sf wind at 60°F (15°C) and no ice or (2) no wind at 60°F (15°C).

The maximum sag, Rule 233A1a(3), shall be calculated (a) using 120° F (49°C) with no wind; (b) using the max temperature; or (c) the Code Ice thickness with a temperature of 32°F (0°C) and no wind.

PLS-CADD shall be used to define the envelope vertices and check clearance to adjacent supply lines.

6.3.2 Adjacent Buildings and other Structures

The required clearance between conductors and buildings or other structures is covered in Rule 234 and varies between the various structure types. The loadings used for the clearance envelopes are given in Section **Error! Reference source not found.**. The Designer shall use PLS-CADD to check these clearances after specifying the required load cases and clearances.

6.3.3 Insulator/Conductor Swing Clearance

Clearances to the supporting structure resulting from insulator swing are addressed in Section 8.1. Additionally, air gap clearances between adjacent circuits on different structures are to be checked under the high wind load case in Section **Error! Reference source not found.**. Minimum clearance shall be that associated for the higher voltage for the 100 mph swing clearance given in Table 8.1.2.

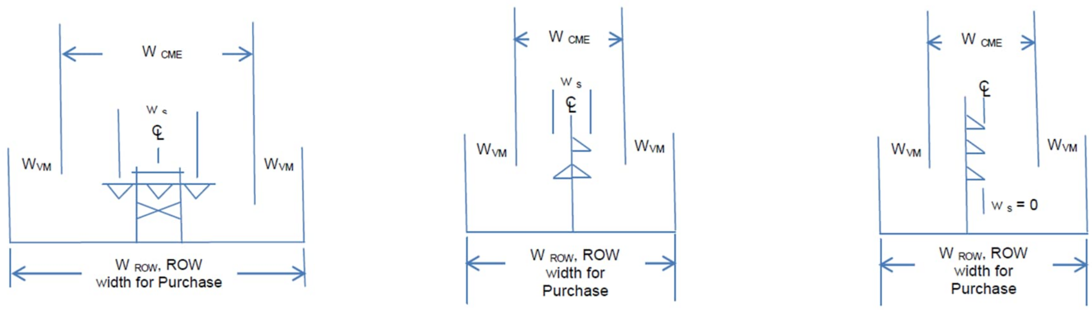
6.3.4 Right of Way Requirements

6.3.4.1 Rights of Way for New Lines

Rights of way (ROW) for new transmission lines must provide spacing sufficient to assure reliability and equipment accessibility for maintenance and construction.

Required ROW widths for new lines must be determined considering four primary parameters: (a) the effective structure width(s), taken as the outboard conductor spacing for the structure; (b) the minimum required spacing between adjacent circuits on separate structures; (c) the conductor displacement due to wind; and (d) a vegetation management width at the edges of the ROW to allow for a cyclical growth and periodic trimming schedules. The sum of the structure widths, any additional circuit spacing dimensions, and the conductor displacements (including the effects of structure deflection, insulator swing, and conductor movement) is called the conductor movement envelope (W_{CME}). Adding the appropriate vegetation management width on each side of W_{CME} gives the minimum allowed ROW width for purchase. Note that total minimum allowed ROW widths for purchase will be rounded upward in whole 5’ increments (e.g., 161’ is rounded to 165’.) The four parameters described above are illustrated for typical ROW situations in Figure 6.3.4.1-1 and Figure 6.3.4.1-2. Additional figures are found in Attachment 4.

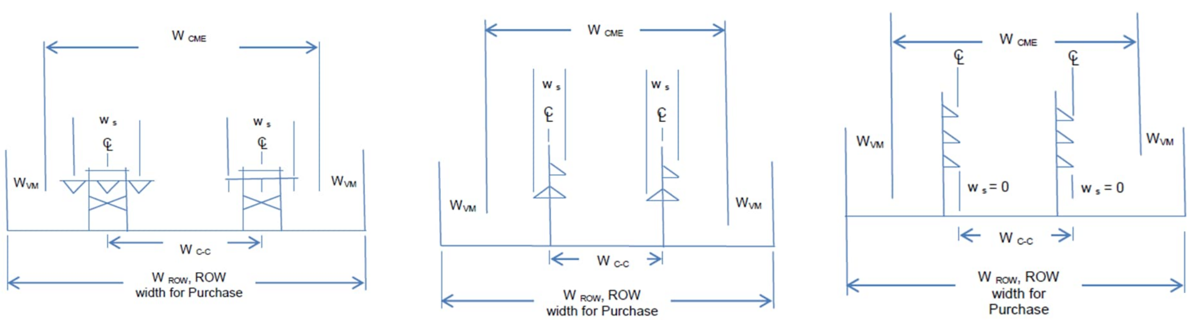
Figure 6.3.4.1-1 – Typical Single Structure ROW



(a) H-Frame (b) Monopole Delta (c) Monopole Vertical

Notes: w_s = Effective Structure Width (Outboard Conductor Spacing) W_{VM} = Vegetation Management Width; W_{CME} = Width, Conductor Movement Envelope; Add Width = c/c Spacing

Figure 6.3.4.1-2 – Typical Double Structure ROW



(a) H-Frame (b) Monopole Delta (c) Monopole Vertical

Notes: w_s = Effective Structure Width (Outboard Conductor Spacing) W_{VM} = Vegetation Management Width; W_{CME} = Width, Conductor Movement Envelope $W_{c\text{-}c}$ = Center to Center Structure Spacing

6.3.4.2 Effective Structure Width (ws) or Outboard Conductor Spacing

Except where special circumstances warrant use of larger values, the minimum allowed ROW widths for new construction shall be based on the effective structure widths (ws) for standard structure framings as set forth in Table 6.3.4.2-1.

Table 6.3.4.2-1 – Typical Effective Structure Widths

		Single Pole	
Voltage	H-frames (ft.)	Delta/ Vert. Double Circuit (ft.)	Single Circuit Vertical (ft.)
500kV	67.66	28.00	0.00
345kV	51.00	24.00	0.00
230kV	40.00	18.00	0.00
161/138/115 kV	32.00	14.33	0.00
69kV	24.00	12.00	0.00

Note that for vertical conductor configurations, the conductors fall on the centerline of the circuit/ROW and the monopole structure itself is offset by a function of the insulator length. In such configurations there are no outboard conductors, and the effective width of the structure is treated as zero.

When determining ROW requirements for constructing a new transmission line adjacent to an existing transmission line (discussed in more detail below), the actual effective widths of the existing structure shall be determined and used in the calculation.

Adjacent Circuit Separation (Wc-c)

Circuit center to center horizontal spacing for ROW determinations shall be as shown in Table 6.3.4.2-2 unless the Performance Standard requires use of a higher value.

Table 6.3.4.2-2 – Minimum Spacing for Adjacent Circuits ($W_{c\text{-}c}$)

		Single Pole	
Voltage	H-frames (ft.)	Delta/ Vert. Double Circuit (ft.)	Single Circuit Vertical (ft.)
500kV	140	96	70

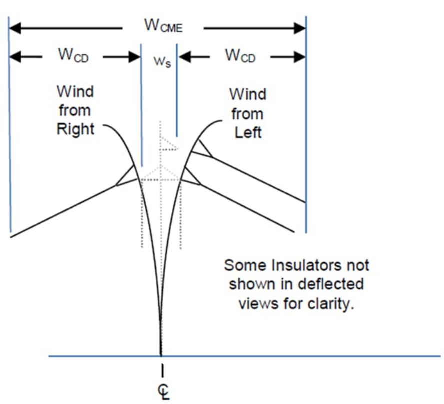
		Single Pole	
Voltage	H-frames (ft.)	Delta/ Vert. Double Circuit (ft.)	Single Circuit Vertical (ft.)
345kV	120	65	45
230kV	75	50	35
161/138/115 kV	60	40	30
69kV	45	30	20

For 345 kV and 500 kV Transmission Lines, the distances specified for adjacent single pole circuits reflect geometrical limits only. Electrical effects (audible noise, EMF, etc.) must be studied, and will require additional separation if indicated by the study. For two adjacent circuits of different voltage or framing, the larger of the two required separation distances shall be used.

6.3.4.3 Displaced Conductor Position (WCD)

During detailed line design, the displaced conductor positions are calculated including the effects of structure deflection and insulator/hardware swing; and using the load cases contained in Section 5. Wind loads are applied transversely in each direction to displace the conductor away from the centerline as illustrated below.

Figure 6.3.4.3-1 – Displaced Conductor Position & Relationship to W_{CME} and w_s



Notes: w_s = Effective Structure Width (Outboard Conductor Spacing) W_{CME} = Width, Conductor Movement Envelope; W_{CD} = Displaced Conductor Position Including Structure Deflection

In addition to checking required horizontal clearances per Sections 6.3.1 and 6.3.2, the displaced conductor position shall stay within the available conductor movement envelope under the extreme wind cases described in Table 5.1.2. As part of the line design, pole placements and span lengths must be adjusted if required to maintain required clearances and keep the conductor within the available width.

The available CME widths in Table 6.3.4.4-1 and Table 6.3.4.5-1 contemplate and accommodate standard framings, typical spans, the current list of typical conductors and their specified stringing limits, etc. Markedly atypical designs may require a more rigorous evaluation of the ROW requirements. Conversely, severe ROW restrictions will likely require atypical design such as shortened spans.

Note that all tabulated values consider the use of V-string assemblies, braced-post assemblies, suspension units with struts, or other configurations where insulator swing is confined.

6.3.4.4 Vegetation Management Width (WVM)

It is assumed that trees grow or someday will grow at the edge of the ROW, and that normal growth cycles will result in further encroachment into the Vegetation Management Width. Therefore, the conductor movement envelope (CME) alone is insufficient as a ROW. Vegetation management in the area adjacent to ROW edges is required to prevent grow-in and to comply with the Minimum Vegetation Clearance Distance (MVCD see also definitions). Thus, additional width between the ROW edge and the outboard conductors is essential to allow planned, efficient vegetation management without violating the MVCD.

To accomplish this, apply a Minimum Vegetation Action Threshold Distance (MVATD) for prioritizing corrective maintenance. The Vegetation Management Width (W_{VM}) to be used when determining ROW width shall bound the MVATD and MVCD, and is tabulated below (values for MVATD and MVCD are provided for reference):

Table 6.3.4.4-1 – Vegetation Management Widths

Voltage	W_{VM} (ft.)	MVATD (ft.)	MVCD (ft.)
500kV	22.5	14.68	7.4
345kV	15.0	9.44	4.5
230kV	12.5	5.14	4.3
161/138/115 kV	10	3.42 / 2.94 / 2.45	2.9 / 2.4 / 2.0
69kV	7.5	2.45	1.2

Where a circuit is to be built at a given voltage but operated at a lower voltage, the W_{VM} for the higher voltage shall be used to determine ROW width.

6.3.4.5 Calculation of Minimum Allowed ROW Width for Purchase - New Single Circuit Line or Double Circuit on the Same Structures

As illustrated in the preceding figures, at any given point, the minimum allowed ROW shall equal the applicable CME plus the applicable vegetation management width (W_{VM}) on each side of the ROW. Assuming multiple circuits are the same voltage, standard ROW widths are determined as:

ROW = WCME + 2(WVM), rounded up to the next whole 5' increment

and are tabulated by voltage and framing type in Table 6.3.4.5-1 and Table 6.3.4.5-2.

Table 6.3.4.5-1 – Minimum Required ROW Widths for Single Structures (Single Circuit or Multi-Circuit on Same Structure)

		Typical ROW Width (ft.) for Purchase			Conductor Movement Envelope - CME (ft.)		
Line Voltage (kV)	WVM (ft.)	H-Frame	Single Pole Delta/Vertical Double Circuit	Single Pole Vertical	H-Frame	Single Pole Delta/Vertical Double Circuit	Single Pole Vertical
500	22.50	225	125	125	180	80	80
345	15.00	190	155	135	160	125	105
230	12.50	150	125	110	125	100	85
161	10.00	120	100	90	100	80	70
69	7.50	90	75	65	75	60	50

Table 6.3.4.5-2 – Minimum Allowed ROW Widths for Multiple Structures and Circuits

	ROW Widths (ft.) assuming two identical lines								
Line Voltage (kV)	ROW Width for Purchase (ft.)			Conductor Movement Envelope - CME (ft.)			Add. Width per line (ft.)		
	H-Frame	Single Pole Delta/Vertical Double Circuit	Single Pole Vertical	H-Frame	Single Pole Delta/Vertical Double Circuit	Single Pole Vertical	H-Frame	Single Pole Delta/Vertical Double Circuit	Single Pole Vertical

500	365	225	195	320	180	150	140	96	70
345	310	220	180	280	190	150	120	65	45
230	225	175	145	200	150	120	75	50	35
161	180	140	120	160	120	100	60	40	30
69	135	105	85	120	90	70	45	30	20

Notes regarding Tables 6.3.4.5-1 and 6.3.4.5-2:

1. Tabulated 500 kV single pole ROW reflect an atypical short span design intended to compact lines on narrower ROWs.

2. As noted in 6.3.4.1, tabulated values reflect Vee-String, Brace Post, Suspension/Strut or other insulator assemblies where conductor attachments are somewhat restrained. Where suspension I-String assemblies are used: at 230 kV and below the ROW widths given shall be increased by 5 feet; and at 345 kV they shall be increased by 10 feet. Only Vee-String assemblies are currently approved for 500 kV.

3. The ROW values presented are indicative of what would be required in straight sections of ROW containing tangent or light angle structures. Large angle changes using multi-pole structures or extensive guying patterns will require additional ROW in the vicinity of the angle structure.

7 CONDUCTOR AND SHIELD WIRE INFORMATION

This section includes design information about standard conductors, both in single and in bundled configurations, along with standard shield wires, including fiber optic wires. It includes tension and vibration control data for the NESC and Entergy design conditions. Conductors and shield wires shall be selected from these standards unless Buyer and Seller otherwise agree in a writing signed by authorized representatives of the Parties.

7.1 Entergy Standard Conductors

The required technical standards for conductors are set forth in this Section 7.1 (properties based on Southwire® data unless noted.):

Table 7.1A – Standard Conductors – Mechanical Properties

Type	Size	Stranding	Code Word	Area (in^2)	Dia. (in.)	Weight (lb/ft)	Strength (lbs)
ACCC/TW (5)	1949	56/1	LAPWING (4)	1.647	1.504	1.938	48,900
	1582	33/1	BITTERN (4)	1.336	1.345	1.566	39,400

Type	Size	Stranding	Code Word	Area (in^2)	Dia. (in.)	Weight (lb/ft)	Strength (lbs)
	1428.5	33/1	BEAUMONT [4]	1.232	1.294	1.436	43,700
	1222	33/1	CARDINAL [4]	1.053	1.198	1.224	37,100
	821.2	18-1	GROSBEAK [4]	0.725	0.990	0.836	30,400
ACSS	1590	45/7	LAPWING	1.34	1.50	1.79	27,900
	1272	45/7	BITTERN	1.07	1.35	1.43	22,300
	954	54/7	CARDINAL	0.85	1.20	1.23	26,000
	666.6	24/7	FLAMINGO	0.59	1.00	0.86	18,200
ACSR	1780	84/19	CHUKAR	1.51	1.60	2.08	51,000
	1590	45/7	LAPWING	1.34	1.50	1.79	42,200
	1272	45/7	BITTERN	1.07	1.35	1.43	34,100
	1033.5	45/7	ORTOLAN [1]	0.87	1.21	1.163	27,700
	954	54/7	CARDINAL	0.85	1.20	1.23	33,800
	954	45/7	RAIL [2]	0.80	1.165	1.075	25,290
	666.6	24/7	FLAMINGO	0.59	1.00	0.86	23,700
	336.4	26/7	LINNET	0.31	0.72	0.46	14,100
ACAR	1024.5	34/13	N/A [3]	0.80	1.165	0.96	23,100
	649.5	18/19	N/A	0.51	0.93	0.61	17,100
	395.2	15/7	N/A	0.31	0.72	0.37	10,100

(1) Not for New Construction, Capital Maintenance only

(2) 345 kV and 500 kV only – Use for new construction

(3) 500 kV only – for Capital Maintenance work only

(4) Source: General Cable/LAMIFIL Data

(5) It is generally preferential to develop a custom conductor solution using an ACCR conductor in lieu of the ACCC conductors. Use of the ACCC standards will generally be limited to extension of existing ACCC lines or other similar circumstances.

Ampacity ratings for the standard conductors are determined using the commercially available software SWRate, which is based on the methodology of IEEE 738. Ampacity was determined using design parameters specified in Entergy standards and the conductor properties contained in the SWRate program library. Line ratings are also expressed as conductance in MVA using the expression MVA = V * A * 0.001 * 3^0.5, where V is voltage in kV, and A is rated ampacity in amps. Ampacity and conductance ratings for the standard conductors are summarized below.

Table 7.1B – Standard Conductors – Capacity

Type	Size / Code Word	Rated Amps (1)	MVA 69kV	MVA 115kV	MVA 138kV	MVA 161 kV	MVA 230kV	MVA 345kV	MVA 500kV
ACCC/TW (3)	1949 / LAPWING	2490	298	496	595	694	992	-	-
	1582 / BITTERN	2180	261	434	521	608	868	-	-
	1429 / BEAUMONT	2050	245	408	490	572	817	-	-
	1222 / CARDINAL	1857	222	370	444	518	740	-	-
	821.4 / GROSBEAK	1439	172	287	344	401	573	-	-
ACSS	1590 / LAPWING	2263	270	451	541	631	902	-	-
	1272 / BITTERN	1957	234	390	468	546	780	-	-
	954 / CARDINAL	1607	192	320	384	448	640	-	-
	666.6 / FLAMINGO	1312	157	261	314	366	523	-	-
ACSR	1780 / CHUKAR	1608	192	320	384	448	641	-	-

Type	Size / Code Word	Rated Amps (1)	MVA 69kV	MVA 115kV	MVA 138kV	MVA 161 kV	MVA 230kV	MVA 345kV	MVA 500kV
	1590 / LAPWING	1494	179	298	357	417	595	-	-
	1272 / BITTERN	1303	156	260	311	363	519	-	-
	1033.5/ ORTOLAN (2)	1144	137	228	273	319	456	-	-
	954 / CARDINAL	1088	130	217	260	303	433	-	-
	954 / RAIL	1088	130	217	260	303	433	650	942
	666.6 / FLAMINGO	882	105	176	211	246	351	-	-
	336.4 LINNET	575	69	115	137	160	229	-	-
ACAR	ACAR 1024.5 (2)	878	105	175	210	245	350	-	760
	ACAR 649.5	658	79	131	157	183	626	-	-
	ACAR 395.2	483	58	96	115	135	192	-	-

(1) At normal operating temperatures, 212ºF (100ºC) for ACSR, 347ºF (175ºC) for ACSS and ACCC, and 176ºF (80ºC) for ACAR.

(2) Other historical limits may govern.

(3) It is generally preferential to develop a custom conductor solution using an ACCR conductor in lieu of the ACCC conductors. Use of the ACCC standards will generally be limited to extension of existing ACCC lines or other similar circumstances.

7.2 Standard Shield Wires

The required technical standards for shield wires are set forth in Table 7.2 below:

Table 7.2 – Standard Shield Wires

Code Word	Class Type	Size	Strand-Ing	Area (in^2)	Dia. (in.)	Weight (lb/ft)	Strength (lbs)
7 #7	Alumoweld	0.0	7	0.11	0.43	0.33	19,060

7.3 Standard Optical Ground Wires

The required technical standards for optical ground wires (OPGW) are set forth below:

Table 7.3 – Standard OPGW Wires

Code Word	Class Type	Fibers	Strand-Ing	Area (in^2)	Dia. (in.)	Weight (lb/ft)	Strength (lbs)
DNO-5651	AlumaCore	24LT	13	0.151	0.528	0.36	18,391
DNO-6651	AlumaCore	48LT	9/6	0.221	0.646	0.42	18,053
DNO-3476	AlumaCore	24	13	0.151	0.528	0.36	18,433
DNO-4596	AlumaCore	48	9/6	0.221	0.646	0.42	18,053
DNO-6205	CentraCore	24	10	0.166	0.528	0.41	21,845
DNO-6210	CentraCore	48	10	0.166	0.528	0.41	21,845
DNO-8161 (1)	AlumaCore	48	13	0.151	0.528	0.36	18,391
DNO-9800 (2)	AlumaCore	48	13	0.151	0.528	0.36	19,391

(1) DNO-8161, 48 fiber AlumaCore will be the default OPGW selection unless project specifics warrant a different selection.

(2) DNO-9800, 48 fiber AlumaCore will be the default OPGW selection for “backbone” applications where dispersion shifted fibers are required by the telecommunications department.

Alternative optical ground wires may be used, provided they meet the same specifications as the above-referenced wires. Similar hardware to that used for standard wires specified herein must be used so that nonstandard hardware does not have to be stocked for maintenance.

7.4 Bundled Conductors

7.4.1 Bundled Conductors (New Construction, excluding 500 kV)

The standard bundled configuration is a vertical bundle in which no spacers are required. If other configurations are used, the conductor supplier and/or manufacture of the spacers shall be consulted regarding spacers requirements.

The standard assembly for bundled dead-end structures shall be the "DEPY" dead-end assembly with a two-insulator attachment to the structure.

Bundled dead-end structures where the maximum tension (with OCF) in each sub-conductor is less than 9700 lbs. may use the "DEP- 2 wire" dead-end assemblies with a single insulator. This assembly shall mainly be used in reduced tension situations.

All bundled structures with angles less than 30 degrees shall be designed as running angle structures, including Structure Types "C", "F" and "G". Those with angles greater than 30 degrees shall be designed as dead-end structures.

7.4.2 Bundled Conductors (500 kV)

The standard 500 kV bundled conductor is a triple delta configuration with spacers at approximately 250 foot intervals.

7.5 Sag and Tension Limitations

7.5.1 NESC Tension Limits

Following are the maximum tension limits allowed in the determination of project sag and tension values. The "Zone Loading" tension limit is an NESC requirement for all load cases with an overload capacity factor of 1.65. The tension limits for extreme wind and heavy ice are Entergy requirements and have an overload capacity factor of 1.0. Load cases are shown in **<u>Section 5.4.</u>** The limit is a percent of the Ultimate Breaking Strength (UBS) of the wire. Limits are based on the Initial tension of the wire.

Load	Tension Limits
• Zone loading (OCF=1.65)	60% UBS - @ Initial Ten. (NESC 261H1)
• Extreme Wind (OCF=1.0)	75% UBS - @ Initial Ten.
• Concurrent Ice & Wind (OCF=1.0)	5% UBS - @ Initial Ten.

Additionally, the NESC (Section 261 H1) requires that the tension at each of the applicable NESC Zone temperatures shown in Table 5.1.2, without external load, shall not exceed the following percent of their UBS:

Initial unloaded tension 35% UBS

Final unloaded tension 25% UBS

These tension limits apply at each of the applicable NESC Zone temperatures shown in Table 5.1.2, unless dampers are used, in which case this limitation is at a maximum of 60°F (15°C).

7.5.2 Tension Limits for Vibration Control

Except for ACCC and ACCR conductors, for vibration control, maximum catenaries (horizontal tension/weight), or “C” values, will be calculated at 0°F (-20°C), 0 mph wind, and 0 inches ice. Calculated values for “C final” shall be 4710 and for “C initial” shall be 6000. Lesser values of “C” will require approval by Buyer.

For ACCC conductors, vibration dampers shall be placed in accordance with the manufacturer’s recommendations.

The following table,” Vibration Control Values”, provides Entergy’s tension limits for the standard conductors. The table was developed considering 900 ft. ruling spans. However, these values may be used for other ruling spans with only slight variations. Other ruling spans will require approval by Buyer.

Table 7.5.2 – Vibration Control Values

Type	Conductor Name	Load Case	Max Tension (pounds)	% of Ultimate Strength
ACSS	LAPWING	0-0-0 (I)	10740	38.5
	LAPWING	0-0-0 (F)	8431	30.2
	BITTERN	0-0-0 (I)	8580	38.5
	BITTERN	0-0-0 (F)	6735	30.2
	CARDINAL	0-0-0 (I)	7380	28.4
	CARDINAL	0-0-0 (F)	5793	22.3
	FLAMINGO	0-0-0 (I)	5160	28.4
	FLAMINGO	0-0-0 (F)	4051	22.3
ACSR	CHUKAR	0-0-0 (I)	12480	24.5
	CHUKAR	0-0-0 (F)	9796	19.2
	LAPWING	0-0-0 (I)	10740	25.5
	LAPWING	0-0-0 (F)	8431	20.0
	BITTERN	0-0-0 (I)	8580	25.2
	BITTERN	0-0-0 (F)	6735	19.8
	ORTOLAN	0-0-0 (I)	6978	25.2

Type	Conductor Name	Load Case	Max Tension (pounds)	% of Ultimate Strength
	ORTOLAN	0-0-0 (F)	5478	19.8
	CARDINAL	0-0-0 (I)	7380	21.8
	CARDINAL	0-0-0 (F)	5793	17.1
	RAIL	0-0-0 (I)	6450	24.9
	RAIL	0-0-0 (F)	5063	19.5
	FLAMINGO	0-0-0 (I)	5160	21.8
	FLAMINGO	0-0-0 (F)	4051	17.1
	LINNET	0-0-0 (I)	2760	19.6
	LINNET	0-0-0 (F)	2167	15.4
ACAR	649.5 ACAR	0-0-0 (I)	3660	21.4
	649.5 ACAR	0-0-0 (F)	2873	16.8
	395.2 ACAR	0-0-0 (I)	2220	22.0
	395.2 ACAR	0-0-0 (F)	1743	17.3
	1024.5 ACAR	0-0-0 (I)	5760	24.9
	1024.5 ACAR	0-0-0 (F)	4522	19.6
SW	7#7 AW	0-0-0 (I)	1980	10.4
	7#7 AW	0-0-0 (F)	1554	8.2
	7/16” Steel	0-0-0 (I)	2400	11.5
	7/16” Steel	0-0-0 (F)	1884	9.1
OPGW	* AlumaCore, DNO-8161	0-0-0 (I)	2160	11.7
	* AlumaCore, DNO-8161	0-0-0 (F)	1696	9.2
	* AlumaCore, DNO-9800	0-0-0 (I)	2160	11.1

Type	Conductor Name	Load Case	Max Tension (pounds)	% of Ultimate Strength
	* AlumaCore, DNO-9800	0-0-0 (F)	1696	8.7
ADSS	ADSS-AE024HG611CA2	0-0-0 (I)	546	18.2
	ADSS-AE024HG611CA2	0-0-0 (F)	429	14.3

*AlumaCore, DNO-8161 is the default.

Note ADSS is not a transmission standard transmission conductor but is frequently used as an under-built non-transmission conductor. Typical ADSS span is on the order of 200 feet.

Also note that (F) load cases shall be controlled by both Creep RS and Load RS, and that bimetallic conductors shall consider the effects of compression at high temperatures

7.5.3 Vibration Control for Long Spans Exceeding the Ruling Span

For span lengths greater than the ruling span, the Designer shall take special care to compare the conductor and shield wire sags, to ensure that adequate clearances at mid-span are maintained under all conditions. The shield wire tension shall not exceed 16% of its ultimate strength at 60ºF (15ºC), final. To account for unusual circumstances (e.g., ravine crossings), it may be necessary to dead-end the shield wire to account for tension differentials and/or increase the tensions along with adding dampers per manufacturer's specifications.

7.6 Correction to Sag when Final Installation is Interrupted

Prolonged stringing durations can affect final sags due to creep beyond that considered in the sagging algorithm. Conductors and shield wires shall be clipped in within 72 hours of achieving the intended stringing tension. Where stringing operations are interrupted or extend beyond this 72-hour threshold, engineering evaluation/approval is required with final approval by Buyer, and the cable manufacturer shall be contacted to obtain technical instructions on the issue.

7.7 Galloping

Certain areas within the Entergy Service Area have been identified as areas prone to galloping and shall require the installation of vibration control devices. These areas are generally in north Arkansas along the Mississippi River in open, flat areas where it is possible for ice to form on the cables.

Phase spacing shall be set to avoid mid-span interference between phases through the required assumption that double ellipse galloping will occur on any span exceeding 400 feet. A galloping overlap of less than 10 percent between phases will be allowed in the design process. It is generally assumed that using span lengths between 400 and 900 feet would eliminate this overlap. The ruling span is set at 80% of the limiting span for this analysis.

7.8 Aeolian Vibration

Aeolian vibration fatigue damage typically occurs in flat, open areas. The most effective way to reduce this type of vibration is to reduce the line tension. Also, the installation of dampers may eliminate or reduce this vibration; however, the conductor and damper suppliers shall be consulted regarding these conditions.

The use of ACSS type conductors may also reduce this vibration after one year of operation because of the self-damping characteristics built into this type of conductor.

7.9 Conductor Corona

Two solutions to reduce conductor corona are larger conductors and/or bundled conductors.

For 161 kV, 115 kV, and 69 kV, 336 kcmil ACSR “Linnet” shall be the minimum conductor size.

At 230 kV, bundled 395 kcmil ACAR conductors or, for single conductor lines, a recommended standard wire size of 954 kcmil ACSR. The minimum wire size for 230 kV using industry standards is approximately one inch in diameter. The smallest standard wire size that meets the industry standard minimum wire size is “Flamingo” 666.6 kcmil ACSR.

For 500 kV transmission lines, 1024 kcmil ACAR and 954 kcmil ACSR “Rail” shall be the minimum conductor sizes to avoid corona effects. The standard for new construction is 954 kcmil “Rail”.

The selection of conductor size, considering corona losses, shall be estimated using the attached figure (obtained from the Westinghouse Transmission and Distribution Manual) entitled “Fig. 31 - Quick Estimating Corona-Loss Curves”. This figure is attached as Attachment 3.

7.10 ACSS and ACSS/TW Conductor

7.10.1 ACSS Sags – Tensions - Stringing

ACSS suppliers have recommended that the ACSS & ACSS/TW conductors be pre-tensioned for approximately 10 to 15 minutes before final sagging of the line. This procedure inelastically stretches and elongates the aluminum wires and the steel core provides total support of the conductor in normal operation. Since little or no stress is left in the aluminum wires, initial and final sags and tensions are nearly the same. Pre-stressing is a means of reducing creep and enhancing self-damping capability. Recommendations for pre-stressing vary and range from the maximum tension. Consult with cable manufacturer for prestressing methodology and specifications.

7.11 Fiber Optic/Shield Wire Requirements

Fiber Optic Shield Wire (OPGW) is often the preferred shield wire. For structures with two shield wires, one shield wire will typically be OPGW and one shield wire will typically be 7#7. Project specific shield wire requirements is subject to approval by Buyer. Substation Relay Design, SCADA, Substation Networking and Corporate Telecommunications will need to determine the number of fibers that they will need. Standard Entergy shield wires are found in Section 7.

7.11.1 Fiber Optic Details

The fiber optic line may be dead-ended if the line angle is over 30°. For line angles between 30° and 50°, a heavy angle suspension assembly may be utilized. Fiber optic construction details are shown on the standard assembly drawings, shown in Attachment 1.

7.11.2 Splice Box Locations

Splice boxes shall be placed at existing or expected future laterals and substations. Additional boxes will be needed at intervals along the line, generally corresponding to reel wire length, line angles, and considering the nearest points of access.

7.12 SW Sagging Relative to Conductors

Every effort shall be made to ensure that the shield wire(s) have less sag than the conductor, so that any flashovers are encouraged to occur at a structure rather than at mid-span. It is suggested that the shield wire have a lesser amount of sag by approximately 0.33 percent of the span length, or approximately two (2) feet, under normal stringing loads, i.e., 60°F (15°C). Where this is not feasible, the tension limits to control vibration in Table 7.5.2 may be relaxed to pull the shield wire more tightly and achieve greater separation. Where the tension limits of Table 7.5.2 are relaxed, a conductor vibration study shall be performed, and vibration dampers shall be installed on the shield wire per the recommendations of the vibration study. Alternately, the standard framing may be modified with approval from Buyer to provide greater separation between the shield wire and the conductor.

7.13 Conductor and Shield Wire Marking

7.13.1 Aerial Patrol Marking

Aerial patrol marking to provide early warning of the hazards due to crossing transmission lines shall be applied as described herein.

7.13.2 Marking for Federal Aviation Administration (FAA) regulations

Marking required to comply with Federal Aviation Administration (FAA) regulations shall not be confused with the aerial patrol marking described in paragraph 7.13.1. When routing new lines, it is generally better to avoid selecting routes that pass within close proximity of airports, landing strips, heliports and facilities such as hospitals that might have aircraft landing on improvised landing sites. Such facilities can be generally identified by examining aerial navigation maps available at pilot centers in most public airports, examination of quadrangle maps published by the U.S. Geological Commission, examination of aerial photographs acquired for the line project, and other sources. Where these facilities cannot be avoided and where it is determined that FAA rules apply, the requirements of FAA Advisory Circular AC 70/7460-1K shall apply.

7.13.3 Navigable Waterway Marking

Lines crossing navigable waterways shall be marked as delineated in the applicable permits.

7.13.4 Avian

Avian markers are to be installed where appropriate to make the line more visible to birds. Several forms of markers are commercially available and marketed to increase line visibility and reduce the possibility of avian mortality. Avian markers shall be required only where specified by wildlife agencies or by applicable permits.

7.13.5 Slow-Moving Vehicle Signs

Slow-moving vehicle signs shall be placed on the third and fourth adjacent structures on both sides of any crossover lines, with the signs facing the approach to the lines from either side of the crossover. It is very important that all crossings be marked on the same number of advance structures for safety reasons. One sign on each structure shall be used to indicate a single crossover ahead. If two crossovers in close proximity exist ahead, then two signs shall be installed on each structure, one sign over the other, if possible. Two-crossover situations shall also have single signs on both sides of structures between the crossovers. Details of the installation are covered in an attachment to this Appendix 2, but generally the signs shall be near the top of the poles or towers of the structures. When used on wooden poles, the signs shall be outside any woodpecker wire covering the pole.

7.13.6 Spiral Vibration Dampers (Yellow)

Spiral dampers in addition to slow-moving vehicle signs may be desirable in some cases with extraordinary visibility difficulty. When used, such dampers shall be installed with a minimum of one pair of dampers on both sides of centerline of the line being patrolled at a point just outside the conductor locations but not less than 15 feet between the pairs. If there are two shield wires on the crossover line, half of the dampers shall be installed on each shield wire.

7.13.7 QuikMark Devices

QuikMark devices, in addition to slow-moving vehicle signs, may be desirable in some cases with extraordinary visibility difficulty. When used, QuikMark devices shall be installed with a minimum of three QuikMark devices on each side of centerline of the line being patrolled at a point just outside the conductor locations but not less than 15 feet between each trio. If there are two shield wires on the crossover line, install half of the QuikMarks on each shield wire.

7.13.8 QuikMark Devices Combined with Spiral Vibration Dampers

QuikMark devices and spiral dampers may be combined to mark shield wires by keeping equal numbers of each on each side of the line being patrolled so the visual effects are balanced on the line. When the Transmission Line crosses under the line of another, the minimum requirement is for QuikMark devices or spiral dampers or both to be installed on the shield wires of the other line. This is for the safety of Entergy aerial patrollers and to protect Entergy and others from claims by the owner of the other line for property damage, lost revenues on the other line, and other claims.

8 OTHER ELECTRICAL CRITERIA

8.1 Electrical Insulation

All insulators shall be polymer (non-ceramic). Insulators that are procured from one of Entergy's approved vendors for insulators and adhere to Entergy's standards are assumed to meet this specification. Insulator types include dead-end, braced post, post, suspension and jumpers. All new HV (69 kV and above) Transmission Lines shall have insulators with corona rings installed. Details for these insulators are included in Attachment **1**.

8.1.1 Insulator Swing

8.1.1.1 Mechanical Clearance

Post and braced post assemblies have the potential for contact between their suspension shoe and their post insulator. The suspension shoe may swing towards the supporting post insulator without any wind due to line deflection angle and/or phase position changes between consecutive structures. With a 6 PSF wind (60 degrees Fahrenheit and final wire tension) further displacing the conductor hardware from its everyday displacement, contact with the sheds (or corona ring) is not allowed. With extreme wind specified in Table 5.1.2 of the design criteria (60 degrees Fahrenheit and final wire tension) further displacing the conductor hardware from its everyday displacement, contact with the rod's sheath is not allowed. A swing angle adapter shall be used to increase mechanical clearance. This adapter does not preclude mechanical conflict, so conductor position shall still be checked.

8.1.1.2 Electrical Clearance

Table 8.1.1.2 specifies required certain clearances from the energized conductor shoe to non–energized portions of the structure under the prescribed conditions specified in the footnotes. These clearances were built into Entergy's standard framings shown in Attachment 1. Certain atypical conditions, such as short spans, structures in dips, transition between framings or phasing, deflection angles near the top of the range, and higher tensions, can warrant deviations from standard, such conditions will require Seller to acquire approval from Buyer. Conductor position shall be verified against Table 8.1.1.2 that the required minimum clearances are met, especially for suspension insulators. For posts and braced posts, the standard post lengths will ensure that these clearances are met, except for the no-wind clearance for bundled conductors. For bundled posts and bundled braced posts, the conductor hardware shall not be allowed to swing more than 30 degrees toward the pole without wind (0 degrees F, initial). Note that the swing angle adapters mentioned in Section 8.1.1 do not improve electrical clearance.

Table 8.1.1.2 – Minimum Insulator Swing Clearances

FRAMING VOLTAGE	CONDITION	CLEARANCE TO ARM OR STRUCTURE	CLEARANCE TO GUY
500 kV	6 psf wind (1)	123 in	11 ft.
500 kV	100 mph (2)	60 in	5 ft.
500 kV	no wind (3)	140 in	12 ft.
500 kV	no wind (4)	140 in	12 ft.

FRAMING VOLTAGE	CONDITION	CLEARANCE TO ARM OR STRUCTURE	CLEARANCE TO GUY
345 kV	6 psf wind (1)	85 in	8 ft.
345 kV	100 mph (2)	41 in	4 ft.
345 kV	no wind (3)	105 in	9 ft.
345 kV	no wind (4)	105 in	9 ft.
230 kV	6 psf wind (1)	52 in	6 ft.
230 kV	100 mph (2)	27 in	3 ft.
230 kV	no wind (3)	83 in	8 ft.
230 kV	no wind (4)	88 in	8 ft.
161 kV	6 psf wind (1)	37 in	5 ft.
161 kV	100 mph (2)	19 in	2 ft.
161 kV	no wind (3)	60 in	7 ft.
161 kV	no wind (4)	71 in	7 ft.
138 kV	6 psf wind (1)	34 in	5 ft.
138 kV	100 mph (2)	16 in	2 ft.
138 kV	no wind (3)	54 in	7 ft.
138 kV	no wind (4)	65 in	7 ft.
115 kV	6 psf wind (1)	28 in	5 ft.
115 kV	100 mph (2)	13 in	2 ft.
115 kV	no wind (3)	49 in	7 ft.
115 kV	no wind (4)	60 in	7 ft.
69 kV	6 psf wind (1)	17 in	3 ft.
69 kV	100 mph (2)	8 in	1 ft.
69 kV	no wind (3)	49 in (36 in) (5)	6 ft.
69 kV	no wind (4)	60 in (49 in) (5)	6 ft.

(1) Max required value between switch surge and NESC air gap. Controlled by NESC with 10% Voltage Surge (1.1 x nom. Voltage).

(2) 60 Hz minimum flash over distance.

(3) No wind clearance for suspension insulator (Impulse Air Gap).

(4) No wind clearance for running angles (Impulse Air Gap).

(5) 69 kV framings use 115 kV no-wind air gaps for improved lightning performance. On existing structures where there isn't room for longer insulators and air gaps, the numbers in parentheses apply.

8.1.1.3 Typical Standard Davit Arms

For the purpose of determining clearances presented in Table 8.1.1.2 accounting for insulator swing; as well as for the purpose of evaluating shield angle and determining conductor coordinates, the following arm lengths and insulator lengths shall be used:

Table 8.1.1.3 – Typical Davit Arm and Insulator Lengths for New Construction

INSULATOR LENGTH[2]			
VOLTAGE (kV)	**TYPE**	**INSULATOR LENGTH (IN)**	**DESIGN LENGTH (IN.)**
69	SUS	59	66
161	SUS	73	78
230	SUS	89	96
69	DE/RA	62	80
161	DE/RA	92	98
230	DE/RA	104	110
69	LP/BP	60	60
161	LP/BP	76	78
230	LP/BP	94	94
DAVIT ARM LENGTH[1]			
VOLTAGE (kV)	**TYPE**	**LENGTH**	**RISE (IN.)**
69	Tangent	5’-6”	13
161	Tangent	8’-6”	25
230	Tangent	11’-0”	24
69	Swing	3’-0”	N/A
161	Swing	4’-0”	N/A
230	Swing	5’-0”	N/A
69	DE	5’-0”	12
161	DE	6’-0”	15
230	DE	8’-0”	20

(1) Davit Arm Length is from pole face to conductor attachment

(2) Design length includes hardware.

8.1.1.4 Insulator Attachments – 69 kV, 161 kV, and 230 kV Structures

Braced post and line post insulators are limited to a line angle of 6 degrees based on the limited compression capacities of these insulators. Insulator capacities shall be obtained from manufacturer.

8.1.1.5 General

The same insulator type can be used for concrete and steel poles. Insulator attachments for post insulators are required to be provided by thru-bolting standard insulators to the pole structures.

Dead-end and suspension insulators are required to be attached to the poles via vangs on steel poles or pole-eye plates on concrete poles.

8.1.1.6 Conductor and Shield Wire Vangs

Standard conductor and shield wire attachment vangs on all steel poles shall be 3/4" plate with 1 1/8" diameter holes and 1 1/2" radius and shall be the same on both ends.

Conductor attachment vangs on concrete poles will be 60,000 or 70,000 pound strength pole-eye plates mounted with 7/8" diameter all-thread rods, similar to those provided by Hughes Brothers in Lincoln, Nebraska.

8.1.1.7 Guy Vangs

Standard guying vangs on all steel poles shall be 3/4" plates with 1 1/8" diameter holes and11/2" radius and shall be the same on both ends. All guy attachment vangs on all concrete poles will be 60,000 or 70,000 pound strength pole-eye plates mounted with 7/8" diameter all-thread rods, similar to those provided by Hughes Brothers in Lincoln, Nebraska.

8.1.1.8 Polymer Insulator Standard Drawing

Attachment 1 has detailed drawings of the Entergy Standard Insulator drawings for 115 kV, 138 kV, 161 kV and 230 kV voltages. Seller shall use the Entergy Standard Insulators and must verify they meet the requirements for the design. The drawing includes the following information:

Braced Post Insulators

Horizontal Line Post Insulators

Suspension Insulators

Dead-End Insulators

Minimum Flashover Characteristics

Minimum Leakage Distance

8.2 Transmission Line Lightning Protection Design

8.2.1 Reference Guides

IEEE Std. 1243-1997	Guide for Improving the Lightning Performance of Transmission Lines
EPRI	Handbook for Improving Overhead Transmission Line Lightning Performance

EPRI	AC Transmission Line Reference Book - 200kV and Above
EPRI	Guide for Transmission Line Grounding
EPRI	Outline of Guide for Application of Transmission Line Surge Arrestors – 42 to 765 kV

Where applicable Seller shall apply the following parameters during the design process.

8.2.2 GFD

The GFD varies greatly throughout Entergy's transmission system and average from 2-7 flashes/Km^2/yr. However, the GFD for any area for a particular year can be more than 3X the historic average. Therefore, Entergy's design parameters do not consider the GFD for the specific line but assume the standard design methods will ensure an adequate reliability throughout the system no matter the GFD of any particular location.

8.2.3 Structure BIL

Although local atmospheric conditions can affect the ability of air to insulate against a flashover the typical breakdown rate for a negative dry arc is 650 kV per meter. Therefore, the structure BIL is 650 kV X air gap in meters.

It is very difficult to maintain an acceptable BIL for distribution circuits on a transmission line structure. In order to maintain acceptable lightning performance when attached to tall shielded transmission structures, fiberglass arms and transmission class insulators are required.

Distribution underbuild is considered a last resort for new construction. It complicates maintenance for both organizations.

8.2.4 Shield Wire Installation

The installation of a shield wire is the required method of lightning protection.

8.2.5 Shield Wire Type and Size

The size and type of shield wire used will be determined by needs other than that required for lightning protection, such as fault current. Any of Entergy's standard shield wires conforming to the parameters set out in the referenced guideline will be adequate for the lightning protection of the line. Note: Supporting distribution phases on transmission structures exposes transmission shield wire to long duration distribution faults for which it was not designed. Therefore, a neutral conductor shall be bonded to each transmission structure.

8.2.6 Shielding Angle

The shielding angle, as measured at the structure from the vertical plane of the shield wire clamp to the conductor clamp, shall be no more than 25° for structures adjacent to spans averaging less than 150 feet above ground level. The required shielding angle on structures where the average conductor height is greater than 150 feet above ground level need to be designed on a case by case basis and shall be subject to approval from Buyer. The average height taken as the height at the structure minus 2/3 the sag.

On single pole structures with one shield wire, the shielding angle shall be checked to the top conductor as well as to the bottom conductor opposite the shield wire attachment.

On H-type structures, the shielding angle shall be checked for each shield wire to its corresponding outer conductor. Unless the distance between the shield wires exceeds 60 feet, the shielding angle to the middle conductor is not considered.

8.2.7 Maximum Grounding Resistance

The maximum allowable grounding resistance shall be obtained as specified in Section 8.3.

8.2.8 Lightning Arrestors

Lightning arrestors shall be used on transmission lines only in cases where a shield wire cannot be installed (e.g., clearance near an airport), the maximum allowable grounding resistance cannot be obtained, or adjacent to extremely long spans where the lightning protection software shows the shield wire is insufficient.

8.3 Grounding and Cathodic Protection

This section covers the design of the grounding and cathodic protection systems for concrete and steel structures for transmission lines.

8.3.1 Grounding

8.3.1.1 Grounding Systems

Entergy's steel and concrete pole structures shall be "effectively grounded" as defined in Section 2 of the NESC. Shield wires are constructed, along with the associated grounding system, on all of Entergy's transmission lines for lightening protection. The use of proper structure grounding will reduce the ground resistance at the structures and will reduce line outages due to lightning strikes.

8.3.1.2 Steel Structure Grounding System

Steel poles shall be bonded to the shield wire by a copperweld jumper. The pole then acts as a ground rod to the ground line. Because the coating at the bottom of direct embedded steel poles insulates the steel, direct embedded poles shall be grounded. This grounding shall be done with ground rods driven into the earth and bonded to the pole. The same grounding is used to ground a steel pole bolted to a concrete pier or set in a concrete pile. Steel poles socketed into steel piles shall be bonded to the steel pile.

8.3.1.3 Concrete Structure Grounding System

Concrete poles shall be bonded to the shield wire through the grounding clip and a terminal lug at the pole top by a copperweld jumper. A copperweld wire shall then run down the pole to another terminal lug below ground. The wire may be internal or external. There are four options for grounding the direct buried pole: (1) connect the ground wire to the pancake at pole bottom; (2) extend the ground wire from the pancake to the ground rod; (3) connect the ground wire from the terminal directly to the ground rod; and (4) connect the ground to the substation ground grid using 4/0 copper. Ground wires shall be continuous (no splices).

For concrete poles set in steel piles, the ground wire shall be extended from the bottom lug and bonded to the pile.

8.3.1.4 Guy Wire Grounding System

In accordance with NESC requirements, guy wires shall be bonded directly to the steel structure or to the ground wire on a concrete structure using a copperweld wire bonded to the guy wire.

8.3.1.5 Achieving Desired Structure Resistance

Tests to verify that the required footing resistance has been obtained using the standard methods shall be performed by Seller.

Seller shall test for grounding resistance, which shall not be greater than:

69 kV & 115kV 13 ohms

138 kV & 161 kV 10 ohms

230 kV 7 ohms

345 kV & 500 kV (H-frames) 18 ohms

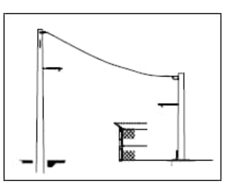
There are two acceptable methods to achieve these requirements: (1) driving additional rods and (2) installing a counterpoise that consists of 100 feet of conductor buried 18" deep parallel to the line.

8.3.1.6 Grounding at Substations

Bonding of Transmission Line Shield Wire to Substation Ground Grid

Electrical currents can be introduced on shield wires from a variety of sources. To prevent these currents from arcing across mechanical connections to get to the substation ground grid, a bonding conductor shall be provided.

The following common shielding configurations and requirements shall be permitted are detailed below:



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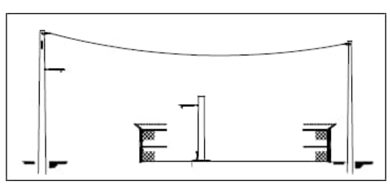

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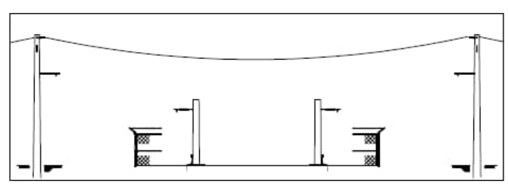

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a. Shield wire attached to Substation pull-off structure

Generally, the transmission line will be dead-ended outside the substation and the shield wire slack span into the station will be positively grounded to the pull-off tower with a jumper and the pull-off tower will be connected to the substation ground grid. It is the responsibility of the substation to make these connections. The last transmission structure in the immediate vicinity of the station shall not be bonded to the substation ground grid unless a specific grounding analysis is performed.

b. Shield wire across station to dedicated shield wire pole

Since the shield wire pole is usually installed within close proximity to the substation; it shall be bonded to the substation ground grid. The last transmission structure in the immediate vicinity of the station shall not be bonded to the station grid unless a specific grounding analysis is performed.

c. Shield wire across station to exiting transmission line structure

One of the transmission structures on either side of the station shall be bonded to the substation ground grid. The structure selected for bonding shall be the one closest to the station or having the fewest physical obstacles between the structure and the station.

8.3.2 Cathodic Protection

The cathodic protection system is a method of protecting steel transmission line structures from corrosion, generally at the ground-line where moisture can mix with air to cause corrosion and thus deterioration and loss of strength of the structures. The protection system used is to attach either magnesium or zinc anodes to the structure.

These anodes provide sacrificial protection for the steel in the structures.

8.3.2.1 Soil Investigations

The soil investigation shall include soil corrosion recommendations to determine the need for anodes and the number required for each structure.

8.3.2.2 Anode Types

Magnesium anodes shall be used except that, in areas such as coastal marshes, zinc anodes may be used where recommended over magnesium anodes by the corrosion engineer based on in-situ conditions

8.3.3 Structure Protection

Steel poles, steel piles and steel guy anchors shall be protected as described below.

8.3.3.1 Steel Dead-End and Guyed Structures

All buried steel (embed poles and piles) at dead-end and guyed steel structures shall be installed with anodes as shown on the Framing Drawings and provided Assembly Drawings. The number of anodes per structure shall be as recommended in the corrosion consultation report or as deemed necessary by the corrosion engineer based on in-situ conditions.

8.3.3.2 Steel Tangent Structures

Steel tangent structures are generally not installed with anodes, anodes shall be installed on structures in areas of known corrosion problems, or when structures are to be installed adjacent to a pipeline or railroad. In these cases, installation shall be in accordance with provided Assembly Drawings in Attachment 1.

Guy Anchors for Steel and Concrete Structures

The steel helix type anchors for both steel and concrete poles shall be installed with anodes.

9 STRUCTURE DESIGN CRITERIA

9.1 Steel Poles

Entergy standard structure framings are shown in Attachment **1**.

9.1.1 Tubular Steel Pole Purchase Specification

Details of structure design that shall be included in the purchase specification are:

ASCE Design Manual Requirements

Material Specifications

Pole Deflection Limitations

Fabrication Requirements

Protective Coating Requirements

Cathodic Protection

Grounding Requirements

Seller shall procure (or cause to be procured) tubular steel poles from tubular steel pole vendors on the Approved Vendor List (Attachment 5) for tubular steel pole vendors and direct the vendor to provide items in conformance with their applicable standard Energy specifications.

9.1.2 General Design Requirements

9.1.2.1 General

All designs shall be in accordance with the provisions of the latest NESC, ASCE/SEI Standard 48, and the requirements stated in this document. All construction shall be Grade B, as defined in Section 24 of the NESC Code.

9.1.2.2 Foundation Rotation

In addition to the applied loadings, all self-supported monopole and un-braced H-frame structures shall be designed with a 3 degree foundation rotation. The point of rotation is assumed to be at the ground line. Smaller foundation rotations for braced H-frame structures shall be considered on a case-by-case basis.

9.1.2.3 Deflection Limitations

The following pole deflection limitations assume 0 degree foundation rotation and shall be adhered to in the design of all poles. The percentage listed is the percent of the pole height above ground.

Table 9.1.2.3 – Deflection Limitations

Load Case / Wires	Tangent (Intact)	Running Angle (Intact)	Dead-end (Intact)	Dead-end (DE One Side)
NESC w/OLF See Loading District	10%	10%	10%	NSL
NESC without/OLF See Loading District	NSL	NSL	NSL	NSL
High Wind See Loading District	10%	10%	10%	NSL
Wind & Ice See Loading District	10%	10%	10%	NSL
Everyday No Wind or Ice - 60°F	3%(1)	3%(1)	3%(1)	NSL
Longitudinal Unbalance 1K at Each Phase Location	NSL	NSL	NA	NA
DE Stringing No Wind or Ice - 60°F	NA	NA	NA	1%(2)

NA - Not Applicable

NSL - No Specified Deflection Limit

(1) Camber if Deflection Exceeds 1%
(2) Only if Specifically Requested

9.1.2.4 Pole Raking

For new project construction, cambering the pole when deflection exceeds 1% of the pole height above ground is the required resolution to concerns arising from what might (aesthetically) appear to be excess pole deflection.

9.1.2.5 Guyed Structures – Pre-Designed

The Designer shall select a pre-designed light duty pole, such as an SW Class H-6 equivalent, to be used as the pole in guyed framings in the pole spotting procedure. This type of pole will make available the range of heights to complete the spotting process. PLS-CADD will select the optimal pole height.

9.1.2.6 Selection of Pre-designed Poles – Optimizing Process

To use the line optimization features PLS-CADD, the Designer must select and input the pre-designed pole types and framings most suited for the Transmission Lines. This shall include the material, framings and pole heights, types and sizes.

9.1.2.7 Pole Design and Verification Process

The purchase order for the structures selected by PLS-CADD during the optimization process is then forwarded to the pole vendor along with a calculated load tree for each pole. The vendor will then review the design of the selected poles before pricing and fabrication. In some cases the poles selected may have to be revised to meet the design criteria.

9.1.3 Procurement

To purchase the poles and associated materials, Seller shall use a type of purchase requisition known as a “White Requisition”.

“White Requisition” – This type of order is used to purchase material from Entergy’s preferred vendors including steel and concrete poles, insulators and conductors. The pole order will generally include the preferred item plus most of the assembly attachment material, such as nuts, bolts, vangs. It is the vendor’s responsibility to verify the size and number of each item. “White Requisitions” are also used to order non-stock-coded items.

9.1.4 Structure Hardware

The Entergy “Standard Structure Framings” in Attachment 1 lists the standard assemblies required for each structure framing. Each assembly drawing lists the bill of materials required for that assembly. The standard hardware parts were designed to meet the maximum tensions and loads calculated for the pre-designed structures previously described but shall be verified by the designer. Unless Buyer grants an exception in writing, poles shall be ordered with sufficient step bolt mounting provisions.

9.1.5 Grounding and Cathodic Protection

See Section 8.3 for design information regarding the required grounding and cathodic protection for steel poles.

9.1.6 Hybrid Structures

Hybrid structures, a combination of a steel top section and a concrete bottom section, shall be used where ground water conditions may cause excessive corrosion of a steel pole. For such structures, the concrete bottom piece shall directly embedded using standard embedment details. Foundation and grounding details are discussed in Section 10 and Section 8.3, respectively.

9.2 Concrete Poles

This section covers the design and analysis of concrete pole structures for single and bundled conductor transmission lines. It covers single pole, two pole, and three pole structures with direct-embedded foundations, socket-type foundations and base-plated foundations all for use on tangent, running angle or dead-end structures. All standard structure framings applicable to this work are delineated in Attachment **1**.

9.2.1 Spun Pre-stressed Concrete Pole Purchase Specification

Details of structure design that shall be included in the purchase specification include:

ASCE and PCI Design Guide Requirements

Material Specifications Pole Deflection Limitations

Fabrication Requirements

Testing Requirements.

Seller shall select a concrete pole vendor from the list of concrete pole vendors set forth in the Approved Vendor List (Attachment 5) and direct the concrete pole vendor to provide items in conformance with their applicable standard Entergy specifications.

9.2.2 General Design Requirements

9.2.2.1 General

All concrete pole and related designs shall be in accordance with the provisions of the latest NESC, the PCI and ASCE Guide Specifications, and the requirements stated in this document. All concrete pole construction shall be at least Grade B, as defined in Section 24 of the NESC Code.

9.2.2.2 Foundation Rotation

In addition to the applied loadings, all self-supporting structures shall be designed with a 3 degree foundation rotation. The point of rotation shall be assumed to be at the ground line.

9.2.2.3 Deflection Limitations

The following pole deflection limitations assume 0 degree foundation rotation and shall be adhered to in the design of all concrete poles. The percentage listed is the percent of the pole height above ground.

Load Case / Wires	*Concrete Structure Type*			
	Tangent	Running Angle	Dead-end	Dead-end
	(Intact)	(Intact)	(Intact)	(DE One Side)
NESC w/OLF See Loading District	10%	10%	10%	NSL
NESC without/OLF See Loading District	2%	2%	2%	NSL
High Wind See Loading District	10%	10%	10%	NSL
Wind & Ice See Loading District	10%	10%	10%	NSL
Everyday No Wind or Ice - 60°F	1%	1%	1%	NSL
Longitudinal Unbalance 1K at Each Phase Location	NSL	NSL	NA	NA

Load Case / Wires	*Concrete Structure Type*			
	Tangent	Running Angle	Dead-end	Dead-end
	(Intact)	(Intact)	(Intact)	(DE One Side)
DE Stringing No Wind or Ice - 60°F	NA	NA	NA	1%

NA - Not Applicable

NSL - No Specified Deflection Limit

9.2.2.4 Pole Raking

Where deflections under the everyday load case exceed 1% of the above ground pole height as described in Section 9.2.2.3, but do not exceed 2% the pole shall be raked to improve aesthetic concerns and minimize secondary moment effects. Where poles are to be raked, the Designer shall provide specific instructions identifying the degree to which the pole shall be raked to compensate for the calculated deflection under the everyday load case.

9.2.3 Procurement

To purchase the poles and associated materials, Seller shall use a type of purchase requisition known as a "White Requisition".

"White Requisition" – This type of order is used to purchase material from Entergy's preferred vendors, including steel and concrete poles, insulators and conductors. The pole order will generally include the poles plus most of the assembly attachment material, such as nuts, bolts, vangs. It is the vendor's responsibility to verify the size and number of each item.

9.2.4 Structure Hardware

The applicable Entergy "Standard Structure Framings" included as Attachment **1** lists the standard assemblies required for each structure framing. Each assembly drawing lists the Bill of Materials required for that assembly. The standard hardware parts are designed to meet the maximum tensions and loads calculated for the pre-designed structures previously described. Unless a deviation is granted by Buyer, poles shall be ordered by Seller with sufficient mounting locations for attachment of climbing provisions.

9.3 H-Frame Design

This section covers the design of concrete and steel H-Frame structures to be used in construction of the Transmission Lines. These standard framings cover transmission structures for single and double circuit construction using standard suspension insulators. Clearance has been provided for the possible use of bundled conductors.

9.3.1 Structure Types

Standard framings are developed for single and double circuit "Light" and "Medium" (HA2) tangent (0° – 1.5°) structures and "Light" and "Medium" (HB2) small angle (1.5° – 6.0°) structures. Standard tubular steel cross arms have been pre-designed and detailed for use in "Light" and "Medium" structures.

The standard framings are based on the base assumption that steel structures will be X-braced and concrete structures will not be X-braced. The pole supplier shall determine if X-braces are required for each structure and shall detail and supply the X-braces and connection hardware if required.

Special "Uplift" framings are included for use in certain structures to address uplift forces in those structures. These structures use the "Light" cross arms with extra vangs to dead-end the conductors.

9.3.2 Cross Arm Design

The maximum allowable spans for the pre-designed standard cross arms are based on the maximum vertical load imposed on the arms. The load cases reviewed for each cross arm are NESC designated loadings with overload factors. Maximum arm deflections range from 1 inch to 2 inches.

The tubular steel cross arms are designed to support the vertical load of the various standard conductors used by Entergy on the standard H-Frame framings. The maximum loads for each of the Standard Framings are shown on the Framing Drawings.

The "Light" and "Medium" standard cross arm sizes are as follows:

Light Cross Arm – TS 6" x 6" x 3/16"

Medium Cross Arm – TS 8" x 8" x ¼"

Shield Wire Arm – TS 4" x 4" x 3/16"

The required use (loading) for the standard cross arms is as follows:

69 kV – Use the Light Cross Arm – for all conditions

161 kV – Use the Light Cross Arm – for ½" Ice loadings

Use the Medium Cross Arm – for 1" Ice loadings

230 kV – Use the Medium Cross Arm for all conditions

9.3.3 Cross Arm Assembly Details

The assembly drawings for attaching cross arms to poles are included in the voltage specific assemblies.

9.3.4 Rock Anchors

In rock formations, where screw type anchors will not penetrate the rock, rock anchors shall be used. There are two types of rock anchors available, to be selected based on in-situ conditions and engineering calculations.

9.3.5 Expanding Rock Anchors

Rods have a diameter of 1.0 inch and an ultimate strength of 36,000 lbs. The limitation of 36,000 lbs can be overcome by using twin anchors. A more stringent limitation is that the rods are non-extendable. This prevents the expanding rock anchors from being used when the non-fractured bedrock is deeper than about four feet below the surface.

9.3.6 Grouted Rock Anchors

The anchors have a 1 ¼ inch diameter round shaft ending in a 4-inch diameter bell. The anchors can be extended with either 1 ¼" round shaft extensions or 1 ½" square shaft extensions. The anchor assembly has an ultimate strength of 70,000 lbs. The strength of the installed anchor (resistance to pullout) is dependent upon the rock type and the dimensions of the grout column. The characteristic of the rock that dominates the calculation for anchor depth is the equivalent cohesion. The installed anchor strength is calculated by multiplying the surface area of the grout column in each layer by the equivalent cohesion of the rock in that layer. For conservatism, any contribution from the overburden shall be ignored.

The High Wind and Heavy Ice Tensions shall be multiplied by 1.65 to provide a safety factor for the anchor installation. For the NESC Zone load case (NESC 250B) a safety factor of 1.0 shall be used as allowed by the code, since that load case already includes an Overload Factor of 1.65. The resulting worst case force shall be resisted by the friction between the grout column and the surrounding rock.

Anchor strength = (circumference) (column length per vertical foot) (constant of 0.9) [(layer 1 thickness)(layer 1 cohesion) + (layer 2 thickness)(layer 2 cohesion) + …]

Seller shall procure that the anchor manufacturer calculates the required anchor depth using their software, but the effective cohesion shall be the parameter that dominates the result. For simplicity, the formula above uses just the effective cohesion. The constant 0.9 is a factor to account for the possible effects of other rock characteristics

The dimension that is to be specified is the distance along the anchor shaft from the ground surface to the bottom of the anchor. The minimum anchor length engaging rock is five feet.

The grout shall be pumped into the hole to ensure that a solid column is produced.

9.3.7 Guying Hardware

Following are listed the strength values in Entergy's Standard Guying Assembly which limit line conductor tensions and are required for this Project.

9.3.7.1 Insulator Assembly

Entergy's Standard Polymer Dead-End Insulators have an ultimate tension capacity of 50,000 lbs. The NESC Strength Factor for insulators is 0.5, therefore the Routine Test Load (RTL or working load) of 25,000 lbs is used.

9.3.7.2 Steel Vangs (Steel Poles)

Steel Dead-End vangs are thru vangs and can be designed for any applied tensions. The NESC Strength Factor for the vangs is 1.0.

9.3.7.3 Pole Eye Plates for Conductor or Shield Wire (Concrete Poles)

The standard guying attachment is the "AS2720 Double Guying Tee" from Hughes Bros. The Ultimate Strength (maximum tension load) is 35,000 lbs per hole. The NESC Strength Factor is 1.0 for NESC Rule 250B Tensions (OLF=1.65) and 0.8 for Extreme Load Tensions (OLF=1.0) for Rule 250C.

9.3.7.4 Pole Eye Plates for Guy Wire (Concrete Poles)

The standard guying attachment is the "A2132 Heavy Dead End Tee" from Hughes Bros. The Ultimate Strength (maximum tension load) is 70,000 lbs. The Strength Factors are the same as for the above "Double Guying Tee". The maximum tension is along the guy slope, thus limiting the line tension depending on the actual guy slope.

9.3.7.5 Double Arming Bolts (Concrete Poles)

The standard bolt used in Entergy's Dead-End Assemblies is an ANSI C135.1, 7/8" "Double Arming Bolt". The maximum Tensile Strength is 25,400 lbs, the maximum shear strength through threads is 17,270 lbs. and the maximum shear strength through the shaft is 24,350 lbs. The shear strength through the threads is always used for the Dead-End Connection. The NESC Strength Factors are also the same as for the "Double Guying Tee". The allowable bolt strength for combination shear and tension loads, such as the guying assembly, is the calculated "interaction stress". These bolts are the limiting factor, depending on guy slope, of the line tension in the guying assembly.

9.3.7.6 Thimble Clevis

The thimble clevis used in the Dead-End Assembly has a 1" pin and is rated at 60,000 lbs. Ultimate Strength. The NESC Strength Factors are the same as the "Double Guying Tee".

9.3.7.7 Extension Link

The extension link is used in place of the thimble clevis when a double down-guy is used with two anchors. The link uses a 1" pin and is rated at 60,000 lbs. Ultimate Strength. The NESC Strength Factors are the same as the "Double Guying Tee".

9.3.7.8 Vari-Grip Dead-End

The vari-grip shall be rated for a 19#8 guy wire with an Ultimate Strength of 43,240 lbs. and 61,500 lbs. with a 19#6 guy wire. The NESC Strength Factor is 1.0.

9.3.7.9 Turnbuckle

The turnbuckle shall be a 1” x 6” with jaw and eye ends with an Ultimate Strength of 50,000 lbs. The NESC Strength Factor is 1.0.

The following table gives the allowable line tension based on the guy assembly and guy wire slopes. All loads are in Kips.

Table 9.3.7.9 – Allowable Line Tensions based on Hardware Limitations

Assembly Part	Ultimate Strength	NESC Strength Factor	Allowable Load	Line Tension Guy Slope 1.5:1	Line Tension Guy Slope 1:1
Dead-End Insulator	50.0	0.5	25	25	25
19#8 Guys	43.2	0.9	38.9	21.6	30.6
19#6 Guys	61.7	0.9	55.5	30.8	39.4
Double Guy Tee (NESC)	35.0	1.0	35.0	19.4	24.8
Extreme Loads	35.0	0.8	28.0	15.5	19.9
Dead-End Tee (NESC)	70.0	1.0	70.0	38.9	49.6
Extreme Loads	70.0	0.8	56.0	31.1	39.7
7/8” D. A. Bolt (NESC)	T=25.4	1.0		21.2	28.0
Extreme Loads	V=17.3	0.8		17.0	23.0
1-1/2” SS Screw Anchor	70.0	1.0	70.0	38.9	49.6
Thimble Clevis (NESC)	60.0	1.0	60.0	33.3	42.5
Extreme Loads	60.0	0.8	48.0	26.7	34.0
Vari-Grip (NESC) w/ 19#8	43.2	1.0	43.2	24.0	30.6
Extreme Loads	43.2	0.8	34.6	19.2	24.5
Turnbuckle (NESC)	50.0	1.0	50.0	27.8	35.5
Extreme Loads	50.0	0.8	40.0	22.2	28.4
Extension Link (NESC)		1.0			
Extreme Loads		0.8			

9.3.8 Guyed Structure Limitations

9.3.8.1 Concrete Structures

The maximum line tension that can be applied on a guyed concrete structure is limited by the combined stress on the 7/8" D. A. Bolts, where the maximum guy tension is 18.0 kips on the 1.5:1 slope. The governing design condition, which is considerably less than the ultimate applied tensions that shall be applied on the larger standard conductors for the Hurricane loads (150 mph wind speed.).

9.3.8.2 Steel Structures

Welded steel thru vangs replace the tees and bolts on the concrete pole and these vangs shall be designed to support all of the possible applied loads. Therefore, as provided in the table, the 19#8 guys, the standard guy material, will govern the line tension limit when this guy wire is used. Where 19#6 guys are used, the anchor hardware will govern the line tension limit.

9.3.8.3 Heavy Ice Zone

In the heavy ice zones (NESC 250D zones), standard through bolts, guy tees and single 19#8 guy wire may be inadequate for larger conductors or bundled configurations. Special design considerations shall be investigated under these conditions.

9.3.8.4 Double Down-guy Assemblies

Double down-guy assemblies shall be used when it is determined that the soil is incapable of supporting the applied load with one anchor or where the loads exceed the allowable guy tension. The double down guy assembly shall consist of one attachment to the pole, a link with two rollers, and two guy wires and two anchors. Double Down-guy assemblies shall use 19#8 guy wires. The anchors shall be separated by at least five (5) feet.

9.3.8.5 Guy Anchor Groups

All standard guyed structure framings reference a particular Guy/Anchor Group which defines the structure voltage, and in turn provides the required number and size of guys, type of anchor, guy configuration and structure type.

9.3.8.6 Cathodic protection

Guy anchor assemblies shall be provided with cathodic protection by the installation of anodes.

Guy anchor assemblies shall be protected by anodes as shown on the "Guy Anchor Group" detail drawings. Refer to Section 8.3 for details.

9.4 Spacing of Dead-End Structures

Dead-end structures shall be required where necessary to carry eccentric loads developed due to conductor tensions. Such dead-end structures shall also be required where necessary as anti-cascading structures, or where they are necessary to facilitate construction. At a maximum spacing, dead-end structure shall be spaced such that no more than two reels of conductor and a single splice are needed between them. While the length of conductor contained on a reel can vary based on the conductor's diameter and unit weight, for most commonly used conductors this will result in a maximum spacing of approximately 4 miles between dead-end structures.

9.5 Considerations at Major Crossings

The Transmission Lines shall be designed to provide additional reliability at major crossings, in particular along major highway crossings serving as evacuation routes from coastal area. Design and maintenance/replacement activities will apply the following:

1. All crossing structures are non-wood, for all voltages

2. If a wood crossing structure is to be replaced, it shall be replaced with non-wood structure

3. All highways are crossed at an angle as close to perpendicular as possible

4. No conductor or shield wire splices within two spans of the crossing span unless expressly approved in writing by Buyer

5. Where conductor/shield wire splices are unavoidable, or where they are installed during conductor maintenance, install implosive, full tension splices or shunt devices in conjunction with the conventional splice.

6. Install redundant insulator configurations on all crossings (e.g., braced post insulators, V-string insulators, semi-strain insulators, etc.)

7. Make shield wire connections more robust at the crossings (e.g., use shackles with nut, vs. shackles with pins, etc.)

8. No guys on crossing structures if possible, and where guys shall be installed, install double guys

9. Install highway crossing structures in locations difficult for vehicles to hit, e.g. behind ditches

10. Provide crash barriers on all highway crossing structures that are not installed in locations difficult for vehicles to hit

10 STRUCTURE FOUNDATIONS

This section covers the design of structure foundations.

Structure foundations shall be designed to meet the NESC District Loading and Everyday Load Cases, as discussed in Section 5.1; and considering the safety factors and deflection limitations discussed in Section 10.2. Note that loads shall generally be extracted from pole manufacturer calculations where the structure has been optimized for a high percentage of utilization. Where structures are designed in groups, the reaction used shall be that of the group (as opposed to loads derived from PLS or elsewhere for the specific location). Where manufacturer calculations are not available, foundations shall be designed for the published class/capacity of the pole used (to assure that future modifications on the line do not overestimate the foundation capacity based on the strength of the pole). Where this is not done, a notation shall be made on the plan and profile sheet stating that the foundation was determined considering actual loads in lieu of the structure’s capacity.

10.1 Soil Information

The Designer shall obtain as much subsurface information as practicable. The basic sources of information are: (1) actual soil boring samples obtained from geotechnical investigations; (2) Geological maps; (3) data from existing U.S. Dept. of Agriculture maps; or (4) other Geotechnical sources (e. g., DOT files, customer soil records, etc.)

Actual soil data obtained from structure locations is preferable. Generally, soil borings are made at angle and dead-end structures and at intervals of approximately two miles within tangent runs depending on the terrain.

Soil information used in design shall be provided by Seller to Buyer.

10.2 Design Methodology – Lateral Load

10.2.1 Program Description

The Designer shall use the computer programs Moment Foundation Analysis and Design (MFAD), and Foundation Analysis and Design (FAD) to design for lateral loads.

10.2.2 General Acceptance Criteria

The Designer shall apply the following generally accepted factors of safety for the calculated lateral loads as related to the calculated ultimate capacity of the pile and the acceptable deflection and rotation of the pile:

Description	**Normal Soil**
Total Ground Line Deflection (1)	3.0 in.
Total Fnd. Rotation (1)	1.5 deg.
Non Recoverable Deflection	1.0 in.
Non Recoverable Rotation	1.0 deg.
Safety Factor (Tangents)	1.2
Safety Factor (Angles/DEs) NESC 250B	1.0
Safety Factor (Angles/DEs) other load cases	1.65

(1) Additionally, for DE Structures, total foundation rotation and ground-line deflection shall be limited to 0.5 degrees and 1 inch under Everyday load case with all conductors on one side only.

10.3 Foundation Types

10.3.1 Basic Foundation Types

The Designer shall select from the following six basic foundation types typically used by Entergy on steel and concrete pole structures: Direct Embedment Foundation, Steel Pile with Socket Foundation, Cap/Base Plate Foundation, Steel Pile with Anchor Bolt Foundation, Drilled Pier with Anchor Bolts Foundation, and Concrete Pile with Steel or Concrete Pole using Socket Foundation. Seller's foundation engineer shall determine suitable foundation types and dimensions. Alternative foundation types shall only be used if expressly approved in writing by Buyer.

Foundation elements shall be designed using applicable material design specifications (e.g. AISC 360 for steel elements, ACI 318 for concrete elements, etc.)

Reveal height for concrete or steel socket piles shall be between 4 feet and 5 feet to facilitate concrete placement and to minimize required excavation for the socketed pole. Foundation height for base-plated poles shall be at least 2 feet, to raise anchor bolts above the ground and the bulk of the wet underbrush. The Designer shall require taller reveals in floodplains, where requested for constructability purposes, or where otherwise needed. The Designer shall not all reveals outside these specifications on the foundation drawings and/or staking sheet.

10.3.2 Grounding and Cathodic Protection

The steel pile shall be designed to act as a ground for both steel and concrete structures. Socket connections and anchor bolt connections using steel piles shall be positively connected between the pole and pile using a #4 copperweld wire connected between the pole and the Two Hole NEMA Pad welded to the pile for a good ground. The cap/base plated connections shall be designed to provide a good grounded connection. Steel and concrete poles supported by concrete drilled piers shall be grounded to copperclad steel ground rods.

Where cathodic protection is required, the anodes shall be connected to the NEMA Pads as indicated on the cathodic protection detailed drawings. In general, unless an analysis for corrosion potential indicates otherwise or the structure is located in exposed bedrock, anodes will be required at all guy anchors, and dead-end or large angle structures supported on steel foundations or embedments. In general, unless local conditions warrant (brackish marsh, shared ROW with railroads or pipelines protected by impressed current cathodic protection, etc.) anodes are not usually required for tangent structures on structures supported on concrete foundations or embedments. Reference is made to Section 8.3 of this Appendix 2.

11 ATTACHMENTS

Attachment 1 – Applicable Standard Framing and Assembly Drawings

Attachment 2 – NESC and Entergy Clearance Requirements

Attachment 3 – Quick Estimating Corona Loss Curves

Attachment 4 – Example ROW

Attachment 5 – Approved Vendor List[1]

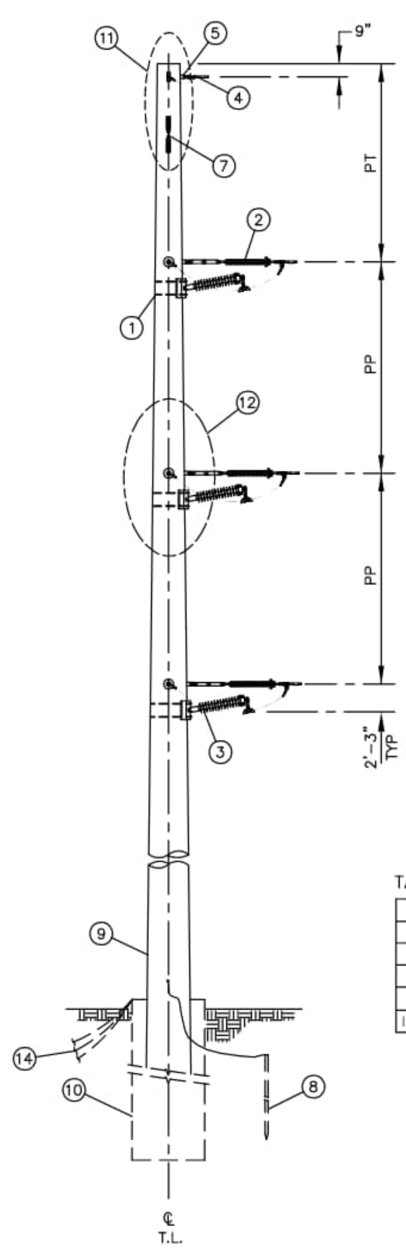
Attachment 6 – Entergy Loading Districts

1 This Attachment provides an Approved Vendor List. This Approved Vendor List is in addition to that found in the Scope Book and is considered acceptable for use, and actually preferred.

ATTACHMENT 1

APPLICABLE STANDARD FRAMING AND ASSEMBLY DRAWINGS

0"–5", SELF SUPPORTING, DE, JUMPER, VERTICAL,
SINGLE CIRCUIT, DE POLYMER, CONC



ASSEMBLY LIST

ITEM	QTY.	ASSEMBLY/DRAWING
1	3	BLT–P–C
2	6	INSUL (SEE TABLE 1)
3	3	INSUL2 (SEE TABLE 1)
4	2	OHG–DE–XX
5	4	TEE–B–B
REFERENCE DRAWINGS		
7	1	SGN–C
8	–	GND–C–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	1	OHGCFG, SHT1, DET. OD
12	3	CONCFG, SHT11, DET. CJ3
13	–	PVO, SHT 1, VW PV–19
14	–	ANODE–XX (IF REQD.)

TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	13'–0"	15'–0"
PP	9'–0"	14'–0"	16'–0"
INSUL	DEP/TRB–69–XX	DEP/TRB–161–XX	DEP/TRB–230–XX
INSUL2	JLP–69–XX	JLP–161–XX	JLP–230–XX

NOTES:
1. For General Notes, See Dwg. TMS220.

SDJA–V–DEP–C

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
0–5° SC S. SPPT. DE, DEP W/J, CONC
STRUCTURE DRAWING & DETAIL

0	01–02–16	REPLACES DWS TAS525A0, TCS626A1, & TDS556A1	WRK	KC	ECW	
NO.	DATE:	REVISION	BY:	CHK:	APPR	

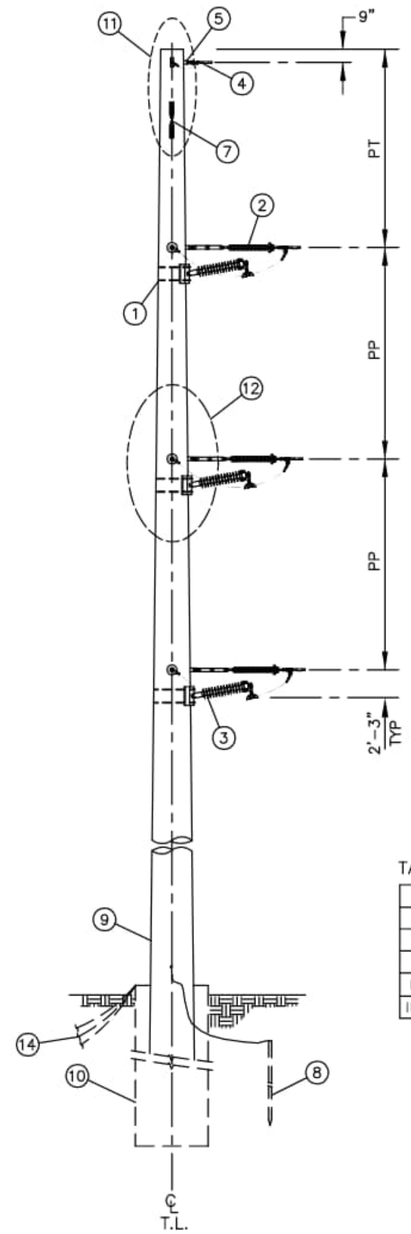
STD NO. | SCALE: NONE

Entergy | No. TMS627A0

PLOT 1=1 | SH. 1 OF 1

rkugl90 12/2/2015 SDJA–V–DEP–C

5°–70°, SELF SUPPORTING, DE, JUMPER, VERTICAL, SINGLE CIRCUIT, DE POLYMER, CONC



ASSEMBLY LIST

ITEM	QTY.	ASSEMBLY/DRAWING
1	3	BLT–P–C
2	6	INSUL (SEE TABLE 1)
3	3	INSUL2 (SEE TABLE 1)
4	2	OHG–DE–XX
5	8	TEE–B

REFERENCE DRAWINGS

ITEM	QTY.	ASSEMBLY/DRAWING
7	1	SGN–C
8	–	GND–C–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	1	OHGCFG, SHT2, DET. OF
12	3	CONCFG, SHT2, DET. CJ
13	–	PVO, SHT 1, VW PV–19
14	–	ANODE–XX (IF REQD.)

TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	13'–0"	15'–0"
PP	9'–0"	14'–0"	16'–0"
INSUL	DEP/TRB–69–XX	DEP/TRB–161–XX	DEP/TRB–230–XX
INSUL2	JLP–69–XX	JLP–161–XX	JLP–230–XX

NOTES:
1. For General Notes, See Dwg. TMS220.

SDJ–V–DEP–C

ENTERGY SERVICES, INC.

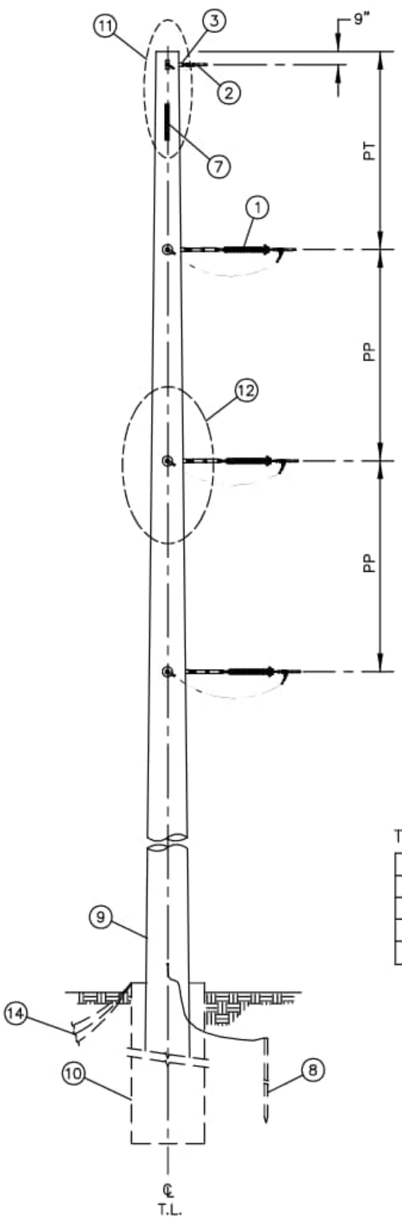
Transmission LineDesign Standard
5–70° SC S. SPPT. DE, DEP W/J, CONC
STRUCTURE DRAWING & DETAIL

STD NO.	SCALE: NONE
Entergy	No. TMS626A0
PLOT 1=1	SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	01–02–16	REPLACES DWS TAS286A2, TCS298A3, & TDS298A3	WRK	KC	ECW

rkugl90 12/2/2015 SDJ–V–DEP–C

70'–120', SELF SUPPORTING, DE, VERTICAL,
SINGLE CIRCUIT, DE POLMER, CONC



ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	6	INSUL (SEE TABLE 1)
2	2	OHG–DE–XX
3	8	TEE–B
REFERENCE DRAWINGS		
7	1	SGN–C
8	–	GND–C–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	1	OHGCFG, SHT2, DET. OF
12	3	CONCFG, SHT1, DET. CC
13	–	PVO, SHT2, VW PV–15
14	–	ANODE–XX (IF REQD.)

TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	13'–0"	15'–0"
PP	9'–0"	14'–0"	16'–0"
INSUL	DEP/TRB–69–XX	DEP/TRB–161–XX	DEP/TRB–230–XX

NOTES:
1. For General Notes, See Dwg. TMS220.

SD–V–DEP–C

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
70–120' SC S. SPPT. DE, DEP, CONC
STRUCTURE DRAWING & DETAIL

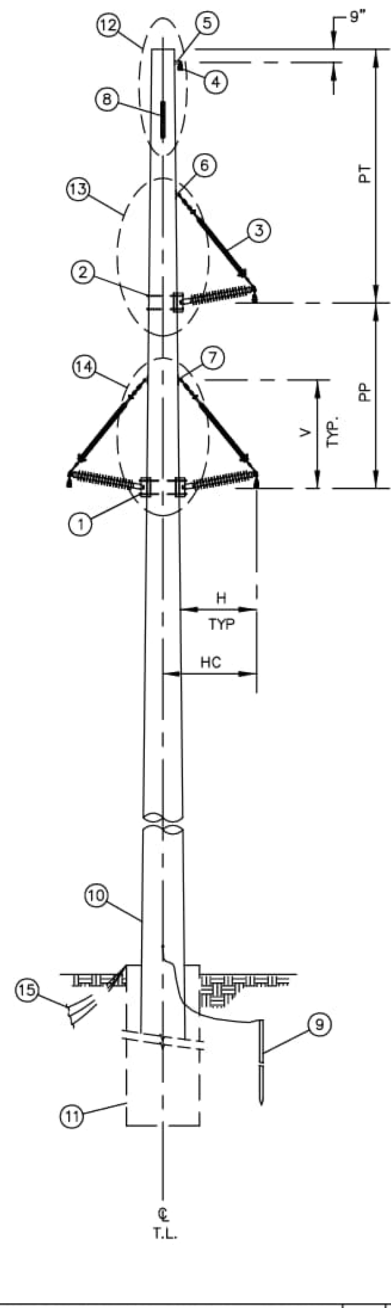
STD NO.	SCALE: NONE
No. TMS625A0	
PLOT 1=1	SH. 1 OF 1

Entergy

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	01–02–16	REPLACES DWS TAS288A1, TCS300A2, & TDS300A2	WRK	KC	ECW

rkugl90 12/2/2015 SD–V–DEP–C

0°–1.5°, DELTA, SINGLE CIRCUIT, BRACED POST 2–1/2", CONC.



ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	1	BLT–2P–C
2	1	BLT–P–C
3	3	INSUL (SEE TABLE 1)
4	1	OHG–SUS–XX
5	1	TEE–OHG–SUS
6	1	TEE–B
7	1	TEE–B–B
REFERENCE DRAWINGS		
8	1	SGN–C
9	–	GND–C–XX
10	–	SEE MFR. DWG.
11	1	FOUNDATION TYPE T.B.D.
12	1	OHGCFG, SHT1, DET. OA
13	1	CONCFG, SHT3, DET. CR
14	1	CONCFG, SHT3, DET. CQ
15	–	ANODE–XX (IF REQD.)

NOTES:
1) For General Notes, See Dwg. TMS220.

TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	15'–0"	19'–0"
PP	8'–0"	13'–0"	14'–0"
V	6'–8"	8'–6"	9'–10"
H	5'–0"	6'–4"	7'–10"
HC	6'–0"	7'–2"	9'–0"
INSUL	BP2–69–XX	BP2–161–XX	BP2–230–XX

A–D–BP2–C

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
0–1.5° SC Delta, BP2, Conc
STRUCTURE DRAWING & DETAIL

STD NO. | SCALE: 1"=1"

Entergy | No. TMS236A0 | PLOT 1=1 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	01–02–16	REPLACES DWS TAS402A1, TCS459A2, & TDS200A2	WRK	KC	ECW

rkugl90 12/8/2015 A–D–BP2–C

6'–20', SELF SUPPORTING, VERTICAL, SINGLE CIRCUIT,
BRACED POST 2–1/2", CONC

ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	3	BLT–P–C
2	3	INSUL (SEE TABLE 1)
3	1	OHG–SUS–XX
4	1	TEE–OHG–SUS
5	3	TEE–B
6		
REFERENCE DRAWINGS		
7	1	SGN–C
8	–	GND–C–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	1	OHGCFG, SHT1, DET. OA
12	3	CONCFG, SHT3, DET. CR
13	–	ANODE–XX (IF REQD.)

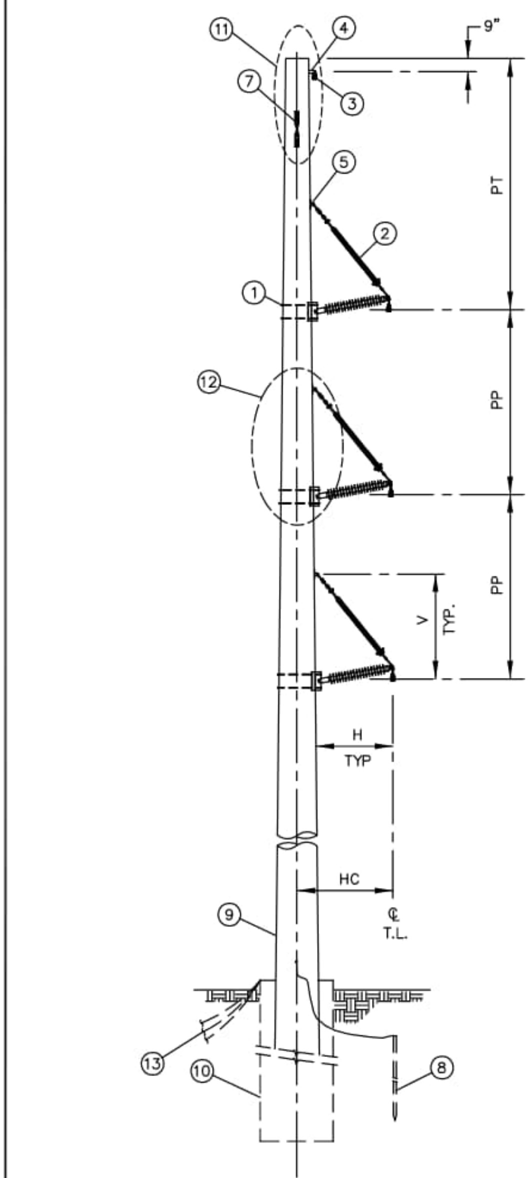


TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	15'–0"	19'–0"
PP	8'–0"	13'–0"	14'–0"
V	6'–8"	8'–6"	9'–10"
H	5'–0"	6'–4"	7'–10"
HC	6'–0"	7'–2"	9'–0"
INSUL	BP2–69–XX	BP2–161–XX	BP2–230–XX

NOTES:

1. For General Notes, See Dwg. TMS220.
2. Line post adapters are required where line angles greater than 3', or phase transitions pull suspension hardware toward the pole. See Dwg. TMD415 for additional materials.

SC–V–BP2–C

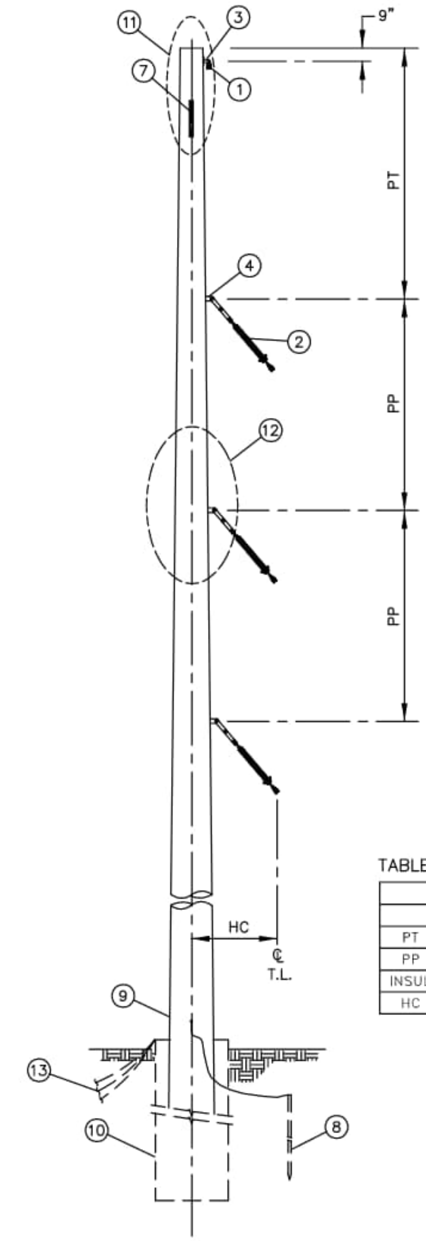
ENTERGY SERVICES, INC.

Transmission LineDesign Standard
6–20' SC VERT, BP2, CONC
STRUCTURE DRAWING & DETAIL

0	01–02–16	REPLACES DWS TAS458A0, TCS285A2, & TDS283A2	WRK	KC	ECW	STD NO. / SCALE: NONE / No. TMS588A0
NO.	DATE:	REVISION	BY:	CHK:	APPR	Entergy / PLOT 1=1 / SH. 1 OF 1

rkugl90 12/2/2015 SC–V–BP2–C

15'–30', SELF SUPPORTING SUSPENSION, VERTICAL,
SINGLE CIRCUIT, SUSPENSION HEAVY POLYMER w/LINK, CONC.



ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	1	OHG–SUS–XX
2	3	INSUL (SEE TABLE 1)
3	1	TEE–OHG–SUS
4	3	TEE–B
5		
6		
REFERENCE DRAWINGS		
7	1	SGN–C
8	–	GND–C–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	1	OHGCFG, SHT1, DET. OA
12	3	CONCFG, SHT1, DET. CA
13	–	ANODE–XX (IF REQD.)

TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	15'–0"	19'–0"
PP	9'–0"	14'–0"	16'–0"
INSUL	SHR–LINK–69–XX	SHR–LINK–161–XX	SHR–LINK–230–XX
HC	6'–0"	7'–0"	9'–0"

NOTES:
1. For General Notes, See Dwg. TMS220.

SF–V–SHR–C

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
15–30' SC S. SPPT. VERT, SUS, CONC
STRUCTURE DRAWING & DETAIL

STD NO. | SCALE: NONE

Entergy

No. TMS633A0

PLOT 1=1 | SH. 1 OF 1

0	01–02–16	REPLACES DWS TAS292A1, TCS304A2, & TDS304A2	WRK	KC	ECW
NO.	DATE:	REVISION	BY:	CHK:	APPR

rkugl90 12/2/2015 SF–V–SHR–C

0'–5', SELF SUPPORTING, DE, JUMPER, VERTICAL, SINGLE CIRCUIT, DE POLYMER, STEEL

ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	3	BLT–P–S
2	6	INSUL (SEE TABLE 1)
3	3	INSUL2 (SEE TABLE 1)
4	2	OHG–DE–XX
REFERENCE DRAWINGS		
7	1	SGN–S
8	–	GND–S–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	–	PVO, SHT 1, VW PV–19
12	–	ANODE–XX (IF REQ.)

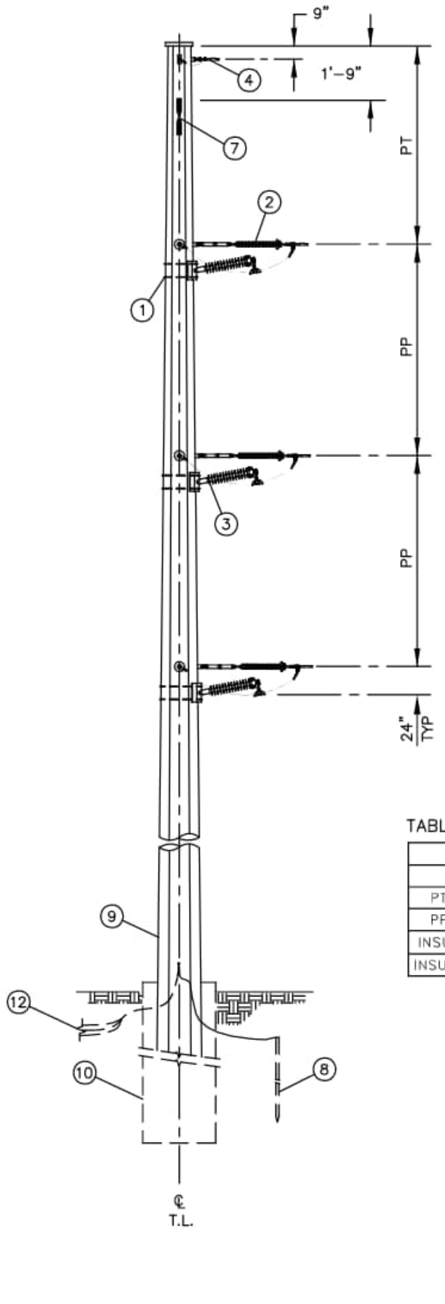


TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	13'–0"	15'–0"
PP	9'–0"	14'–0"	16'–0"
INSUL	DEP/TRB–69–XX	DEP/TRB–161–XX	DEP/TRB–230–XX
INSUL2	JLP–69–XX	JLP–161–XX	JLP–230–XX

NOTES:
1. For General Notes, See Dwg. TMS220.

SDJA–V–DEP–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
0–5' SC S. SPPT. DE, DEP W/J, STL
STRUCTURE DRAWING & DETAIL

0	01–02–16	REPLACES DWS TAS528A0, TCS629A1, & TDS559A1	WRK	KC	ECW
NO.	DATE:	REVISION	BY:	CHK:	APPR:

STD NO. | SCALE: NONE

Entergy | No. TMS642A0

PLOT 1=1 | SH. 1 OF 1

rkugl90 12/2/2015 SDJA–V–DEP–S

5'–70', SELF SUPPORTING, DE, JUMPER, VERTICAL,
SINGLE CIRCUIT, DE POLYMER, STEEL

ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	3	BLT–P–S
2	6	INSUL (SEE TABLE 1)
3	3	INSUL2 (SEE TABLE 1)
4	2	OHG–DE–XX
REFERENCE DRAWINGS		
7	1	SGN–S
8	–	GND–S–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	–	PVO, SHT 1, VW PV–19
12	–	ANODE–XX (IF REQ.)

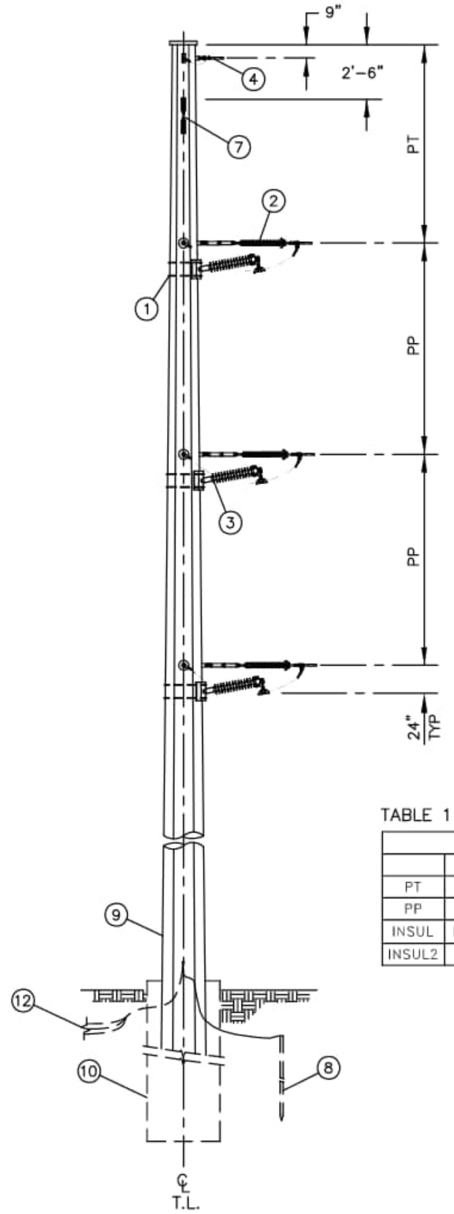


TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	13'–0"	15'–0"
PP	9'–0"	14'–0"	16'–0"
INSUL	DEP/TRB–69–XX	DEP/TRB–161–XX	DEP/TRB–230–XX
INSUL2	JLP–69–XX	JLP–161–XX	JLP–230–XX

NOTES:
1. For General Notes, See Dwg. TMS220.

SDJ–V–DEP–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
5–70' SC S. SPPT. DE, DEP W/J, STL
STRUCTURE DRAWING & DETAIL

STD NO. | SCALE: NONE

Entergy | No. TMS641A0

PLOT 1=1 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR:
0	01–02–16	REPLACES DWS TAS387A3, TCS444A4, & TDS417A4	WRK	KC	ECW

rkugl90 12/2/2015 SDJ–V–DEP–S

70°–120°, SELF SUPPORTING, DE, VERTICAL,
SINGLE CIRCUIT, DE POLMER, STEEL

ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	6	INSUL (SEE TABLE 1)
2	2	OHG–DE–XX
REFERENCE DRAWINGS		
7	1	SGN–S
8	–	GND–S–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	–	PVO, SHT 2, VW PV–15
12	–	ANODE–XX (IF REQ.)

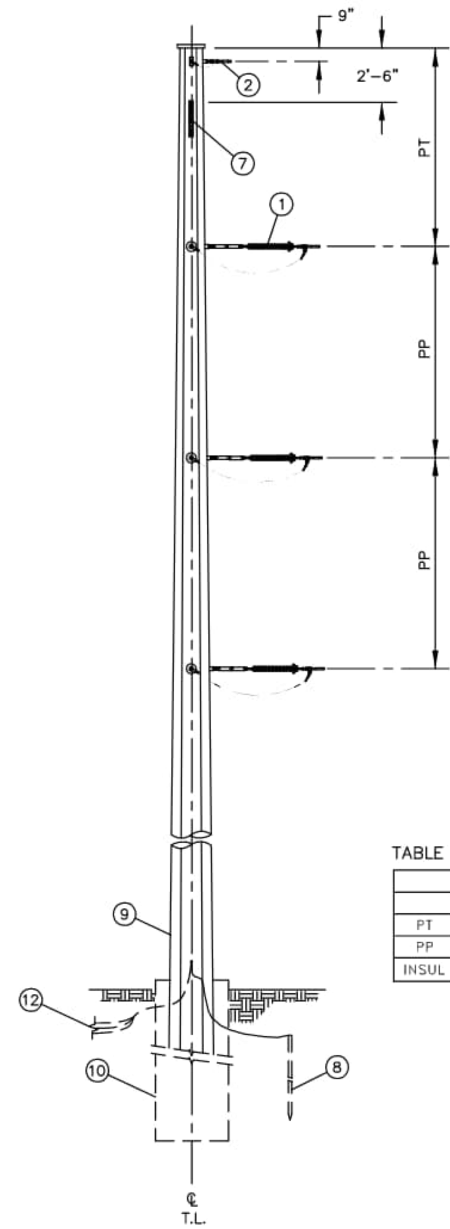


TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	13'–0"	15'–0"
PP	9'–0"	14'–0"	16'–0"
INSUL	DEP/TRB–69–XX	DEP/TRB–161–XX	DEP/TRB–230–XX

NOTES:
1. For General Notes, See Dwg. TMS220.

SD–V–DEP–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
70–120° SC S. SPPT. DE, DEP, STL
STRUCTURE DRAWING & DETAIL

0	01–02–16	REPLACES DWS TAS389A2, TCS446A3, & TDS419A3	WRK	KC	ECW
NO.	DATE:	REVISION	BY:	CHK:	APPR

STD NO. | SCALE: NONE

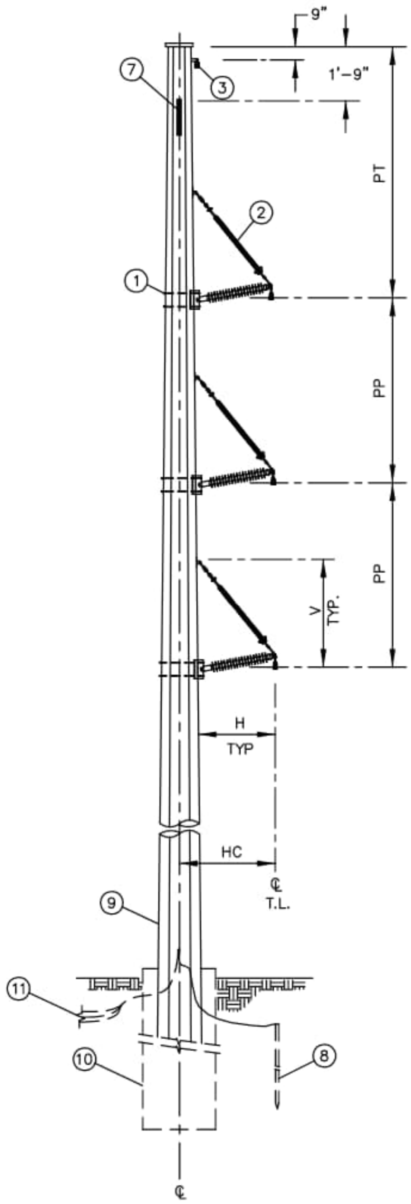
Entergy

No. TMS640A0

PLOT 1=1 | SH. 1 OF 1

rkugl90 12/2/2015 SD–V–DEP–S

0'–1.5', VERTICAL, SINGLE CIRCUIT, BRACED POST 2-1/2", STEEL



ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	3	BLT–P–S
2	3	SEE INSUL TABLE 1
3	1	OHG–SUS–XX
4		
5		
6		
REFERENCE DRAWINGS		
7	1	SGN–S
8	–	GND–S–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	–	ANODE–XX (IF REQ.)

NOTES:
1) For General Notes, See Dwg. TMS220.

TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	15'–0"	19'–0"
PP	8'–0"	13'–0"	14'–0"
V	6'–8"	8'–6"	9'–10"
H	5'–0"	6'–4"	7'–10"
HC	6'–0"	7'–2"	9'–0"
INSUL	BP2–69–XX	BP2–161–XX	BP2–230–XX

A–V–BP2–S

ENTERGY SERVICES, INC.

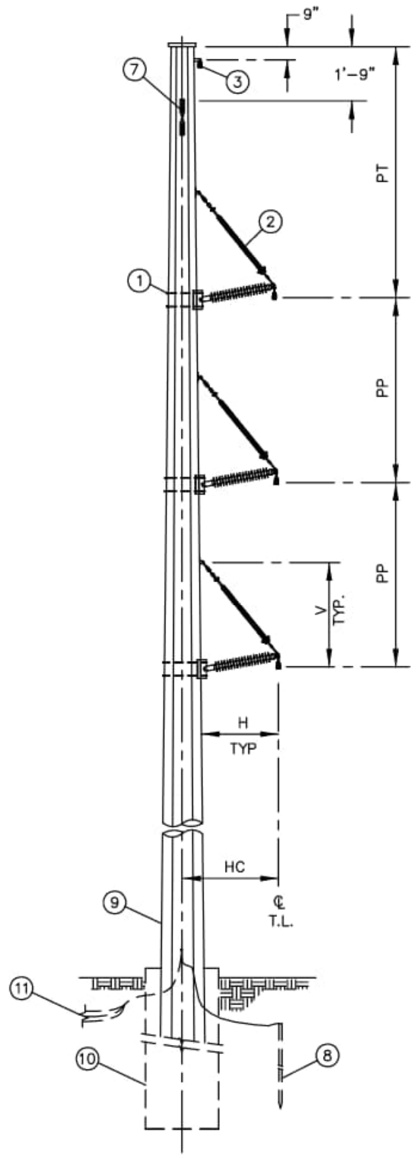
Transmission LineDesign Standard
0–1.5' SC Vert, BP2, Stl
STRUCTURE DRAWING & DETAIL

STD NO.		SCALE: NONE	
Entergy	No. TMS277A0		
	PLOT 1=1		SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	01–02–16	Replaces Dws TAS411A1, TCS335A2, & TDS323A2	WRK	KC	ECW

rkugl90 12/3/2015 A–V–BP2–S

6'–20', VERTICAL, SELF SUPPORTING, SINGLE CIRCUIT,
BRACED POST 2-1/2", STEEL



ASSEMBLY LIST

ITEM	QTY.	ASSEMBLY/DRAWING
1	3	BLT–P–S
2	3	INSUL (SEE TABLE 1)
3	1	OHG–SUS–XX
4		
5		
6		

REFERENCE DRAWINGS

ITEM	QTY.	ASSEMBLY/DRAWING
7	1	SGN–S
8	–	GND–S–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	–	ANODE–XX (IF REQ.)

TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	15'–0"	19'–0"
PP	8'–0"	13'–0"	14'–0"
V	6'–8"	8'–6"	9'–10"
H	5'–0"	6'–4"	7'–10"
HC	6'–0"	7'–2"	9'–0"
INSUL	BP2–69–XX	BP2–161–XX	BP2–230–XX

NOTES:
1. For General Notes, See Dwg. TMS220.
2. Line post adapters are required where line angles greater than 3°, or phase transitions pull suspension hardware toward the pole. See Dwg. TMD415 for additional materials.

SC–V–BP2–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
6–20° SC VERT, BP2, STL
STRUCTURE DRAWING & DETAIL

STD NO.	SCALE: NONE
Entergy	No. TMS606A0
PLOT 1=1	SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	01–02–16	REPLACES DWS TAS465A0, TCS431A2, & TDS402A2	WRK	KC	ECW

rkugl90 12/2/2015 SC–V–BP2–S

15'–30', SELF SUPPORTING SUSPENSION, VERTICAL,
SINGLE CIRCUIT, SUSPENSION HEAVY POLYMER w/LINK, STEEL

ASSEMBLY LIST

ITEM	QTY.	ASSEMBLY/DRAWING
1	1	OHG–SUS–XX
2	3	INSUL (SEE TABLE 1)
3		
4		
5		
6		
REFERENCE DRAWINGS		
7	1	SGN–S
8	–	GND–S–XX
9	–	SEE MFR. DWG.
10	1	FOUNDATION TYPE T.B.D.
11	–	ANODE–XX (IF REQ.)

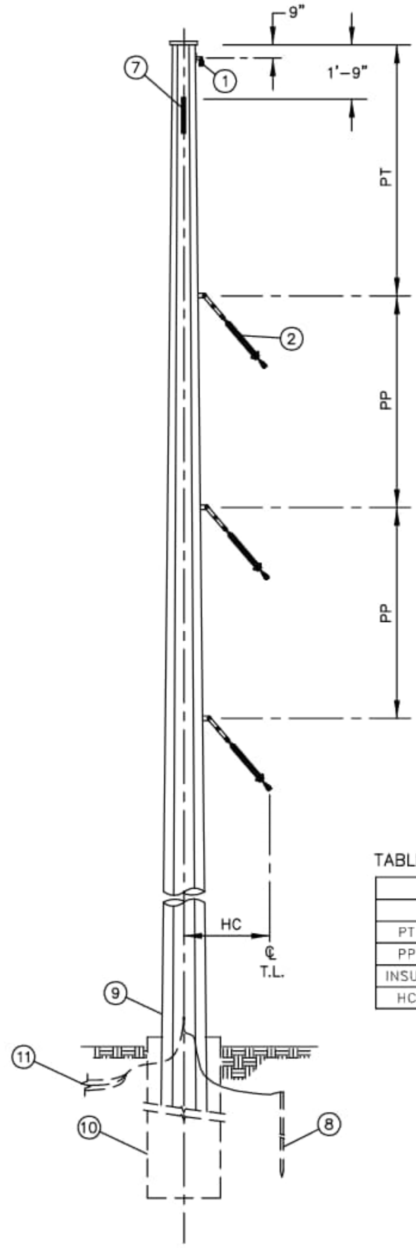


TABLE 1

VARIABLE DIMENSIONS & REF. DWGS.			
	69 kV	161 kV	230 kV
PT	10'–6"	15'–0"	19'–0"
PP	9'–0"	14'–0"	16'–0"
INSUL	SHR–LINK–69–XX	SHR–LINK–161–XX	SHR–LINK–230–XX
HC	6'–0"	7'–0"	9'–0"

NOTES:
1. For General Notes, See Dwg. TMS220.

SF–V–SHR–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
15–30' SC S. SPPT. VERT, SUS, STL
STRUCTURE DRAWING & DETAIL

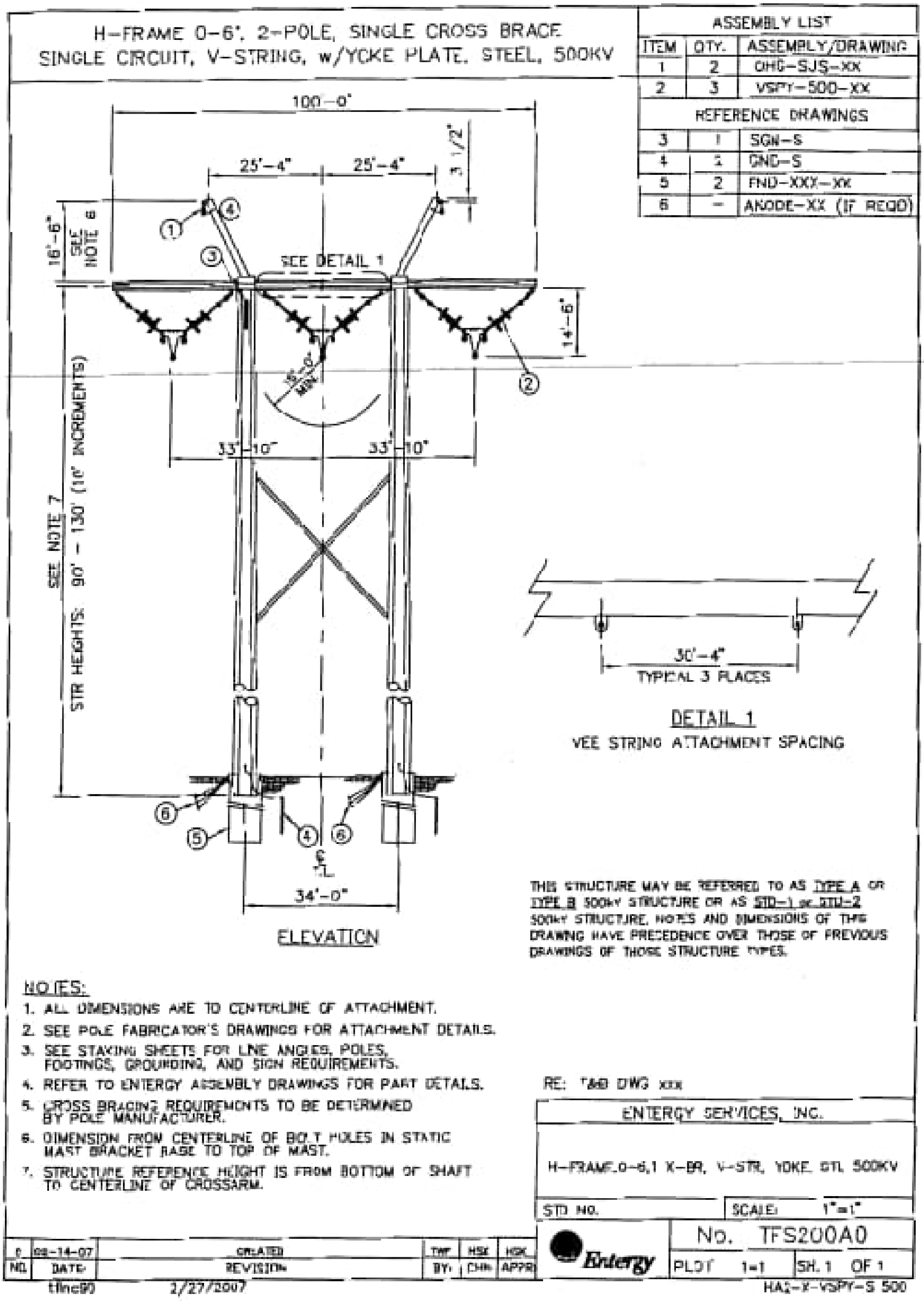
STD NO. SCALE: NONE

No. TMS648A0

Entergy PLOT 1=1 SH. 1 OF 1

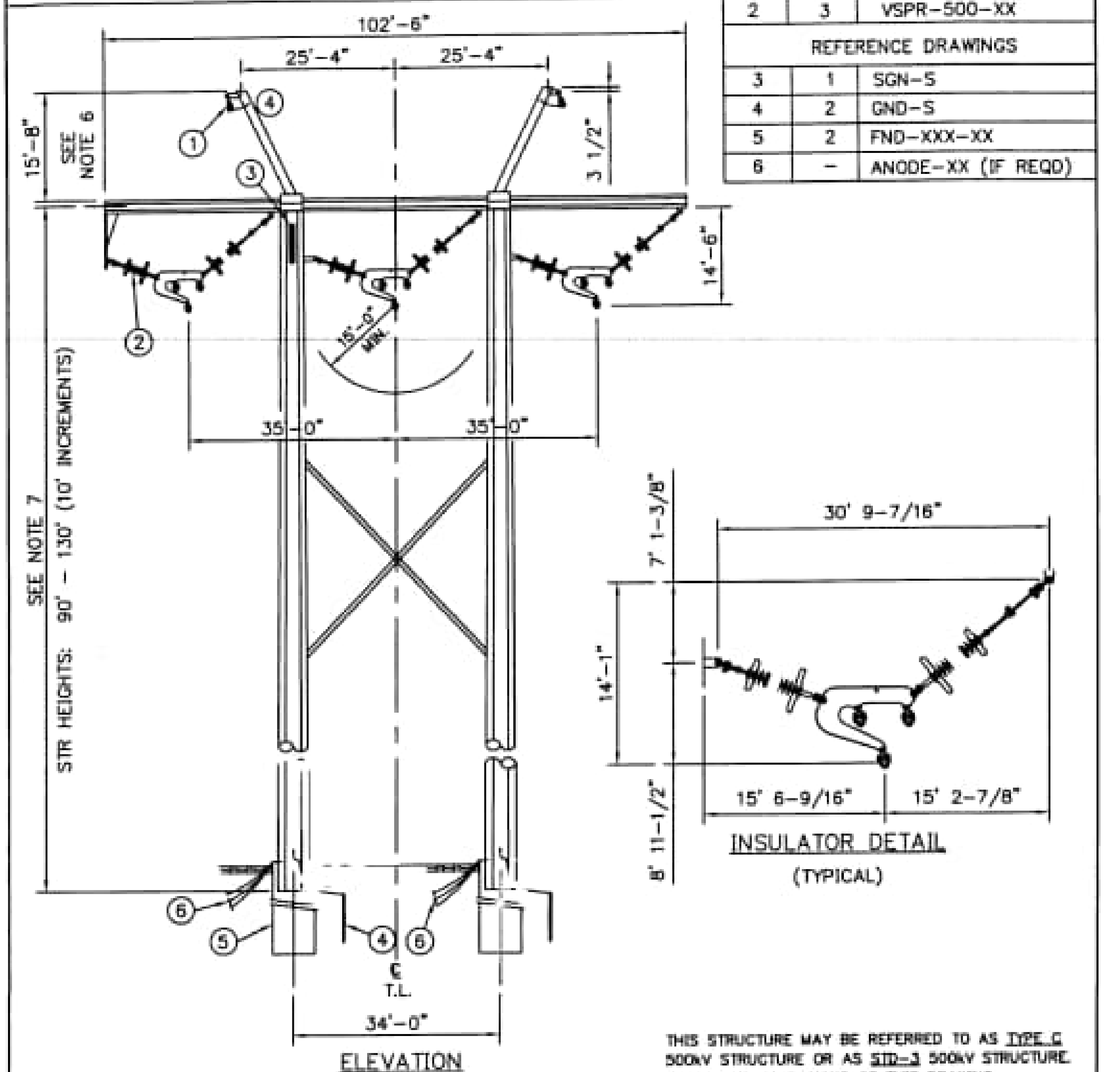
NO.	DATE:	REVISION	BY:	CHK:	APPR
0	01–02–16	REPLACES DWS TAS393A1, TCS450A2, & TDS423A2	WRK	KC	ECW

rkugl90 12/2/2015 SF–V–SHR–S


H-FRAME 0-6", 2-POLE, SINGLE CROSS BRACE
SINGLE CIRCUIT, V-STRING, w/YOKE PLATE, STEEL, 500KV
ASSEMBLY LIST
ITEM | QTY. | ASSEMBLY/DRAWING
1 | 2 | OHG-SJS-XX
2 | 3 | VSPY-500-XX
REFERENCE DRAWINGS
3 | 1 | SGN-S
4 | 1 | GND-S
5 | 2 | FND-XXX-XX
6 | - | ANODE-XX (IF REQD)
100'-0"
25'-4"
25'-4"
3 1/2"
16'-6"
SEE NOTE 6
SEE DETAIL 1
14'-6"
15'-0" MIN.
33'-10"
33'-10"
SEE NOTE 7
STR HEIGHTS: 90' - 130' (10' INCREMENTS)
34'-0"
ELEVATION
30'-4"
TYPICAL 3 PLACES
DETAIL 1
VEE STRING ATTACHMENT SPACING
THIS STRUCTURE MAY BE REFERRED TO AS TYPE A OR TYPE B 500KV STRUCTURE OR AS STD-1 or STD-2 500KV STRUCTURE. NOTES AND DIMENSIONS OF THIS DRAWING HAVE PRECEDENCE OVER THOSE OF PREVIOUS DRAWINGS OF THOSE STRUCTURE TYPES.
NOTES:
1. ALL DIMENSIONS ARE TO CENTERLINE OF ATTACHMENT.
2. SEE POLE FABRICATOR'S DRAWINGS FOR ATTACHMENT DETAILS.
3. SEE STAKING SHEETS FOR LINE ANGLES, POLES, FOOTINGS, GROUNDING, AND SIGN REQUIREMENTS.
4. REFER TO ENTERGY ASSEMBLY DRAWINGS FOR PART DETAILS.
5. CROSS BRACING REQUIREMENTS TO BE DETERMINED BY POLE MANUFACTURER.
6. DIMENSION FROM CENTERLINE OF BOLT HOLES IN STATIC MAST BRACKET BASE TO TOP OF MAST.
7. STRUCTURE REFERENCE HEIGHT IS FROM BOTTOM OF SHAFT TO CENTERLINE OF CROSSARM.
RE: T&D DWG xxx
ENTERGY SERVICES, INC.
H-FRAME 0-6,1 X-BR, V-STR, YOKE, STL 500KV
STD NO.
SCALE: 1"=1"
No. TFS200A0
Entergy
PLOT 1=1
SH. 1 OF 1
0 | 02-14-07 | CREATED | TWF | HSK | HSK
NO. | DATE | REVISION | BY | CHK | APPR
tlinc90
2/27/2007
HA2-X-VSPY-S 500

H-FRAME 6-15', 2-POLE, SINGLE CROSS BRACE
SINGLE CIRCUIT, V-STRING RUNNING ANGLE, w/YOKE PLATE, STEEL, 500KV

ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	2	OHG-SUS-XX
2	3	VSPR-500-XX
REFERENCE DRAWINGS		
3	1	SGN-S
4	2	GND-S
5	2	FND-XXX-XX
6	–	ANODE-XX (IF REQD)



NOTES:

1. ALL DIMENSIONS ARE TO CENTERLINE OF ATTACHMENT.
2. SEE POLE FABRICATOR'S DRAWINGS FOR ATTACHMENT DETAILS.
3. SEE STAKING SHEETS FOR LINE ANGLES, POLES, FOOTINGS, GROUNDING, AND SIGN REQUIREMENTS.
4. REFER TO ENTERGY ASSEMBLY DRAWINGS FOR PART DETAILS.
5. CROSS BRACING REQUIREMENTS TO BE DETERMINED BY POLE MANUFACTURER.
6. DIMENSION FROM CENTERLINE OF BOLT HOLES IN STATIC MAST BRACKET BASE TO TOP OF MAST.
7. STRUCTURE REFERENCE HEIGHT IS FROM BOTTOM OF SHAFT TO CENTERLINE OF CROSSARM.

THIS STRUCTURE MAY BE REFERRED TO AS TYPE C 500kV STRUCTURE OR AS STD-3 500kV STRUCTURE. NOTES AND DIMENSIONS OF THIS DRAWING HAVE PRECEDENCE OVER THOSE OF PREVIOUS DRAWINGS OF THOSE STRUCTURE TYPES

RE: T&B DWG xxx

ENTERGY SERVICES, INC.

H-FRAME,6-15,1 X-BR,V-STR,RA,YOKE,STL 500kV

STD NO. | SCALE: 1"=1"

No. TFS201A0

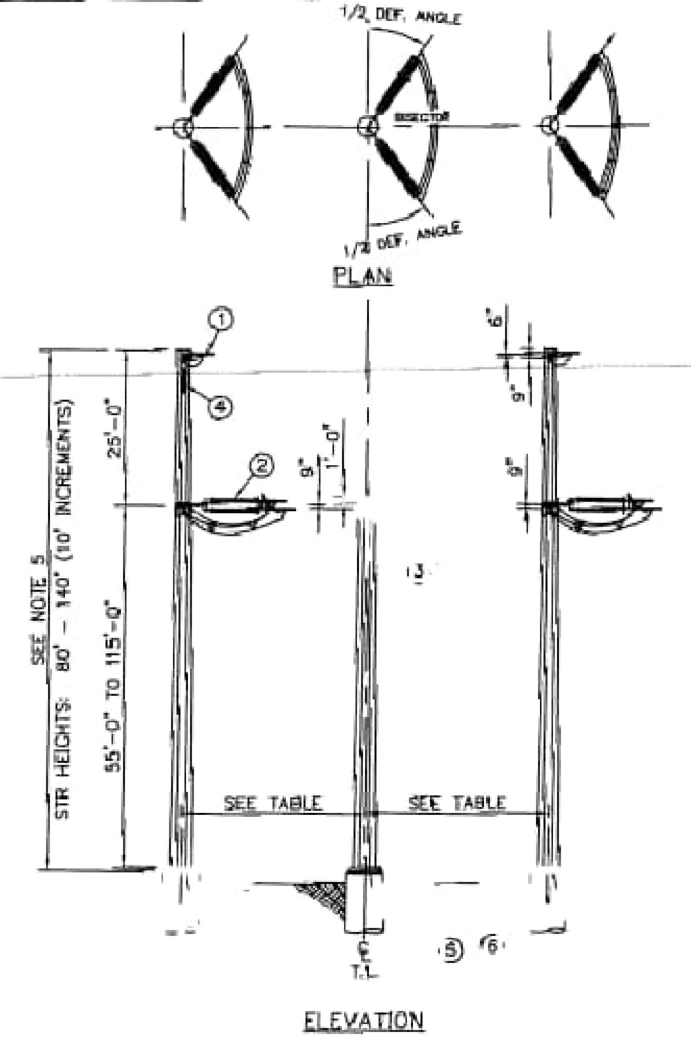
Entergy | PLOT 1=1 | SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	02-14-07	CREATED	TWF	HSK	HSK

tfinc90 2/27/2007 HC2-X-VSPR-S 500

DEADEND 70°–120° SELF SUPPORTING, 3–POLE
SINGLE CIRCUIT, DE POLY w/YOKE, STEEL 500kV

ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	4	OHG–DE–XX
2	6	DEPY–500–XX
REFERENCE DRAWINGS		
3	NOTE 6	SD–CG318–XX
4	1	SCN–S
5	2	GND–S
6	2	FND–XXX–XX



POLE SPACING TABLE	
DEF. ANGLE RANGE	POLE SPACING
53 – 63	40
63 – 71	42
71 – 78	44
78 – 84	46
84 – 89	48
89 – 94	50
94 – 98	52
98 – 101	54
101 – 105	40
105 – 108	42
108 – 110	44
110 – 113	46
113 – 115	48
115 – 117	50
117 – 120	52
120 – 121	54

(SEE NOTE 7)

NOTES:

1. ALL DIMENSIONS ARE TO CENTERLINE OF ATTACHMENT.
2. SEE POLE FABRICATOR'S DRAWINGS FOR ATTACHMENT DETAILS.
3. SEE STAKING SHEETS FOR LINE ANGLES, POLES, FOOTINGS, GROUNDING, AND SIGN REQUIREMENTS.
4. REFER TO ENTERGY ASSEMBLY DRAWINGS FOR PART DETAILS.
5. STRUCTURE REFERENCE HEIGHT IS FROM BOTTOM OF SHAFT TO TOP OF POLE.
6. PLACE SPACERS ON JUMPERS AS REQUIRED TO MAINTAIN UNIFORM DISTANCE BETWEEN SUB–CONDUCTORS.
7. LEG SPACING BASED ON MAINTAINING 34' PHASE TO PHASE SPACING.

THIS STRUCTURE MAY BE REFERRED TO AS TYPE E 500kV STRUCTURE OR AS STD–5 500kV STRUCTURE. NOTES AND DIMENSIONS OF THIS DRAWING HAVE PRECEDENCE OVER THOSE OF PREVIOUS DRAWINGS OF THOSE STRUCTURE TYPES

RE: T&B DWG xxx

ENTERGY SERVICES, INC.

DE 70–120 SS, 3–POLE, POLY, YOKE, STL 500kV

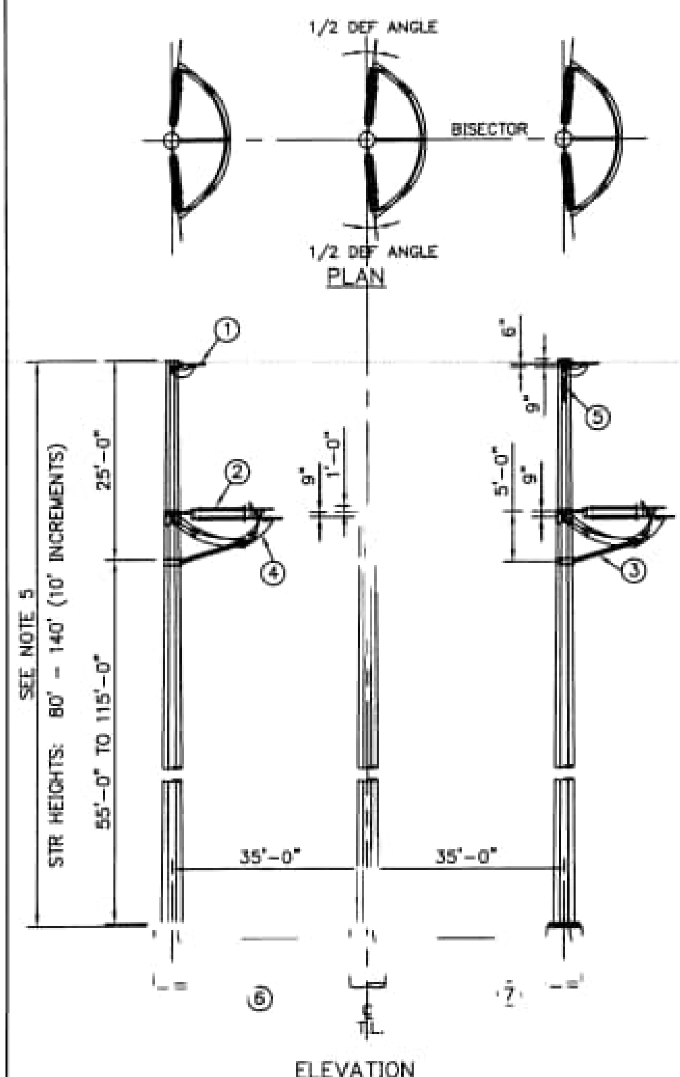
STD NO.	SCALE: 1"=1"
Entergy	No. TFS202A0
PLOT 1=1	SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	02–14–07	CREATED	TWF	HSK	HSK

tfinc90 2/27/2007 SLE3–DEPY–S 500

DEADEND 10°–70° SELF SUPPORTING, JUMPER, 3–POLE
SINGLE CIRCUIT, DE POLY w/YOKE, STEEL 500kV

ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	2	OHG–DE–XX
2	6	DEPY–500–XX
3	3	JLPH–500–XX
REFERENCE DRAWINGS		
4	NOTE 6	SD–CG318–XX
5	1	SGN–S
6	3	GND–S
7	3	FND–XXX–XX



POLE SPACING TABLE	
DEF ANGLE RANGE	POLE SPACING
00 – 27	35
27 – 38	36
38 – 46	37
46 – 53	38
53 – 58	39
58 – 63	40
63 – 67	41
67 – 71	42

(SEE NOTE 7)

NOTES:

1. ALL DIMENSIONS ARE TO CENTERLINE OF ATTACHMENT.
2. SEE POLE FABRICATOR'S DRAWINGS FOR ATTACHMENT DETAILS.
3. SEE STAKING SHEETS FOR LINE ANGLES, POLES, FOOTINGS, GROUNDING, AND SIGN REQUIREMENTS.
4. REFER TO ENTERGY ASSEMBLY DRAWINGS FOR PART DETAILS.
5. STRUCTURE REFERENCE HEIGHT IS FROM BOTTOM OF SHAFT TO TOP OF POLE.
6. PLACE SPACERS ON JUMPERS AS REQUIRED TO MAINTAIN UNIFORM DISTANCE BETWEEN SUB–CONDUCTORS.
7. LEG SPACING BASED ON MAINTAINING 34' PHASE TO PHASE SPACING.

THIS STRUCTURE MAY BE REFERRED TO AS TYPE D 500kV STRUCTURE OR AS STD–4 500kV STRUCTURE. NOTES AND DIMENSIONS OF THIS DRAWING HAVE PRECEDENCE OVER THOSE OF PREVIOUS DRAWINGS OF THOSE STRUCTURE TYPES

RE: T&B DWG xxx

ENTERGY SERVICES, INC.

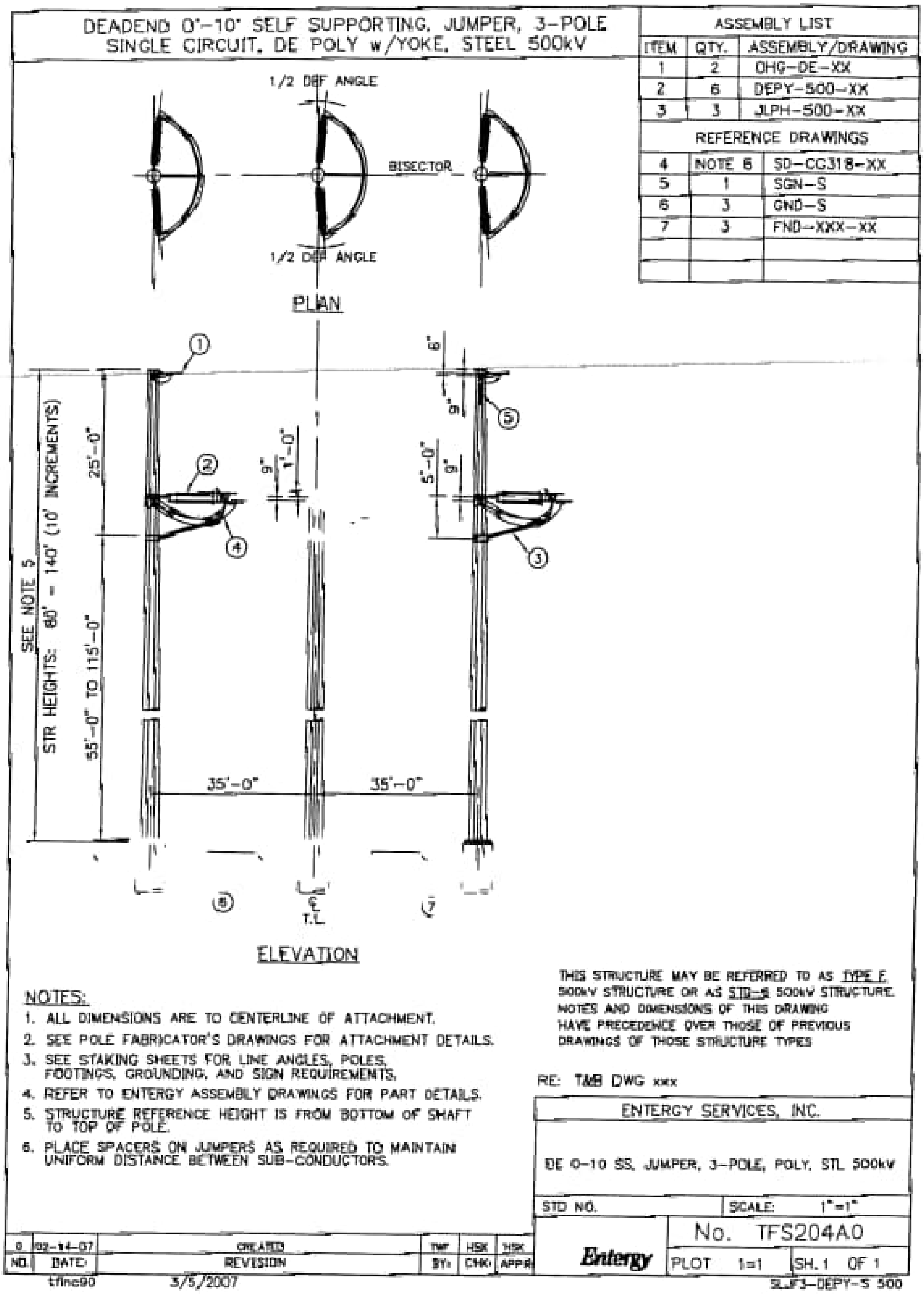
DE 10–70 SS, JUMPER, 3–POLE, POLY, STL 500kV

0	02–14–07	CREATED	TWF	HSK	HSK
NO.	DATE	REVISION	BY	CHK	APPR

STD NO. | SCALE: 1"=1"

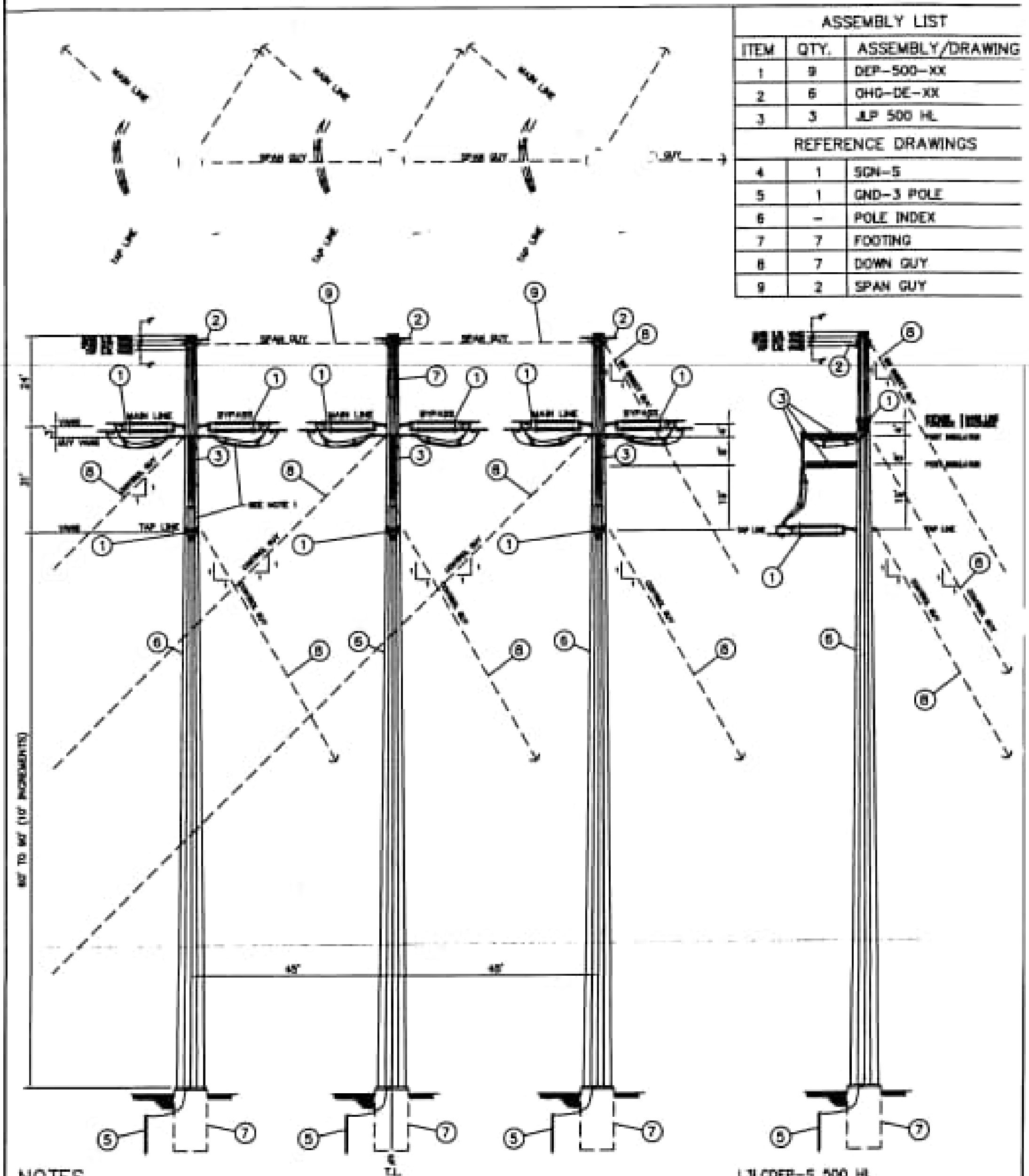
Entergy | No. TFS203A0 | PLOT 1=1 | SH. 1 OF 1

tfinc90 3/5/2007 SLJD3–DEPY–S 500


DEADEND 0°-10° SELF SUPPORTING, JUMPER, 3-POLE
SINGLE CIRCUIT, DE POLY w/YOKE, STEEL 500kV
ASSEMBLY LIST
ITEM | QTY. | ASSEMBLY/DRAWING
1 | 2 | OHG-DE-XX
2 | 6 | DEPY-500-XX
3 | 3 | JLPH-500-XX
REFERENCE DRAWINGS
4 | NOTE 6 | SD-CG318-XX
5 | 1 | SGN-S
6 | 3 | GND-S
7 | 3 | FND-XXX-XX
1/2 DEF ANGLE
BISECTOR
1/2 DEF ANGLE
PLAN
SEE NOTE 5
STR HEIGHTS: 80' - 140' (10' INCREMENTS)
25'-0"
55'-0" TO 115'-0"
6"
9"
1'-0"
5'-0"
35'-0"
35'-0"
℄ T.L.
ELEVATION
NOTES:
1. ALL DIMENSIONS ARE TO CENTERLINE OF ATTACHMENT.
2. SEE POLE FABRICATOR'S DRAWINGS FOR ATTACHMENT DETAILS.
3. SEE STAKING SHEETS FOR LINE ANGLES, POLES, FOOTINGS, GROUNDING, AND SIGN REQUIREMENTS.
4. REFER TO ENTERGY ASSEMBLY DRAWINGS FOR PART DETAILS.
5. STRUCTURE REFERENCE HEIGHT IS FROM BOTTOM OF SHAFT TO TOP OF POLE.
6. PLACE SPACERS ON JUMPERS AS REQUIRED TO MAINTAIN UNIFORM DISTANCE BETWEEN SUB-CONDUCTORS.
THIS STRUCTURE MAY BE REFERRED TO AS TYPE F 500kV STRUCTURE OR AS STD-8 500kV STRUCTURE. NOTES AND DIMENSIONS OF THIS DRAWING HAVE PRECEDENCE OVER THOSE OF PREVIOUS DRAWINGS OF THOSE STRUCTURE TYPES
RE: T&B DWG xxx
ENTERGY SERVICES, INC.
DE 0-10 SS, JUMPER, 3-POLE, POLY, STL 500kV
STD NO.
SCALE: 1"=1"
No. TFS204A0
Entergy
PLOT 1=1
SH. 1 OF 1
0 | 02-14-07 | CREATED | TWF | HSK | HSK
NO. | DATE | REVISION | BY | CHK | APPR
tfinc90
3/5/2007
SL_F3-DEPY-S 500

80'–100', DE, 3–POLE
HIGH–LOW, STEEL 500kV

ASSEMBLY LIST		
ITEM	QTY.	ASSEMBLY/DRAWING
1	9	DEP–500–XX
2	6	OHG–DE–XX
3	3	JLP 500 HL
REFERENCE DRAWINGS		
4	1	SGN–5
5	1	GND–3 POLE
6	–	POLE INDEX
7	7	FOOTING
8	7	DOWN GUY
9	2	SPAN GUY

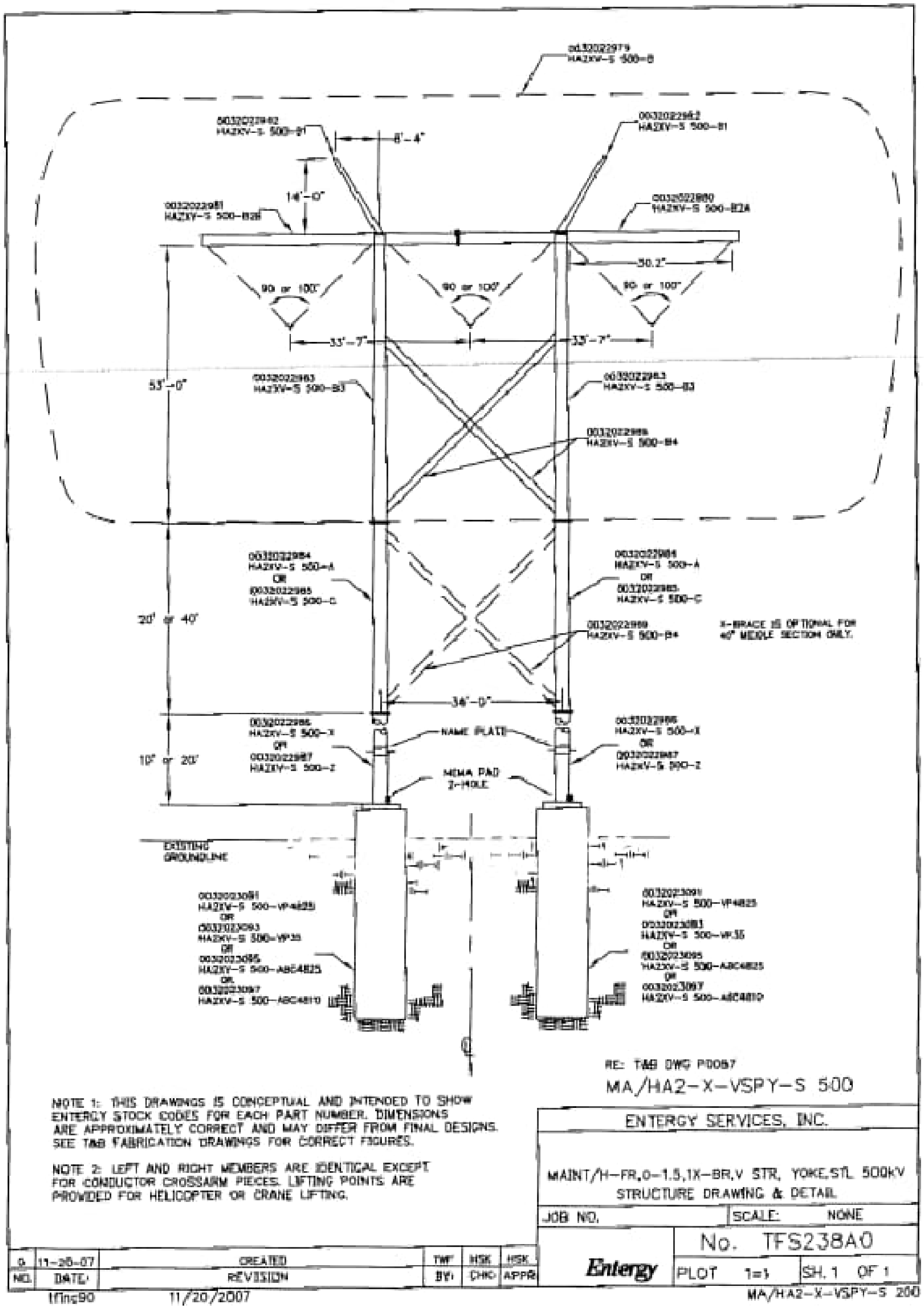


NOTES
1. BYPASS JUMPER AND TAP LINE JUMPER ARE NOT TO BE IN PLACE AT SAME TIME.
2. SEE DWG TFA206A FOR SPACING DETAIL AND BUS ORIENTATION
3. INSTALL NEMA PADS ON POLES AT ALL CONDUCTOR DEAD END LOCATIONS.
4. BYPASS SPANS SERVE TO TRANSFER TENSION THRU THE STRUCTURE.
5. DOWN GUYS ARE OPTIONAL. DESIGNER MUST SPECIFY FOR POLE SUPPLIER.
6. ALL THREE POLES ARE TO BE FRAMED IDENTICALLY WITH RESPECT TO HOLES, NEMA PADS, VANGS, ETC.

NO.	DATE	REVISION	BY	CHK	APPR
0	6–15–07	CREATED	TWF	HSK	HSK

ENTERGY SERVICES, INC.
Transmission LineDesign Standard
80–100, DE, 3–POLE, HIGH–LOW, STEEL 500kV
STRUCTURE DRAWING & DETAIL
STD NO. SCALE: NONE
Entergy No. TFS205A0
PLOT 1=40 SH. 1 OF 1

tfinc90 6/28/2007 L3LCDEP–S 500 HL



14'-0"
8'-4"
30.2"
90 or 100"
33'-7"
53'-0"
20' or 40'
34'-0"
10' or 20'
NAME PLATE
NEMA PAD 2-HOLE
EXISTING GROUNDLINE
X-BRACE IS OPTIONAL FOR 40' MIDDLE SECTION ONLY.
RE: T&B DWG P0087
MA/HA2-X-VSPY-S 500
NOTE 1: THIS DRAWINGS IS CONCEPTUAL AND INTENDED TO SHOW ENTERGY STOCK CODES FOR EACH PART NUMBER. DIMENSIONS ARE APPROXIMATELY CORRECT AND MAY DIFFER FROM FINAL DESIGNS. SEE T&B FABRICATION DRAWINGS FOR CORRECT FIGURES.
NOTE 2: LEFT AND RIGHT MEMBERS ARE IDENTICAL EXCEPT FOR CONDUCTOR CROSSARM PIECES. LIFTING POINTS ARE PROVIDED FOR HELICOPTER OR CRANE LIFTING.
ENTERGY SERVICES, INC.
MAINT/H-FR,0-1.5,1X-BR,V STR, YOKE,STL 500KV
STRUCTURE DRAWING & DETAIL
JOB NO.
SCALE: NONE
No. TFS238A0
Entergy
PLOT 1=1
SH. 1 OF 1
0
11-26-07
CREATED
TWF
HSK
HSK
NO.
DATE
REVISION
BY
CHK
APPR
tfinc90
11/20/2007
MA/HA2-X-VSPY-S 200

LOADING TABLE *

ITEMS	LOAD	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6
SHIELDWIRE	T1	1760	820	1859	213	213	213
	V1	1343	3218	557	557	557	557
	L1	0	0	0	0	2036	0
CONDUCTOR	T2	9241	4278	12161	1540	1540	1540
	V2	10295	16327	5015	5015	5015	5015
	L2	0	0	0	0	0	14709
WIND ON STRUCTURE	W	10	0	25.6	0	0	0
STRUCTURE WEIGHT	VS	TO BE DETERMINED BY T&B					
LINEMAN & EQUIP. WEIGHT	V3	500					

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)
CONDUCTOR LOADS ARE TOTAL PER PHASE
(SEE ADDITIONAL CASE 7 BELOW)

WIRE DATA:

SHIELDWIRE (SEE NOTE 7)

24 FIBER OPGW (GW2400 – 64 mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15°F MAX TENSION 7833 LBS INITIAL
EVERYDAY CONDITION, 60°F TENSION 2036 LBS INITIAL

7#7 ALLUMOWELD
DIA=0.433", WT=0.330 LBS/FT, RTS=19,060 LBS
1" RADIAL ICE, 15°F MAX TENSION 7328 LBS INITIAL
EVERYDAY CONDITION, 60°F TENSION 1740 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" RADIAL ICE, 15°F MAX TENSION 13623 LBS INITIAL(SUB COND)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB COND)

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15° F. OLF=1.0

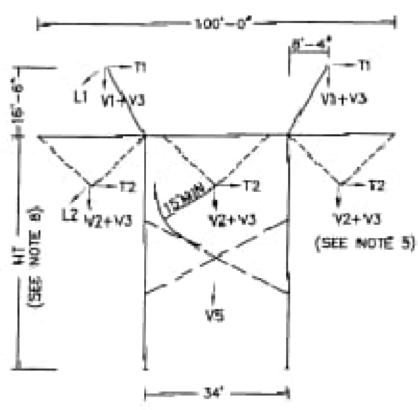
CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

CASE 4 – PRECAMBER: NO WIND, NO ICE, 60° F, OLF=1.0

CASE 5 – BROKEN SHIELDWIRE: NO WIND, NO ICE, 60° F. OLF=1.0

CASE 6 – BROKEN PHASE: NO WIND, NO ICE, 60° F. OLF=1.0

CASE 7 – 25.6 PSF LONG. WIND ON STR. W/O WIRES, OLF=1.0



LOAD TREE 500KV

SPAN DATA:

WIND SPAN = 1200' at 6° Line Angle – 1600' at 0° Line Angle
WEIGHT SPAN = 1400 FEET
RULING SPAN = 1000 FEET

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T), AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRE AND TRANSVERSE COMPONENT OF THE TENSION DUE TO THE LINE ANGLE.
4. V1 INCLUDES 50 POUNDS FOR EACH SHIELDWIRE ASSEMBLY. V2 INCLUDES 500 POUNDS FOR EACH INSULATOR ASSEMBLY.
5. V3 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. STRUCTURES TO BE DESIGNED FOR MAX OF EITHER 1200' WIND SPAN AT 6° LINE ANGLE OR 1600' WIND SPAN AT 0° LINE ANGLE. ABOVE TABLE REFLECTS CONTROLLING CONFIGURATION FOR EACH LOADING CONDITION. (6° CONTROLS ALL CASES)
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO (2) SHIELD WIRES (FIBER OR 7#7 – ONE PER PEAK). ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLS THE DESIGN
8. STR. REF. HT. IS FROM BOTTOM OF SHAFT TO CL OF CROSSARM. DESIGN STRUCTURE FOR 90' TO 130' HTS. IN 10' INCREMENTS.
9. PROVIDE BASE PLATE DESIGN FOR EACH STRUCTURE.
10. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
11. PROVIDE BASE PLATED PILE DESIGN (DIAMETER & THICKNESS) FOR EACH STRUCTURE (BASED ON 4 FT PILE REVEAL).
12. SEE DRAWING STD-2 FOR STRUCTURE FRAMING.

HA2-X-VSPY-S 500 SK2

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, H-FRAME, 0°-6°, 90'-130'
STRUCTURE DRAWING & DETAIL

STD NO. | SCALE: NONE
No. TFS239A0
Entergy | PLOT 1=1 | SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	11-29-07	CREATED	TWF	HSK	HSK

11nc90 12/7/2007 HA2-X-VSPY-S 500; SK2

LOADING TABLE *

ITEMS	LOAD	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6
SHIELDWIRE	T1	2682	2045	2392	532	652	532
	V1	1343	3218	557	557	557	557
	L1	0	0	0	0	5000	0
CONDUCTOR	T2	14752	10669	15472	3840	3840	3604
	V2	10295	16327	5015	5015	5015	5015
	L2	0	0	0	0	0	8000
WIND ON STRUCTURE	W	10	0	25.6	0	0	0
STRUCTURE WEIGHT	VS	TO BE DETERMINED BY T&B					
LINEMAN & EQUIP. WEIGHT	V3	500					

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)
CONDUCTOR LOADS ARE TOTAL PER PHASE
~~(SEE ADDITIONAL CASE 7 BELOW)~~

WIRE DATA:

SHIELDWIRE (SEE NOTE 7)

24 FIBER OPGW (GW2400 – 64 mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15°F MAX TENSION 7833 LBS INITIAL
EVERYDAY CONDITION, 60°F TENSION 2036 LBS INITIAL

7#7 ALLUMOWELD
DIA=0.433", WT=0.330 LBS/FT, RTS=19,060 LBS
1" RADIAL ICE, 15°F MAX TENSION 7328 LBS INITIAL
EVERYDAY CONDITION, 60°F TENSION 1740 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" RADIAL ICE, 15°F MAX TENSION 13623 LBS INITIAL(SUB COND)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB COND)

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F, TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND,15° F. OLF=1.0

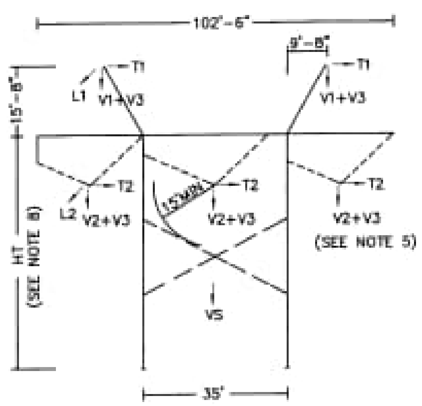
CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

CASE 4 – PRECAMBER: NO WIND, NO ICE, 60° F. OLF=1.0

CASE 5 – BROKEN SHIELDWIRE: NO WIND, NO ICE, 60° F, OLF=1.0

CASE 6 – UNBALANCED PHASE: NO WIND, NO ICE, 60° F. OLF=1.0

CASE 7 – 25.6 PSF LONG. WIND ON STR. W/O WIRES, OLF=1.0



LOAD TREE 500KV

SPAN DATA:

WIND SPAN = 1000' at 15° Line Angle
WEIGHT SPAN = 1400 FEET
RULING SPAN = 1000 FEET

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T), AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRE AND TRANSVERSE COMPONENT OF THE TENSION DUE TO THE LINE ANGLE.
4. V1 INCLUDES 50 POUNDS FOR EACH SHIELDWIRE ASSEMBLY. V2 INCLUDES 500 POUNDS FOR EACH INSULATOR ASSEMBLY.
5. V3 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. STRUCTURES TO BE DESIGNED FOR 1000' WIND SPAN AT 15° LINE ANGLE. PROVIDE SPAN AND ANGLE CHART FOR 5° TO 14° LINE ANGLE.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO (2) SHIELD WIRES (FIBER OR 7#7 – ONE PER PEAK). ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLS THE DESIGN
8. STR. REF. HT. IS FROM BOTTOM OF SHAFT TO CL OF CROSSARM. DESIGN STRUCTURE FOR 90' TO 130' HTS. IN 10' INCREMENTS.
9. PROVIDE BASE PLATE DESIGN FOR EACH STRUCTURE.
10. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
11. PROVIDE BASE PLATED PILE DESIGN (DIAMETER & THICKNESS) FOR EACH STRUCTURE (BASED ON 4 FT PILE REVEAL).
12. SEE DRAWING STD–3 FOR STRUCTURE FRAMING.

HC2–X–VSPR–S 500 SK3

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, H–FRAME, 6°–15°, 90'–130'
STRUCTURE DRAWING & DETAIL

STD NO. | SCALE: NONE

No. TFS240A0

Entergy | PLOT 1=1 | SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	11–21–07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007 HC2–X–VSPR–S 500; SK3

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	2468	2045	2111	532
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	13712	10669	13608	3840
		V2	14388	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	1234	1022	1055	266
		V1	1289	3082	535	535
		L1	6933	7766	4808	2019
	COND	T2	6856	5334	6804	1920
		V2	9586	15448	4622	4622
		L2	40218	40519	30442	14583
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V4	500			
JUMPER INSULATOR WEIGHT		V3	215			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 – 84mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

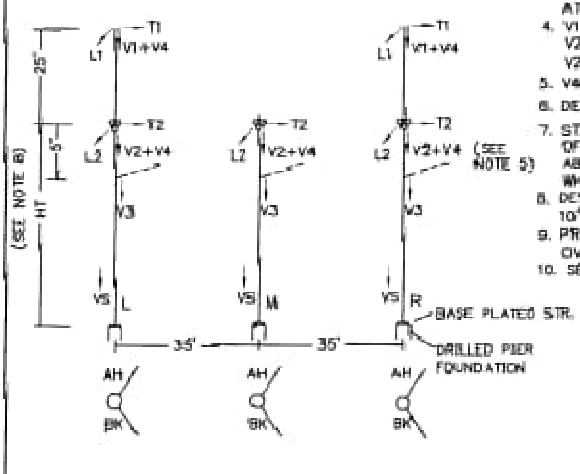
CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S). V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT) V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V4 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIELD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET POLE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD–4 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3–POLE

SLE3–DEPY–S 500 SK4 (15)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 15', 55, 55'–115'
STRUCTURE DRAWING & DETAIL

STD NO.		SCALE: NONE
Entergy	No. TFS241A0	
	PLOT 1=1	SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	11–21–07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007 SLE3–DEPY–S 500; SK4 (15)

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	3669	3391	2944	881
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	20682	17691	18884	6397
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	1835	1695	1472	441
		V1	1289	3082	535	535
		L1	6827	7647	4734	1988
	COND	T2	10341	8846	9442	3184
		V2	9586	15448	4622	4622
		L2	39604	39900	29977	14360
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V4	500			
JUMPER INSULATOR WEIGHT		V3	215			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 – 64mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15' F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60'F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15'F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60'F TENSION 4903 LBS INITIAL (SUB CONDUCT)

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15' F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

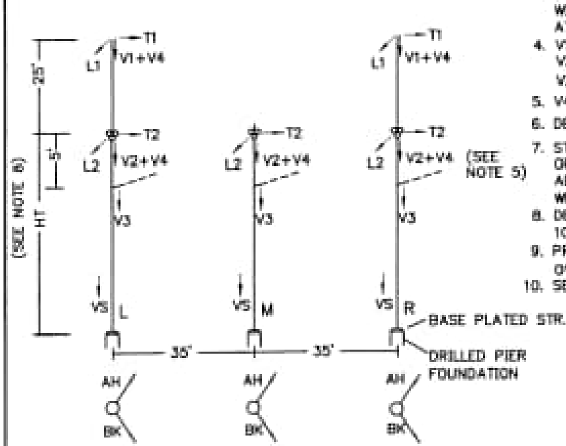
CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15' F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60' F, OLF=1.00.

CASE 4 – EVERYDAY: NO WIND, NO ICE, 60' F. OLF=1.0

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S). V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT) V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V4 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIRLD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD-4 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3–POLE

SLE3–DEPY–S 500 SK4 (25)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 25', SS, 55'–115'
STRUCTURE DRAWING & DETAIL

STD NO.		SCALE: NONE			
Entergy	No. TFS242A0				
	PLOT 1=1	SH. 1 OF 1			

NO.	DATE	REVISION	BY	CHK	APPR
0	11–21–07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007 SLE3–DEPY–S 500; SK4 (25)

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	4848	4711	3761	1224
		V1	1887	4574	774	774
		L1	0	0	0	0
	COND	T2	27516	24570	24058	8846
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	2424	2355	1881	612
		V1	1289	3082	535	535
		L1	6669	7470	4625	1942
	COND	T2	13759	12290	12029	4423
		V2	9586	15448	4622	4622
		L2	38683	38377	29284	14028
WIND ON STRUCTURE		W	10	0	25.5	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V4	500			
JUMPER INSULATOR WEIGHT		V3	215			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 - 64mm2 / 523)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 3036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15°F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65, VERTICAL OLF=1.50.

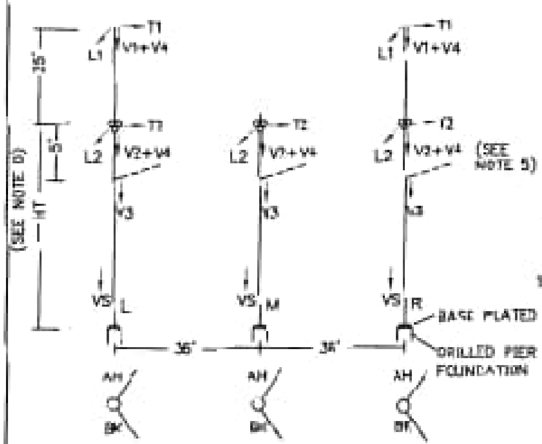
CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.0G

CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S). V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT) V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V4 (LINEMAN+EQUIPMENT) – 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIELD WIRES (FIBER OR 7#7) - ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD-4 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3-POLE

SLE3-DEPY-S 500 SK4 (35)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 35', SS, 55'-115'
STRUCTURE DRAWING & DETAIL

STD NO.		SCALE: NONE
Entergy	No. TFS243A0	
	PLOT 1=1	SH. 1 OF 1

NO	DATE	REVISION	BY	CHK	APPR
0	11-21-07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007 SLE3-DEPY-S 500, SK4 (35)

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	5994	5995	4556	1558
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	34169	31280	29093	11258
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	2997	2998	2278	779
		V1	1289	3082	535	535
		L1	6460	7237	4480	1881
	COND	T2	17085	15640	14546	5629
		V2	9586	15448	4622	4622
		L2	37477	37758	28368	13589
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V4	500			
JUMPER INSULATOR WEIGHT		V3	215			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE
(2) 24 FIBER OPGW (GW2400 – 64mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR
(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15°F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

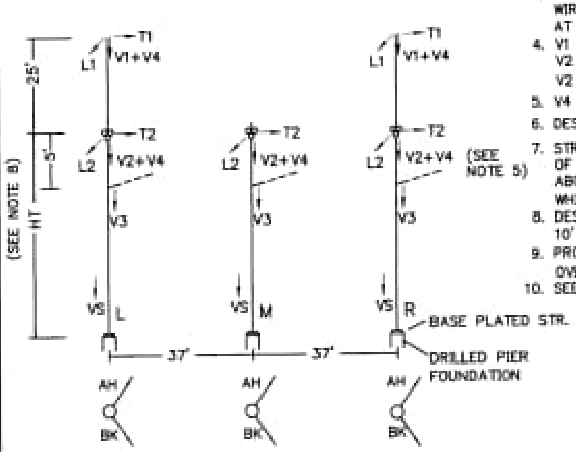
CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S). V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT) V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V4 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIRLD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD-4 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3-POLE

SLE3-DEPY-S 500 SK4 (45)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 45°, 55, 55'-115'
STRUCTURE DRAWING & DETAIL

STD NO.		SCALE: NONE
Entergy	No. TFS244A0	
	PLOT 1=1	SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	11-21-07	CREATED	TWF	HSK	HSK

tflnc90 12/7/2007 SLE3-DEPY-S 500; SK4 (45)

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	7100	7234	5323	1880
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	40584	37742	33948	13584
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	3550	3617	2661	940
		V1	1289	3082	535	535
		L1	6203	6948	4301	1806
	COND	T2	20292	18871	16974	6792
		V2	9586	15448	4622	4622
		L2	35982	36251	27236	13047
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V4	500			
JUMPER INSULATOR WEIGHT		V3	215			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 – 64mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15°F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

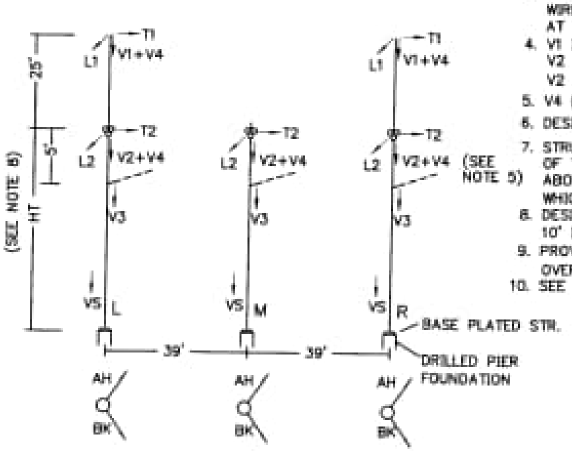
CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S). V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT) V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V4 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIRLD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD–4 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3–POLE

SLE3–DEPY–S 500 SK4 (55)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 55', SS, 55'–115'
STRUCTURE DRAWING & DETAIL

STD NO.	SCALE: NONE
Entergy	No. TFS245A0
PLOT 1=1	SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	11–21–07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007

SLE3–DEPY–S 500; SK4 (55)

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	8157	8417	6056	2188
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	46713	43918	38588	15806
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	4078	4209	3028	1094
		V1	1289	3082	535	535
		L1	5898	6606	4090	1717
	COND	T2	23357	21959	19294	7903
		V2	9586	15448	4622	4622
		L2	34212	34469	25896	12405
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V4	500			
JUMPER INSULATOR WEIGHT		V3	215			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 – 84mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15°F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

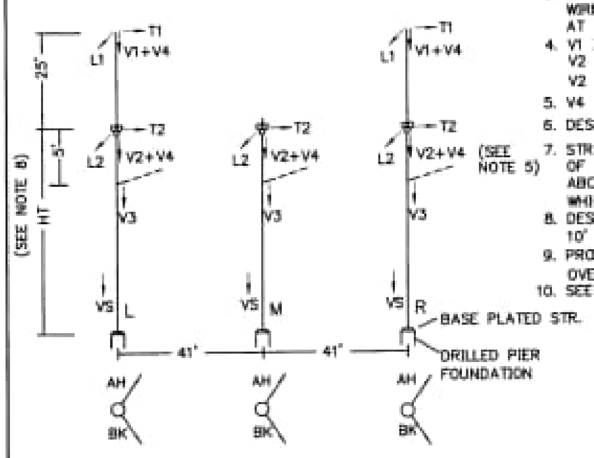
CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S).
   V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT)
   V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V4 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIRLD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD–4 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3–POLE

SLE3–DEPY–S 500 SK4 (65)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 65°, SS, 55'–115'
STRUCTURE DRAWING & DETAIL

STD NO.		SCALE: NONE	
Entergy	No. TFS246A0		
	PLOT 1=1	SH. 1 OF 1	

NO.	DATE	REVISION	BY	CHK	APPR
0	11–21–07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007 SLE3–DEPY–S 500; SK4 (65)

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	8664	8986	6407	2336
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	49656	46883	40815	16873
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	4332	4493	3204	1168
		V1	1289	3082	535	535
		L1	5728	6416	3972	1668
	COND	T2	24828	23441	20408	8437
		V2	9586	15448	4622	4622
		L2	33229	33478	25152	12049
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V3	500			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 – 64mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15°F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND,15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

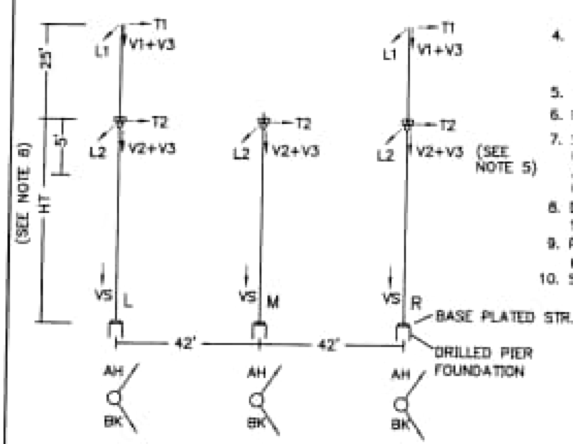
CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S). V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT) V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V3 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIRLD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD-5 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3–POLE

SLE3–DEPY–S 500 SK5 (70)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 70°, SS, 55'–115'
STRUCTURE DRAWING & DETAIL

STD NO. SCALE: NONE

No. TFS247A0

Entergy PLOT 1=1 SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	11–21–07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007

SLE3–DEPY–S 500; SK5 (70)

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	9632	10070	7079	2617
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	55272	52540	45066	18910
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	4816	5035	3539	1309
		V1	1289	3082	535	535
		L1	5357	6000	3715	1560
	COND	T2	27636	26270	22533	9455
		V2	9586	15448	4622	4622
		L2	31075	31307	23521	11286
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V3	500			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 – 64mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15°F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND,15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

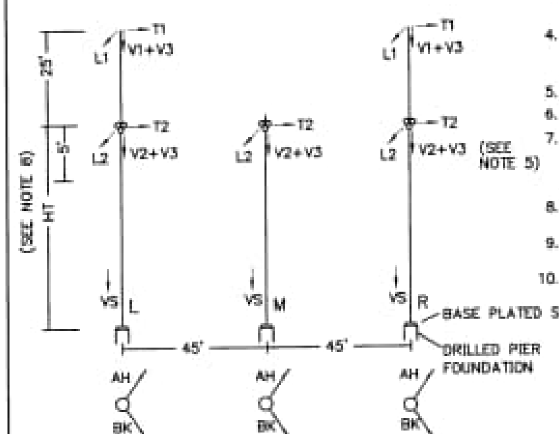
CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S). V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT) V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V3 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIELD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD-5 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3–POLE

SLE3–DEPY–S 500 SK5 (80)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 80', SS, 55'–115'
STRUCTURE DRAWING & DETAIL

STD NO. | SCALE: NONE

Entergy | No. TFS248A0

PLOT 1=1 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	11–21–07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007

SLE3–DEPY–S 500; SK5 (80)

LOADING TABLE *						
ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	10532	11078	7702	2879
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	60490	57797	49015	20802
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	5266	5539	3851	1440
		V1	1289	3082	535	535
		L1	4945	5539	3429	1440
	COND	T2	30245	28899	24508	10401
		V2	9586	15448	4622	4622
		L2	28684	28899	21712	10401
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V3	500			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 – 64mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15°F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

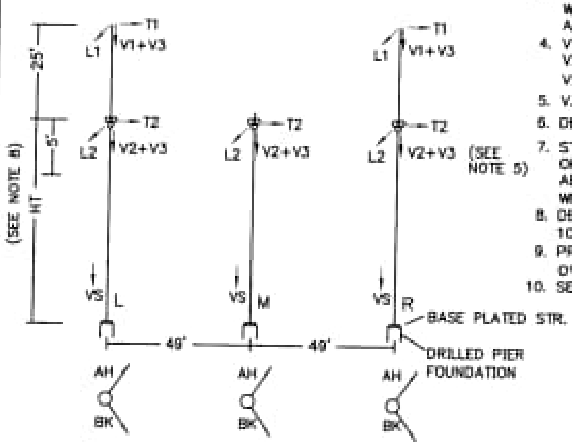
CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S). V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT) V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V3 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIRLD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD–5 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3–POLE

SLE3–DEPY–S 500 SK5 (90)

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 90°, SS, 55'–115'
STRUCTURE DRAWING & DETAIL

STD NO.	SCALE: NONE
Entergy	No. TFS249A0
	PLOT 1=1	SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	11–21–07	CREATED	TWF	HSK	HSK

tfinc90 12/7/2007

SLE3–DEPY–S 500; SK5 (90)

LOADING TABLE *

ITEMS		LOAD	CASE 1	CASE 2	CASE 3	CASE 4
INTACT	SW	T1	11356	12001	8274	3119
		V1	1887	4576	774	774
		L1	0	0	0	0
	COND	T2	65271	62615	52635	22535
		V2	14386	23110	6950	6950
		L2	0	0	0	0
DE ONE SIDE	SW	T1	5678	6000	4137	1560
		V1	1289	3082	535	535
		L1	4495	5035	3117	1309
	COND	T2	32636	31307	26317	11268
		V2	9586	15448	4622	4622
		L2	26075	26270	19737	9455
WIND ON STRUCTURE		W	10	0	25.6	0
STRUCTURE WEIGHT		VS	TO BE DETERMINED BY T&B			
LINEMAN & EQUIP. WEIGHT		V3	500			

* V, T AND L IN POUNDS, W IN PSF (OLF INCLUDED)

WIRE DATA:

SHIELDWIRE

(2) 24 FIBER OPGW (GW2400 – 64mm2 / 528)
DIA=0.528", WT=0.362 LBS/FT, RTS=18,432 LBS
1" RADIAL ICE, 15° F MAX TENSION 7833 LBS INITIAL
EVERYDAY COND, 60°F TENSION 2036 LBS INITIAL

PHASE CONDUCTOR

(3) 954.0 KCMIL 45/7 STRAND ACSR "RAIL" (TRIPLE BUNDLED)
DIA=1.165", WT=1.0750 LBS/FT, RTS=25,900 LBS
1" ICE, 15°F MAX TENSION 13623 LBS INITIAL (SUB CONDUCT)
EVERYDAY CONDITION, 60°F TENSION 4903 LBS INITIAL (SUB CONDUCT)

SPAN DATA:

WIND SPAN = 750 FT (INTACT) 375 FT (DE)
WEIGHT SPAN = 2000 FT (INTACT) 1340 FT (DE)
RULING SPAN = 1000 FT

MECHANICAL LOADING CRITERIA:

CASE 1 – NESC MEDIUM: 4 PSF WIND ON WIRES AND STRUCTURE, 1/4" RADIAL ICE, 15° F. TRANSVERSE WIND OLF=2.50, LONGITUDINAL OLF=1.65; VERTICAL OLF=1.50.

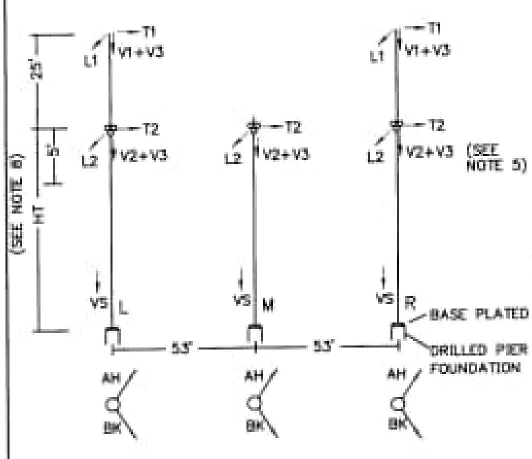
CASE 2 – HEAVY ICE: 1" RADIAL ICE, NO WIND, 15° F. OLF=1.0

CASE 3 – HIGH WIND: 25.6 PSF WIND ON WIRES AND STRUCTURE, NO ICE, 60° F, OLF=1.00.

CASE 4 – EVERYDAY: NO WIND, NO ICE, 60° F. OLF=1.0

NOTES:

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS PER MECHANICAL LOADING CRITERIA.
2. FOR STRUCTURAL DESIGN, THE LONGITUDINAL (L), TRANSVERSE (T) AND VERTICAL (V) LOADS SHALL BE CONSIDERED TO ACT SIMULTANEOUSLY WITH WIND AND THE DEAD WEIGHT OF THE STRUCTURE.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND ON THE WIRES AND TRANSVERSE (TENSION) LOADS FROM THE LINE ANGLE AT THE STRUCTURE.
4. V1 INCLUDES 50 LBS FOR SHIELDWIRE ASSEMBLY(S).
   V2 INCLUDES 500 LBS FOR INSULATOR ASSEMBLIES. (INTACT)
   V2 INCLUDES 300 LBS FOR INSULATOR ASSEMBLY. (DE)
5. V3 (LINEMAN+EQUIPMENT) = 500 LBS AT ANY ONE LOCATION.
6. DESIGN STRUCTURE FOR BOTH INTACT & DE ONE SIDE CONDITION.
7. STRUCTURES TO BE DESIGNED TO SUPPORT ANY COMBINATION OF TWO SHIELD WIRES (FIBER OR 7#7) – ONE PER OUTSIDE LEG. ABOVE TABLE REFLECTS THE LOADINGS DUE TO THE OPGW WHICH CONTROLLS THE DESIGN.
8. DESIGN FOR HEIGHTS TO CONDUCTOR FROM 55' TO 115' IN 10' INCREMENTS (OVERALL HT 80' TO 140').
9. PROVIDE SOCKET PILE DESIGN (DIAMETER, THICKNESS, AND OVERLAP) FOR EACH STRUCTURE.
10. SEE DRAWING STD-5 FOR STRUCTURE FRAMING.



LOAD TREE 500KV 3-POLE

SLE3-DEPY-S 500 SK5 (100)

0	11-21-07	CREATED	TWF	HSK	HSK
NO.	DATE:	REVISION	BY:	CHK:	APPR

tfinc90 12/7/2007

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LOAD TREE, DEADEND, 100", SS, 55'-115'
STRUCTURE DRAWING & DETAIL

STD NO. SCALE: NONE

Entergy

No. TFS250A0

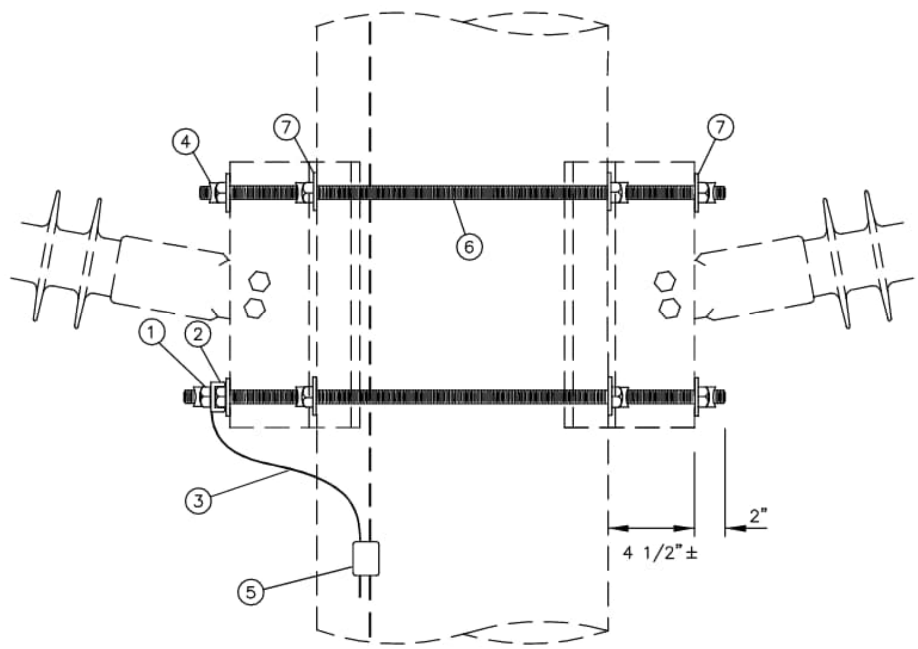
PLOT 1=1 SH. 1 OF 1

SLE3-DEPY-S 500; SK5 (100)

BILL OF MATERIALS

VARIABLE BOLT ASSY, DOUBLE POLY POST FOR CONCRETE WITH GROUNDING

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	EN000171	NUT, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
2	1	EN000358	CLIP, BONDING, 7/8", STL, GALV, FOR GROUNDING TO 7/8" BOLT
3	1	EN000362	WIRE, COPPERWELD, #4 (.1158 lbs/ft)
4	8	EN000426	NUT, LOCK, SQUARE, STL, GALV. ANSI–C135.1, 7/8" DIA. 9 THD
5	1	EN000360	CONNECTOR, #4 COPPER CRIMPIT
6	2	LS909XX	BOLT, DOUBLE ARMING, 7/8"xVARIABLE LENGTH, GALV, w/4 SQ NUTS
7	8	EN005685	WASHER, FLAT ROUND, 2" STEEL, GALV, FOR 7\8" BOLT



1) All Double Arming Bolts shall be trimmed to avoid conflict with guys, grounding, conductors, etc. and painted with galvanized paint.

2) Grounding Lug location may be above or below assembly depending on pole tank ground location.

BLT–2P–C

ENTERGY STANDARD DWG.

DESIGN APPROVAL	STANDARDS APPROVAL
SIGNED / DATE	SIGNED / DATE

BOLT ASSY (CONCRETE)
DOUBLE POLYMER POST INS.

APPROVED BY: EJG		DATE:	01–27–97
CHECKED BY:	JWS	SCALE:	NONE
DRAWN BY:	ECSI	ESI NO.	TMD207A1

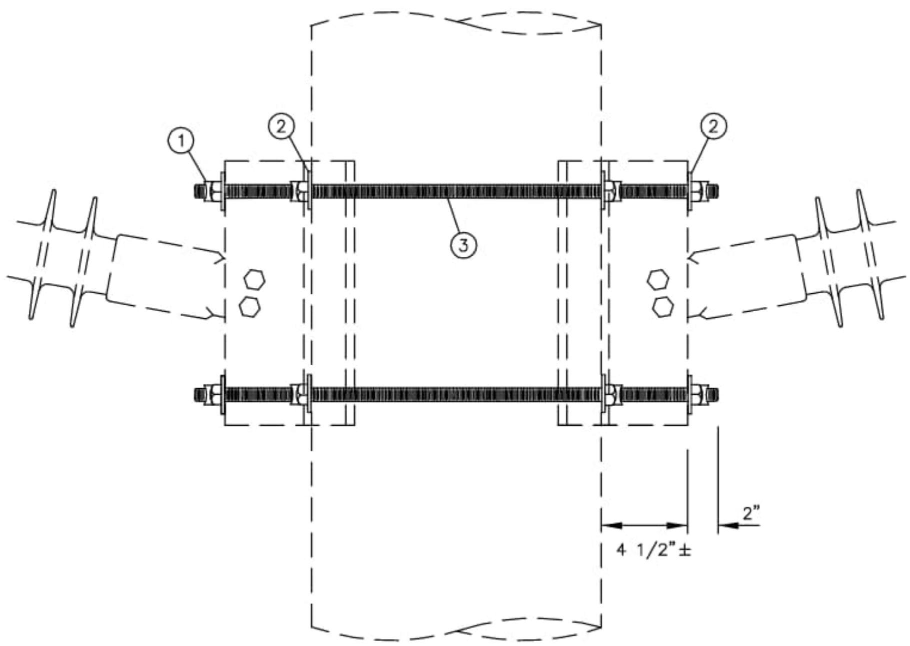
Entergy | No. BLT2PC | PLOT 1=8 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	APPR:
1	5–28–03	REV. DIM., CHANGE WASHER FROM SQ. TO FLAT ROUND	ITRON	

BILL OF MATERIALS

VARIABLE BOLT ASSY, DOUBLE POLY POST FOR STEEL

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	8	EN000426	NUT, LOCK, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
2	8	EN005685	WASHER, FLAT ROUND, 2" STEEL, GALV, FOR 7\8" BOLT
3	2	LS909XX	BOLT, DOUBLE ARMING, 7/8"xVARIABLE LENGTH, GALV, w/4 SQ NUTS



1) All Double Arming Bolts shall be trimmed to avoid conflict with guys, grounding, conductors, etc. and painted with galvanized paint.

BLT–2P–S

ENTERGY STANDARD DWG.

DESIGN APPROVAL	STANDARDS APPROVAL
SIGNED / DATE	SIGNED / DATE

BOLT ASSY (STEEL)
DOUBLE POLYMER POST INS.

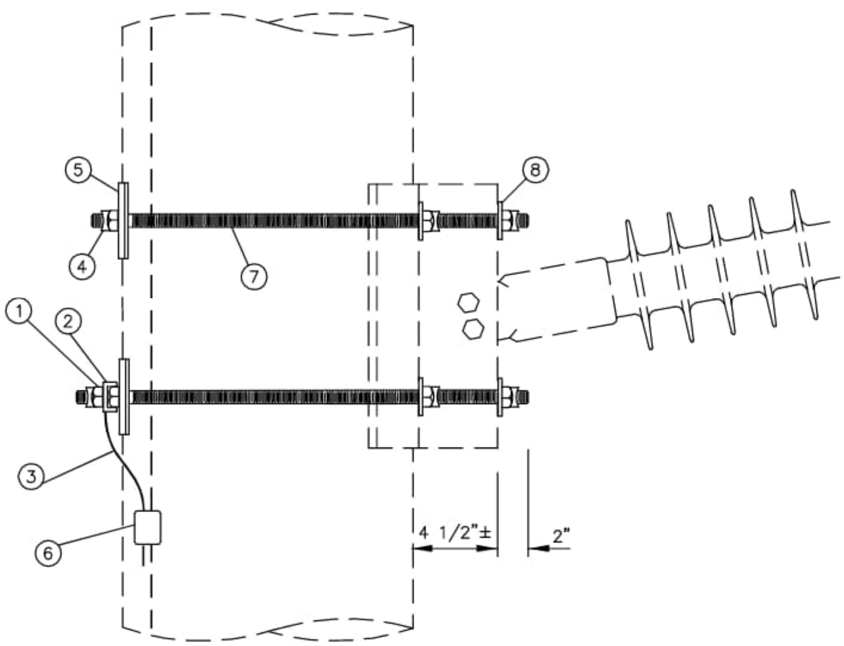
APPROVED BY:	DATE: 2–12–96
CHECKED BY:	SCALE: NONE
DRAWN BY: ECSI	ESI NO. TMD208A1
Entergy No. BLT2PS	
PLOT 1=8	SH. 1 OF 1

NO.	DATE:	REVISION	BY:	APPR:
1	5–28–03	CHANGE WASHER, DIM.	ITRON	

BILL OF MATERIALS

VARIABLE BOLT ASSY, SINGLE POLY POST FOR CONCRETE WITH GROUNDING

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	EN000171	NUT, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
2	1	EN000358	CLIP, BONDING, 7/8", STL, GALV, FOR GROUNDING TO 7/8" BOLT
3	1	EN000362	WIRE, COPPERWELD, #4 (.1158 lbs/ft)
4	6	EN000426	NUT, LOCK, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
5	2	EN012280	WASHER, SQUARE CURVED, STL, GALV, 7/8" BOLT, 3"x3"x1/4"
6	1	EN000360	CONNECTOR, #4 COPPER CRIMPIT
7	2	LS909XX	BOLT, DOUBLE ARMING, 7/8"xVARIABLE LENGTH, GALV, w/4 SQ NUTS
8	4	EN005685	WASHER, FLAT ROUND, 2" STEEL, GALV, FOR 7\8" BOLT



1) All Double Arming Bolts shall be trimmed to avoid conflict with guys, grounding, conductors, etc. and painted with galvanized paint.

2) Grounding Lug location may be above or below assembly depending on pole tank ground location.

1	5–30–03	CHANGE WASHER, DIM.	ITRON	
NO.	DATE:	REVISION	BY:	APPR:

BLT–P–C

ENTERGY STANDARD DWG.

DESIGN APPROVAL	STANDARDS APPROVAL
SIGNED / DATE	SIGNED / DATE

BOLT ASSY (CONCRETE)
SINGLE POLYMER POST INS.

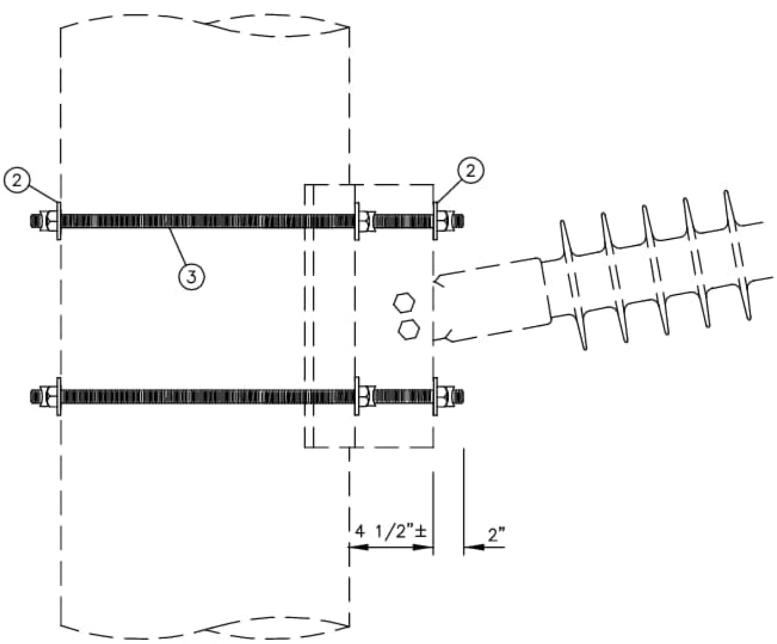
APPROVED BY:	EJG	DATE:	01–27–97
CHECKED BY:	JWS	SCALE:	NONE
DRAWN BY:	ECSI	ESI NO.	TMD211A1

Entergy — No. BLTPC — PLOT 1=8 — SH. 1 OF 1

BILL OF MATERIALS

VARIABLE BOLT ASSY, SINGLE POLY POST FOR STEEL

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	6	EN000426	NUT, LOCK, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
2	6	EN005685	WASHER, FLAT ROUND, 2" STEEL, GALV, FOR 7/8" BOLT
3	2	LS909XX	BOLT, DOUBLE ARMING, 7/8"xVARIABLE LENGTH, GALV, w/4 SQ. NUTS



1) All Double Arming Bolts shall be trimmed to avoid conflict with guys, grounding, conductors, etc. and painted with galvanized paint.

BLT–P–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard

BOLT ASSEMBLY (STEEL) SINGLE POLYMER POST INS.

STRUCTURAL ASSEMBLY DETAIL

NO.	DATE	REVISION	BY	CHK	APPR
3	07–21–10	ADDED ASSEMBLY NAME	CBM	ECW	ECW
2	01–13–10	INCREASED STOCK NO. ITEM EN005685 FROM 4 TO 6	BAB		
1	05–30–03	CHANGE WASHER, DIM.	ITRON		
0	02–12–06	ISSUED	ECSI		

STD NO. | SCALE:

Entergy

No. TMD212A3

PLOT | SH. OF

cmcgr91 8/11/2010 BLT–P–S

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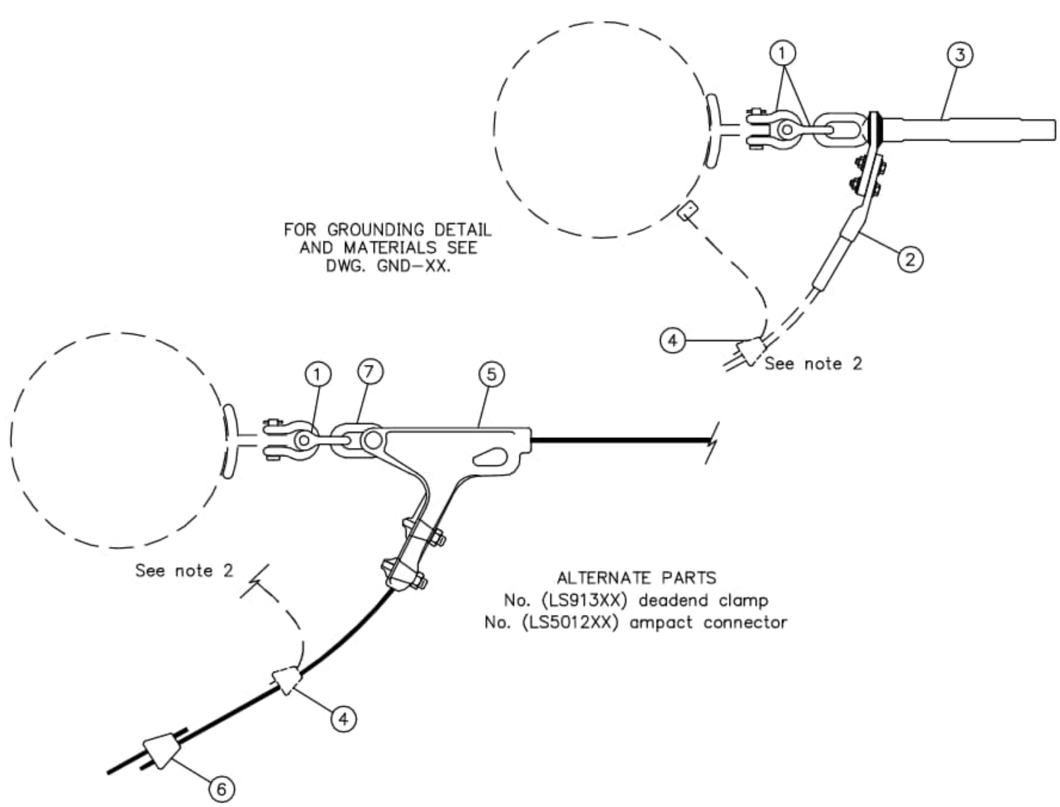
BILL OF MATERIALS

OHGW DEADEND			
ITEM	QTY.	STOCK NO.	DESCRIPTION
1	2	EN000492	SHACKLE, ANCHOR, 40K ULT, 3/4" PIN DIA, 2-3/4" LONG
2	1	LS9004XX	TERMINAL CONNECTOR, 15 DEG, FOR VARIABLE SIZE WIRE
3	1	LS9005XX	DEADEND, ALUMINUM COMPRESSION BODY, SINGLE TONGUE, VARIABLE WIRE SIZE
4	–	LS5012XX	CONNECTOR, AMPACT, SEE GND ASSEMBLY DRAWING FOR MATERIAL
ALTERNATE FOR BOLTED ASSEMBLY			
ITEM	QTY.	STOCK NO.	DESCRIPTION
1	2	EN000492	SHACKLE, ANCHOR, 40K ULT, 3/4" PIN DIA, 2-3/4" LONG
4	–	LS5012XX	CONNECTOR, AMPACT, SEE GND ASSEMBLY DRAWING FOR MATERIAL
5	1	LS913XX	DEADEND BOLTED STRAIN ALUMWELD
6	1	LS5012XX	CONNECTOR, AMPACT, VARIABLE CONDUCTOR SIZE TO VARIABLE CONDUCTOR SIZE
7	1	EN000390	LINK, CHAIN, XMSN: CONNECTING, CS, 1/2" PITCH; 2 1/4" LONG



1) Item #2, #3 and #6 are conductor dependent.
2) For grounding detail and materials, see applicable Gnd-xx drawing.
3) For horizontal vang orientation, omit one of item 1.

OHG-DE-XX

NO.	DATE:	REVISION	BY:	CHK:	APPR:
6	07-21-10	SHOW ITEM 4 ON ASSEMBLY	CBM	ECW	ECW
5	08-15-06	REVISIED ITEM #4	RJL		
4	01-31-01	MODIFIED STOCK NUMBER LS5029XX	LS		
3	01-04-01	MODIFIED CALLOUTS	LS		
2	06-07-00	MODIFIED STOCK NUMBER LS5012XX	RMB		
1	11-16-99	ADDED AMPACT & CARTRIDGE DESCRIPTION	RMB		
0		ISSUED	ECSI		

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
OVERHEAD GROUNDWIRE DEADEND ASSY
STRUCTURAL ASSEMBLY DETAIL

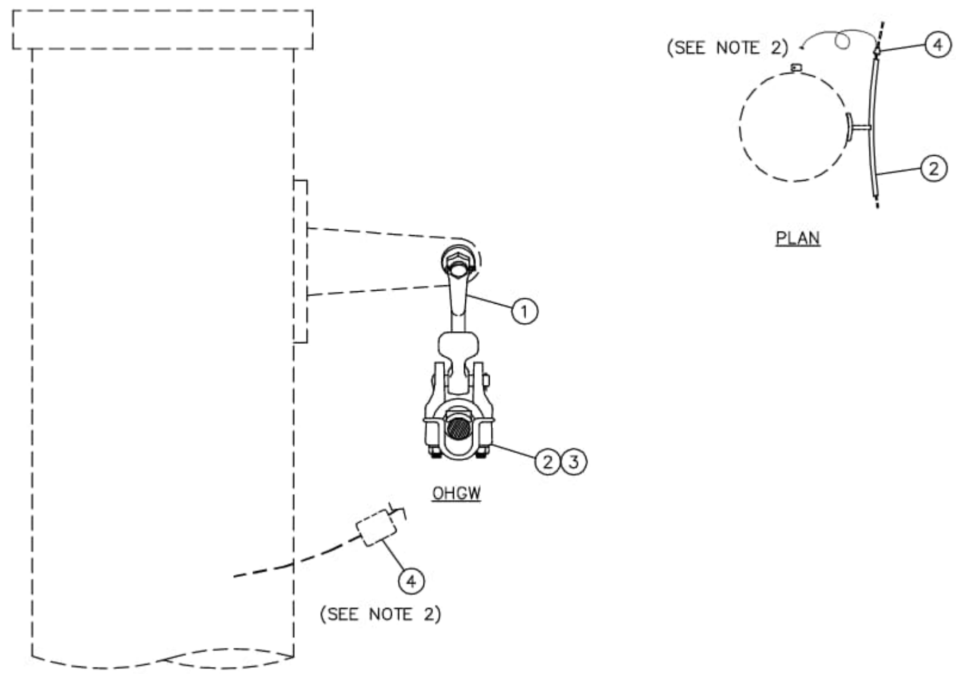
STD NO.	SCALE: NONE	
Entergy	No. TMD222A6	
	PLOT 1=8	SH. 1 OF 1

rlafon 8/15/2006 OHG-DE-XX

BILL OF MATERIALS

OHGW SUSPENSION, 0-30°

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	EN004375	BALL CLEVIS, 45 DEG Y, 30K ULT, 3/4" PIN DIA
2	1	LS9003XX	ROD, ARMOR, PREFORMED, ALUMINUM, VARIABLE CONDUCTOR SIZE
3	1	LS9008XX	CLAMP, SUSPENSION, ALUMINUM, VARIABLE WIRE SIZE, w/SOCKET EYE
4	–	LS5012XX	CONNECTOR, AMPACT



1) Item #2 and #3 are conductor dependent. These items are selected for each project and may be with or without Armor Rod.

2) For grounding detail and materials see applicable GND–XX drawing.

NO.	DATE:	REVISION	BY:	APPR:
9	8–15–06	REMOVED OPTGW OPTION, DELETED ITEM #4	RJL	
8	12–9–03	ADDED BACK GROUNDING DETAILS	ITRON	
7	5–30–03	ADDED OPTGW OPTION	ITRON	
6	2–17–03	ADDED POLE CAP AND GROUNDING NOTE 2	ITRON	
5	10–15–02	REMOVE GROUNDING DETAIL	ITRON	
4	1–18–02	MODIFIED ITEMS 1, 2 AND 3.	LSFT	
3	1–29–01	MODIFIED STOCK NUMBER LS9007XX	LSFT	
2	1–29–01	MODIFIED STOCK NUMBER LS5012XX	RMB	

OHG–SUS–XX

ENTERGY STANDARD DWG.

DESIGN APPROVAL	STANDARDS APPROVAL
SIGNED / DATE	SIGNED / DATE

OVERHEAD GROUNDWIRE SUSPENSION ASSY

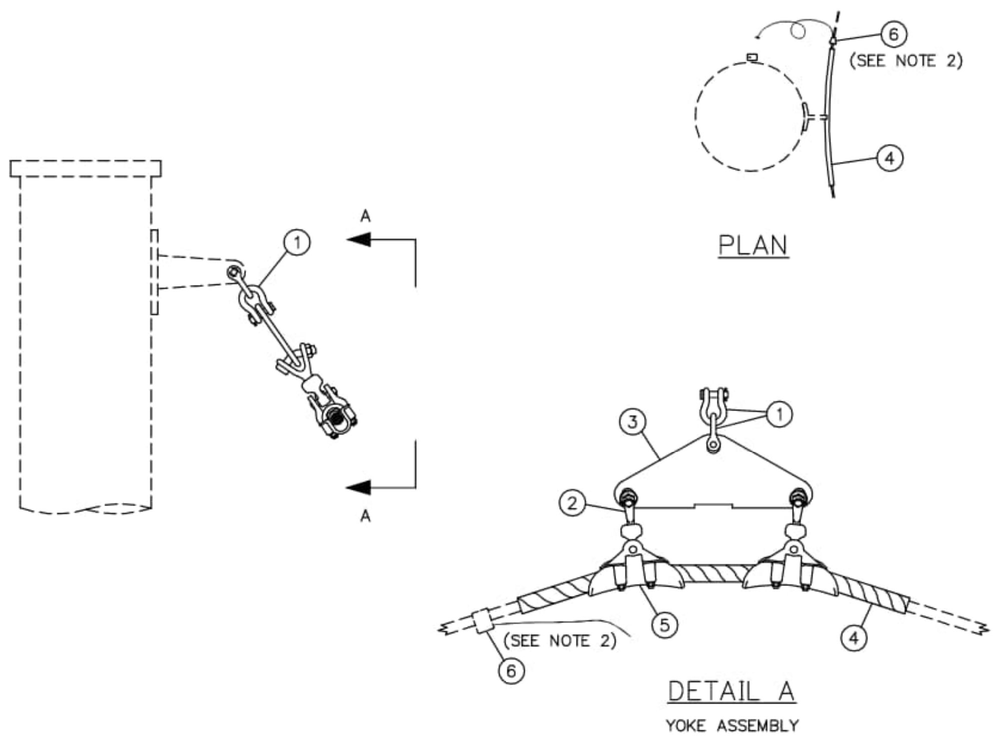
APPROVED BY:	DATE: 2–15–03
CHECKED BY:	SCALE: NONE
DRAWN BY: ITRON	ESI NO. TMD223A9

Entergy — No. OHGSUS — PLOT 1=8 — SH. 1 OF 1

BILL OF MATERIALS

OHGW SUSPENSION, 30–50° WITH YOKE PLATE

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	2	EN000492	SHACKLE, ANCHOR, 40K ULT, 3/4" PIN DIA, 2–3/4" LONG
2	2	EN004375	BALL CLEVIS, 45 DEG Y, 30K ULT, 3/4 PIN DIA
3	1	EN015676	PLATE, YOKE, DUCTILE IRON, 18" WIDTH, 30K ULT, 3/4" GALV
4	1	LS9003XX	ROD, ARMOR, PREFORMED, ALUMINUM, VARIABLE CONDUCTOR SIZE
5	2	LS9007XX	CLAMP, SUSPENSION, ALUMINUM, VARIABLE SIZE WIRE, W/SOCKET EYE
6	–	LS5012XX	CONNECTOR, AMPACT, SEE GROUND ASSEMBLY DRAWING FOR MATERIAL



1) ITEM #4 AND #5 ARE CONDUCTOR DEPENDENT. THESE ITEMS ARE SELECTED FOR EACH PROJECT AND MAY BE WITH OR WITHOUT ARMOR ROD.

2) FOR GROUNDING DETAIL AND MATERIALS SEE APPLICABLE GND–XX DRAWING.

NO.	DATE:	REVISION	BY:	APPR:
6	8–15–06	REVISED ITEM #6	RJL	
5	12–8–03	ADDED BACK GROUNDING DETAILS	ITRON	
4	2–18–03	ADDED POLE CAP AND GROUNDING NOTE	ITRON	
3	1–29–01	MODIFIED STOCK NUMBER LS9007XX	LS	
2	6–7–00	MODIFIED STOCK NUMBER LS5012XX	RMB	
1	11–16–99	ADDED AMPACT & CARTRIDGE DESCRIPION	RMB	

OHG–SUY–XX

ENTERGY STANDARD DWG.

DESIGN APPROVAL	STANDARDS APPROVAL
SIGNED / DATE	SIGNED / DATE

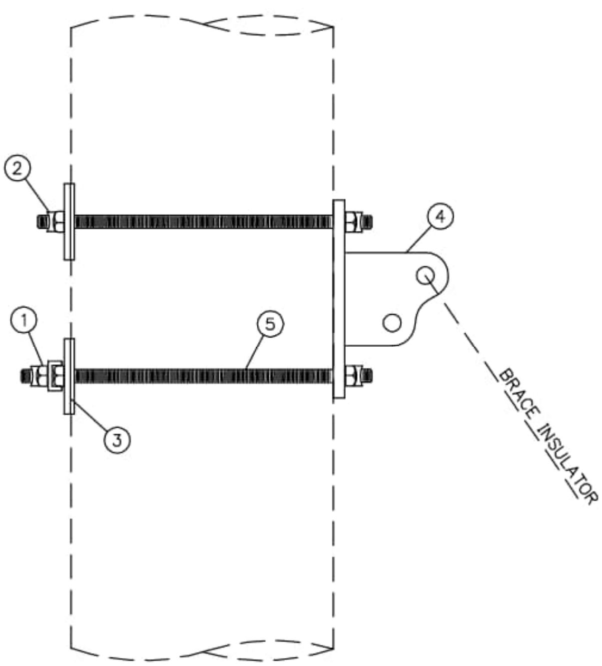
OVERHEAD GROUNDWIRE HEAVY ANGLE ASSY

APPROVED BY:	DATE: 1–29–01
CHECKED BY:	SCALE: NONE
DRAWN BY: ECSI	ESI NO. TMD224A6
Entergy	No. OHGSUY
	PLOT 1=16 SH. 1 OF 1

BILL OF MATERIALS

TEE ASSY, BRACE POST FOR STEEL WITH BOLTS

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	EN000171	NUT, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
2	4	EN000426	NUT, LOCK, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
3	2	EN003796	WASHER, SQUARE CURVED, STL, GALV, ANSI–C135.1, 7/8" BOLT, 1/4" THK, 4"x4"
4	1	EN011909	PLATE, POLE EYE, GALV STL, DBL EYE, 70K ULT, 8" BOLT SPACING
5	2	LS909XX	BOLT, DOUBLE ARMING, 7/8"xVARIABLE LENGTH, GALV, w/4 SQ NUTS



1) All Double Arming Bolts shall be trimmed to avoid conflict with guys, grounding, conductors, etc. and painted with galvanized paint.

2) Grounding Lug location may be above or below assembly depending on pole tank ground location.

TEE–B–S				
ENTERGY STANDARD DWG.				
DESIGN APPROVAL		STANDARDS APPROVAL		
SIGNED / DATE		SIGNED / DATE		
TEE ASSY (STEEL) BRACE				
APPROVED BY:	EJG	DATE:	12–19–00	
CHECKED BY:	JWS	SCALE:	NONE	
DRAWN BY:	ECSI	ESI NO.	TMD279A0	
Entergy	No.		TBS	
	PLOT	1=8	SH. 1 OF 1	

NO.	DATE:	REVISION	BY:	APPR:

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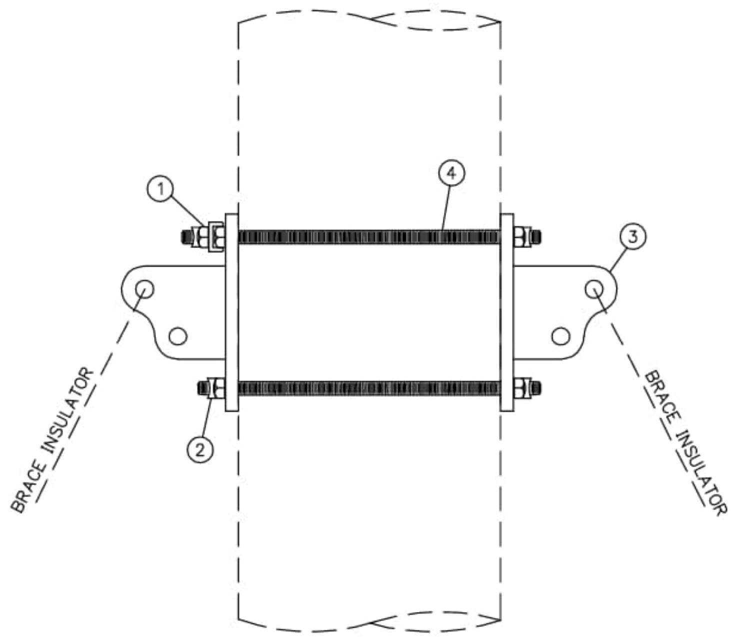
BILL OF MATERIALS

TEE ASSY, BRACE TO BRACE FOR STEEL WITH BOLTS

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	EN000171	NUT, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
2	4	EN000426	NUT, LOCK, SQUARE, STL, GALV, ANSI–C135.1, 7/8" DIA, 9 THD
3	2	EN011909	PLATE, POLE EYE, GALV STL, DBL EYE, 70K ULT, 8" BOLT SPACING
4	2	LS909XX	BOLT, DBL ARMING, 7/8"xVARIABLE LENGTH, GALV, w/4 SQ NUTS



1) All Double Arming Bolts shall be trimmed to avoid conflict with guys, grounding, conductors, etc. and painted with galvanized paint.

2) Grounding Lug location may be above or below assembly depending on pole tank ground location.

TEE–B–B–S	
ENTERGY STANDARD DWG.	
DESIGN APPROVAL	STANDARDS APPROVAL
SIGNED / DATE	SIGNED / DATE
TEE ASSY (STEEL) BRACE – BRACE	
APPROVED BY: EJG	DATE: 12–19–00
CHECKED BY: JWS	SCALE: NONE
DRAWN BY: ECSI	ESI NO. TMD280A0
Entergy	No. TBBS
PLOT 1=8	SH. 1 OF 1

NO.	DATE:	REVISION	BY:	APPR:

TEMP\AM-Work\ewilli2\M-LITAPETSP047,D-TDocs,S-Template\ESI\STANDARDS\Transmission\AMISC\TMD280A0.DWG, 6/10/2010 5:02:10 PM, ewilli2

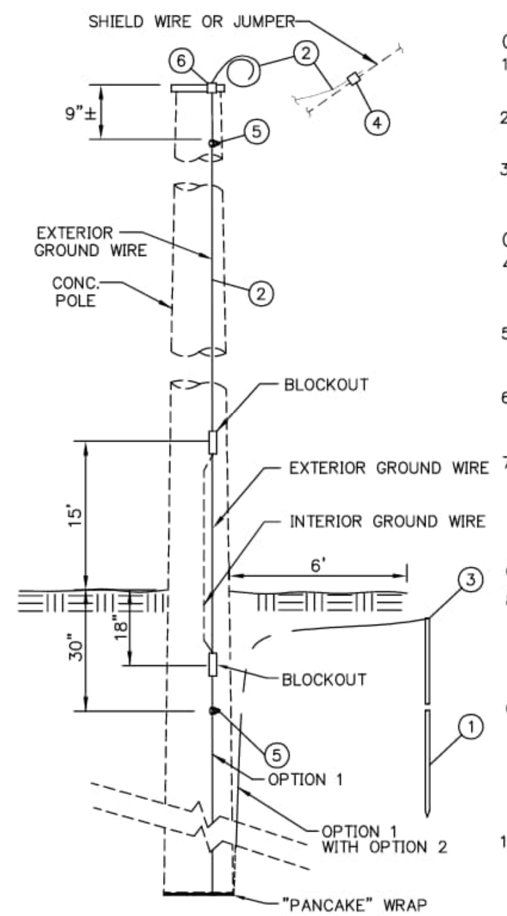
BILL OF MATERIALS – GROUNDING

ITEM	TYP. QUANTITY FOR STR. w/ 1 POLE	2POLE	3 POLE	STOCK NO.	DESCRIPTION
1	1 ***	2 ***	3 ***	EN013434	ROD, GROUND, 5/8"x8', COPPER CLAD
2	15 lb.**	30 lb.**	44 lb.**	EN000362	WIRE, COPPERWELD, #4 (.1158lbs/ft)
3	1 ***	2 ***	3 ***	EN008745	CONNECTOR, CADWELD, #4 TO TOP OF 5/8" GROUND ROD ("L")
4	1 *	2	2	LS5012XX	CONNECTOR, AMPACT, VARIABLE CONDUCTOR SIZE TO #4 COPPERWELD.
5	2	4	6	EN014861	TERMINAL, ELEC:, GROUNDING LUG, 1/2" DIA., 13THD, BRONZE
6	–	–	–	EN012112	GROUNDING CLIP SUPPLIED BY POLE MFG.

* FOR DOUBLE SHIELD WIRE, DOUBLE QTY, OF ITEM 4. ITEM 4 IS NOT USED FOR GROUNDING OPGW TO POLE. FOR OPGW SEE DRAWING TMD396.

** QUANTITY FOR ITEM 2 IS TYPICAL FOR POLES UP TO 100' ABOVE GROUND HEIGHT.

*** FOR HIGH-RESISTANCE SOILS, ADDITIONAL GROUND RODS WILL BE REQUIRED AND "T" CONNECTORS (EN009796) CAN BE USED TO FACILITATE ADDITIONAL RODS.



GENERAL

1. REFERENCE "GROUNDING AND CATHODIC PROTECTION CONSTRUCTION SPECIFICATION". TRANSMISSION LINE STANDARD T00109 FOR GROUNDING REQUIREMENTS.
2. REFERENCE DWGS. TMD222, TMD223 TMD224, AND TMD225 FOR OVERHEAD GROUND WIRE ASSEMBLIES; AND DWG. TMD390 FOR GUY TO POLE BONDING.
3. REFERENCE DWGS. TMD396, TMD397, AND TMD398 FOR OPGW GROUNDING ASSEMBLIES.

GROUNDING – NON OPGW SHIELD WIRE TO POLE

4. REMOVE POLE SUPPLIER PROVIDED GROUND CLIPS (2 ea. W/GREEN BOLTS) AND REPLACE WITH TERMINAL (GROUNDING) LUGS (ITEM 5) AS SHOWN.
5. ATTACH POLE GROUND TO POLE BY THREADING THRU TERMINAL LUGS (ITEM 5). EXTEND GROUND WIRE THRU GROUNDING CLIP (ITEM 6) AND EXTEND 5' COILED.
6. FOR SUSPENSION TYPE CONNECTION, CONNECT TO S.W. WITH AMPACT CONNECTOR (ITEM 4). APPROX. 5' BEYOND ARMOR ROD.
7. FOR DEAD END CONNECTION, CONNECT TO JUMPER WITH AMPACT CONN. (ITEM 4). PROVIDE ENOUGH WIRE TO ALLOW FREE MOVEMENT OF S.W. OR JUMPER. REMOVE EXCESS.

GROUNDING FOR ALL POLES:

8. PROVIDE GROUND WIRE BETWEEN THE TERMINALS (ITEM 5) AT TOP AND BELOW GROUND. BETWEEN THE BLOCKOUTS, THE WIRE MAY BE EXTERNAL OR INTERNAL. INTERNAL PROVIDES PROTECTION FROM THEFT AND SNAGGING BY EQUIPMENT.

OPTIONS FOR GROUNDING BELOW GROUNDLINE

(WIRES BELOW GROUNDLINE MUST CONNECT TO BOTTOM TERMINAL):

9. OPTION 1 – PROVIDE GROUND WIRE TO BUTT OF POLE AND FORM COIL OF WIRE (PANCAKE) ON CLIPS PROVIDED (GROUND RODS NOT USED).
10. OPTION 2 – PROVIDE CONTINUOUS GROUND WIRE (NO SPLICE) FROM PANCAKE TO GROUND ROD AND OR COUNTER POISE.

GND–C–EMBED

NO.	DATE:	REVISION	BY:	CHK:	APPR
5	9–6–17	REV. NOTES 2 & 3, CLARIFY MULTI–POLE BOM	ECW	CDHH	JRA
4	9–30–16	UPDATED AND REFORMATED BOM'S AND NOTES	ECW	PL	JRA
3	08–11–10	CORRECTED ITEM#'S IN NOTES	CBM	ECW	ECW
2	12–31–09	ADD GROUND ROD DIM	HDR	RCR	ECW
1	07–24–06	REVISED ITEM #5	RMB		
0	02–11–03	ISSUED	ITRON		

ENTERGY SERVICES, INC.

Transmission LineDesign Standard

GROUNDING, CONCRETE POLE, DIRECT EMBED STRUCTURAL ASSEMBLY DETAIL

STD NO. SCALE: NONE

Entergy No. TMD293A5

PLOT 1=32 SH. 1 OF 1

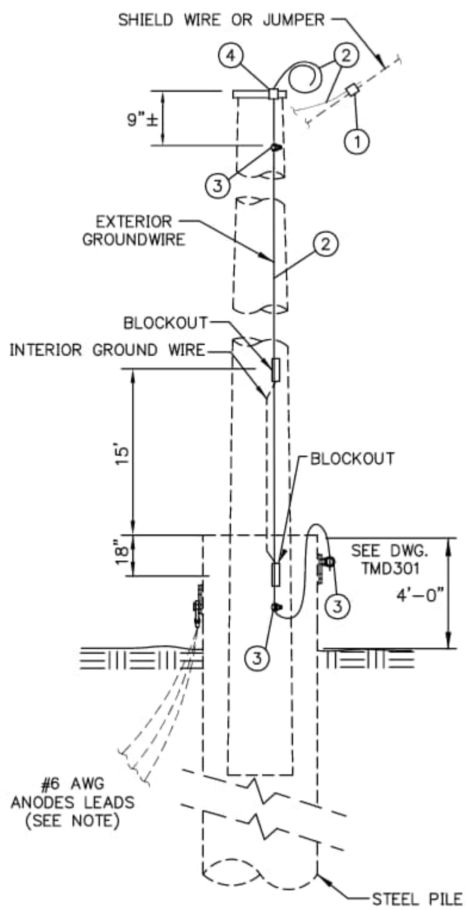
ewilli2 9/6/2017 GNDCEMB

BILL OF MATERIALS – GROUNDING

ITEM	TYP. QUANTITY FOR STR. w/ 1 POLE	2 POLES	3 POLES	STOCK NO.	DESCRIPTION
1	1 *	2	2	LS5012XX	CONNECTOR, AMPACT, VARIABLE CONDUCTOR SIZE TO #4 COPPERWELD.
2	12 lb.**	24 lb.**	35 lb.**	EN000362	WIRE, COPPERWELD, #4 (.1158lbs/ft)
3	3	6	9	EN014861	TERMINAL, ELEC:, GROUNDING LUG, 1/2" DIA., 13THD, BRONZE
4	–	–	–	EN012112	GROUNDING CLIP SUPPLIED BY POLE MFG.

* FOR DOUBLE SHIELD WIRE, DOUBLE QTY, OF ITEM 1. ITEM 1 IS NOT USED FOR GROUNDING OPGW TO POLE. FOR OPGW SEE DRAWING TMD396.

** QUANTITY FOR ITEM 2 IS TYPICAL FOR POLES UP TO 100' ABOVE GROUND HEIGHT.



GENERAL

1. REFERENCE "GROUNDING APPLICATION GUIDELINE", TRANSMISSION LINE STANDARD TO0109 FOR GROUNDING REQUIREMENTS.
2. REFERENCE DWGS. TMD222, TMD223 TMD224, AND TMD225 FOR OVERHEAD GROUND WIRE ASSEMBLIES; AND DWG. TMD390 FOR GUY TO POLE BONDING.
3. REFERENCE DWGS. TMD396, TMD397, AND TMD398 FOR OPGW GROUNDING ASSEMBLIES.

GROUNDING – NON-OPGW SHIELD WIRE TO POLE

4. REMOVE POLE SUPPLIER PROVIDED GROUND CLIPS (2ea. W/GREEN BOLTS) AND REPLACE WITH TERMINAL (GROUNDING) LUGS (ITEM 3) AS SHOWN. ±
5. ATTACH POLE GROUND TO POLE BY THREADING THRU TERMINAL LUGS. (ITEM 3). EXTEND GROUND WIRE THRU GROUNDING CLIP (ITEM 4) AND EXTEND 5' COILED.
6. FOR SUSPENSION TYPE CONNECTION, CONNECT TO S.W. WITH AMPACT CONNECTOR (ITEM 1). APPROX. 5' BEYOND ARMOR ROD.
7. FOR DEAD END CONNECTION, CONNECT TO JUMPER WITH AMPACT CONNECTOR (ITEM 1). PROVIDE ENOUGH WIRE TO ALLOW FREE MOVEMENT OF S.W. OR JUMPER. REMOVE EXCESS.

GROUNDING FOR ALL POLES

8. PROVIDE GROUND WIRE BETWEEN THE TERMINALS (ITEM 3) AT TOP OF POLE AND BELOW TOP OF PILE BETWEEN THE BLOCKOUTS, THE WIRE MAY BE EXTERNAL OR INTERNAL. INTERNAL PROVIDES PROTECTION FROM THEFT.
9. PROVIDE GROUND WIRE FROM BOTTOM TERMINAL TO GROUND NEMA PAD ON EXTERIOR OF PILE.
10. PANCAKE IS NOT RECOMMENDED ON POLE BUTT BECAUSE OF INCOMPATABLE METALS THAT MIGHT CONTRIBUTE TO CORROSION.

ANODES

11. ANODES SHALL BE CONNECTED TO THE PILE AS DETAILED ON DWG. TMD299 AND INSTALLED ON DWG. TMD299 AND TMD302. ALL MATERIAL FOR ANODE INSTALLATION IS SHOWN ON DWG. TMD299.

GND-C-PILE

NO.	DATE:	REVISION	BY:	CHK:	APPR
3	9-6-17	REV. NOTES 2 & 3, CLARIFY MULTI-POLE BOM	ECW	CDHH	JRA
2	9-30-16	UPDATED AND REFORMATED BOM'S AND NOTES	ECW	PL	JRA
1	08-15-06	REPLACE ANGLE BRACKET WITH NEMA PAD, ITEM #	RJL		
0	02-15-03	ISSUED	ITRON		

ENTERGY SERVICES, INC.

Transmission LineDesign Standard

Grounding, Concrete Pole, Steel Pile

STRUCTURAL ASSEMBLY DETAIL

STD NO. SCALE:

Entergy

No. TMD294A3

PLOT SH. OF

ewilli2 9/6/2017 GND-C-PILE

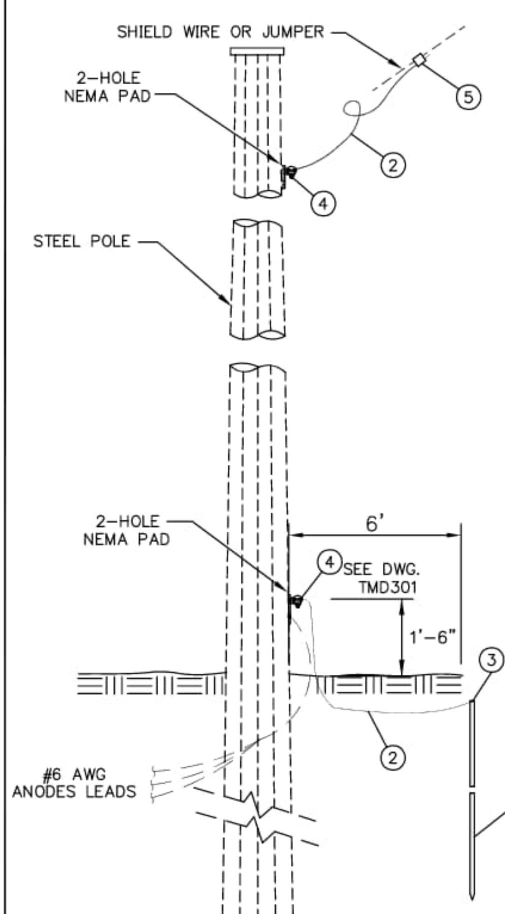
BILL OF MATERIALS – GROUNDING

	TYP. QUANTITY FOR STR. w/				
ITEM	1 POLE	2 POLES	3 POLES	STOCK NO.	DESCRIPTION
1	1**	2**	3**	EN013434	ROD, GROUND, 5/8"x8', COPPER CLAD
2	2 lb. ***	4 lb. ***	4 lb. ***	EN000362	WIRE, COPPERWELD, #4 (.1158lbs/ft)
3	1**	2**	3**	EN008745	CONNECTOR, CADWELD, #4 TO TOP OF 5/8" GROUND ROD ("L")
4	2	4	5	EN014861	TERMINAL, GROUNDING LUG, #8-2/0 TO 1/2-13, BRONZE ALLOY
5	1 *	2 *	2 *	LS5012XX	CONNECTOR, AMPACT, VARIABLE CONDUCTOR SIZE TO #4 COPPERWELD.

* FOR DOUBLE SHIELD WIRE, DOUBLE QTY. OF ITEM 5. ITEM 5 IS NOT USED FOR GROUNDING OPGW TO POLE. FOR OPGW SEE DRAWING TMD343.

** FOR HIGH-RESISTANCE SOILS, ADDITIONAL GROUND RODS WILL BE REQUIRED AND "T" CONNECTORS (EN009796) CAN BE USED TO FACILITATE ADDITIONAL RODS.

*** SOFT DRAWN COPPER (32159134) MAY BE SUBSTITUTED FOR CONNECTIONS AT TOP OF POLE ONLY.



GENERAL

1. REFERENCE "GROUNDING APPLICATION GUIDELINE", TRANSMISSION LINE STANDARD T00109 FOR GROUNDING REQUIREMENTS.
2. REFERENCE DWGS. TMD222, TMD223 TMD224, AND TMD225 FOR OVERHEAD GROUND WIRE ASSEMBLIES; AND DWG. TMD389 FOR GUY TO POLE BONDING.
3. REFERENCE DWGS. TMD389, TMD399, AND TMD402 FOR OPGW GROUNDING ASSEMBLIES.

GROUNDING – NON-OPGW SHIELD WIRE TO POLE

4. ATTACH CONNECTING GROUND WIRE TO TERMINAL LUG (ITEM 4) AS DETAILED ON DET. "A", SHT. TMD301 AND TO SHIELD WIRE OR JUMPER WITH AMPACT CONNECTOR (ITEM 5).

GROUNDING – POLE TO GROUND ROD

5. ATTACH CONNECTING GROUND WIRE TO TERMINAL LUG ON POLE AS DETAILED ON DET. "A" DWG. TMD300 AND TO GROUND ROD AS SHOWN ON THIS DWG.

ANODES

6. ANODES SHALL BE CONNECTED TO THE POLE AS DETAILED ON DET. "A" DWG. TMD300 AND INSTALLED ON DWG. TMD302. ALL MATERIAL FOR ANODE INSTALLATION IS SHOWN ON DWG. TMD300.

GND-S-EMBED

NO.	DATE:	REVISION	BY:	CHK:	APPR
4	9-6-17	REV. NOTES 2/3, CLARIFY MULTI-POLE BOM, ALT. ITEM 1	ECW	CDHH	JRA
3	9-30-16	UPDATED AND REFORMATED BOM'S AND NOTES	ECW	PL	JRA
2	12-21-09	ADDED GROUND ROD DIMENSION	HDR	RLR	ECW
1	07-24-06	REVISED ITEM #5	RMB		
0	02-11-03	ISSUED	ITRON		

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
GROUNDING, STEEL POLE, DIRECT EMBED
STRUCTURAL ASSEMBLY DETAIL

STD NO. SCALE: NONE

Entergy No. TMD295A4

PLOT 1=32 SH. 1 OF 1

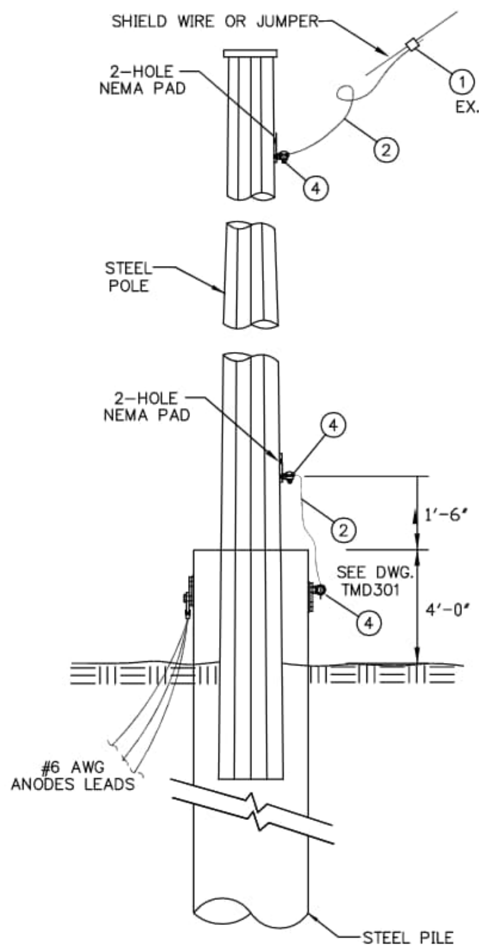
ewilli2 9/6/2017 GNDSEMB

BILL OF MATERIALS – GROUNDING

ITEM	TYP. QUANTITY FOR STR. w/ 1 POLE	2 POLES	3 POLES	STOCK NO.	DESCRIPTION
1	1 *	2	2	LS5012XX	CONNECTOR, AMPACT, VARIABLE CONDUCTOR SIZE TO #4 COPPERWELD.
2	2 lb. **	4 lb. **	6 lb. **	EN000362	WIRE, COPPERWELD, #4 (.1158lbs/ft)
3	0	0	0	–	–
4	3	6	8	EN014861	TERMINAL, GROUNDING LUG, #8–2/0 TO 1/2–13, BRONZE ALLOY

* FOR DOUBLE SHIELD WIRE, DOUBLE QTY, OF ITEM 1. ITEM 1 IS NOT USED FOR GROUNDING OPGW TO POLE. FOR OPGW SEE DRAWING TMD343.

** SOFT DRAWN COPPER (32159134) MAY BE SUBSTITUTED FOR CONNECTIONS AT TOP OF POLE ONLY.



EX. EN010109 USED FOR #4 TO 7#7 CONNECTION

GENERAL
1. REFERENCE "GROUNDING APPLICATION GUIDELINE", TRANSMISSION LINE STANDARD TO0109 FOR GROUNDING REQUIREMENTS.
2. REFERENCE DWGS. TMD222, TMD223 TMD224, AND TMD225 FOR OVERHEAD GROUND WIRE ASSEMBLIES; AND DWG. TMD389 FOR GUY TO POLE BONDING.
3. REFERENCE DWGS. TMD389, TMD399, AND TMD402 FOR OPGW GROUNDING ASSEMBLIES.

GROUNDING – NON–OPGW SHIELD WIRE TO POLE
4. ATTACH CONNECTING GROUND WIRE TO TERMINAL LUG (ITEM 4) AS DETAILED ON DET. "A", SHT. TMD301 AND TO SHIELD WIRE OR JUMPER WITH AMPACT CONNECTOR (ITEM 5).

GROUNDING – POLE TO PILE
5. ATTACH GROUND WIRE TO POLE BY THREADING THROUGH TERMINAL LUG AS SHOWN ON DET. "A", DWG. TMD301. ATTACH GROUND WIRE TO PILE WITH GROUNDING CONNECTOR AS SHOWN ON DETAIL "B", DWG. TMD301.

ANODES
6. ANODES SHALL BE CONNECTED TO THE PILE AS DETAILED ON DET. "A", DWG. TMD299 AND INSTALLED ON DWG. TMD302 AND TMD299. ALL MATERIAL FOR ANODE INSTALLATION IS SHOWN ON DWG. TMD299.

GND–S–PILE

NO.	DATE:	REVISION	BY:	CHK:	APPR:
4	9–6–17	REV. NOTES 2/3, CLARIFY MULTI–POLE BOM, ALT. ITEM 1	ECW	CDHH	JRA
3	9–30–16	UPDATED AND REFORMATED BOM'S AND NOTES	ECW	PL	JRA
2	1–5–15	DELETE ITEM 3, REV. QUAN. ITEM 4	ECW	FWM	WLS
1	7–24–06	REVISED ITEM #1	RMB		
0	02–12–03	ISSUED	ITRON		

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
Grounding, Steel Pole, Steel Pile
STRUCTURAL ASSEMBLY DETAIL

STD NO. SCALE:

Entergy No. TMD296A4

PLOT SH. OF

ewilli2 9/6/2017 GND–S–PILE

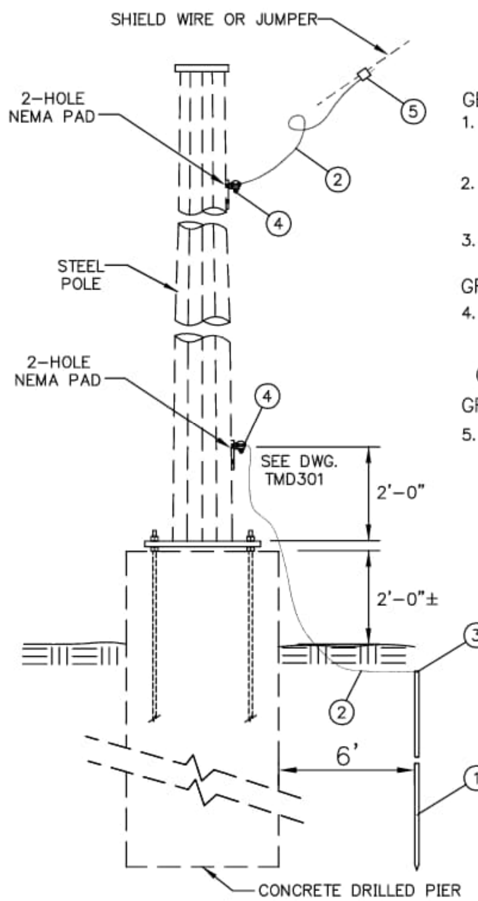
BILL OF MATERIALS – GROUNDING

ITEM	TYP. QUANTITY FOR STR. w/ 1 POLE	2 POLES	3 POLES	STOCK NO.	DESCRIPTION
1	1**	2**	3**	EN013434	ROD, GROUND, 5/8"x8', COPPER CLAD
2	2 lb. ***	4 lb. ***	6 lb. ***	EN000362	WIRE, COPPERWELD, #4 (.1158lbs/ft)
3	1**	2**	3**	EN008745	CONNECTOR, CADWELD, #4 TO TOP OF 5/8" GROUND ROD ("L")
4	2	4	5	EN014861	TERMINAL, GROUNDING LUG, #8-2/0 TO 1/2-13, BRONZE ALLOY
5	1 *	2 *	2 *	LS5012XX	CONNECTOR, AMPACT, VARIABLE CONDUCTOR SIZE TO #4 COPPERWELD.

* FOR DOUBLE SHIELD WIRE, DOUBLE QTY. OF ITEM 5. ITEM 5 IS NOT USED FOR GROUNDING OPGW TO POLE. FOR OPGW SEE DRAWING TMD343.

** FOR HIGH-RESISTANCE SOILS, ADDITIONAL GROUND RODS WILL BE REQUIRED AND "T" CONNECTORS (EN009796) CAN BE USED TO FACILITATE ADDITIONAL RODS.

*** SOFT DRAWN COPPER (32159134) MAY BE SUBSTITUTED FOR CONNECTIONS AT TOP OF POLE ONLY.



GENERAL

1. REFERENCE "GROUNDING APPLICATION GUIDELINE", TRANSMISSION LINE STANDARD T00109 FOR GROUNDING REQUIREMENTS.
2. REFERENCE DWGS. TMD222, TMD223 TMD224, AND TMD225 FOR OVERHEAD GROUND WIRE ASSEMBLIES; AND DWG. TMD389 FOR GUY TO POLE BONDING.
3. REFERENCE DWGS. TMD389, TMD399, AND TMD402 FOR OPGW GROUNDING ASSEMBLIES.

GROUNDING – NON-OPGW SHIELD WIRE TO POLE

4. ATTACH CONNECTING GROUND WIRE TO TERMINAL LUG AS DETAILED ON DET. "A", SHT. TMD301 AND TO SHIELD WIRE OR JUMPER WITH AMPACT CONNECTOR (ITEM 5).

GROUNDING – POLE TO GROUND ROD

5. ATTACH CONNECTING GROUND WIRE TO TERMINAL LUG (ITEM 4) ON POLE AS DETAILED ON DET. A DWG. TMD301 AND TO GROUND ROD AS SHOWN ON THIS DWG.

GND-S-PIER

NO.	DATE:	REVISION	BY:	CHK:	APPR
5	9-6-17	REV. NOTES 2/3, CLARIFY MULTI-POLE BOM, ALT. ITEM 1	ECW	CDHH	JRA
4	9-30-16	UPDATED AND REFORMATED BOM'S AND NOTES	ECW	PL	JRA
3	12-21-09	ADDED GROUND ROD DIMENSION	HDR	RLR	ECW
2	07-24-06	REVISED ITEM #5	RMB		
1	01-25-05	REMOVED ANODES	RMB		

ENTERGY SERVICES, INC.

Transmission LineDesign Standard

GROUNDING, STEEL POLE, CONCRETE DRILLED PIER STRUCTURAL ASSEMBLY DETAIL

STD NO. | SCALE: NONE

Entergy

No. TMD297A5

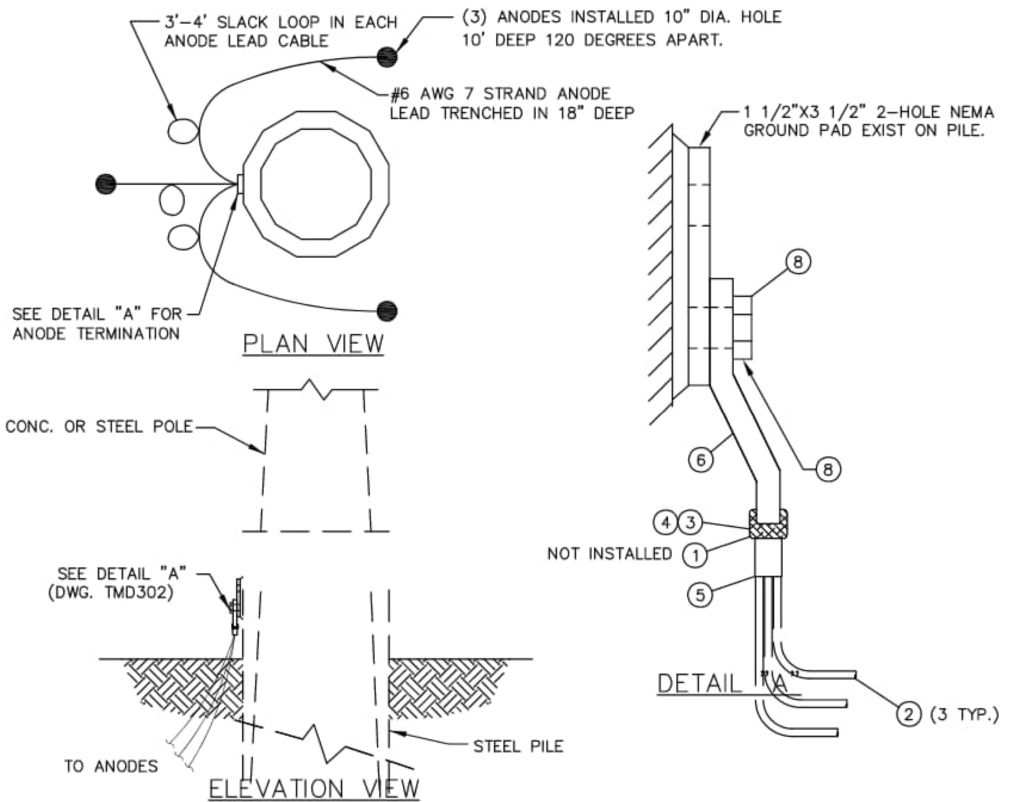
PLOT 1=32 | SH. 1 OF 1

ewilli2 9/6/2017 GND-S-PIER

BILL OF MATERIALS

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1*	EN013170	HANDLE; CLAMP, METAL; CADWELD, FITS C/E/R 3" MOLDS (1 PER 50 CONN.)
2	3	SEE DWG TMD302	ANODE, W/#6 AWG., SIZE AND MATERIAL VARY WITH INSTALLATION
3	1*	32122722	MOLD, EXOTHERMIC, 3/0 STR. CU CABLE TO 1/4"X-1 1/2"LUG, (1 PER 50 CONN.)
4	1.5	EN019108	CARTRIDGE, THERMOWELD POWDER; #90 CHARGE, CADWELD METAL
5	1	EN019109	SLEEVE: CADWELD; ADAPTER SLEEVES ARE USED TO ADAPT 1/0, 1 STR
6	1	32074891	NEMA 1-HOLE COPPER BUS BAR FOR PIPE PILE FOUNDATIONS
7	1	EN019252	COMPOUND: ELECTRICAL JOINT, INHIBITOR, GREASE LIKE, 8 OZ TUBE
8	1	0000018450	ASSEMBLY, BOLT: MACH, SS, 1/2" DIA. x 1" LG. W/NUT & WASHERS. SEE NOTE 5.

* – ORDER ONE EA. PER 50 CONNECTIONS



NOTES

1) FOR INSTALLATION OF ANODES REFER STANDARD T00109 AND DWG. TMD302.
2) COAT ALL MECHANICAL CONNECTIONS (THREADS AND BUS BAR TO NUTS) WITH ELECTRICAL JOINT INHIBITOR COMPOUND.
3) ANODE MATERIAL PROVIDED TO PROTECT STEEL PILE. SEE DWG. TMD296 FOR BONDING OF STEEL POLE TO STEEL PILE.
4) USE GALVANIZING TOUCH-UP ENOI9331 IF REQUIRED.
5) ITEM 8 HAS 1 NUT & 1 WASHER THAT WILL NOT BE USED.

NO.	DATE	REVISION	BY	CHK	APPR
3	8-21-14	REV. STK NO. ITEM 6, CHANGE MOLD ITEM 3	ECW		WLS
2	03-17-14	REVISED ITEMS 2 & 6, NOTES 1 & 3	ECW	JRA	WLS
1	08-10-06	GENERAL DRAWING REVISION	RJL		
0	2-11-03	CREATED	ITRON		

ANODE-S-PILE

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
ANODE INSTALLATION DETAILS FOR STEEL PILES
STRUCTURAL ASSEMBLY DETAIL

STD NO. T00109 SCALE: NONE

Entergy No. TMD299A3

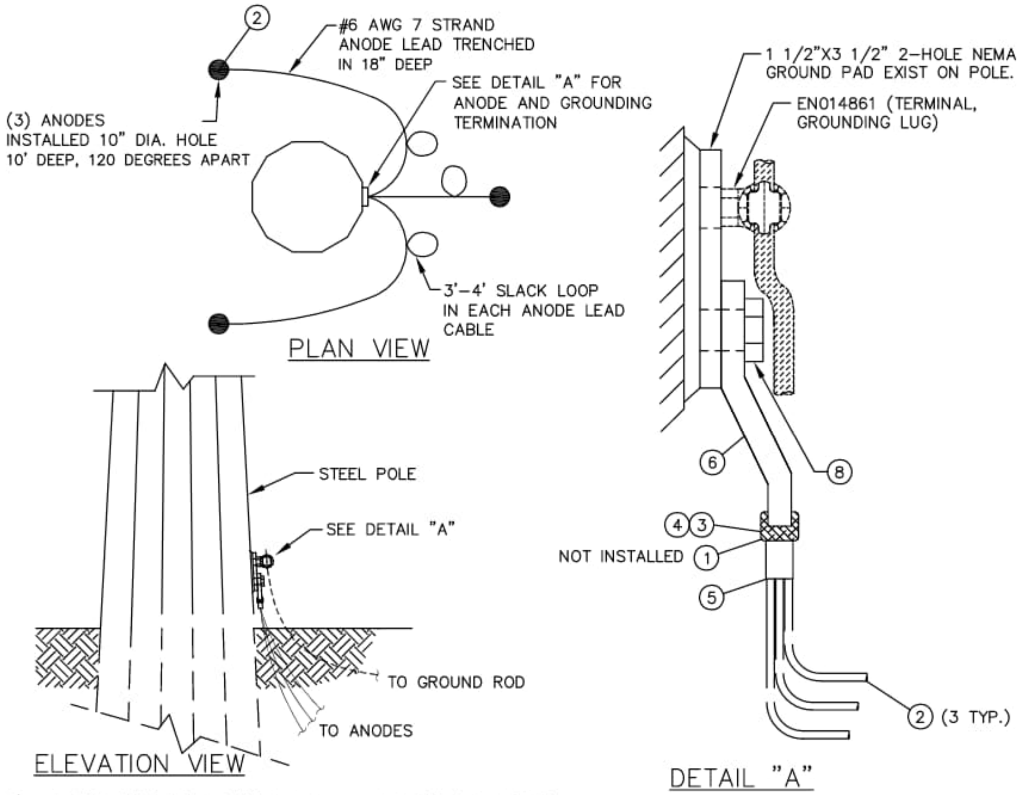
PLOT 1=32 SH. 1 OF 1

EWILLI2 8-21-14 ANODE-S-PILE

BILL OF MATERIALS

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1*	EN013170	HANDLE; CLAMP, METAL; CADWELD, FITS C/E/R 3" MOLDS (1 PER 50 CONN.)
2	3	SEE DWG. TMD302	ANODE, W/#6 AWG., SIZE AND MATERIAL VARY WITH INSTALLATION
3	1*	32122722	MOLD, EXOTHERMIC, 3/0 STR. CU CABLE TO 1/4"X-1 1/2" (1 PER 50 CONN.)
4	1.5	EN019108	CARTRIDGE, THERMOWELD POWDER; #90 CHARGE, CADWELD METAL
5	1	EN019109	SLEEVE: CADWELD; ADAPTER SLEEVES ARE USED TO ADAPT 1/0, 1 STR
6	1	32074891	NEMA 1-HOLE COPPER BUS BAR FOR PIPE PILE FOUNDATIONS
7	1	EN019252	COMPOUND: ELECTRICAL JOINT, INHIBITOR, GREASE LIKE, 8 OZ TUBE
8	1	0000018450	ASSEMBLY, BOLT: MACH, SS, 1/2" DIA. x 1" LG. W/NUT AND WASHERS. (SEE NOTE 5)

* – ORDER ONE EA. PER 50 CONNECTIONS



1) FOR INSTALLATION OF ANODES REFER TO STANDARD T00109 AND DWG. TMD302.
2) COAT ALL MECHANICAL CONNECTIONS (THREADS AND BUS BAR TO NUTS) WITH ELECTRICAL JOINT INHIBITOR COMPOUND.
3) ANODES NOT REQUIRED FOR POLES SUPPORTED ON CONC. DRILLED PIERS, OR POLES BACKFILLED WITH CONCRETE. SEE DWG. TMD296 FOR BONDING OF STEEL POLE TO STEEL PILE.
4) USE GALVANIZING TOUCH-UP EN019331 IF REQUIRED.
5) ITEM 8 HAS 1 NUT & 1 WASHER THAT WILL NOT BE USED.

ANODE-S-EMBED/PIER

NO.	DATE	REVISION	BY	CHK	APPR
4	8-21-14	REV. STK. NO. ITEM 6, CHANGE MOLD ITEM 3	ECW		WLS
3	03-17-14	REVISED ITEMS 2 & 6, NOTES 1 & 3	ECW	JRA	WLS
2	8-10-06	REVISED ITEM 8, DEL ITEM 9, ADDED NOTE 4 & 5	MDB		
1	2-15-03	UPDATE MATERIALS LIST	ITRON		
0	2-11-03	CREATED	ITRON		

EWILLI2 8-21-14

ENTERGY SERVICES, INC.

Transmission LineDesign Standard

ANODE INSTALLATION DETAILS FOR STEEL POLES

STRUCTURAL ASSEMBLY DETAIL

STD NO. T00109 SCALE: NONE

Entergy No. TMD300A4

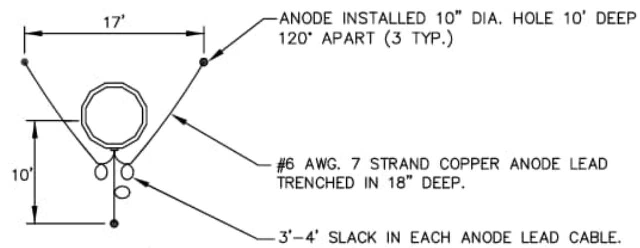
PLOT 1=32 SH. 1 OF 1

ANODE-S-EMBED/PIER

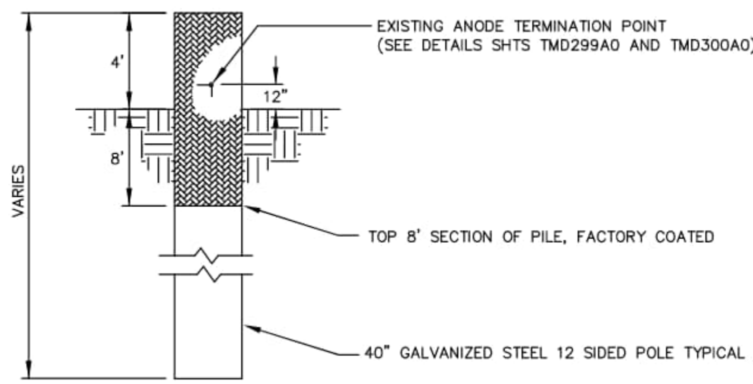
TYPICAL APPLICATION OF ANODE MATERIALS

STOCK NO.	DESCRIPTION	TYPICAL APPLICATION
EN015961 *	ANODE HIGH POTENTIAL MAGNESIUM, 32 LBS, W/ BACKFILL	RESISTIVITY > 2000 OHM-CM
EN015964	ANODE HIGH POTENTIAL MAGNESIUM, 60 LBS, W /BACKFILL	RESISTIVITY > 2000 OHM-CM
32108212 *	ANODE MAGNESIUM ALLOY, 32 LBS, W /BACKFILL	RESISTIVITY 1000 TO 2000 OHM-CM
32108213 *	ANODE MAGNESIUM ALLOY, 50 LBS, W /BACKFILL	RESISTIVITY 1000 TO 2000 OHM-CM
EN015968 *	ANODE ZINC, 30 LBS, W /BACKFILL	RESISTIVITY < 1000 OHM-CM
EN015970	ANODE ZINC, 60 LBS, W /BACKFILL	RESISTIVITY < 1000 OHM-CM
EN015972	ANODE ZINC, 120 LBS, W /BACKFILL	RESISTIVITY < 1000 OHM-CM
EN015967 *	ANODE ZINC, 30 LBS, W/O BACKFILL	RESISTIVITY < 1000 OHM-CM, VERY SOFT SOIL
EN015969	ANODE ZINC, 60 LBS, W/O BACKFILL	RESISTIVITY < 1000 OHM-CM, VERY SOFT SOIL
EN015971	ANODE ZINC, 120 LBS, W/O BACKFILL	RESISTIVITY < 1000 OHM-CM, VERY SOFT SOIL

*SEE NOTE 2.



PLAN VIEW



ELEVATION VIEW

1) ANODE WEIGHT IS WEIGHT OF METAL AND DOES NOT INCLUDE BACKFILL, LEADS, ETC., SEE INDUS FOR HANDLING WEIGHTS. LEAD NO. 6 AWG 7S, BSD COPPER THW INSULATION.
2) INSTALL IN 10"-DIA. X 10-FT HOLE. REMOVE PLASTIC BAG, LOWER IN BY LEAD; FILL SOIL AROUND AT ONCE. HOLE DEPTH MAY BE REDUCED TO 8' FOR 30#, 32# AND 50# ANODES.
3) LEAD CONNECTION AS SHOWN IN DRAWING DETAILS.

ANODE-INSTALLATION

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
CATHODIC PROTECTION FOR STEEL STRUCTURES
TYP. ANODE INSTALLATION

STD NO. T00109 | SCALE: NONE

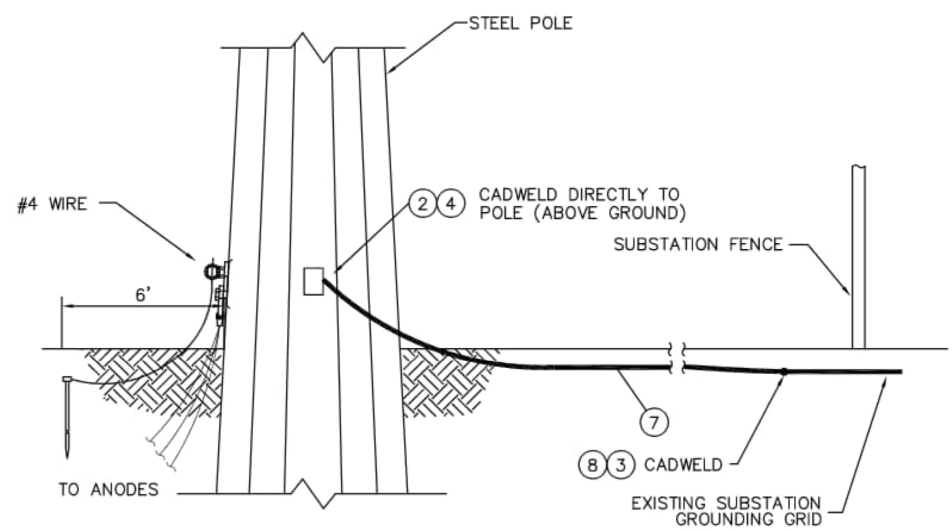
Entergy | No. TMD302A1 | PLOT 1=32 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR:
1	03-17-14	ADD ALT. MATLS; COATING DIM., REV. NOTES 1 2, & 4	ECW	JRA	WLS
0	02-15-03	DRAWING ISSUED	ITRON		

BILL OF MATERIALS

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1*	EN013170	HANDLE; CLAMP, METAL; CADWELD, FITS C/E/R 3" MOLDS (1 PER 50 CONNECTIONS)
2	1	32046156	MOLD, 19 # 9 COPPERWELD STRANDED CABLE TO VERTICAL STEEL (1 PER 10 CONN.)
3	1	EN013619	CARTRIDGE, EXOTHERMIC, #150 CHARGE, F20 ALLOY FOR Cu–TO–Cu AND Cu–TO–STEEL
4	1	EN013173	CARTRIDGE, EXOTHERMIC, #200 CHARGE, WELD METAL
5	1	EN019252	COMPOUND: ELECTRICAL JOINT, INHIBITOR, GREASE LIKE, 8 OZ TUBE
6	1	EN019331	COATING; PROTECTIVE, 1/2 PINT; TOUCHUP FOR ALL TAR EXTENDED
7	50 ft.	32127987	WIRE, CAMO COPPERWELD, ANTI–THEFT, 19 #9 AWG, 40% CONDUCTIVITY
8	1	32046150	MOLD, 19 # 9 COPPERWELD STRANDED CABLE TO 4/0 (1 PER 10 CONNECTIONS)

* ORDER ONE EACH PER 50 CONNECTIONS.



NOTES:

1. FOR INSTALLATION OF ANODES REFER TO DOCUMENT TITLED "INSTALLATION OF CATHODIC PROTECTION ANODES". SEE DWG'S. TMD300 AND TMD302 FOR ANODE INSTALLATION DETAILS AND MATERIAL.
2. COAT ALL MECHANICAL CONNECTIONS (THREADS AND BUS BAR TO NUTS) WITH ITEM #5.
3. SEE DWG. TMD295, TMD296 OR TMD297 FOR POLE GROUNDING DETAILS AND MATERIAL.
4. GROUNDING IN ACCORDANCE WITH THIS DRAWING IS FOR POLE(S) THAT SUPPORT SHIELD WIRE SPAN(S) THAT CROSS OR TERMINATE IN A SUBSTATION.
5. ITEMS 1, 2 & 8 ARE CADWELD ITEMS – NOT INSTALLED.

GND–S–POLE–SUBSTA

NO.	DATE:	REVISION	BY:	CHK:	APPR
5	1–5–15	BOM, ITEMS 2,3,4,7,& 8, ADD ITEM NUMBERS TO DRG	ECW	FWM	WLS
4	07–22–10	NOTE 4, DEL. EN019108/RENUM IT. #'S, REV. IT. 3 QUAN.	CBM	JRA	ECW
3	07–22–10	GROUND ROD DIM	CBM	ECW	ECW
2	12–17–09	REV STK CODE FOR ITEM 8	HDR	ECW	ECW
1	06–30–06	GENERAL REVISION	MDB		
0	02–11–03	ISSUED	ITRON		

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
GROUNDING, STEEL POLE TO SUBSTATION GRID
STRUCTURAL ASSEMBLY DETAIL

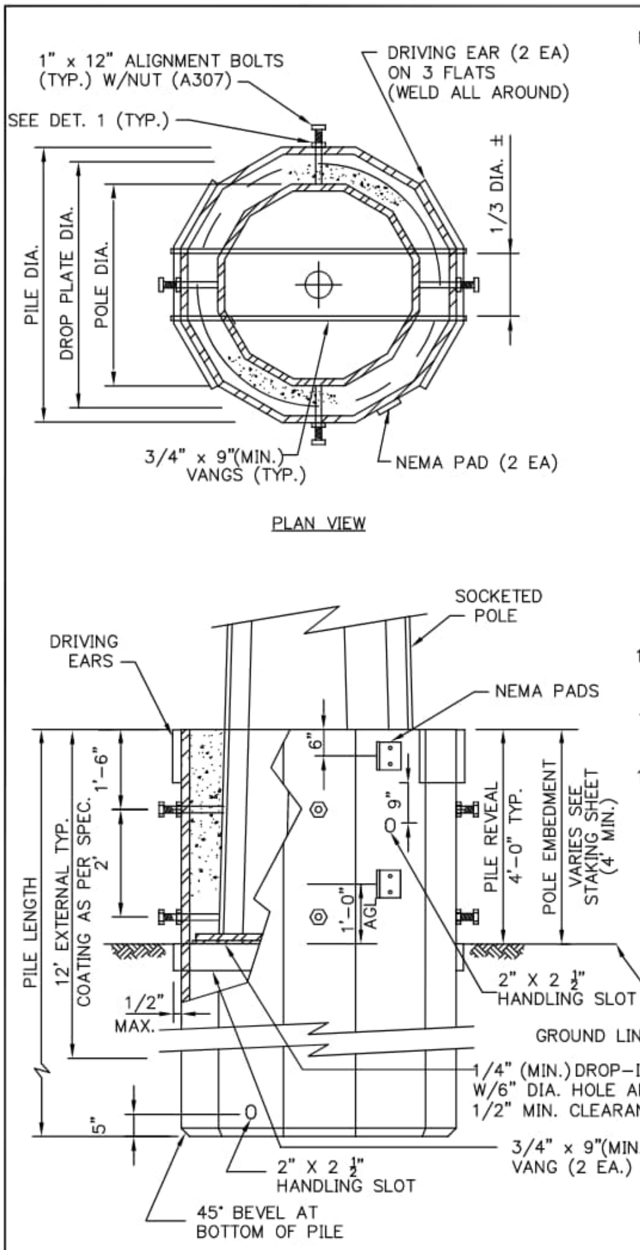
STD NO. | SCALE: NONE

No. TMD303A5

Entergy

PLOT 1=1 | SH. 1 OF 1

EWILLI2 12–15–2014 GNDSPSUB



ELEVATION VIEW
POLE/PILE BASE DETAIL

NOTES FOR STEEL PILE DETAIL–SOCKET

1. PROPOSED PILE LENGTHS AND DIA. ARE SHOWN ON THE PROJECT STAKING SHEET. PILE SUPPLIER SHALL VERIFY PROPOSED PILE THICKNESS AND DIAMETER. SEE STD # TC0301
2. POLE SUPPLIER SHALL DESIGN DRIVING EARS.
3. PILE TIP TO BE OPEN
4. PILE SUPPLIER TO PROVIDE THE FOLLOWING ACCESSORIES:
   - (8) 1"x12" ALIGNMENT BOLTS & NUTS
   - (1) 1/4" (MIN.) DROP-IN PLATE
   - (2) 1/2" TH. VIBRATING DRIVING EARS
   - (2) LARGE 2-HOLE NEMA PADS SEE STD# TC0301
   - (2) 3/4" x 9" (MIN.) VANGS
5. SUPPLIER TO COAT AS SPECIFIED IN STD# TC0301
6. NEMA PADS TO BE INSTALLED AS PER STD# TC0301 WELD ALL AROUND
7. SEE GROUNDING AND CATHODIC PROTECTION DETAILS ON STD DWG TMD297, LATEST REV.
8. PILES SHALL BE DELIVERED WITH ALIGNMENT BOLTS INSTALLED ON PILES.
9. DRAWING SHOWN FOR STEEL POLE. DETAIL FOR PILE SHALL BE THE SAME FOR CONCRETE POLES.
10. VENDOR SHALL PROVIDE HANDLING SLOTS (2 EA), TOP & BOTTOM OF PILE.
11. INSTALL PILE PER STANDARD T00107 WORK THIS DRAWING WITH STD. T00104.
12. FILL ANNULUS BETWEEN POLE AND PILE WITH CONCRETE PER STD. T00123

DETAIL 1

PILE–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard

Steel Pile, Socket Connection Details, Concrete or Steel Pole

STRUCTURAL ASSEMBLY DETAIL

NO.	DATE:	REVISION	BY:	CHK:	APPR
2	9–30–16	REV. NOTE 11 & 12, TO UPDATE REFS. TO STANDARDS	ECW	JRA	PL
1	09–15–11	COMPLETE REVISION TO MATCH VENDOR DETAILS	CBM	ECW	ECW
0		DRAWING ISSUED			

STD NO. SCALE:

Entergy — No. TMD307A2

PLOT SH. OF

ewilli2 9/12/2016 PILE–S

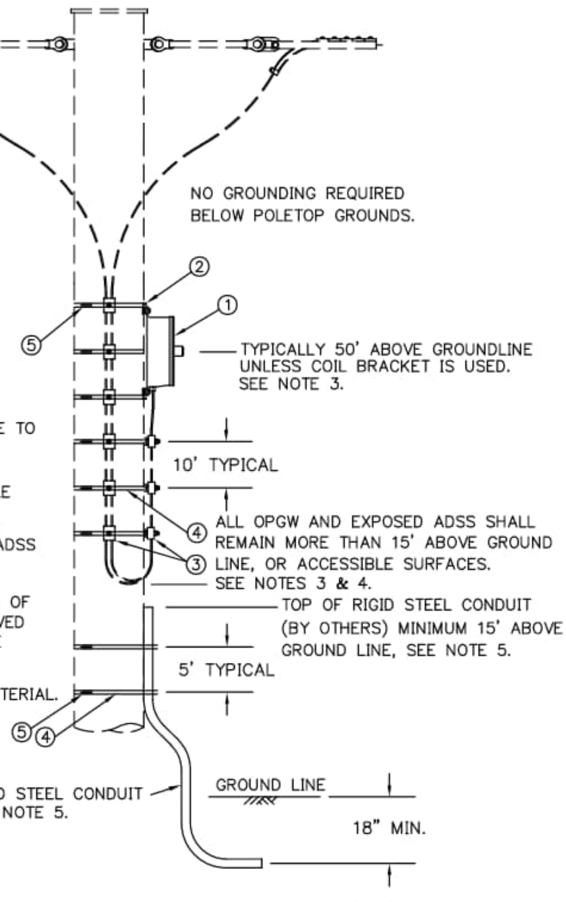
BILL OF MATERIALS

SPLICE BOX, POLE

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0032018592	SPLICE BOX: FIBER OPTIC, HOLES FOR 1/2" LAG SCREW OR BOLT
2	1	0032026880	ADAPTER, ASSEMBLY, BANDING, FIBER OPTIC, FOR 3/4 BAND, CONSISTING OF TWO ADAPTERS AND TWO 1/2" HEX BOLT ASSEMBLIES
3	12	LS9014XX	CLAMP, DOWNLEAD: FIBER OPTIC, WITH BANDING ADAPTER
4	1 ROLL	0000017124	BAND, STRAPPING, 3/4" WD X 100FT LG ROLL, STAINLESS STEEL, 201
5	12	0000017123	CLAMP, BAND: ADJUSTABLE, 3/8" X 6" BOLT, FOR 3/4" BAND

ITEM #3 AVAILABLE

57MM	0032038843	0.400–0.500" DIA
64MM	0032038845	0.501–0.600" DIA
52MM	0032038846	0.601–0.700" DIA
92MM	0032038846	0.601–0.700" DIA



NOTES

1. ITEM #3 IS OPGW DEPENDENT. THIS ITEM IS SELECTED FOR EACH PROJECT.
2. PROVIDE ENOUGH OPGW TO REACH GROUNDLINE PLUS 35 FEET.
3. IN AREAS ACCESSIBLE TO THE PUBLIC MAINTAIN 15' MINIMUM OPGW AND SPLICE BOX CLEARANCE TO GROUND OR TOP OF ACCESIBLE SURFACES'. WORK WITH DRAWING SMC005, CURRENT REV.
4. IN SUBSTATIONS OR OTHER AREAS INACCESSIBLE TO THE PUBLIC, SPLICE BOX MAY BE LOCATED 5' ABOVE THE GROUND SURFACE PROVIDED THE THE ADSS IS SECURED. MEANS OF SECURING ADSS PROVIDED BY OTHERS.
5. WHEN SPLICING TO UNDERGROUND ADSS CONTRACTOR TO PROVIDE LENGTH AS REQUIRED OF GALV. STL. 2" SCHED. 40 CONDUIT OR APPROVED EQUAL. CONDUIT TO BE FORMED AROUND POLE FOUNDATION WHERE PRESENT, AND EXTEND 1.5' MINIMUM BELOW GRADE GRADE AS SHOWN. CONDUIT TO BE SECURED WITH 3/4" STRAP MATERIAL.

NO.	DATE:	REVISION	BY:	CHK:	APPR
5	9–6–17	ADD GUARD PIPE, REV NOTES 1 – 3, ADD NOTE 4 & 5	ECW	CDHH	JRA
4	2–18–10	CHANGED UNITS FOR ITEM 4	TWF	HSK	HSK
3	12–08–09	REPLACE ITEM NOS. IN BOM	HDR	ECW	ECW
2	8–3–07	REPL. ADAPT. W/ ASSY, REV. DIA. RANGES	TWF	HSK	HSK
1	05–15–07	REVISED NAME & DESCRIPTION	TWF	HSK	HSK

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
SPLICE BOX, POLE
STRUCTURAL ASSEMBLY DETAIL

STD NO. | SCALE: NONE

Entergy | No. TMD337A5

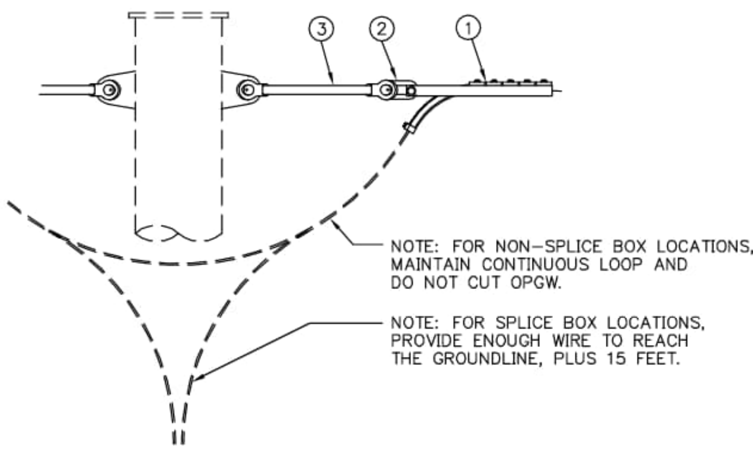
PLOT 1=1 | SH. 1 OF 1

ewilli2 9/6/2017 SB–P–XX

BILL OF MATERIALS

OVERHEAD GROUND WIRE, DEADEND, OPGW, POLE			
ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	LS9011XX	DEADEND: BOLTED STRAIN,OPGW,3/4" PIN DIA.
2	1	0000012586	LINK, CHAIN: 5/8" X 3-1/4", 40K
3	1	0000024787	CLEVIS CLEVIS: Y-Y, 30K, 3/4" PD, 15" LONG

NOTE: ILLUSTRATED AS TANGENT OR SMALL ANGLE STRUCTURE. LARGER ANGLES WILL HAVE THE PULLOFFS AT DIFFERENT ELEVATIONS BY SEVERAL INCHES.



ITEM #1 AVAILABLE

57MM	0000018531	0.465" DIA
64MM	0032018594	0.528" DIA
52MM	0032018595	0.646" DIA
92MM	0032018596	0.671" DIA

1) ITEM #1 IS OPGW DEPENDENT.
THIS ITEM IS SELECTED FOR EACH PROJECT.

OHG-DE-OP-P-XX

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
OVERHEAD GRNDWIRE, DE, OPGW, POLE
STRUCTURAL ASSEMBLY DETAIL

NO.	DATE:	REVISION	BY:	CHK:	APPR:
2	5-15-07	REVISED NOTES, NAME & DESCRIPTION	TWF	HSK	HSK
1	8-23-06	UPDATED BILL OF MATERIAL	RJL	HSK	HSK
0	X	CREATED		HSK	HSK

STD NO. | SCALE: NONE
Entergy | No. TMD339A2
PLOT 1=1 | SH. 1 OF 1

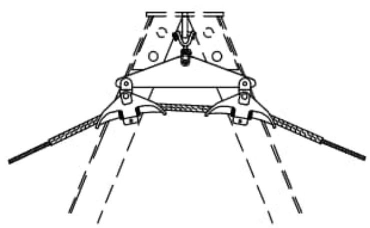
tfinc90 6/25/2007 OHG-DE-OP-P-XX

TEMP\AM-Work\ewilli2\M-LITAPETSP047,D-TDocs,S-Template\ESI\STANDARDS\Transmission\MISC\TMD339A2.dwg, 5/28/2010 5:03:37 PM, ewilli2

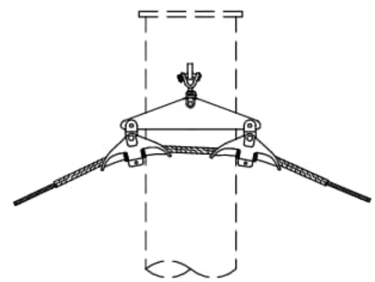
BILL OF MATERIALS

OVERHEAD GROUND WIRE, SUSP. 30–50° w/YOKE, OPGW

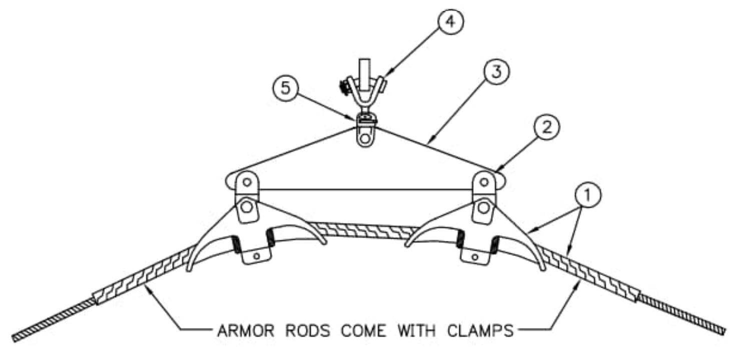
ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	LS9010XX	CLAMP, SUSP: DOUBLE (2 CLAMPS).,ALUM AL,15K,W/48" ARM RODS,30°–60° MAX. ANGLE
2	2	0032020410	CLEVIS EYE: STRAIGHT, 30K, 2–7/8" LG,1–5/8" EYE WD,3/4" EYE RAD, 5/8" PIN DIA
3	1	0032020414	PLATE, YOKE: DELTA, DUCTILE IRON, 18" LONG, 30K
4	1	0000004375	BALL CLEVIS: 45 DEG Y, 30K, 3/4" PD, CLASS 52–3/5
5	1	0000000486	SOCKET CLEVIS: STRAIGHT, 30K, 5/8" PD, CLASS 52–3/5



AS ON LATTICE TOWER



AS ON POLE



ITEM #1 AVAILABLE
57MM 0032018593 0.450–0.475" DIA
64MM 0000017195 0.528–0.555" DIA
52MM 0000017196 0.615–0.646" DIA
92MM 0000017198 0.647–0.679" DIA

OHG–SUY–OP–XX

1) ITEM #1 OPGW DEPENDENT.
THIS ITEM IS SELECTED FOR EACH PROJECT.

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
OVERHEAD GRNDWIRE, SUSP 30–50 W/YOKE, OPGW
STRUCTURAL ASSEMBLY DETAIL

NO.	DATE:	REVISION	BY:	CHK:	APPR:
2	5–15–07	REVISED NAME & DESCRIPTION. COMBINED DWGS TMD340 & TMD341	TWF	HSK	HSK
1	8–01–06	EXPANDED DESCRIPTIONS OF ITEMS 1 & 2	CDR	HSK	HSK
0	5–24–04	CREATED	.	HSK	HSK

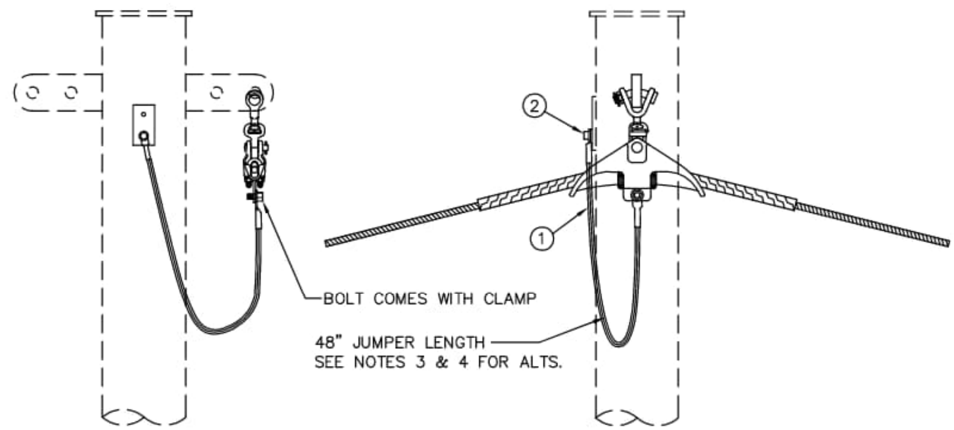
STD NO.	SCALE:	NONE
Entergy	No. TMD341A2	
	PLOT 1=1	SH. 1 OF 1

tfinc90 6/25/2007 OHG–SUY–OP–XX

BILL OF MATERIALS

GROUND, SUSP. 0-30°, OPGW, STEEL POLE

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0032033755	JUMPER, STATIC LINE: MULTI-STRANDED TINNED COPPER, 133/.0177, 48" LG, W/TERMINALS
2	1	0000018450	ASSEMBLY, BOLT: MACH, SS, HEX HEAD, 1/2" DIA. X 1" LG., WITH NUT, 2 WASHERS AND 1 BELLEVILLE WASHER



NOTES:

1. ITEM 1 CAN BE MADE UP WITH 48" OF THE WIRE (0032018798) AND TWO TERMINALS (0032031548) AND COMPRESSING THE TERMINALS WITH AN INDENT DIE.
2. ITEM 2 HAS 1 NUT AND 1 WASHER THAT WILL NOT BE NEEDED.
3. USE 72" JUMPER (0032052394) FOR APPLICATION ON POLES WITH 3 FOOT SW DAVIT ARMS.
4. SEE DRAWING TMQ207 FOR OTHER AVAILABLE JUMPER LENGTHS.

GND-SUS-OP-S

NO.	DATE	REVISION	BY	CHK	APPR
3	3-26-14	ADD NOTES 3 AND 4 WITH ALT. JUMPER LENGTHS.	ECW	JRA	WLS
2	3-15-07	REV. NOTES, NAME & DESCRIPTION. SIDE VIEW ADDED.	TWF	HSK	HSK
1	8-17-06	DELETED 1 BOLT ON CLAMP, MADE JUMPER AND TERMINALS AN ASSEMBLY	RJL	HSK	HSK
0	5-24-04	CREATED	.	HSK	HSK

ENTERGY SERVICES, INC.

Transmission LineDesign Standard

GROUND, SUSP, 0-30, OPGW, STEEL POLE

STRUCTURAL ASSEMBLY DETAIL

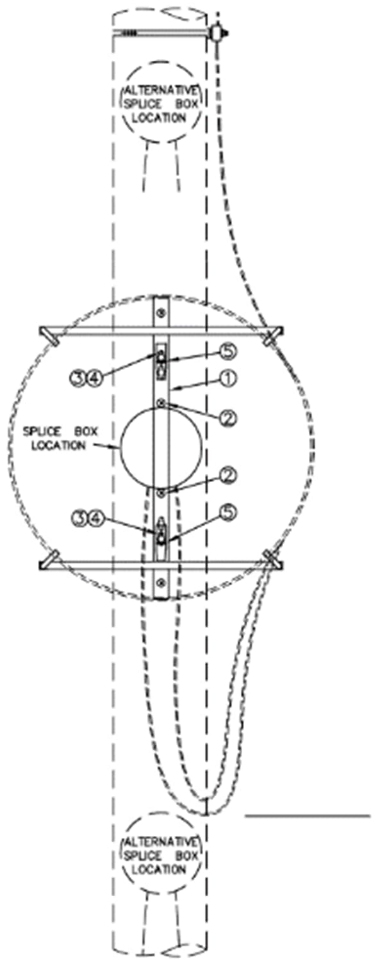
STD NO.	SCALE: NONE
Entergy	No. TMD343A3
PLOT 1=1	SH. 1 OF 1

ewilli2 3-17-14 GND-SUS-OP-S

BILL OF MATERIALS

COIL BRACKET, OPGW, STEEL POLE

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0032031230	BRACKET, COIL,: 60 INCH, GALV. STEEL, PER ENTERGY DWG TMM060A
2	2	–	BOLT, MACHINE, 1/2"–13 X 1", ALL THREAD, GALV. STEEL, NO NUT, NO WASHER (ANY SUPPLIER)
3	0	0000000139	BOLT ASSEMBLY, MACHINE: HEX HEAD, GALV. STEEL, 5/8"–11 X 1–1/2", WITH HEX NUT
4	0	0000005532	WASHER, ROUND, FLAT, 11/16" ID, 1–1/2" OD, 1/8" THICK, ASTM A153, GALV. STEEL
5	0	0032031232	PLATE, BENT, GALV. STEEL, PER ENTERGY DWG. TMM061A



NOTE #1: ASSEMBLY WILL TYPICALLY BE BANDED TO POLE USING 3/4" SS BAND MATERIAL AND ADAPTERS SUPPLIED WITH THE SPLICE BOX. ALTERNATELY, THE COIL BRACKET ASSEMBLY MAY BE SECURED WITH TWO 1/2: BOLTS (ITEM 2) USING ANY TWO OF THE FOUR THREADED RECEIVER PROVIDED.

NOTE #2: TWO EACH OF ITEMS 3 AND 5, AND FOUR OF ITEM 4 MAY ALSO BE USED TO SECURE THE COIL BRACKET ASSEMBLY TO POLES ALREADY IN SERVICE THAT WERE MANUFACTURED WITH STEP CLIPS. THE STEP CLIP DETAIL IS COMMON ON OLDER POLES MANUFACTURED BY THOMAS & BETTS.

NOTE #3: COIL BRACKET ASSEMBLY CAN BE INSTALLED WITH EITHER END UP. BEFORE TIGHTENING BOLTS, BE SURE THAT WEIGHT OF COMPONENTS PULLS THEM FIRMLY INTO SLOTTED HOLES IN THE CHANNEL.

NOTE #4: THE LOWEST PART OF THE INSTALLATION MUST BE A MINIMUM OF 15 FEET ABOVE GROUNDINE AND THE CABLE MUST COME INTO THE BOTTOM OF THE SPLICE BOX WITH NO STRAIN ON THE CONNECTORS. ADDITIONAL BANDING MAY BE NECESSARY TO GATHER AND STABILIZE THE EXCESS CABLE LENGTH TO THE BRACKET AND POLE. HOLES ARE PROVIDED IN THE END OF EACH ARM TO ACCOMMODATE CABLE TIES OR WIRE TIES.

15' MINIMUM ABOVE GL. IF ALTERNATE SPLICE BOX LOCATION IS USED, NO PART OF INSTALLATION CAN BE LOWER THAN 15' ABOVE THE GROUND LINE.

CB–OP–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
COIL BRACKET, OPGW, STEEL POLE
STRUCTURAL ASSEMBLY DETAIL

NO.	DATE	REVISION	BY	CHK	APPR
3	9–24–15	ADD REF. LINE FOR 15' MIN. DIMENSION	ECW		ECW
2	8–21–14	QTY. ITEMS 3–5, REV. NOTES 1 & 2	ECW		WLS
1	5–15–07	REVISED NAME & DESCRIPTION	TWF	HSK	HSK
0	3–30–06	CREATED	RMB	HSK	HSK

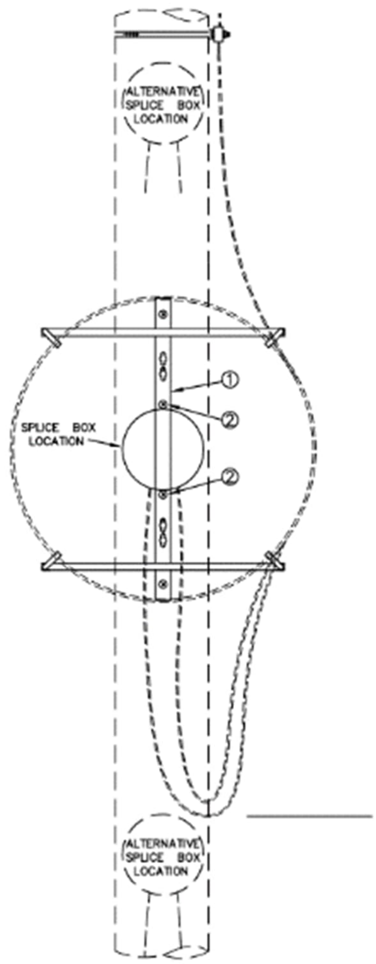
STD NO.		SCALE: NONE
Entergy	No. TMD386A3	
	PLOT 1=1	SH. 1 OF 1

EWILLI2 08–24–15 CB–OP–S

BILL OF MATERIALS

COIL BRACKET, OPGW, CONCRETE POLE

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0032031230	BRACKET, COIL,: 60 INCH, GALV. STEEL, PER ENTERGY DWG TMM060A
2	2	–	BOLT, MACHINE, 1/2"–13 X 1", ALL THREAD, GALV. STEEL, NO NUT, NO WASHER (ANY SUPPLIER)
–	–	–	–
–	–	–	–
–	–	–	–



NOTE #1: ASSEMBLY WILL TYPICALLY BE BANDED TO POLE USING 3/4" SS BAND MATERIAL AND ADAPTERS SUPPLIED WITH THE SPLICE BOX. ALTERNATELY, THE COIL BRACKET ASSEMBLY MAY BE SECURED WITH TWO 1/2: BOLTS (ITEM 2) USING ANY TWO OF THE FOUR THREADED RECEIVER PROVIDED.

NOTE #2: COIL BRACKET ASSEMBLY CAN BE INSTALLED WITH EITHER END UP. BEFORE TIGHTENING BOLTS, BE SURE THAT WEIGHT OF COMPONENTS PULLS THEM FIRMLY INTO SLOTTED HOLES IN THE CHANNEL.

NOTE #3: THE LOWEST PART OF THE INSTALLATION MUST BE A MINIMUM OF 15 FEET ABOVE GROUNDINE AND THE CABLE MUST COME INTO THE BOTTOM OF THE SPLICE BOX WITH NO STRAIN ON THE CONNECTORS. ADDITIONAL BANDING MAY BE NECESSARY TO GATHER AND STABILIZE THE EXCESS CABLE LENGTH TO THE BRACKET AND POLE. HOLES ARE PROVIDED IN THE END OF EACH ARM TO ACCOMMODATE CABLE TIES OR WIRE TIES.

15' MINIMUM ABOVE GL. IF ALTERNATE SPLICE BOX LOCATION IS USED, NO PART OF INSTALLATION CAN BE LOWER THAN 15' ABOVE THE GROUND LINE.

CB–OP–C

ENTERGY SERVICES, INC.

Transmission LineDesign Standard

COIL BRACKET, OPGW, CONCRETE POLE
STRUCTURAL ASSEMBLY DETAIL

NO.	DATE:	REVISION	BY:	CHK:	APPR:
3	9–24–15	ADD REF. LINE FOR 15' MIN. DIMENSION	ECW		ECW
2	8–21–14	REV NOTE 1, DEL ITEM 3 & NOTE 2, RENUM NOTES	ECW		WLS
1	5–15–07	REVISED NAME & DESCRIPTION	TWF	HSK	HSK
0	3–30–06	CREATED	RMB	HSK	HSK

STD NO. | SCALE: NONE

Entergy | No. TMD387A3

PLOT 1=1 | SH. 1 OF 1

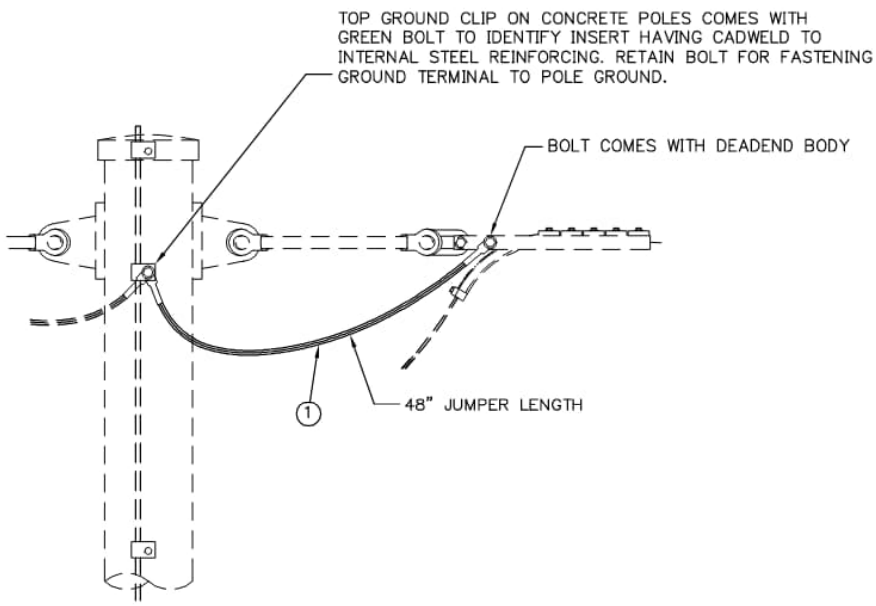
EWILLI2 8/24/15 CB–OP–C

BILL OF MATERIALS

GROUND, DEADEND, OPGW, CONCRETE POLE

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0032033755	JUMPER, STATIC LINE: MULTI-STRANDED TINNED COPPER, 133/.0177, 48" LG, W/TERMINALS

NOTE: ITEM 1 CAN BE MADE UP WITH 48" OF THE WIRE (0032018798) AND TWO TERMINALS (0032031548) AND COMPRESSING THE TERMINALS WITH AN INDENT DIE.



GND–DE–OP–C

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
GROUND, DEADEND, OPGW, CONCRETE POLE
STRUCTURAL ASSEMBLY DETAIL

STD NO. | SCALE: NONE

No. TMD398A0

Entergy | PLOT 1=1 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR:
0	5–15–07	CREATED	TWF	HSK	HSK

tfinc90 5/31/2007 GND–DE–OP–C

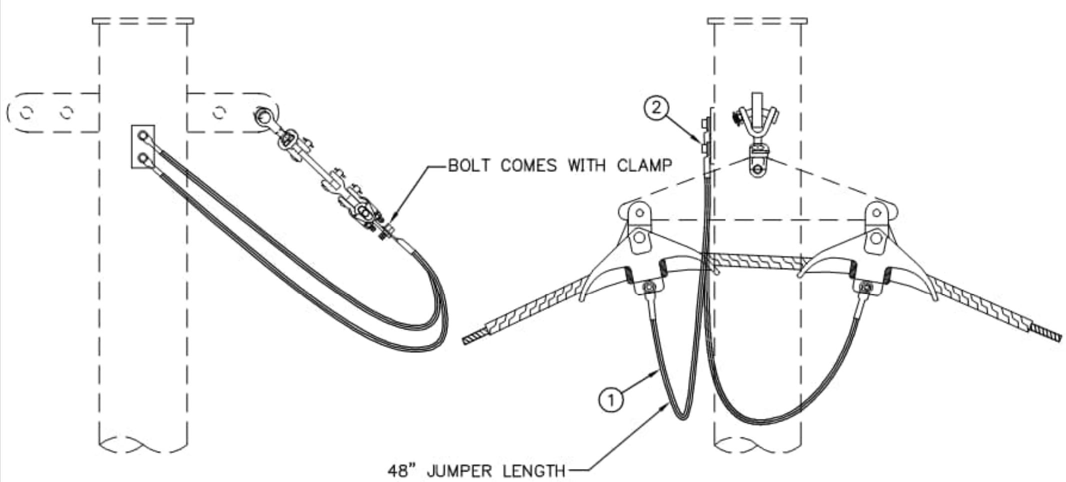
BILL OF MATERIALS

GROUND, SUSP. 30–50' w/YOKE, OPGW, STEEL POLE

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	2	0032033755	JUMPER, STATIC LINE: MULTI–STRANDED TINNED COPPER, 133/.0177, 48" LG, W/TERMINALS
2	2	0000018450	ASSEMBLY, BOLT: MACH, SS, HEX HEAD, 1/2" DIA. X 1" LG., WITH NUT, 2 WASHERS AND 1 BELLEVILLE WASHER

NOTE: ITEM 1 CAN BE MADE UP WITH 48" OF THE WIRE (0032018798) AND TWO TERMINALS (0032031548) AND COMPRESSING THE TERMINALS WITH AN INDENT DIE.

NOTE: ITEM 2 HAS 1 NUT AND 1 WASHER THAT WILL NOT BE NEEDED.



THIS DRAWING REPLACES: TMD343B1

GND–SUY–OP–S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
GROUND, SUSP, 30–50, W/YOKE, OPGW, STEEL POLE
STRUCTURAL ASSEMBLY DETAIL

STD NO. | SCALE: NONE

No. TMD399A0

PLOT 1=1 | SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	5–15–07	CREATED	TWF	HSK	HSK

tfinc90 5/31/2007 GND–SUY–OP–S

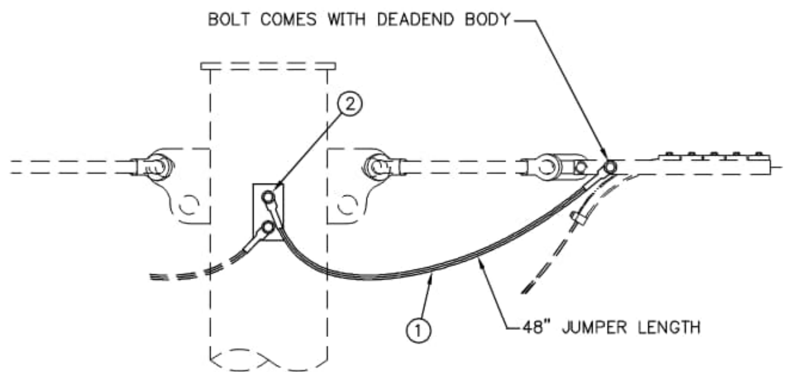
TEMP\AM-Work\ewilli2\M-LITAPETSP047,D-TDocs,S-Template\ESI\STANDARDS\Transmission\AMISC\TMD399A0.dwg, 5/28/2010 3:09:52 PM, ewilli2

BILL OF MATERIALS

GROUND, DEADEND, OPGW, STEEL POLE

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0032033755	JUMPER, STATIC LINE: MULTI-STRANDED TINNED COPPER, 133/.0177, 48" LG, W/TERMINALS
2	1	0000018450	ASSEMBLY, BOLT: MACH, SS, HEX HEAD, 1/2" DIA. X 1" LG., WITH NUT, 2 WASHERS AND 1 BELLEVILLE WASHER

NOTE: ITEM 1 CAN BE MADE UP WITH 48" OF THE WIRE (0032018798) AND TWO TERMINALS (0032031548) AND COMPRESSING THE TERMINALS WITH AN INDENT DIE.
NOTE: ITEM 2 HAS 1 NUT AND 1 WASHER THAT WILL NOT BE NEEDED.



THIS DRAWING REPLACES: TMD343C1

GND-DE-OP-S

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
GROUND, DEADEND, OPGW, STEEL POLE
STRUCTURAL ASSEMBLY DETAIL

STD NO.	SCALE: NONE
Entergy	No. TMD402A0
PLOT 1=1	SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR:
0	5-15-07	CREATED	TWF	HSK	HSK

tfinc90 5/31/2007 GND-DE-OP-S

-TEMP\AM-Work\ewilli2\M-LITAPETSP047,D-TDocs,S-Template\ESI\STANDARDS\Transmission\AMISC\TMD402A0.dwg, 5/25/2010 1:27:23 PM, ewilli2

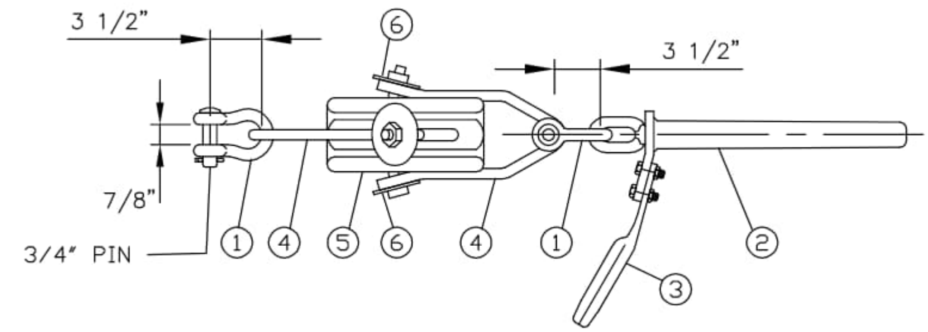
LIST OF COMPONENTS

QUAN ASSY	ITEM NO.	DESCRIPTION	CATALOG NUMBER	ULTIMATE STRENGTH	BASIC MATERIAL	WEIGHT EACH	ENTERGY STOCK NO.
2	1	ANCHOR SHACKLE	ASH-66A	50,000 #	F.S.	2.25 #	EN000491
1	2	COMPRESSION D.E.	*SEE TABLE*	–	ALUM.		*SEE TABLE*
1	3	TERMINAL	*SEE TABLE*	–	ALUM.		*SEE TABLE*
2	4	SHACKLE	J732	12,400#	F.S.	1.46#	**
1	5	INSULATOR	L506	20,000#	PORC.	2.90#	**
4	6	CLIPPED WASHER	ASM-7159-1		STL		**

** ITEMS 4, 5 & 6 ARE COMBINED INTO ENTERGY STOCK CODE 000125-308.
INDUS CAT ID 000125-308 LISTS THESE ITEMS AS ONE MACLEAN PART NUMBER XXXXXXXXXXXXX.

FOR COMPRESSION DEAD END

SHIELD WIRE	SHIELD WIRE DIA.	COMP. D.E. (ITEM 2)	ENTERGY STOCK NO.	TERMINAL (ITEM 3)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.
7 NO. 7 ALUMOWELD	0.433	V3816.484T	EN005526	3916.484	EN028530	C-7687-OGWDE1-2
3/8" EHS STEEL	0.375	V3814.386T	EN005530	3914.386	EN028531	C-7687-OGWDE2-2
7/16" EHS STEEL	0.438	V3816.453T	EN005531	3914.386	EN028531	C-7687-OGWDE4-2



GENERAL NOTES

THESE INSULATED SHIELD WIRE ASSEMBLIES ARE PRIMARILY FOR SELECT LINES OF THE 500KV SYSTEM WHERE POWER LOSSES ARE A CONCERN. THERE MAY BE OTHER APPLICATIONS ON THE LOWER VOLTAGE LINES WHERE RADIO INTERFERENCE IS A CONCERN.

OHG-DEJB-XX

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
OVERHEAD GROUNDWIRE DEADEND ASSY
STRUCTURAL ASSEMBLY DETAIL

STD NO. | SCALE: NONE

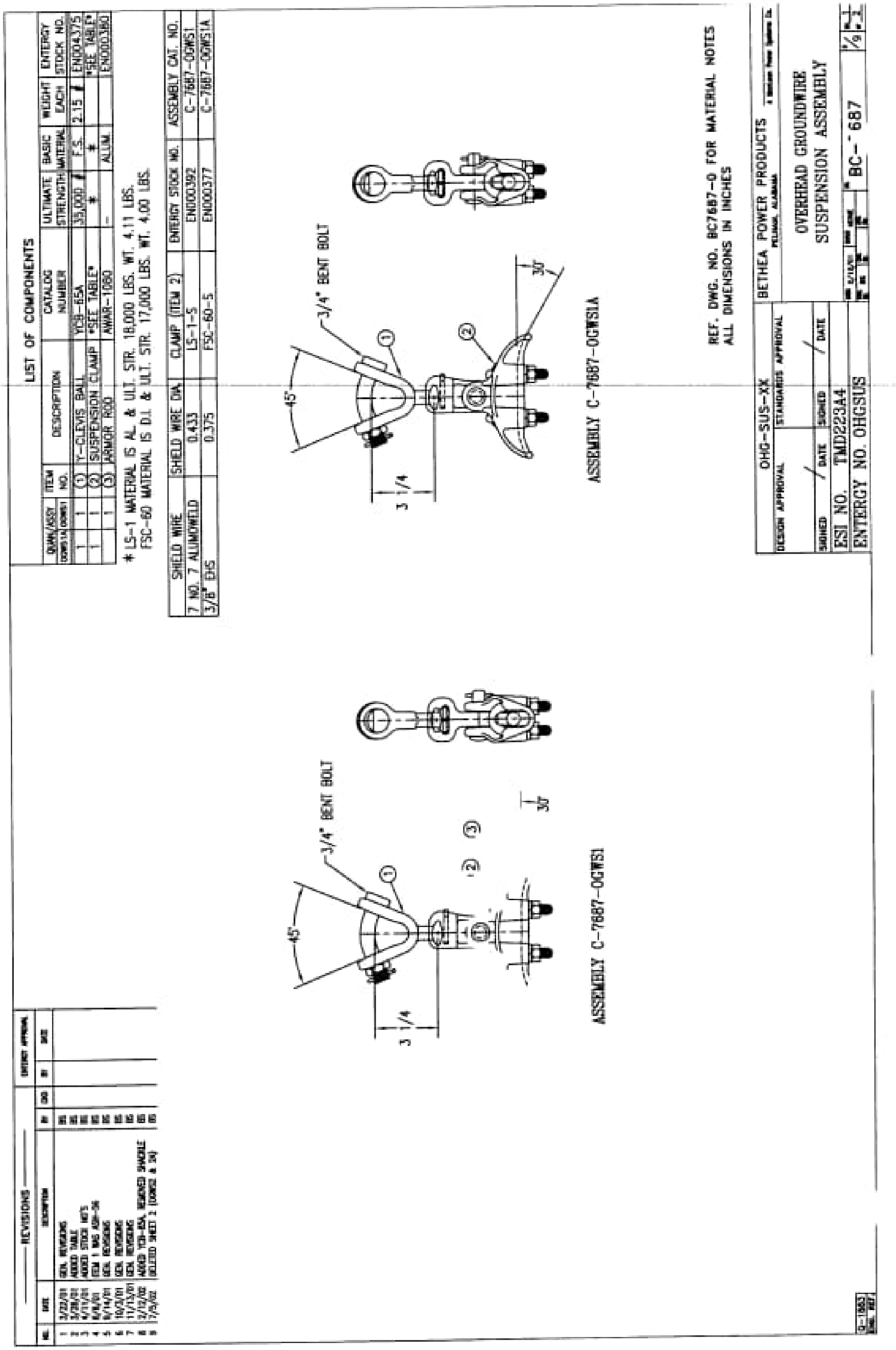
No. TMD403A0

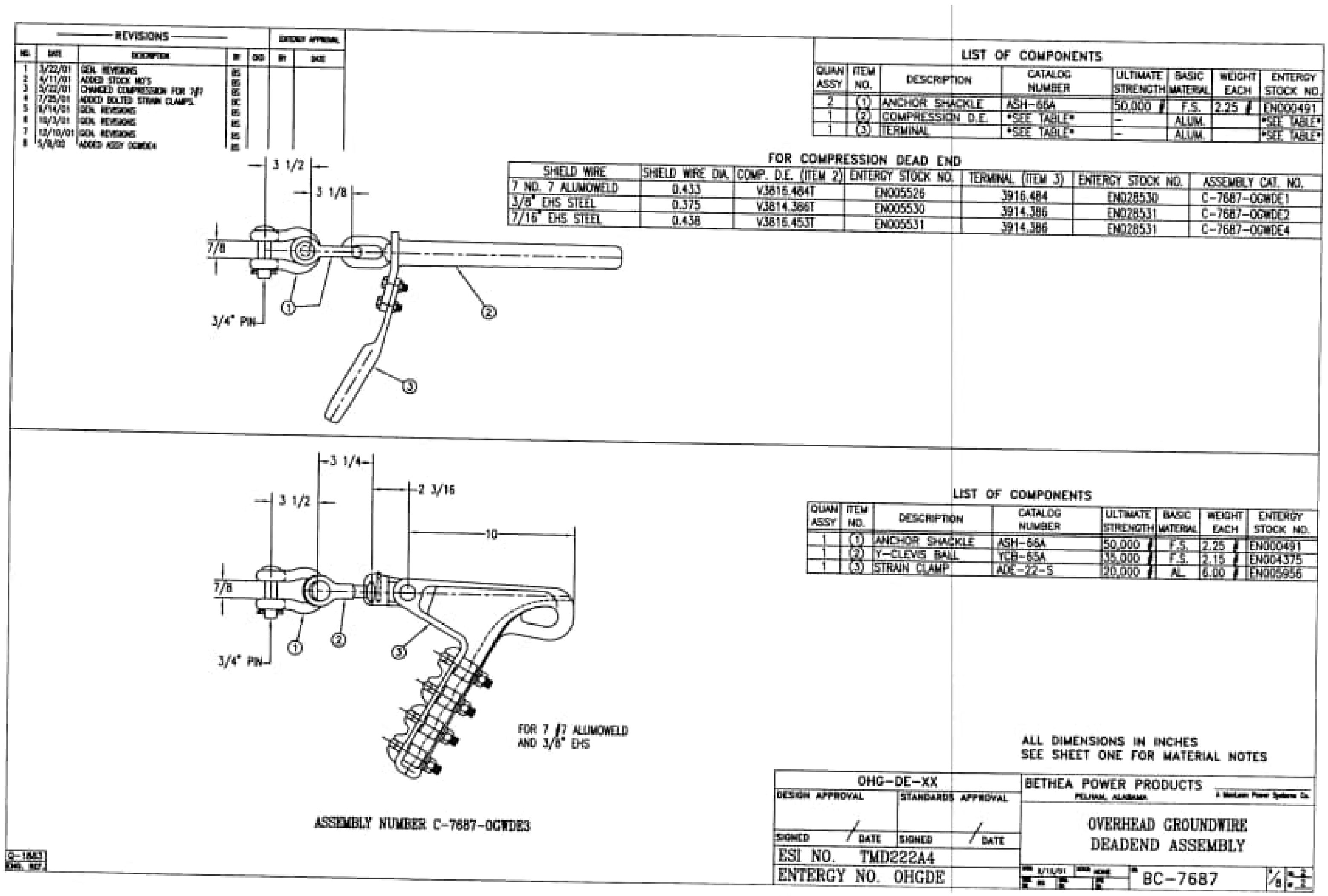
Entergy | PLOT 1=1 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	12-13-07	CREATED	TWF	HSK	HSK

tfinc90 12/20/2007 OHG-DEJB-XX

T:EMP\AM-Work\ewilli2\M-LITAPETSP047,D-TDocs,S-Template\ESI\STANDARDS\Transmission\AMISC\TMD403A0.dwg, 5/28/2010 5:05:01 PM, ewilli2


LIST OF COMPONENTS
* LS-1 MATERIAL IS AL. & ULT. STR. 18,000 LBS. WT. 4.11 LBS.
FSC-60 MATERIAL IS D.I. & ULT. STR. 17,000 LBS. WT. 4.00 LBS.
3/4" BENT BOLT
45°
3 1/4
30°
ASSEMBLY C-7687-OGWS1A
ASSEMBLY C-7687-OGWS1
REF. DWG. NO. BC7687-0 FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES
BETHEA POWER PRODUCTS
OVERHEAD GROUNDWIRE
SUSPENSION ASSEMBLY
OHG-SUS-XX
ESI NO. TMD223A4
ENTERGY NO. OHGSUS
BC-687
REVISIONS



REVISIONS

NO.	DATE	DESCRIPTION	BY
1	3/22/01	GEN. REVISIONS	BS
2	4/11/01	ADDED STOCK NO'S	BS
3	5/22/01	CHANGED COMPRESSION FOR 7/7	BS
4	7/25/01	ADDED BOLTED STRAIN CLAMPS	BC
5	8/14/01	GEN. REVISIONS	BS
6	10/3/01	GEN. REVISIONS	BS
7	12/10/01	GEN. REVISIONS	BS
8	5/8/02	ADDED ASSY OGWDE4	BS

LIST OF COMPONENTS

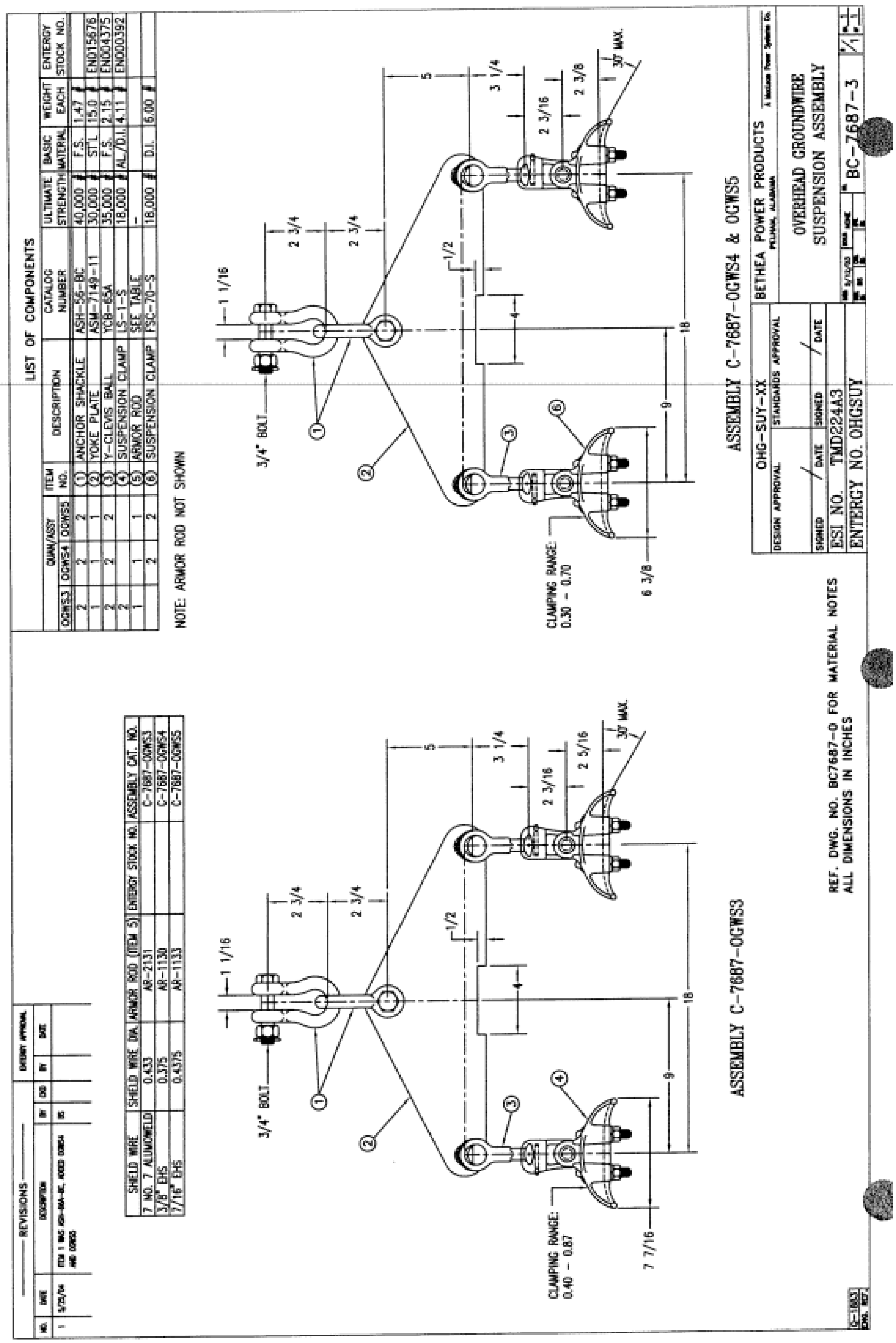
QUAN ASSY	ITEM NO.	DESCRIPTION	CATALOG NUMBER	ULTIMATE STRENGTH	BASIC MATERIAL	WEIGHT EACH	ENTERGY STOCK NO.
2	1	ANCHOR SHACKLE	ASH-66A	50,000 #	F.S.	2.25 #	EN000491
1	2	COMPRESSION D.E.	*SEE TABLE*	–	ALUM.		*SEE TABLE*
1	3	TERMINAL	*SEE TABLE*	–	ALUM.		*SEE TABLE*

FOR COMPRESSION DEAD END

SHIELD WIRE	SHIELD WIRE DIA.	COMP. D.E. (ITEM 2)	ENTERGY STOCK NO.	TERMINAL (ITEM 3)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.
7 NO. 7 ALUMOWELD	0.433	V3816.484T	EN005526	3916.484	EN028530	C-7687-OGWDE1
3/8" EHS STEEL	0.375	V3814.386T	EN005530	3914.386	EN028531	C-7687-OGWDE2
7/16" EHS STEEL	0.438	V3816.453T	EN005531	3914.386	EN028531	C-7687-OGWDE4

LIST OF COMPONENTS

QUAN ASSY	ITEM NO.	DESCRIPTION	CATALOG NUMBER	ULTIMATE STRENGTH	BASIC MATERIAL	WEIGHT EACH	ENTERGY STOCK NO.
1	1	ANCHOR SHACKLE	ASH-66A	50,000 #	F.S.	2.25 #	EN000491
1	2	Y-CLEVIS BALL	YCB-65A	35,000 #	F.S.	2.15 #	EN004375
1	3	STRAIN CLAMP	ADE-22-5	20,000 #	AL.	6.00 #	EN005956


LIST OF COMPONENTS
QUAN/ASSY OGWS3 OGWS4 OGWS5 | ITEM NO. | DESCRIPTION | CATALOG NUMBER | ULTIMATE STRENGTH | BASIC MATERIAL | WEIGHT EACH | ENTERGY STOCK NO.
2 2 2 | (1) | ANCHOR SHACKLE | ASH-56-BC | 40,000 # | F.S. | 1.47 #
1 1 1 | (2) | YOKE PLATE | ASM-7149-11 | 30,000 # | STL | 15.0 # | EN015676
2 2 2 | (3) | Y-CLEVIS BALL | YCB-65A | 35,000 # | F.S. | 2.15 # | EN004375
2 | (4) | SUSPENSION CLAMP | IS-1-S | 18,000 # | AL/D.I. | 4.11 # | EN000392
1 1 1 | (5) | ARMOR ROD | SEE TABLE | -
2 2 | (6) | SUSPENSION CLAMP | FSC-70-S | 18,000 # | D.I. | 6.00 #
NOTE: ARMOR ROD NOT SHOWN
SHIELD WIRE | SHIELD WIRE DIA. | ARMOR ROD (ITEM 5) | ENTERGY STOCK NO. | ASSEMBLY CAT. NO.
7 NO. 7 ALUMOWELD | 0.433 | AR-2131 | | C-7687-OGWS3
3/8" EHS | 0.375 | AR-1130 | | C-7687-OGWS4
7/16" EHS | 0.4375 | AR-1133 | | C-7687-OGWS5
REVISIONS
3/4" BOLT
CLAMPING RANGE: 0.30 - 0.70
CLAMPING RANGE: 0.40 - 0.87
30° MAX.
ASSEMBLY C-7687-OGWS4 & OGWS5
ASSEMBLY C-7687-OGWS3
REF. DWG. NO. BC7687-0 FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES
OHG-SUY-XX
DESIGN APPROVAL
STANDARDS APPROVAL
ESI NO. TMD224A3
ENTERGY NO. OHGSUY
BETHEA POWER PRODUCTS
PELHAM, ALABAMA
OVERHEAD GROUNDWIRE SUSPENSION ASSEMBLY
BC-7687-3

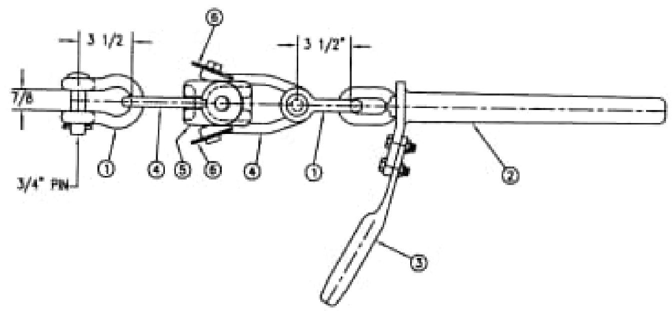
MPS REVISIONS					ENTERGY APPROVAL	
NO.	DATE	DESCRIPTION	BY	CKD	BY	DATE

LIST OF COMPONENTS

QUAN ASSY	ITEM NO.	DESCRIPTION	CATALOG NUMBER	ULTIMATE STRENGTH	BASIC MATERIAL	WEIGHT EACH	ENTERGY STOCK NO.
2	1	ANCHOR SHACKLE	ASH-66A	50,000 #	F.S.	2.25 #	EN000491
1	2	COMPRESSION D.E.	*SEE TABLE*	–	ALUM.		*SEE TABLE*
1	3	TERMINAL	*SEE TABLE*	–	ALUM.		*SEE TABLE*
2	4	SHACKLE	J732	12,400 #	F.S.	1.46 #	
1	5	INSULATOR	L506	20,000 #	PORC.	2.90 #	
4	6	CLIPPED WASHER	ASM-7159-1		STL		

FOR COMPRESSION DEAD END

SHIELD WIRE	SHIELD WIRE DIA.	COMP. D.E. (ITEM 2)	ENTERGY STOCK NO.	TERMINAL (ITEM 3)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.
7 NO. 7 ALUMOWELD	0.433	V3816.484T	EN005526	3916.484	EN028530	C-7687-OGWDE1-2
3/8" EHS STEEL	0.375	V3814.386T	EN005530	3914.386	EN028531	C-7687-OGWDE2-2
7/16" EHS STEEL	0.438	V3816.453T	EN005531	3914.386	EN028531	C-7687-OGWDE4-2



REF. DWG. NO. BC7687-0 FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES

ENTERGY REV.	REVISION DATE
A	10/12/07

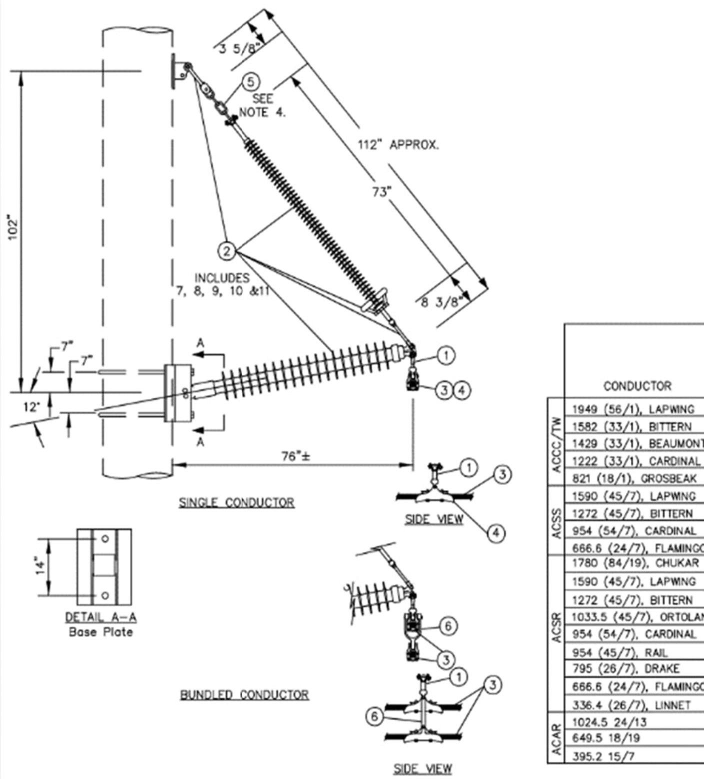
ESI NO.

MACLEAN POWER SYSTEMS
A MacLean-Fogg Company

OVERHEAD GROUNDWIRE
DEADEND ASSEMBLY

BC-7687-4

Q-1883



BILL OF MATERIALS

INSULATOR, 2-1/2" POLYMER BRACED LINE POST ASSY FOR 161kV

ITEM	QUANTITY BP2	QUANTITY BP2B	STOCK NO.	DESCRIPTION	CATALOG NUMBER	BASIC MATERIAL	WEIGHT EA. (LBS)	ULTIMATE STRENGTH (LBS)
1	1	1	EN004375	BALL CLEVIS, 45 DEG Y, 35K ULT, 3/4" PIN DIA	YCB-65A	F.S.	2.2	35,000
2	1	1	EN016149	INSULATOR, 2-1/2" BRACED POST ASSY., POLYMER, HIGH POL. 161kV	B291076AL48A	COMP.	101.3	SEE APP. CURVE
3	1	2	LS9003XX	ROD, ARMOR, PREFORMED, ALUMINUM, VARIABLE CONDUCTOR SIZE	SEE TABLE	ALUM.	VARIES	N/A
4	1	–	LS9008XX	CLAMP, SUSPENSION, ALUMINUM, VARIABLE WIRE SIZE, w/SOCKET EYE	SEE TABLE	AL./D.I.	VARIES	25,000 U.N.O.
5	1	1	32103543	CHAIN, STL., GALVANIZED, 1.78 LBS/FT., 72.4K ULT.	CH5/8-14LK	F.S.	4.2	72,400
6	–	1	LS915XX	YOKE, VERTICAL DOUBLE BUNDLE, VARIABLE SIZE WIRE	SEE TABLE	AL./D.I.	VARIES	25,000 *
7	–	–	EN018718	Y-CLEVIS-CLEVIS (SUPPLIED AS PART OF ITEM 2)	YCC-65	D.I.	1.4	30,000
8	–	–	EN014858	INSULATOR, SUSPENSION (SUPPLIED AS PART OF ITEM 2)	S148073VA12	COMP	16.5	25,000
9	–	–	EN018719	SOCKET CLEVIS H. L. (SUPPLIED AS PART OF ITEM 2)	SCHL-55	D.I.	3.3	30,000
10	–	–	EN014853	INSULATOR, POST (SUPPLIED AS PART OF ITEM 2)	H291076VX18	COMP.	75.2	SEE APP. CURVE
11	–	–	EN020681	RING, CORONA (SUPPLIED AS PART OF ITEM 8)	CR16/18-8	ALUM.	4.0	N/A

* ULTIMATE STRENGTH FOR BUNDLING YOKE IS AS AN ASSEMBLY

	CONDUCTOR	ARMOR ROD (ITEM 3)	ENTERGY STK. NO.	DIA. W/ARM. ROD (IN)	TAKEOFF ANGLE (DEG)	FOR SINGLE CONDUCTORS (BP2) CLAMP (ITEM 4)	ENTERGY STOCK NO.	ASSEMBLY CATALOG. NO.	FOR BUNDLED CONDUCTORS (BP2B) BUNDLE (ITEM 6)	ENTERGY STOCK NO.	ASSEMBLY CATALOG. NO.
ACCC/TW	1949 (56/1), LAPWING	INCL.	w/ ITEM 4	–	–	TLS-0119SE **	32068997	NOT YET ASSIGNED	N/A	N/A	N/A
	1582 (33/1), BITTERN	INCL.	w/ ITEM 4	–	–	TLS-0115SE **	32068992	NOT YET ASSIGNED	N/A	N/A	N/A
	1429 (33/1), BEAUMONT	INCL.	w/ ITEM 4	–	–	AGS-5138	32082067	NOT YET ASSIGNED	N/A	N/A	N/A
	1222 (33/1), CARDINAL	INCL.	w/ ITEM 4	–	–	TLS-0111SE	32068988	NOT YET ASSIGNED	N/A	N/A	N/A
	821 (18/1), GROSBEAK	INCL.	w/ ITEM 4	–	–	TLS-0105SE	32068975	NOT YET ASSIGNED	N/A	N/A	N/A
ACSS	1590 (45/7), LAPWING	AR-0163	EN000381	2.376	15	ACFS-244-20-20-S	EN028863	C-8083-BP2-4	VBACFS-18-2442020-S	32127531	NOT YET ASSIGNED
	1272 (45/7), BITTERN	AR-0146	EN000155	2.075	15	ACFS-214-20-20-S	32020718	C-8083-BP2-3	VBACFS-18-2142020-S	32127530	NOT YET ASSIGNED
	954 (54/7), CARDINAL	AR-0143	EN000383	1.816	15	ACFS-186-20-20-S	32020716	C-8083-BP2-2	VBACFS-18-1862020-S	32127529	NOT YET ASSIGNED
	666.6 (24/7), FLAMINGO	AR-0137	EN000384	1.620	15	ACFS-175-20-20-S	32020714	C-8083-BP2-1	VBACFS-18-1752020-S	32127527	NOT YET ASSIGNED
ACSR	1780 (84/19), CHUKAR	AR-0165	EN000382	2.474	30	ASC-11-S	EN004361	C-7648-BP2-6	VBLS-12-1111-S	EN027828	C-7648-BP2B-6
	1590 (45/7), LAPWING	AR-0163	EN000381	2.376	30	ASC-11-S	EN004361	C-7648-BP2-5	VBLS-12-1111-S	EN027828	C-7648-BP2B-5
	1272 (45/7), BITTERN	AR-0146	EN000155	2.075	30	ASC-11-S	EN004361	C-7648-BP2-4	VBLS-12-1111-S	EN027828	C-7648-BP2B-4
	1033.5 (45/7), ORTOLAN	AR-0144	EN027807	1.943	30	LS-9-S	EN028185	C-7648-BP2-8	VBLS-12-99-S	EN027829	C-7648-BP2B-8
	954 (54/7), CARDINAL	AR-0143	EN000383	1.816	30	LS-8-S	EN000370	C-7648-BP2-3	VBLS-12-88-S	EN027825	C-7648-BP2B-3
	954 (45/7), RAIL	AR-0143	EN000383	1.785	30	LS-8-S	EN000370	C-7648-BP2-3	VBLS-12-88-S	EN027825	C-7648-BP2B-3
	795 (26/7), DRAKE	AR-0141	EN004005	1.728	30	LS-8-S	EN000370	C-7648-BP2-7	VBLS-12-88-S	EN027825	C-7648-BP2B-7
	666.6 (24/7), FLAMINGO	AR-0137	EN000384	1.620	30	LS-8-S	EN000370	C-7648-BP2-2	VBLS-12-88-S	EN027825	C-7648-BP2B-2
	336.4 (26/7), LINNET	AR-0130	EN000385	1.129	30	LS-6-S	EN000158	C-7648-BP2-1	VBLS-12-66-S	EN027823	C-7648-BP2B-1
ACAR	1024.5 24/13	AR-0143	EN000383	1.785	30	LS-8-S	EN000370	C-7648-BP2-3	VBLS-12-88-S	EN027825	C-7648-BP2B-3
	649.5 18/19	AR-0135	EN027806	1.428	30	LS-6-S	EN000158	C-7648-BP2-9	VBLS-12-66-S	EN027823	C-7648-BP2B-9
	395.2 15/7	AR-0130	EN000385	1.129	30	LS-6-S	EN000158	C-7648-BP2-1	VBLS-12-66-S	EN027823	C-7648-BP2B-1

** ULTIMATE STRENGTH FOR TLS-0115SE & TLS-0119SE is 30k

NOTES

1) Item #3, #4 and #6 are conductor dependent. Clamps/Bundles are selected for each project and are Applied with Armor Rod, unless specifically noted.
2) For Braced Post individual part details see Insulator Mfg. drawings.
3) Note that 161 kV Insulators are used for 115 & 138 kV applications.
4) Stock Code shown is for Pre-Cut Chain. Alternately, cut 14 links from EN018717.
5) For Hardware Only, add suffix "-H" to Assembly Cat. No. Ex.: C-7648-BP2-1-H

MIN ELEC./MECH. SPECIFICATIONS

MIN. ELECTRICAL VALUES	
60 HZ DRY FO	590 KV
60 HZ WET FO	510 KV
CIFO+	960 KV
CIFO-	1020 KV
STRIKE DIST.	60 IN.
LEAKAGE DIST.	140 IN.
MIN. MECHANICAL STRENGTH	
MDCL	SUBMIT CURVES

NO.	DATE:	REVISION	BY:	CHK:	APPR:
–					
11	11-20-14	ADDED ELEC. SPECS. & COND. HARDWARE TABLE, RE-DRAWN 11X17	ECW	JPM	MLS
10	05-08-12	ADD STK CODE FOR PRE-CUT CHAIN; CORR. BUNDLE	ECW	HSK	RLR
9	10-19-11	CORRECT ANGLE DIMENSION OF POST	ECW	JRA	RLR
8	05-05-11	UPDATE ITEM 2 DESC., ADD CORONA RING	CBM	ECW	ECW
7	07-20-10	REV. BOM ITEM 5	CBM	ECW	ECW
6	05-28-03	ADDED DIMENSION	ITRON		

BP2-161-XX

ENTERGY SERVICES, INC.

TRANSMISSION LINE STANDARD
POLYMER ASSY., 2 1/2" BRACED POST
161 kV INSULATOR ASSEMBLY DETAIL

STD NO. TA0504 | SCALE: N. T. S.

Entergy | No. TCA200A11

PLOT 1:24 | SH. 1 OF 1

BP2-161-XX

10-15-2014

ewlll2

INSULATOR, SUSPENSION, 25,000 LBS.

S1. SPECIFIED MECHANICAL LOAD (SML) = 25,000 LBS. ROUTINE TEST LOAD (RTL) = 12,500 LBS

S2. END FITTING TO BE A Y-CLEVIS, AND AN ANSI CLASS 52-5 BALL

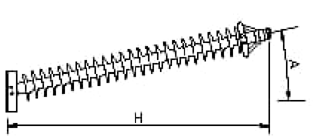
S3. 115 kV AND 138 kV INSULATORS USED FOR MAINTENANCE ONLY. FOR NEW CONSTRUCTION 161 kV INSULATORS WILL BE USED IN 115 kV, 138 kV, AND 161 kV APPLICATIONS.

S4. USED IN SUSPENSION APPLICATIONS AND AS PART OF BRACED POST ASSEMBLIES.

INSULATOR, LINE POST, 2.5" ROD DIA.

AND

INSULATOR, LINE POST, 3" ROD DIA.



P1. SPECIFIED TENSILE LOAD (STL) = 15,000 LBS. (2.5" ROD) 20,000 LBS. (3" ROD)

P2. MAX. DESIGN CANTILEVER LOAD (MDCL) AND SPECIFIED CANTILEVER LOAD (SCL) TO BE NOTED ON VENDOR DRAWINGS AND CATALOG SHEETS.

P3. LINE END FITTING TO BE A DROP TONGUE FITTING WITH 2 HOLES FOR 3/4" PIN.

P4. STRUCTURE END FITTING TO BE BENDABLE GAIN BASE. BASE SHALL HAVE A HOLE AT THE TOP AND A SLOT AT THE BOTTOM SIZED FOR 7/8" BOLTS AT 14" CENTERS.

P5. 115 kV AND 138 kV INSULATORS USED FOR MAINTENANCE ONLY. FOR NEW CONSTRUCTION 161 kV INSULATORS WILL BE USED IN 115 kV, 138 kV, AND 161 kV APPLICATIONS.

P6. USED IN LINE POST AND JUMPER APPLICATIONS, AND AS PART OF BRACED POST ASSEMBLIES.

P7. 3" POST GENERALLY APPLIED FOR HEAVY ZONE LOADING, ANGLE STRUCTURES, AND/OR WHERE CONDUCTOR SWING IS TOWARD THE POLE.

INSULATOR, DEADEND, 50,000 LBS.

D1. SPECIFIED MECHANICAL LOAD (SML) = 50,000 LBS. ROUTINE TEST LOAD (RTL) = 25,000 LBS

D2. END FITTINGS ARE TO BE OVAL/CHAIN EYE AND ANSI CLASS 52-11 BALL

D3. 115 kV AND 138 kV INSULATORS USED FOR MAINTENANCE ONLY. FOR NEW CONSTRUCTION 161 kV INSULATORS WILL BE USED IN 115 kV, 138 kV, AND 161 kV APPLICATIONS.

D4. USED IN DEADEND AND HEAVY SUSPENSION APPLICATIONS.

INSULATOR ASSY., BRACED LINE POST, 2.5" ROD DIA.

AND

INSULATOR ASSY., BRACED LINE POST, 3" ROD DIA.

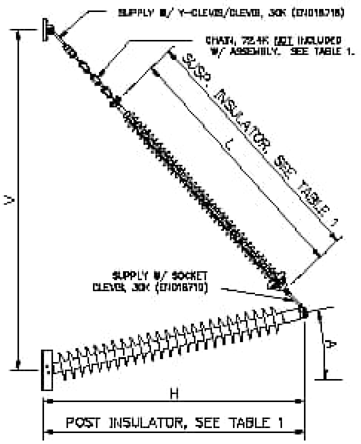


TABLE 1

	V (kV)	ENTERGY STOCK CODE: BP ASSY	SUSP.	POST	CHAIN
2.5"	115	EN018144	EN014860	EN014788	32103533
	138	EN018146	EN014859	EN014852	32103538
	161	EN018149	EN014858	EN014853	32103543
	230	EN018150	EN014864	EN014789	32103540
3"	115	EN018145	EN014860	EN014794	32103531
	138	EN018148	EN014859	EN014795	32103533
	161	EN018151	EN014858	EN014797	32103539
	230	EN018153	EN014864	EN014803	32103541

B1. EACH ASSEMBLY SHALL CONSIST OF ONE (1) 25K SUSPENSION INSULATOR; ONE (1) POST INSULATOR; ONE (1) 30K Y-CLEVIS/CLEVIS CONNECTOR; AND ONE (1) 30K SOCKET/CLEVIS CONNECTOR.

B2. SUSPENSION AND POST INSULATORS TO MAKE THE ASSEMBLY SHALL MEET ALL OTHER APPLICABLE REQUIREMENTS OF THIS DRAWING.

B3. ALLOWABLE LOADING DIAGRAMS FOR THE COMBINED ASSEMBLY SHALL ACCOMPANY THE VENDOR CATALOG SHEETS/DRAWINGS.

B4. 138 kV INSULATOR ASSEMBLY USED FOR MAINTENANCE ONLY. 115 kV INSULATOR ASSEMBLY USED FOR MAINTENANCE AND NEW 69 kV APPLICATIONS. FOR NEW CONSTRUCTION 161 kV INSULATORS WILL BE USED IN 115 kV, 138 kV, AND 161 kV APPLICATIONS.

B6. 3" BRACED POST GENERALLY APPLIED FOR HEAVY ZONE LOADING, ANGLE STRUCTURES, AND/OR WHERE CONDUCTOR SWING IS TOWARD THE POLE.

SPECIFIED DIMENSIONS AND ELECTRICAL CHARACTERISTICS

TYPE	LINE VOLTAGE (kV)	ENTERGY STOCK CODE	DESIGN DIMENSIONS H	V	L	A	PORC. BELL EQUIVALENT	MIN. LEAK. DIST. (IN.)	MIN. DRY ARC DIST. (IN.)	MIN. 60-Hz F. O. (kV) DRY	WET	MIN. CRITICAL IMPULSE F. O. (kV) POS.	NEG.	CORONA RING REQUIRED LINE END	STRUCT. END
SUSPENSION INSULATOR 25,000 LB.	69	EN014865	–	–	48"	–	8	90	36	380	330	640	660	–	–
	115	EN014860	–	–	60"	–	8	120	48	485	410	750	835	–	–
	138	EN014859	–	–	66"	–	9	130	56	540	480	805	955	–	–
	161	EN014858	–	–	75"	–	10	140	60	590	510	900	1020	6" VOL	–
	230	EN014864	–	–	90"	–	13	200	77	735	640	1240	1270	6" VOL	–
POST INSULATOR, 2.5" ROD DIA.	69	EN014787	45"	–	–	12"	8	90	36	380	330	640	660	–	–
	115	EN014788	60"	–	–	12"	8	120	48	485	410	750	835	–	–
	138	EN014852	66"	–	–	12"	9	130	56	540	480	805	955	–	–
	161	EN014853	76"	–	–	12"	10	140	60	590	510	900	1020	–	–
	230	EN014789	94"	–	–	12"	13	200	77	735	640	1240	1270	–	–
	161	32094117	76"	–	–	12"	10	140	60	590	510	900	1020	6" VOL	–
	230	32094118	94"	–	–	12"	13	200	77	735	640	1240	1270	6" VOL	–
POST INSULATOR, 3" ROD DIA.	69	EN014793	45"	–	–	17"	8	90	36	380	330	640	660	–	–
	115	EN014794	60"	–	–	17"	8	120	48	485	410	750	835	–	–
	138	EN014795	66"	–	–	17"	9	130	56	540	480	805	955	–	–
	161	EN014797	76"	–	–	17"	10	140	60	590	510	900	1020	–	–
	230	EN014803	94"	–	–	17"	13	200	77	735	640	1240	1270	–	–
	161	32094119	76"	–	–	17"	10	140	60	590	510	900	1020	6" VOL	–
	230	32094115	94"	–	–	17"	13	200	77	735	640	1240	1270	6" VOL	–
DEADEND INSULATOR 50,000 LB.	69	EN014806	–	–	64"	–	8	120	49	485	430	830	880	–	–
	115	EN014807	–	–	75"	–	10	135	61	590	510	970	1025	–	–
	138	EN014809	–	–	80"	–	11	170	68	640	560	1045	1105	–	–
	161	EN014810	–	–	92"	–	12	185	78	690	620	1215	1275	6" VOL	–
	230	EN018124	–	–	104"	–	16	220	88	830	700	1380	1440	6" VOL	–
BRACED POST INSULATOR 2.5" ROD DIA.	115	EN018144	60"	80"	60"	12"	8	120	48	485	410	750	835	–	–
	138	EN018146	66"	90"	66"	12"	9	130	56	540	480	865	930	–	–
	161	EN018149	76"	102"	73"	12"	10	140	60	590	510	960	1020	6" VOL	–
	230	EN018150	94"	120"	90"	12"	13	200	77	735	640	1240	1270	6" VOL	–
BRACED POST INSULATOR 3" ROD DIA.	115	EN018143	60"	80"	60"	17"	8	120	48	485	410	750	835	–	–
	138	EN018148	66"	90"	66"	17"	8	130	56	540	480	865	955	–	–
	161	EN018151	76"	102"	73"	17"	10	140	60	590	510	960	1020	6" VOL	–
	230	EN018152	94"	120"	90"	17"	13	200	77	735	640	1240	1270	6" VOL	–

NOTES:

1. DESIGN DIMENSIONS "H", "V" AND "L" MAY VARY BY +/- 1". DESIGN DIMENSION "A" MAY VARY BY +/- 1". MANUFACTURING TOLERANCES SHALL BE AS STATED IN THE VENDOR'S QUALITY ASSURANCE MANUAL AND APPROVED BY ENTERGY.
2. END FITTINGS ON SUSPENSION AND DEADEND INSULATORS SHALL HAVE INTEGRAL DESIGN ELEMENTS (e.g., CORONA BALLS) DEMONSTRATED TO EFFECTIVELY DISTRIBUTE ELECTRICAL FIELD STRESS GRADIENTS ON THE POLYMER. ALTERNATELY, MINI-RINGS MUST BE PROVIDED.
3. 161 kV AND 230 kV INSULATORS SHALL BE SUPPLIED WITH CORONA RINGS AS NOTED ABOVE. WHERE CORONA RINGS ARE REQUIRED FOR BRACED POST ASSEMBLIES, THE CORONA RING SHALL BE SUPPLIED FOR THE SUSPENSION INSULATOR ONLY.
4. WHERE CORONA RINGS ARE REQUIRED, THE INSULATOR MUST MEET THE TABULATED ELECTRICAL CHARACTERISTICS WITH CORONA RINGS INSTALLED.
5. ALL CORONA RINGS SHALL BE SHIPPED EITHER INSTALLED ON OR IN THE SAME PACKING FOR THE INSULATOR.
6. ALL INSULATORS SHALL BE IDENTIFIED BY PERMANENTLY MARKING EACH WITH:
   - MANUFACTURER'S NAME OR SYMBOL
   - MANUFACTURER'S PART NUMBER
   - LOT CODE NUMBER
   - YEAR MANUFACTURED
   - MECHANICAL STRENGTH IN POUNDS
   - ENTERGY STOCK CODE
   - VOLTAGE CLASS (230kV, 161kV, 138kV, 115kV OR 69kV)
   - 25K SUSPENSION UNITS SHALL BE MARKED "SUSPENSION"
   - 50K DEADEND UNITS SHALL BE MARKED "DEADEND"
7. STOCK CODES SHOWN ARE OLDER FORMAT TO BE CONSISTENT WITH OTHER DRAWINGS. NEW FORMAT CONSISTS OF 10 DIGIT NUMERAL WITH PRECEDING ZEROS (e.g. EN012345 WILL APPEAR AS 0000012345 ON PURCHASE ORDER.)

NO.	DATED	REVISION	BY:	CHK:	APPR:
5	10-12-11	DEL. NOTE & REV. ELECTRICAL VALUES, REV. CHAIN	ECW		
4	10-12-11	COMPLETE REVISION	ECW	HSK	RLR
3	08-28-11	ADD CORONA SHIELDS TO 161 kV, REV. NOTES 1 & 3		ECW	RLR
2	09-29-07	CORRECTED DRAFTING STANDARD ERRORS	TWF	HSK	
1	3-30-06	REPLACED TURNBUCKLES WITH CHAIN LINKS	RMB		

ENTERGY SERVICES, INC.

Transmission Standard

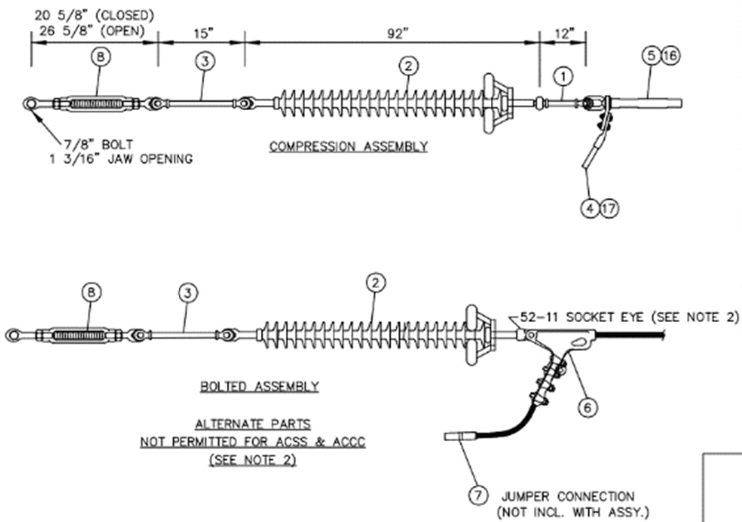
POLYMER INSULATOR STANDARD, 69-230kV

STD NO. | SCALE: NONE

No. TMC007A5

PLOT 1=1 SH. 1 OF 1

TD0203 Attachment 3, Polymer Insulator Standard Drawing



BILL OF MATERIALS

INSULATOR, DEADEND, POLYMER WITH TURNBUCKLE, 161kV

ITEM	QUANTITY DE2	QUANTITY DE4	STOCK NO.	DESCRIPTION	CATALOG NUMBER	BASIC MATERIAL	WEIGHT EA. (LBS)	ULTIMATE STR. (LBS)
1	1	–	EN015705	SKT. CLEVIS, HOT LINE, 45 DEG Y, 10-15/16" LONG, 50K ULT, 7/8" PIN	SYCHL-87	D.I.	3.45	50,000
2	1	1	EN014810	INSULATOR, DE, POLYMER, HIGH POLLUTION, 50K LB SML, 161kV	S298092VA10	COMP.	23.3	50,000
3	1	1	EN015176	LINK, EXTENSION, CLEVIS-CLEVIS, 15" C-C, 50K ULT	YCYCHL-77	D.I.	10.0	50,000
4	1	–	LS9004XX	TERMINAL CONNECTOR, 15 DEG, FOR VARIABLE SIZE WIRE	SEE TABLE	ALUM.	VARIES	–
5	1	–	LS9005XX	DEADEND, ALUM. COMPR. BODY, SINGLE TONGUE, FOR VAR. SIZE WIRE	SEE TABLE	ALUM.	VARIES	–
6	–	1	LS913XX	DEADEND BOLTED STRAIN ALUM. ALLOY	SEE TABLE	ALUM.	VARIES *	–
7	–	–	LS5029	JUMPER SPLICE (NOT INCLUDED WITH ASSEMBLY)	–	–	–	–
8	1	1	EN015815	TURNBUCKLE, 1"x6", JAW-EYE	G227N-BC-1x6	F.S.	9.2	50,000
9	–	–	–	–	–	–	–	–
10	–	–	–	–	–	–	–	–
11	–	–	–	–	–	–	–	–
12	–	–	–	–	–	–	–	–
13	–	–	–	–	–	–	–	–
14	–	–	–	–	–	–	–	–
15	–	–	EN020683	RING, CORONA (SUPPLIED WITH ITEM 2.)	CR24/32-8	ALUM.	5.0	N/A
16	0/1	–	NOTE 3	COMPOUND, ELECTRICAL FILLER	NOTE 3	–	–	N/A
17	0.5	0	NOTE 4	COMPOUND, ELECTRICAL JOINT	NOTE 4	–	–	N/A

* ADE-2526-S8; 30,000 LB. ULT. STR.
ADE-27-S8; 35,000 LB. ULT. STR.
ADE-24-S8; 27,000 LB. ULT. STR.
ADE-27CE-S8; 45,000 LB. ULT. STR.

	CONDUCTOR	COND. DIA. (IN)	FOR COMPRESSION ASSEMBLY (DE2) COMP. DE (ITEM 5)	ENTERGY STOCK NO.	TERMINAL (ITEM 4)	ENTERGY STOCK NO.	ASSEMBLY CATALOG. NO.	FOR BOLTED ASSEMBLY (DE4) STRAIN CLAMP (ITEM 6)	ENTERGY STOCK NO.	ASSEMBLY CATALOG. NO.
ACCC/TW	1949.0 (56/1), LAPWING	1.504	5600-1090NT	32118747	600-353-1	32118749	NOT YET ASSIGNED	N/A	N/A	N/A
ACCC/TW	1582.0 (33/1), BITTERN	1.345	5600-1080NT	32069426	600-253-11	32069448	NOT YET ASSIGNED	N/A	N/A	N/A
ACCC/TW	1428.5 (33/1), BEAUMONT	1.294	5600-1078NT	32118745	600-253-9	32101160	NOT YET ASSIGNED	N/A	N/A	N/A
ACCC/TW	1222.0 (33/1), CARDINAL	1.198	5600-1070NT	32069424	600-253-7	32069447	NOT YET ASSIGNED	N/A	N/A	N/A
ACCC/TW	821.2 (18/1), GROSBEAK	0.990	5600-1050NT	32069419	600-153-7	32069445	NOT YET ASSIGNED	N/A	N/A	N/A
ACSS	1590.0 (45/7), LAPWING	1.504	E33173HT-NT	32020679	5140.162HT-SS	32009549	C-8083-DE2-4	N/A	N/A	N/A
ACSS	1272.0 (45/7), BITTERN	1.345	E33161HT-NT	32020677	5136.144HT-SS	32020420	C-8083-DE2-3	N/A	N/A	N/A
ACSS	954.0 (54/7), CARDINAL	1.196	E33150HT-NT	32019804	5130.125HT-SS	32019813	C-8083-DE2-2	N/A	N/A	N/A
ACSS	666.6 (24/7), FLAMINGO	1.000	ENGE33135HT-NT	32020675	5127.106HT-SS	32020419	C-8083-DE2-1	N/A	N/A	N/A
ACSR	1780.0 (84/19), CHUKAR	1.602	VES-174-NT	EN004275	TF-17-SS	EN004445	C-7648-DE2-7	ADE-27-CE-S8	EN005957	C-7648-DE4-4
ACSR	1590.0 (45/7), LAPWING	1.504	VES-164-NT	EN004276	TF-16-SS	EN004446	C-7648-DE2-6	ADE-27-S8	EN005721	C-7648-DE4-2
ACSR	1272.0 (45/7), BITTERN	1.345	VES-153-NT	EN000161	TF-15-SS	EN000164	C-7648-DE2-5	ADE-27-S8	EN005721	C-7648-DE4-2
ACSR	1033.5 (45/7), ORTOLAN	1.213	VES-134-NT	32009718	TF-13-SS	EN004447	C-7648-DE2-13	ADE-2526-S8	EN006015	C-7648-DE4-1
ACSR	954.0 (54/7), CARDINAL	1.196	VES-135-NT	EN004083	TF-13-SS	EN004447	C-7648-DE2-4	ADE-2526-S8	EN006015	C-7648-DE4-1
ACSR	954.0 (45/7), RAIL	1.165	VES-133-NT	EN004352	TF-13-SS	EN004447	C-7648-DE2-3	ADE-2526-S8	EN006015	C-7648-DE4-1
ACSR	795.0 (26/7), DRAKE	1.108	VES-126-NT	EN027808	TF-12-SS	EN027977	C-7648-DE2-8	ADE-2526-S8	EN006015	C-7648-DE4-1
ACSR	666.6 (24/7), FLAMINGO	1.000	VES-115-NT	EN004277	TF-11-SS	EN004448	C-7648-DE2-2	ADE-2526-S8	EN006015	C-7648-DE4-1
ACSR	336.4 (26/7), LINNET	0.720	VES-086-NT	EN004278	TF-08-SS	EN004449	C-7648-DE2-1	ADE-24-S8	EN005298	C-7648-DE4-3
ACAR	1024.5 (24/13)	1.165	VES-130-NT	EN027818	TF-13-SS	EN004447	C-7648-DE2-12	ADE-2526-S8	EN006015	C-7648-DE4-1
ACAR	649.5 (18/19)	0.928	VES-100-NT	EN027817	TF-10-SS	EN027819	C-7648-DE2-11	ADE-2526-S8	EN006015	C-7648-DE4-1
ACAR	395.2 (15/7)	0.720	VES-080-NT	EN027816	TF-08-SS	EN004449	C-7648-DE2-10	ADE-24-S8	EN005298	C-7648-DE4-3

NOTES

1) Item #4, #5, #6 and #7 are conductor dependent and are selected for each project.
2) Designer may substitute #6 and #7 for items #1, #4 and #5. Strain clamp shall include socket eye for a 52-11 ball. Use of bolted clamps will require the use of non-tension jumper splices.
3) ACSR & ACAR terminals and compression DE fittings are supplied pre-filled (zero quantity req.). Make up as needed with EN005687. (AFC10T). ACSS compression hardware requires High Temp. Compound 32063032 (AFCHT10T). ACCC compression hardware requires High Temp. Compound 32119913 (PENHT-1LB).
4) ACSR & ACAR terminals require normal temperature joint compound EN019252 (CTB8). ACSS & ACCC terminals require high temperature joint compound 32121109 (ALNOX10T).
5) For hardware only, add suffix "-H" to assembly catalog number. Ex.: C-7648-DE2-1-H.

11-17-2014

ewill2

MIN ELEC./MECH. SPECIFICATIONS

MIN. ELECTRICAL VALUES	
60 HZ DRY FO	690 KV
60 HZ WET FO	625 KV
CIFO+	1215 KV
CIFO-	1275 KV
DRY ARC DIST.	75 IN.
LEAKAGE DIST.	180 IN.
MIN. MECHANICAL STRENGTH	
ULT.	50,000 LBS

NO.	DATE:	REVISION	BY:	CHK:	APPR:
–					
5	12-31-14	ADDED ELEC. SPECS. & COND. HARDWARE TABLE, RE-DRAWN 11X17	ECW	JPM	WLS
4	05-23-11	ADDED CORONA RING, UPDATE ITEM 2 DESC.	CBM	ECW	ECW
3	10-14-04	MODIFIED MATERIAL	RWB		
2	11-29-00	ADDED (1-WIRE) TO NAME	RWB		
1	06-09-00	ADDED ALT. PARTS	LSFT		
0		DRAWING CREATED	RWB		

DEP-TRB-161-XX (1-WIRE)

ENTERGY SERVICES, INC.

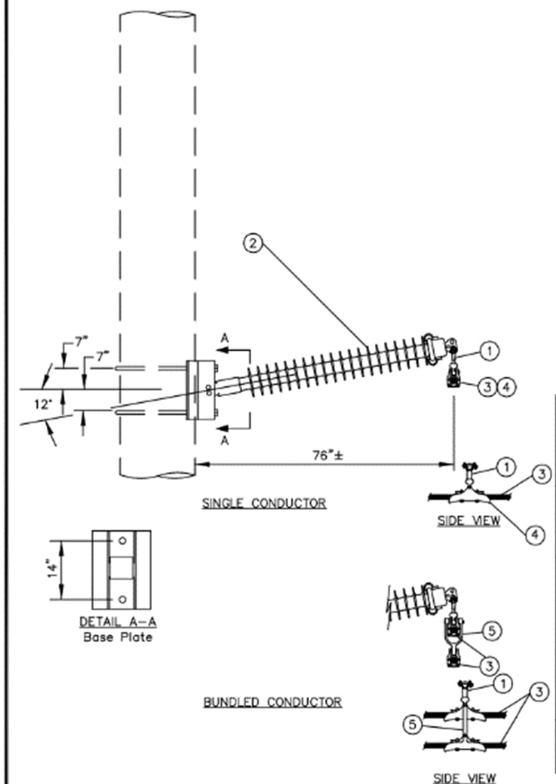
TRANSMISSION LINE STANDARD
POLYMER ASSY., DEADEND W/ TURNBUCKLE
161 kV INSULATOR ASSEMBLY DETAIL

STD NO. TA0504 | SCALE: N. T. S.

Entergy | No. TCA205A5

PLOT 1:24 | SH. 1 OF 1

DEP-TRB-161-XX (1 WIRE)



BILL OF MATERIALS

INSULATOR, 2–1/2" POLYMER JUMPER LINE POST ASSY FOR 161 kV

ITEM	QUANTITY JLP	QUANTITY JLPB	STOCK NO.	DESCRIPTION	CATALOG NUMBER	BASIC MATERIAL	WEIGHT EA. (LBS)	ULTIMATE STRENGTH (LBS)
1	1	1	EN004375	BALL CLEVIS, 45 DEG Y, 35K ULT, 3/4" PIN DIA	YCB-65A	F.S.	2.2	35,000
2	1	1	32094117	INSULATOR, 2–1/2" POST, POLYMER, HIGH POL. 161 kV	H291076VA04	COMP.	80.2	SEE APP. CURVE
3 *	1 *	2 *	LS9003XX	ROD, ARMOR, PREFORMED, ALUMINUM, VARIABLE CONDUCTOR SIZE	SEE TABLE	ALUM.	VARIES	N/A
4	1	–	LS9008XX	CLAMP, SUSPENSION, ALUMINUM, VARIABLE WIRE SIZE, w/SOCKET EYE	SEE TABLE	AL./D.I.	VARIES	25,000 U.N.O.
5	–	1	LS915XX	YOKE, VERTICAL DOUBLE BUNDLE, VARIABLE SIZE WIRE	SEE TABLE	AL./D.I.	VARIES	25,000 U.N.O **
6	–	–	32093707	RING, CORONA (SUPPLIED WITH ITEM 2.)	LP25CR6	ALUM.	5.0	N/A

* ITEM NOT REQUIRED WHEN USING ACAR & ACSR CONDUCTORS ** ULTIMATE STRENGTH FOR BUNDLING YOKE IS AS AN ASSEMBLY

	CONDUCTOR	ARMOR ROD (ITEM 3)	ENTERGY STK. NO.	DIA. (IN)	TAKEOFF ANGLE (DEG)	FOR SINGLE CONDUCTORS (JLP) CLAMP (ITEM 4)	ENTERGY STOCK NO.	ASSEMBLY CATALOG. NO.	FOR BUNDLED CONDUCTORS (JLPB) BUNDLE (ITEM 5)	ENTERGY STOCK NO.	ASSEMBLY CATALOG. NO.
ACCC/TW	1949 (56/1), LAPWING	INCL. w/ ITEM 4		–	–	TLS-0119SE ***	32068997	NOT YET ASSIGNED	N/A	N/A	N/A
	1582 (33/1), BITTERN	INCL. w/ ITEM 4		–	–	TLS-0115SE ***	32068992	NOT YET ASSIGNED	N/A	N/A	N/A
	1429 (33/1), BEAUMONT	INCL. w/ ITEM 4		–	–	AGS-5138	32082067	NOT YET ASSIGNED	N/A	N/A	N/A
	1222 (33/1), CARDINAL	INCL. w/ ITEM 4		–	–	TLS-0111SE	32068988	NOT YET ASSIGNED	N/A	N/A	N/A
	821 (18/1), GROSBEAK	INCL. w/ ITEM 4		–	–	TLS-0105SE	32068975	NOT YET ASSIGNED	N/A	N/A	N/A
ACSS	1590 (45/7), LAPWING	ARA1590-45-59	32117836	2.376	15	ACFS-244-20-20-S	EN028863	C-8083-JLP-4	VBACFS-18-2442020-S	32127531	NOT YET ASSIGNED
	1272 (45/7), BITTERN	ARA1272-45-55	32117835	2.075	15	ACFS-214-20-20-S	32020718	C-8083-JLP-3	VBACFS-18-2142020-S	32127530	NOT YET ASSIGNED
	954 (54/7), CARDINAL	ARA954-45-51	32117829	1.816	15	ACFS-186-20-20-S	32020716	C-8083-JLP-2	VBACFS-18-1862020-S	32127529	NOT YET ASSIGNED
	666.6 (24/7), FLAMINGO	ARA636-26-45	32117825	1.620	15	ACFS-175-20-20-S	32020714	C-8083-JLP-1	VBACFS-18-1752020-S	32127527	NOT YET ASSIGNED
ACSR	1780 (84/19), CHUKAR	–	–	1.602	30	LS-8-S	EN000370	C-7648-JLP-5	VBLS-12-88-S	EN027825	C-7648-JLPB-5
	1590 (45/7), LAPWING	–	–	1.504	30	LS-7-S	EN000386	C-7648-JLP-4	VBLS-12-77-S	EN027824	C-7648-JLPB-4
	1272 (45/7), BITTERN	–	–	1.345	30	LS-6-S	EN000158	C-7648-JLP-3	VBLS-12-66-S	EN027823	C-7648-JLPB-3
	1033.5 (45/7), ORTOLAN	–	–	1.213	30	LS-6-S	EN000158	C-7648-JLP-7	VBLS-12-66-S	EN027823	C-7648-JLPB-7
	954 (54/7), CARDINAL	–	–	1.196	30	LS-6-S	EN000158	C-7648-JLP-3	VBLS-12-66-S	EN027823	C-7648-JLPB-3
	954 (45/7), RAIL	–	–	1.165	30	LS-6-S	EN000158	C-7648-JLP-3	VBLS-12-66-S	EN027823	C-7648-JLPB-3
	795 (26/7), DRAKE	–	–	1.108	30	LS-6-S	EN000158	C-7648-JLP-6	VBLS-12-66-S	EN027823	C-7648-JLPB-6
	666.6 (24/7), FLAMINGO	–	–	1.000	30	LS-2-S	EN000387	C-7648-JLP-2	VBLS-12-22-S	EN027822	C-7648-JLPB-2
	336.4 (26/7), LINNET	–	–	0.720	30	LS-1-S ****	EN000392	C-7648-JLP-1	VBLS-12-22-S	EN027822	C-7648-JLPB-2
ACAR	1024.5 24/13	–	–	1.165	30	LS-6-S	EN000158	C-7648-JLP-7	VBLS-12-66-S	EN027823	C-7648-JLPB-7
	649.5 18/19	–	–	0.928	30	LS-2-S	EN000387	C-7648-JLP-2	VBLS-12-22-S	EN027822	C-7648-JLPB-2
	395.2 15/7	–	–	0.720	30	LS-1-S ****	EN000392	C-7648-JLP-1	VBLS-12-22-S	EN027822	C-7648-JLPB-2

**** ULTIMATE STRENGTH FOR LS-1-S is 18k
*** ULTIMATE STRENGTH FOR TLS-0115SE & TLS-0119SE is 30k

NOTES

1) Item #3, #4 and #5 are conductor dependent. Clamps/Bundles are selected for each project and are Applied with Armor Rod, unless specifically noted.
2) Note that 161 kV Insulators are used for 115 kV 138 kV and 161 kV applications.
3) For Hardware Only, add suffix "-H" to Assembly Cat. No. Ex.: C-7648-JLP-1-H

MIN ELEC./MECH. SPECIFICATIONS

MIN. ELECTRICAL VALUES	
60 HZ DRY FO	590 KV
60 HZ WET FO	510 KV
CIFO+	960 KV
CIFO-	1020 KV
STRIKE DIST.	60 IN.
LEAKAGE DIST.	140 IN.
MIN. MECHANICAL STRENGTH	
MDCL	1176 LBS.

NO.	DATE:	REVISION	BY:	CHK:	APPR:
5	11-20-14	ADDED ELEC. SPECS. & COND. HARDWARE TABLE, RE-DRAWN 11X17	ECW	JPM	M.S
4	08-28-11	UPDATE ITEM 2 STOCK CODE & DESCRIPTION	ECW		
3	05-05-11	ADDED CORONA RING, UPDATE ITEM 2 DESCRIPTION	CBM	ECW	ECW
2	10-07-04	ADDED ACSS CONDUCTOR & REV. STK. NUMBER FOR ITEM 4	MDB		
1	11-30-00	COMBINED DWG TCA236 WITH TCA207	LSFT		
0		DRAWING CREATED			

JLP-161-XX

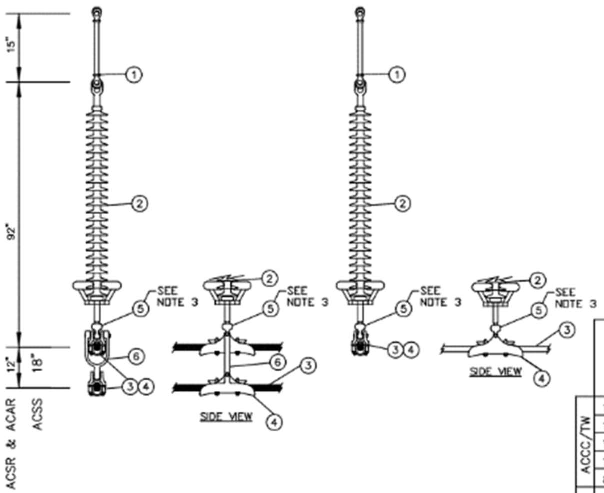
ENTERGY SERVICES, INC.

TRANSMISSION LINE STANDARD
POLYMER ASSY., 2 1/2" JUMPER LINE POST
161 kV INSULATOR ASSEMBLY DETAIL

STD NO. TA0504 | SCALE: N. T. S.
Entergy | No. TCA207A5
PLOT 1:24 | SH. 1 OF 1

JLP-161-XX

11-7-2014
ewill2



BUNDLED CONDUCTOR

SINGLE CONDUCTOR

BILL OF MATERIALS

INSULATOR LINE SUSPENSION HEAVY POLYMER WITH LINK 161kV

ITEM	QUANTITY SHL	QUANTITY SHLB	STOCK NO.	DESCRIPTION	CATALOG NUMBER	BASIC MATERIAL	WEIGHT EA. (LBS)	ULTIMATE STRENGTH (LBS)
1	1	1	EN015176	LINK, EXTENSION, CLEVIS-CLEVIS, 15" 50K ULT	YCYCHL-77	D.I.	10	50,000
2	1	1	EN014810	INSULATOR, DEADEND, EYE-BALL, POLYMER, HIGH POLL, 161 kV, 50K	S298092VA10	COMP.	23	50,000
3	1	2	LS9003XX	ROD, ARMOR, PREFORMED, ALUMINUM, VARIABLE CONDUCTOR SIZE	SEE TABLE	ALUM.	VARIES	N/A
4	1	–	LS9008XX	CLAMP, SUSPENSION, ALUMINUM, VARIABLE WIRE SIZE, w/SOCKET EYE	SEE TABLE	AL./D.I.	VARIES	25,000 U.N.O.
5	1	1	LS5044XX	SOCKET EYE, VARIABLE WIDTH, FOR 52-11 BALL (ACCC ONLY)	VARIES	F.S.	VARIES	VARIES
6	–	1	LS915XX	YOKE, VERTICAL DOUBLE BUNDLE, VARIABLE SIZE WIRE	SEE TABLE	AL./D.I.	VARIES	25,000 *
7	–	–	EN020683	RING, CORONA (SUPPLIED WITH ITEM 2.)	CR24/32-8	ALUM.	5	N/A
8	–	–						
9	–	–						
10	–	–						
11	–	–						

* ULTIMATE STRENGTH FOR BUNDLING YOKE IS AS AN ASSEMBLY

	CONDUCTOR	ARMOR ROD (ITEM 3)	ENTERGY STK. NO.	DIA. W/ARM. ROD (IN)	TAKEOFF ANGLE (DEG)	FOR SINGLE CONDUCTORS (SHL) CLAMP (ITEM 4)	ENTERGY STOCK NO.	ASSEMBLY CATALOG. NO.	FOR BUNDLED CONDUCTORS (SHLB) BUNDLE (ITEM 6)	ENTERGY STOCK NO.	ASSEMBLY CATALOG. NO.
ACCC/TW	1949 (56/1), LAPWING	INCL.	w/ ITEM 4	–	–	TLS-0119SE **	32068997	NOT YET ASSIGNED	N/A	N/A	N/A
ACCC/TW	1582 (33/1), BITTERN	INCL.	w/ ITEM 4	–	–	TLS-0115SE **	32068992	NOT YET ASSIGNED	N/A	N/A	N/A
ACCC/TW	1429 (33/1), BEAUMONT	INCL.	w/ ITEM 4	–	–	AGS-5138	32082067	NOT YET ASSIGNED	N/A	N/A	N/A
ACCC/TW	1222 (33/1), CARDINAL	INCL.	w/ ITEM 4	–	–	TLS-0111SE	32068988	NOT YET ASSIGNED	N/A	N/A	N/A
ACCC/TW	821 (18/1), GROSBEAK	INCL.	w/ ITEM 4	–	–	TLS-0105SE	32068975	NOT YET ASSIGNED	N/A	N/A	N/A
ACSS	1590 (45/7), LAPWING	AR-0163	EN000381	2.376	15	ACFS-244-20-20-S8	32020729	C-8083-SS3-4	VBACFS-18-2442020-S8	32127537	NOT YET ASSIGNED
ACSS	1272 (45/7), BITTERN	AR-0146	EN000155	2.075	15	ACFS-214-20-20-S8	32020719	C-8083-SS3-3	VBACFS-18-2142020-S8	32127536	NOT YET ASSIGNED
ACSS	954 (54/7), CARDINAL	AR-0143	EN000383	1.816	15	ACFS-186-20-20-S8	32020717	C-8083-SS3-2	VBACFS-18-1862020-S8	32127535	NOT YET ASSIGNED
ACSS	666.6 (24/7), FLAMINGO	AR-0137	EN000384	1.620	15	ACFS-175-20-20-S8	32020715	C-8083-SS3-1	VBACFS-18-1752020-S8	32127532	NOT YET ASSIGNED
ACSR	1780 (84/19), CHUKAR	AR-0165	EN000382	2.474	30	ASC-11-S8	EN027804	C-7648-SSL-6	VBLS-12-1111-S8	EN028534	C-7648-SSLB-6
ACSR	1590 (45/7), LAPWING	AR-0163	EN000381	2.376	30	ASC-11-S8	EN027804	C-7648-SSL-5	VBLS-12-1111-S8	EN028534	C-7648-SSLB-5
ACSR	1272 (45/7), BITTERN	AR-0146	EN000155	2.075	30	ASC-11-S8	EN027804	C-7648-SSL-4	VBLS-12-1111-S8	EN028534	C-7648-SSLB-4
ACSR	1033.5 (45/7), ORTOLAN	AR-0144	EN027807	1.943	30	LS-9-S8	EN027805	C-7648-SSL-8	VBLS-12-99-S8	EN028535	C-7648-SSLB-8
ACSR	954 (54/7), CARDINAL	AR-0143	EN000383	1.816	30	LS-8-S8	EN027801	C-7648-SSL-3	VBLS-12-88-S8	EN028533	C-7648-SSLB-3
ACSR	954 (45/7), RAIL	AR-0143	EN000383	1.785	30	LS-8-S8	EN027801	C-7648-SSL-3	VBLS-12-88-S8	EN028533	C-7648-SSLB-3
ACSR	795 (26/7), DRAKE	AR-0141	EN004005	1.728	30	LS-8-S8	EN027801	C-7648-SSL-7	VBLS-12-88-S8	EN028533	C-7648-SSLB-7
ACSR	666.6 (24/7), FLAMINGO	AR-0137	EN000384	1.620	30	LS-8-S8	EN027801	C-7648-SSL-2	VBLS-12-88-S8	EN028533	C-7648-SSLB-2
ACSR	336.4 (26/7), LINNET	AR-0130	EN000385	1.129	30	LS-6-S8	EN027802	C-7648-SSL-1	VBLS-12-66-S8	EN028532	C-7648-SSLB-1
ACAR	1024.5 24/13	AR-0143	EN000383	1.785	30	LS-8-S8	EN027801	C-7648-SSL-3	VBLS-12-88-S8	EN028533	C-7648-SSLB-3
ACAR	649.5 18/19	AR-0135	EN027806	1.428	30	LS-6-S8	EN027802	C-7648-SSL-9	VBLS-12-66-S8	EN028532	C-7648-SSLB-9
ACAR	395.2 15/7	AR-0130	EN000385	1.129	30	LS-6-S8	EN027802	C-7648-SSL-1	VBLS-12-66-S8	EN028532	C-7648-SSLB-1

** ULTIMATE STRENGTH FOR TLS-0115SE & TLS-0119SE is 30k

NOTES

1) Item #3 and #4 are conductor dependent. Clamps/Bundles are selected for each project and are Applied with Armor Rod, unless specifically noted.
2) For hardware only add suffix "-H" to assembly catalog number EX: C-7648-SSLB-1-H
3) For ACCC conductors, replace socket eye supplied with clamp with socket eye intended for 52-11 ball. EN015435 shall be substituted when using ACCC GROSBEAK and ACCC BEAUMONT. 32139415 shall be substituted when using ACCC CARDINAL, ACCC BITTERN and ACCC LAPWING.

MIN ELEC./MECH. SPECIFICATIONS

MIN. ELECTRICAL VALUES	
60 HZ DRY FO	690 KV
60 HZ WET FO	625 KV
CIFO+	1215 KV
CIFO-	1275 KV
STRIKE DIST.	75 IN.
LEAKAGE DIST.	180 IN.
MIN. MECHANICAL STRENGTH	
ULT.	50,000 LBS.

06-11-15

ewilli2

SHR-LINK-161-XX

NO.	DATE:	REVISION	BY:	CHK:	APPR:
6	6-17-15	ADD NOTE 3	KC	ECW	ECW
5	12-31-14	ADDED ELEC. SPECS. & COND. HARDWARE TABLE, RE-DRAWN 11X17	ECW	JPM	WLS
4	5-23-11	ADDED CORONA RING, UPDATED ITEM 2 DESC.	CBM	ECW	ECW
3	1-10-02	MODIFIED ITEM 1 ON BUNLED MATERIAL LIST	LSFT		
2	6-22-01	CHANGED NAME TO SHRLINK	LSFT		

ENTERGY SERVICES, INC.

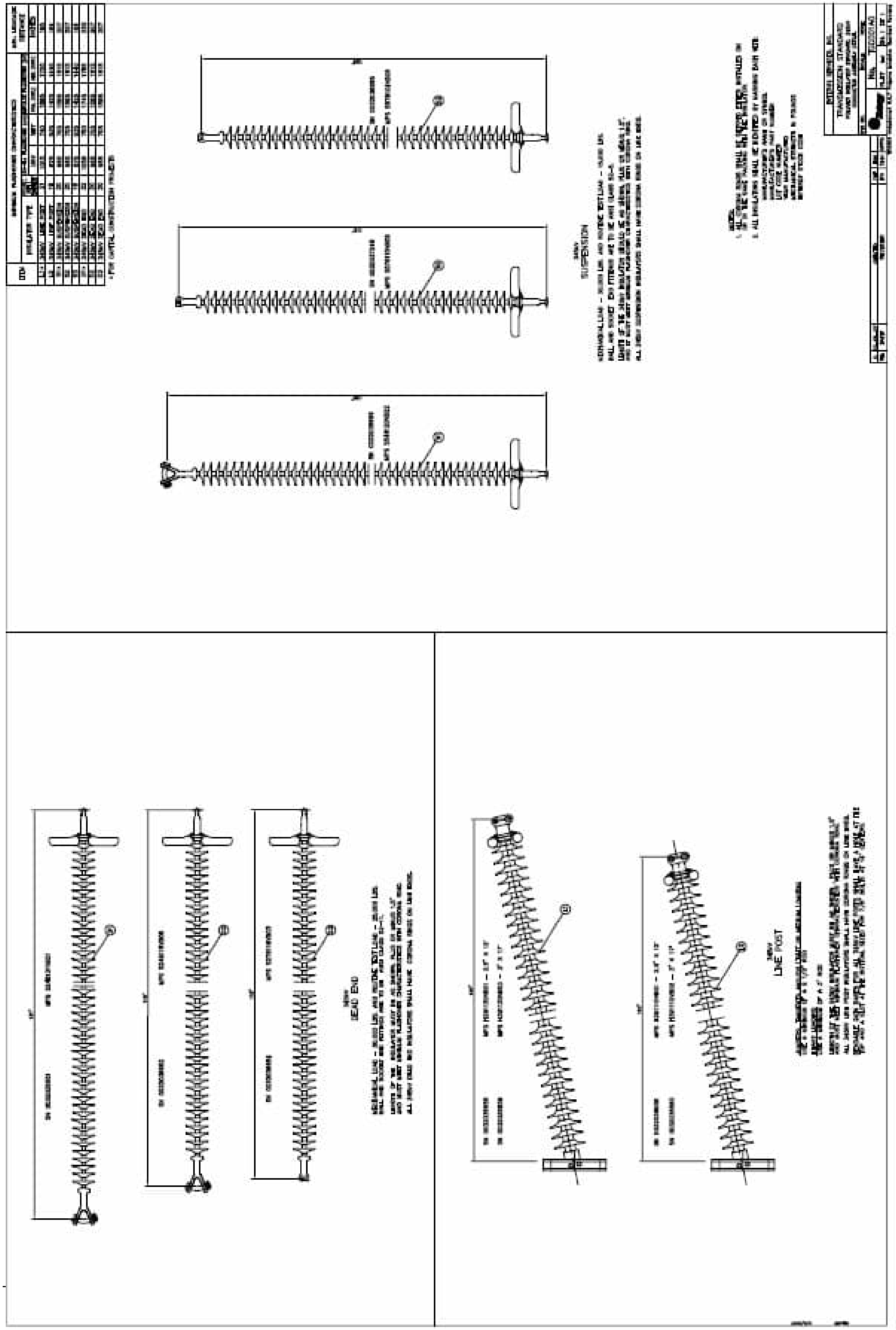
TRANSMISSION LINE STANDARD
POLYMER ASSY., HEAVY SUSPENSION
161 kV INSULATOR ASSEMBLY DETAIL

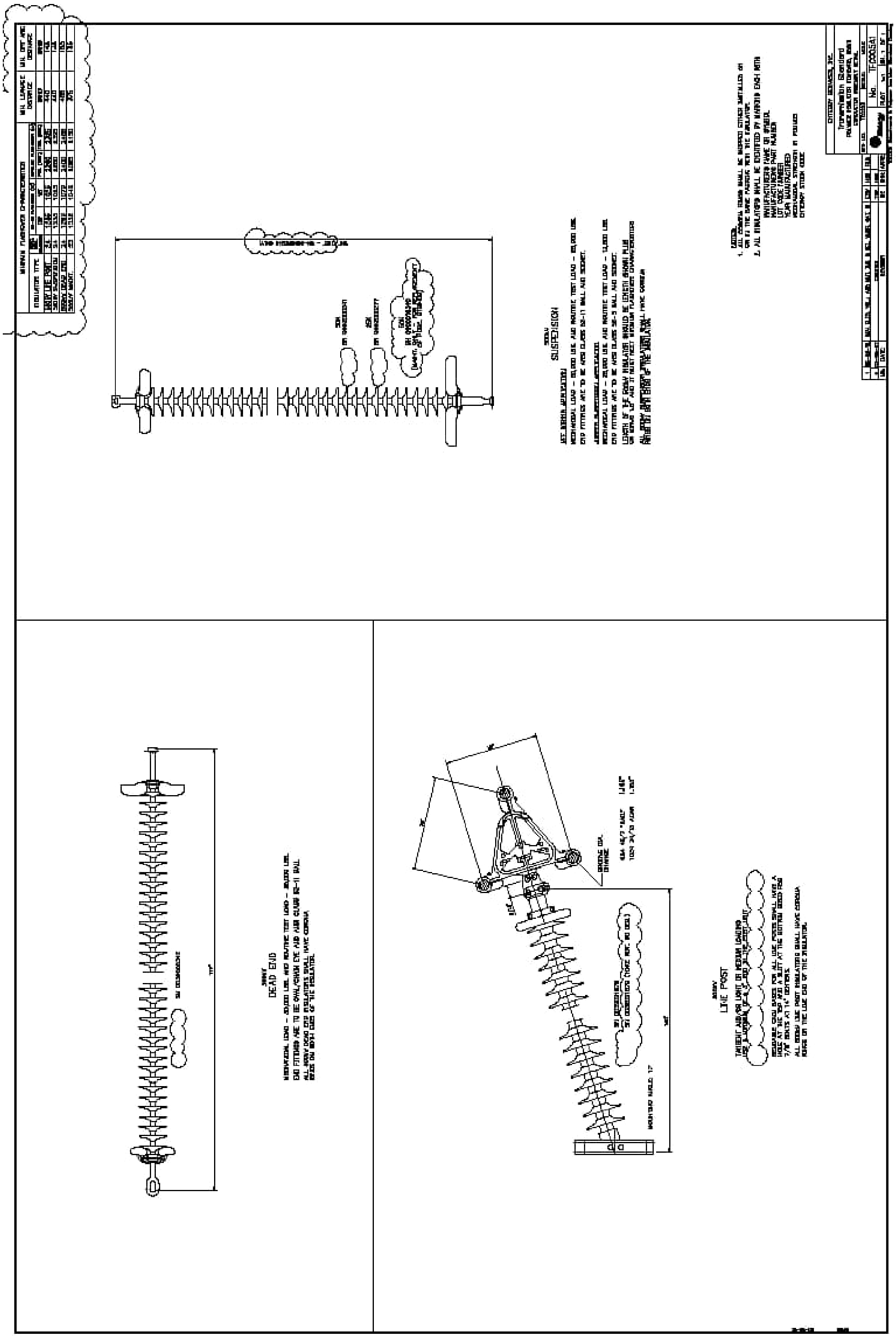
STD NO. TA0504 | SCALE: N. T. S.

Entergy | No. TCA214A6

PLOT 1:24 | SH. 1 OF 1

SHRLINK-161-XX


SUSPENSION
DEAD END
LINE POST



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BILL OF MATERIALS

DEADEND, POLYMER, WITH BUNDLING YOKE, 500KV

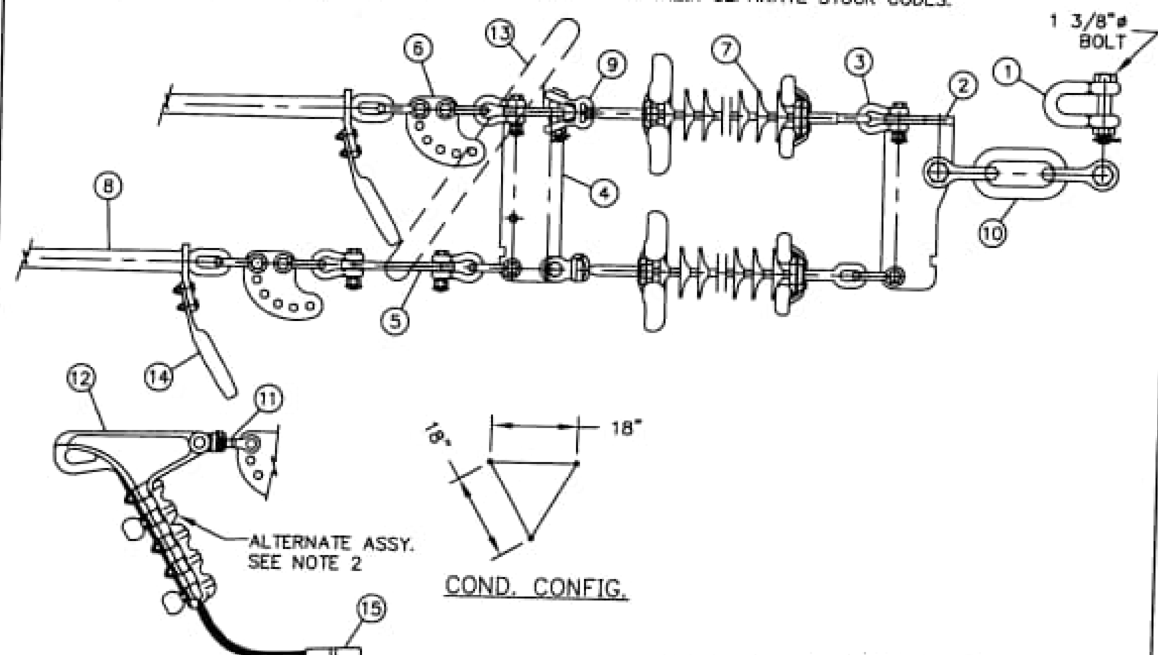
ITEM	COMP. QTY.	BOLTED QTY.	STOCK NO.	DESCRIPTION
1	2	2	0032009672	SHACKLE, CHAIN, 150k ULT .STR.
2	1	1	0032009669	YOKE PLATE, TRIPLE BUNDLE, DEADEND, 18" SEPARATION, 110k ULT. STR.
3	14	11	0000000689	SHACKLE, ANCHOR, 60k ULT. STR.
4	1	1	0032009670	YOKE PLATE, TRIPLE BUNDLED, DEADEND, 18" SEPARATION, 110k ULT. STR.
5	1	1	0032009665	LINK EXTENSION, EYE-EYE, 40k ULT. STR.
6	3	3	0032009668	PLATE, ADJUSTMENT, 40k ULT. STR.
7	3	3	0032000342	INSULATOR, LINE, EYE-BALL, POLYMER, 500kV, 50k ULT .STR.
8	3		LS9012XX	DEADEND, COMPRESSION, ALUMINUM, SINGLE TONGUE, 33k, FOR VARIABLE
9	3	3	0000028529	SOCKET, Y-CLEVIS, 50k
10	1	1	0032000136	LINK, CHAIN, 132k ULT., 7" LONG
11		3	0032021867	CLEVIS BALL, 35k, BALL CLASS 52-3/5
12		3	LS9013XX	DEADEND, BOLTED, STRAIN, ALUM., 30K, FOR VARIABLE WIRE SIZE
13	1	1	0032009685	CORONA RING, 500kV DEADEND, ALUM.
14	3		LS9014XX	~~TERMINAL CONNECTOR, 15 DEG., FOR VARIABLE WIRE SIZE~~
15*		3	LS5029XX	JUMPER, SPLICE, FOR VARIABLE WIRE SIZE

CONDUCTOR	CONDUCTOR DIA.	COMP. D.E. (ITEMS 8 & 14)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	VES-130-EHV**	0032000078	C-7686-DE1	NA
954.0 45/7 "RAIL"	1.165	VES-133-EHV**	0032021873	C-7686-DE2	NA
954 54/7 "CARDINAL"	1.196	VES-135-EHV**	0032021874	C-7686-DE4	NA

CONDUCTOR RANGE:	BOLTED STRAIN CLAMP (ITEM 12)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
.710" - 1.318"	ADE-2526-S-SPH4	0000028892	C-7686-DE3	NA

* ITEMS 15 ARE NOT FURNISHED WITH THE MACLEAN ASSEMBLIES.

** COMPRESSION DEADEND BODIES COME WITH JUMPER TERMINALS, ITEM 14. EITHER OF OF ITEMS 8 AND 14 CAN BE RETURNED TO STORES WITH THEIR SEPARATE STOCK CODES.



RE: MACLEAN DWG. BC-7686-1

1) ITEM #8, #12, #14 & #15 ARE CONDUCTOR DEPENDENT.
2) DESIGNER MAY SUBSTITUTE #11 & #12 & #15, FOR ITEMS #3 (QTY. 2) & #8. STRAIN CLAMP SHALL INCLUDE SOCKET EYE FOR A 52-3/5 BALL. USE OF BOLTED CLAMPS WILL REQUIRE THE USE OF NON-TENSION JUMPER SPLICES.

ENTERGY SERVICES, INC.

DEADEND, POLYMER, W/BUNDLING YOKE, 500kV

NO.	DATE	REVISION	BY	CHK	APPR
0	03-05-07	CREATED	TWF	HSK	

tflnc90 3/5/2007

STD NO. | SCALE: NONE

Entergy

No. TFA200A0

PLOT 1=1 | SH. 1 OF 1

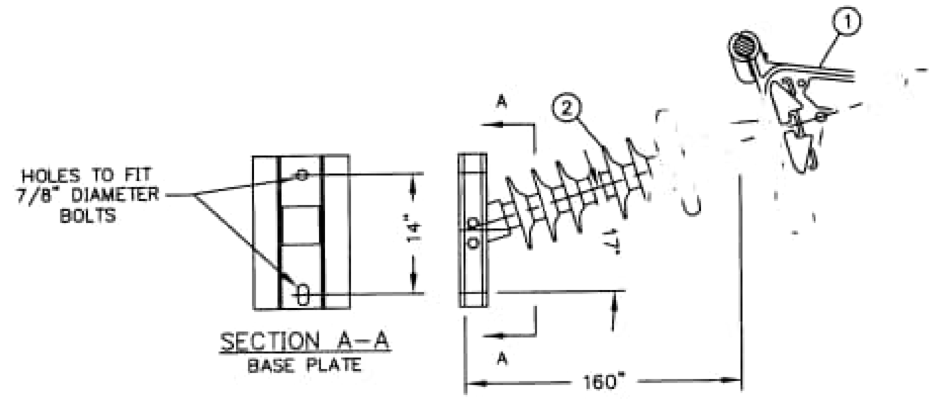
DEPY-500-XX; BC-7686-1

BILL OF MATERIALS

JUMPER LINE POST, POLYMER, w/BUNDLING YOKE, HORIZONTAL, 500kV

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	LS9015XX	JUMPER YOKE, 10k ULT. STR. 18" SEPARATION, ALUMINUM ALLOY
2	1	0032021878	INSULATOR, LINE POST, 3", POLYMER, 500kV, 10k ULT. STR.

CONDUCTOR	CONDUCTOR DIA.	JMPR. YOKE (ITEM 1)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	C-7686-4	0032021850	C-7686-J2	NA
954.0 45/7 "RAIL"	1.165	C-7686-4	0032021850	C-7686-J2	NA
954 54/7 "CARDINAL"	1.196	C-7686-4A	0032021860	C-7686-J2A	NA



1) ITEM #1 IS CONDUCTOR DEPENDENT. THIS ITEM IS SELECTED FOR EACH PROJECT (WITHOUT ARMOR RODS).

RE: MACLEAN DWG. BC-7686-4

0	03-05-07	CREATED	TWF	HSK	
NO.	DATE:	REVISION	BY:	CHK:	APPR

tflnc90 3/19/2007

ENTERGY SERVICES, INC.

JUMPER LINE POST, POLYMER, W/YOKE, HOR, 500kV

STD NO. | SCALE: NONE

No. TFA201A0

Entergy | PLOT 1=1 | SH. 1 OF 1

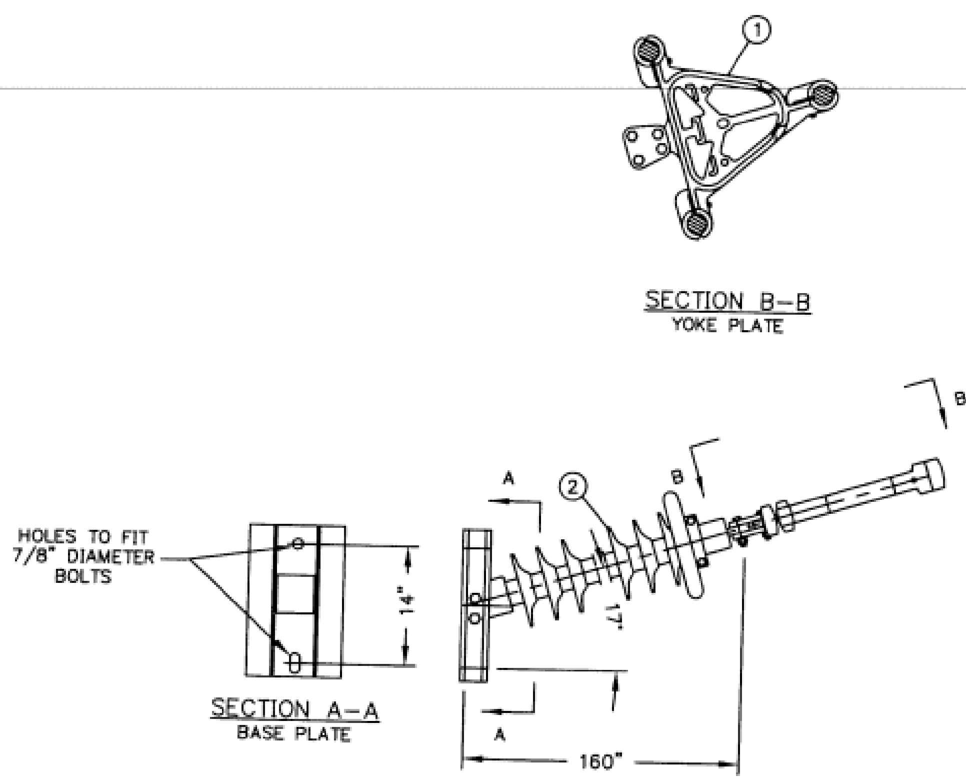
JLPB-HJ-500-XX; BC-7686-4

BILL OF MATERIALS

JUMPER LINE POST, POLYMER, w/BUNDLING YOKE, VERTICAL, 500kV

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	LS9015XX	JUMPER YOKE, 10k ULT. STR. 18" SEPARATION, ALUMINUM ALLOY
2	1	0032021879	INSULATOR, LINE POST, 3", POLYMER, 500kV, 10k ULT. STR.

CONDUCTOR	CONDUCTOR DIA.	JMPR. YOKE (ITEM 1)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	C-7686-4	0032021850	C-7686-J3	NA
954.0 45/7 "RAIL"	1.165	C-7686-4	0032021850	C-7686-J3	NA
954 54/7 "CARDINAL"	1.196	C-7686-4A	0032021860	C-7686-J3A	NA



1) ITEM #1 IS CONDUCTOR DEPENDENT. THIS ITEM IS SELECTED FOR EACH PROJECT (WITHOUT ARMOR RODS).

RE: MACLEAN DWG. BC-7686-5

ENTERGY SERVICES, INC.

JUMPER LINE POST, POLYMER, W/YOKE, VER, 500kV

STD NO. | SCALE: NONE

Entergy | No. TFA202A0

PLOT 1=1 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	03-05-07	CREATED	TWF	HSK	

tfinc90 3/5/2007

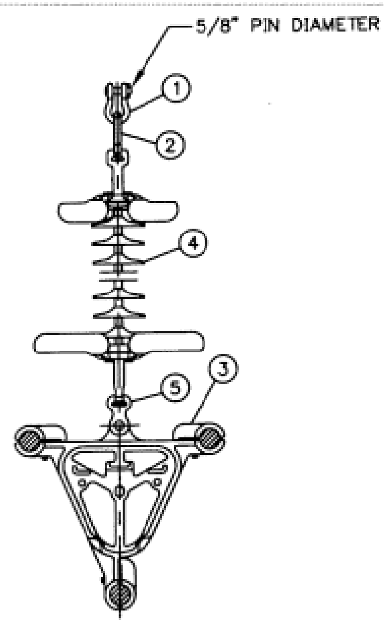
JLPB-VJ-500-XX; BC-7686-5

BILL OF MATERIALS

JUMPER SUSPENSION, POLYMER, w/ BUNDLING YOKE 500kV

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0000004466	SHACKLE, ANCHOR, 30k ULT .STR., 5/8" PIN DIA. 2-13/16"
2	1	0000028889	BALL EYE, OVAL, 35k ULT. STR., BALL CLASS 52-3/5
3	1	LS9016XX	YOKE, JUMPER, 10k ULT. STR. 18" SEPARATION, ALUM. ALLOY
4	1	0032000277	INSULATOR, SUSPENSION, B&S, POLYMER, 500kV, 25k ULT. STR.
5	1	0032021870	CLEVIS, SOCKET, 30k ULT. STR., CLASS 52-3/5

CONDUCTOR	CONDUCTOR DIA.	JMPR. YOKE (ITEM 3)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	C-6549-3	0032021827	C-7686-J1	NA
954.0 45/7 "RAIL"	1.165	C-6549-3	0032021827	C-7686-J1	NA
954 54/7 "CARDINAL"	1.196	C-7686-5	0032021863	C-7686-J1A	NA



1) ITEM #3 IS CONDUCTOR DEPENDENT. THIS ITEM IS SELECTED FOR EACH PROJECT WITHOUT ARMOR RODS.

RE: MACLEAN DWG. BC-7686-2

-05-07	CREATED	TWF	HSK		
DATE:	REVISION	BY:	CHK:	APP	

ENTERGY SERVICES, INC.

JUMPER SUSPENSION, POLYMER, W/YOKE, 500kV

STD NO. | SCALE: NONE

No. TFA203A0

Entergy | PLOT 1=1 | SH. 1 OF 1

JSPB-500-XX; BC-7686-2

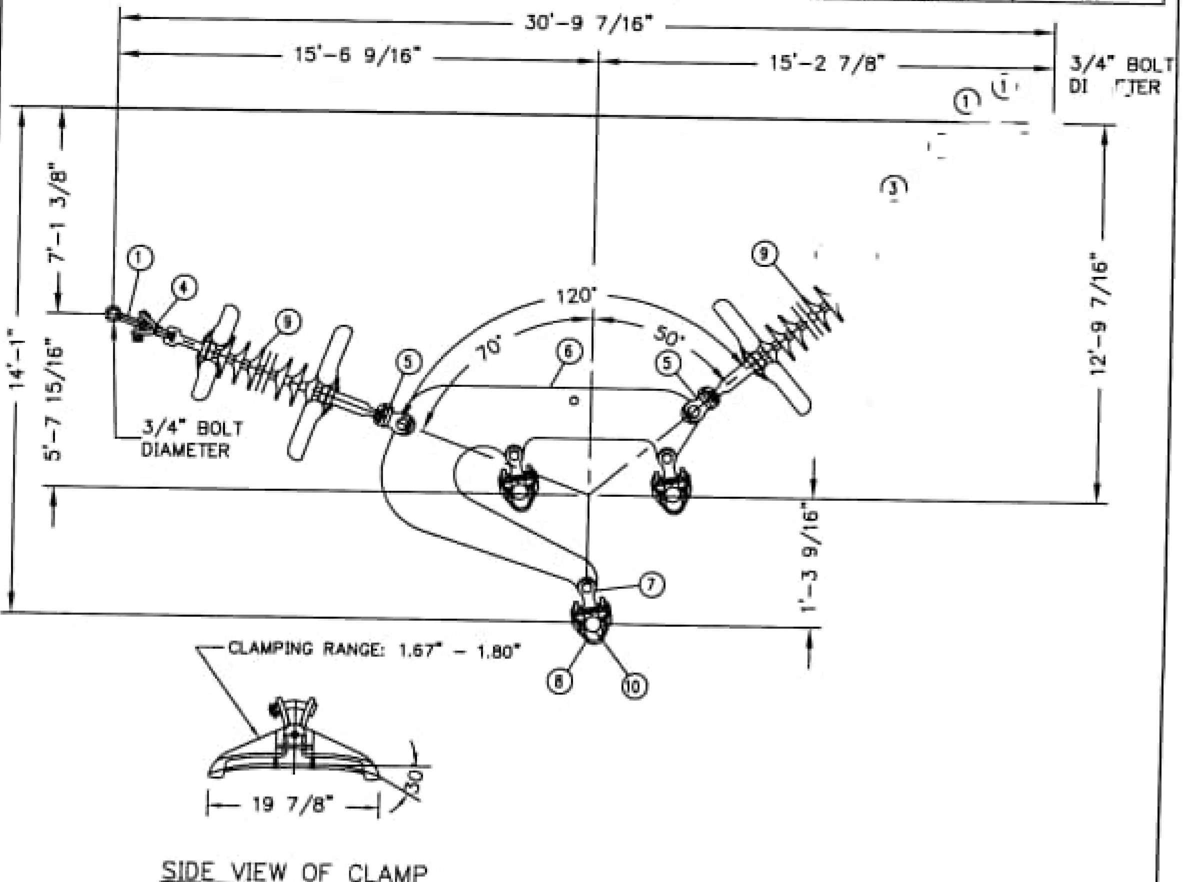
tflnc90 3 5 2007

BILL OF MATERIALS

VEE-STRING, POLYMER, W/BUNDLING YOKE, RUNNING ANGLE, 500kV

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	3	0000000689	SHACKLE, ANCHOR, 60k ULT. STR.
2	1	0032036825	LINK, EXTENSION, 50k
3	1	0000028891	BALL CLEVIS, 50k, HL
4	1	0000000410	BALL Y-CLEVIS, 50k
5	2	0000028529	SOCKET, Y-CLEVIS, 50k, 90 DEGREE
6	1	0032036830	YOKE PLATE, TRIPLE BUNDLE, 18" SEPARATION
7	3	0000028888	CLEVIS EYE, 45 DEG. Y, 30k
8	3	LS9017XX	CLAMP, SUSPENSION, ALUM. ALLOY, 25k, CORONA FREE
9	2	0032000341	INSULATOR, SUSPENSION, B&S, POLYMER, 500kV, 50k ULT. STR.
10	3	LS9018XX	ARMOR ROD, EHV

CONDUCTOR	CONDUCTOR DIA.	CLAMP CAT. NO.	ENTERGY STOCK NO.	ARMOR ROD CAT. NO.	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	ACFS1802025N	0032036831	AR-0506(EHV)	000121-558	C-7686-RA1	NA
954 45/7 "RAIL"	1.165	ACFS1802025N	0032036831	AR-0506(EHV)	000121-558	C-7686-RA1	NA
954 54/7 "CARDINAL"	1.196	ACFS1802025N	0032036831	AR-0506(EHV)	000121-558	C-7686-RA1	NA



SIDE VIEW OF CLAMP

1) ITEMS #8 & #10 ARE CONDUCTOR DEPENDENT. THESE ITEMS ARE SELECTED FOR EACH PROJECT AND MAY BE WITH OR WITHOUT ARMOR RODS.

RE: MACLEAN DWG. BC-7686-7

ENTERGY SERVICES, INC.

VEE-STRING, POLYMER, W/YOKE, RUN. ANG, 500kV

0	03-05-07	CREATED	TWF	HSK		
NO.	DATE	REVISION	BY	CHK	APPR	

STD NO. | SCALE: NONE

Entergy | No. TFA204A0

PLOT 1=1 | SH. 1 OF 1

tflnc90 3/5/2007

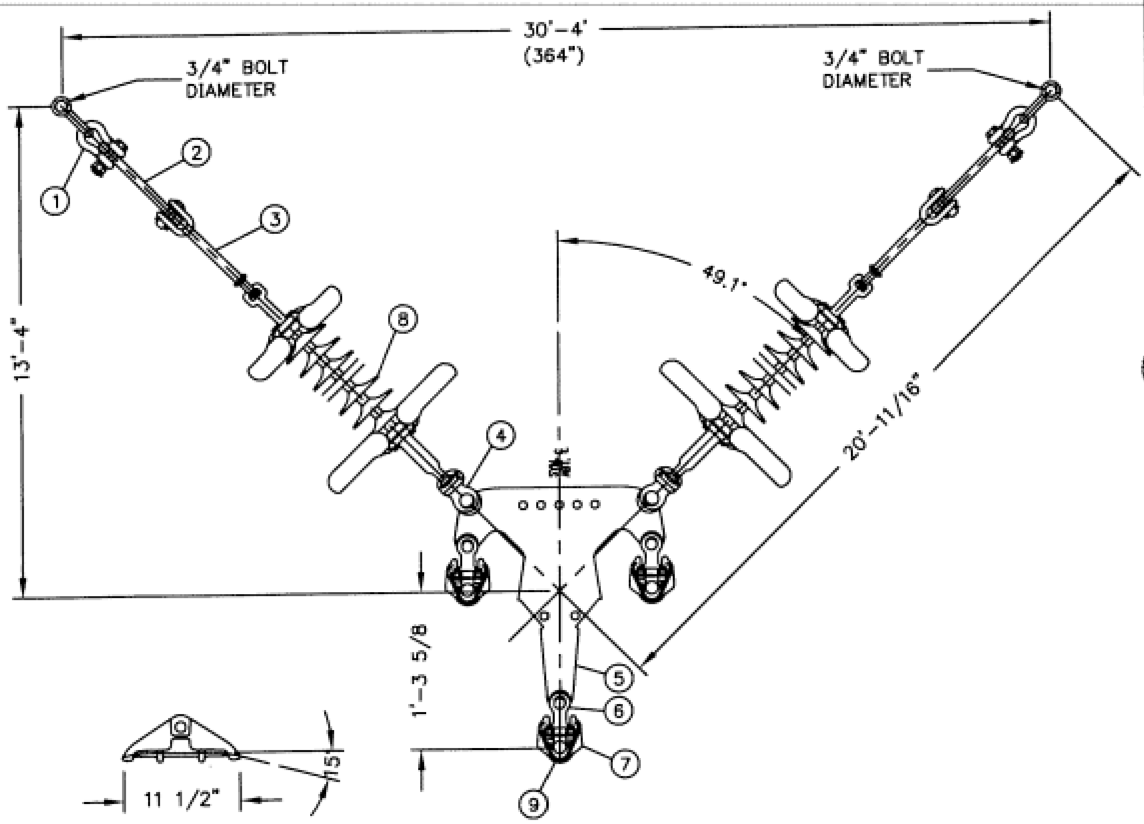
VSPR-500-XX; BC-7686-7

BILL OF MATERIALS

VEE-STRING, POLYMER, W/BUNDLING YOKE, 500kV

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	4	0000000689	SHACKLE, ANCHOR, 60k ULT. STR.
2	2	0032034296	LINK, EXTENSION, 50k
3	2	0000028891	BALL CLEVIS, 50k
4	2	0000028529	SOCKET, Y-CLEVIS, 50k
5	1	0032021845	YOKE PLATE, TRIPLE BUNDLE, 18" SEPARATION
6	3	0000028888	CLEVIS EYE, 45 DEG. Y, 30k
7	3	LS9019XX	CLAMP, SUSPENSION, ALUM. ALLOY, 25k, CORONA FREE
8	2	0032000341	INSULATOR, SUSPENSION, B&S, POLYMER, 500kV, 50k ULT. STR.
9	3	LS9018XX	ARMOR ROD, EHV

CONDUCTOR	CONDUCTOR DIA.	CLAMP CAT. NO.	ENTERGY STOCK NO.	ARMOR ROD CAT. NO.	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	CF-184-N	0000028890	AR-0506(EHV)	000121-558	C-8098-VS1	NA
954 45/7 "RAIL"	1.165	CF-184-N	0000028890	AR-0506(EHV)	000121-558	C-8098-VS1	NA
954 54/7 "CARDINAL"	1.196	CF-184-N	0000028890	AR-0506(EHV)	000121-558	C-8098-VS1	NA



SIDE VIEW OF CLAMP

1) ITEMS #7 & #9 ARE CONDUCTOR DEPENDENT. THESE ITEMS ARE SELECTED FOR EACH PROJECT AND MAY BE WITH OR WITHOUT ARMOR RODS.

RE: MACLEAN DWG. BC-8098-1

ENTERGY SERVICES, INC.

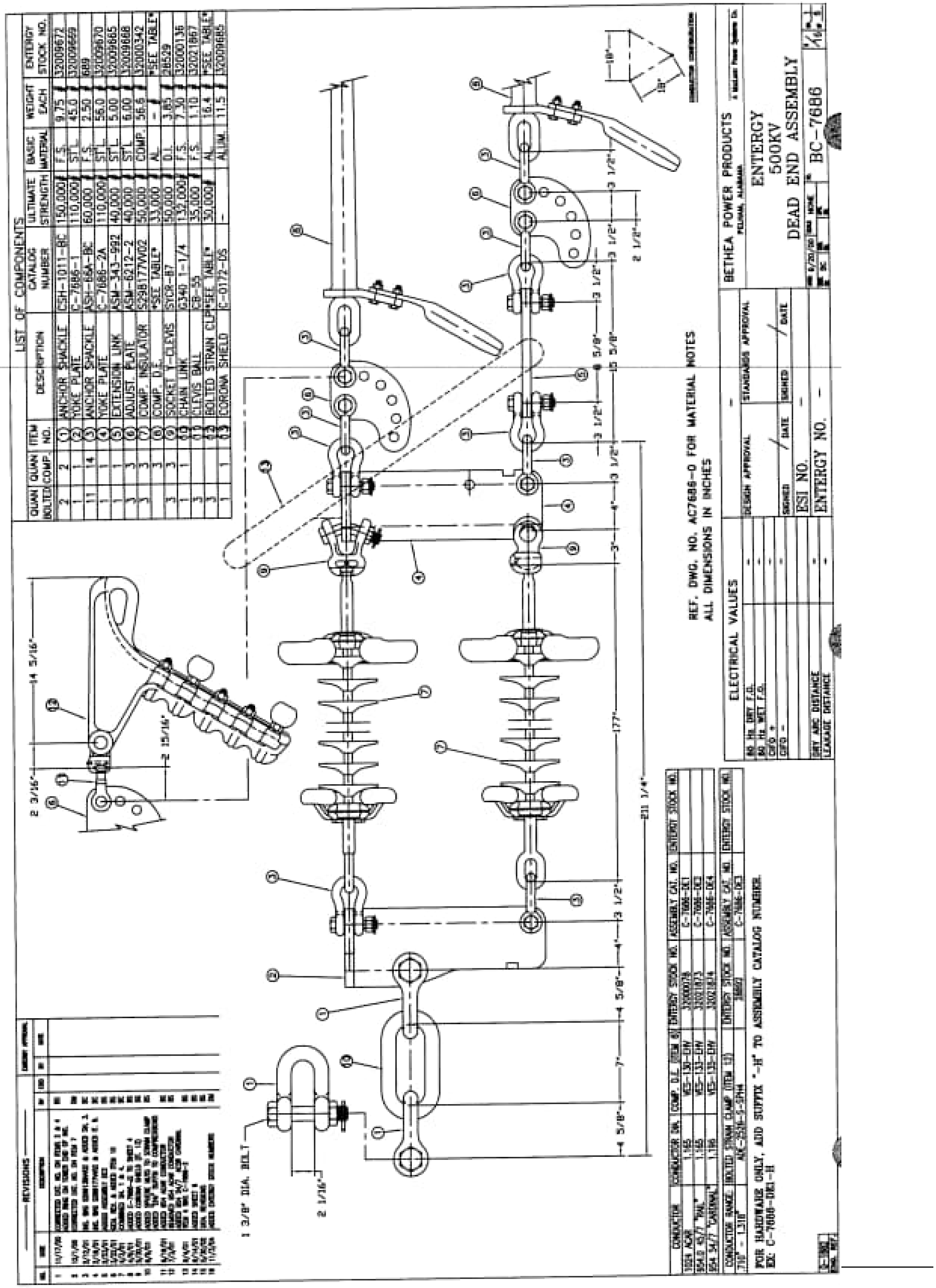
VEE-STRING, POLYMER, W/BUNDLING YOKE, 500kV

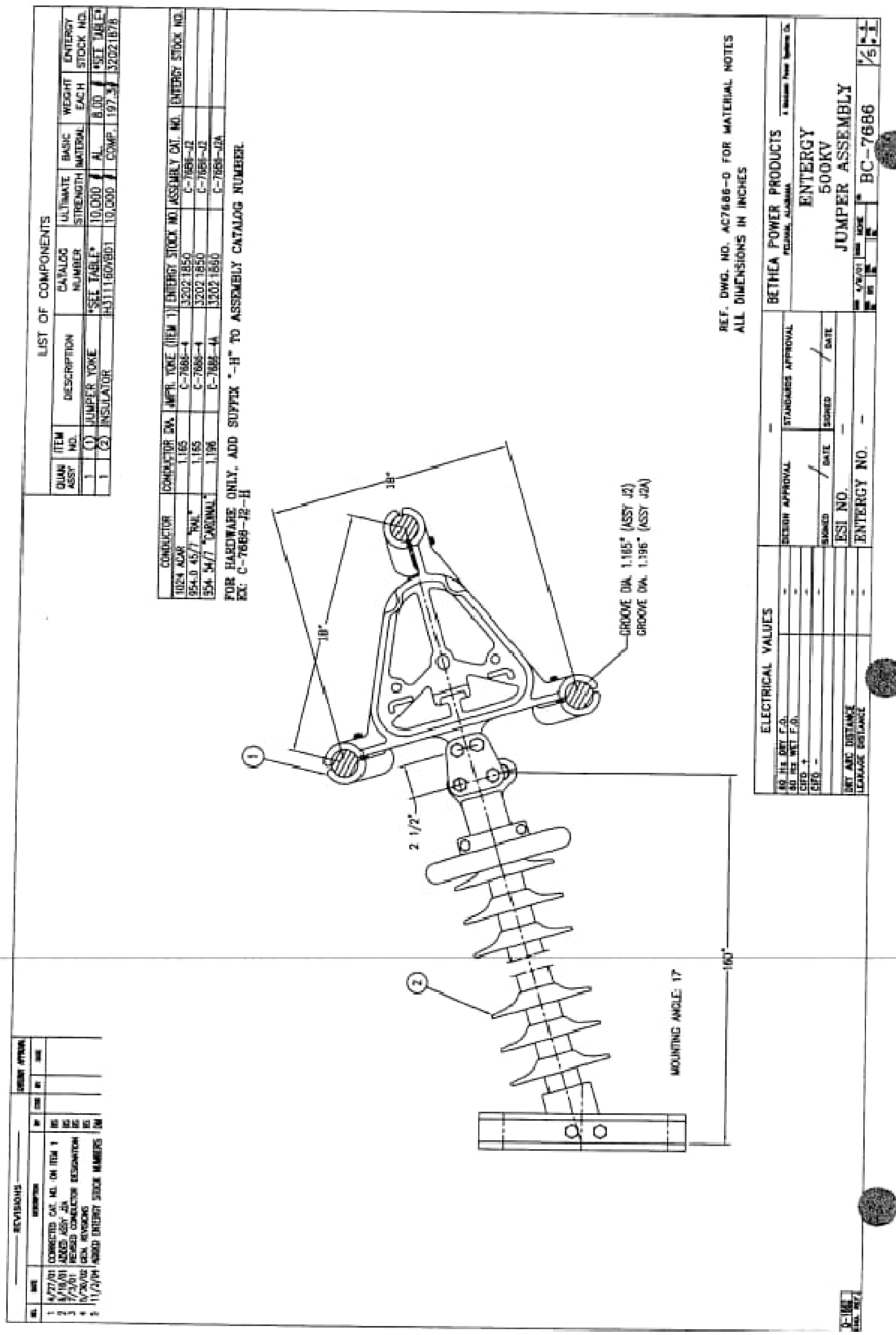
STD NO. | SCALE: NONE

Entergy | No. TFA205A0 | PLOT 1=1 | SH. 1 OF 1

NO.	DATE	REVISION	BY	CHK	APPR
0	03-05-07	CREATED	TWF	HSK	

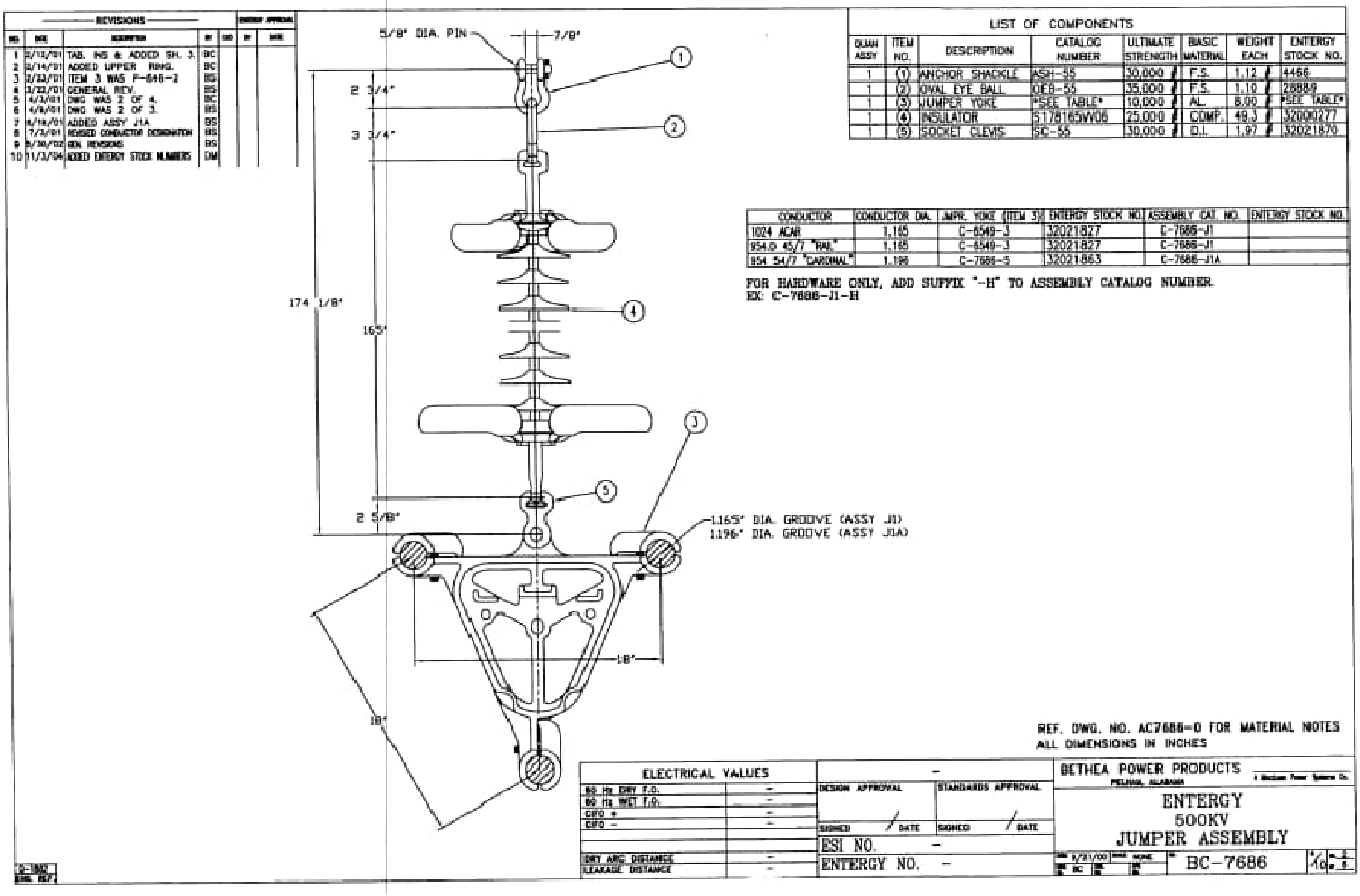
tfinc90 3/5/2007 VSPY-500-XX; BC-8098-1

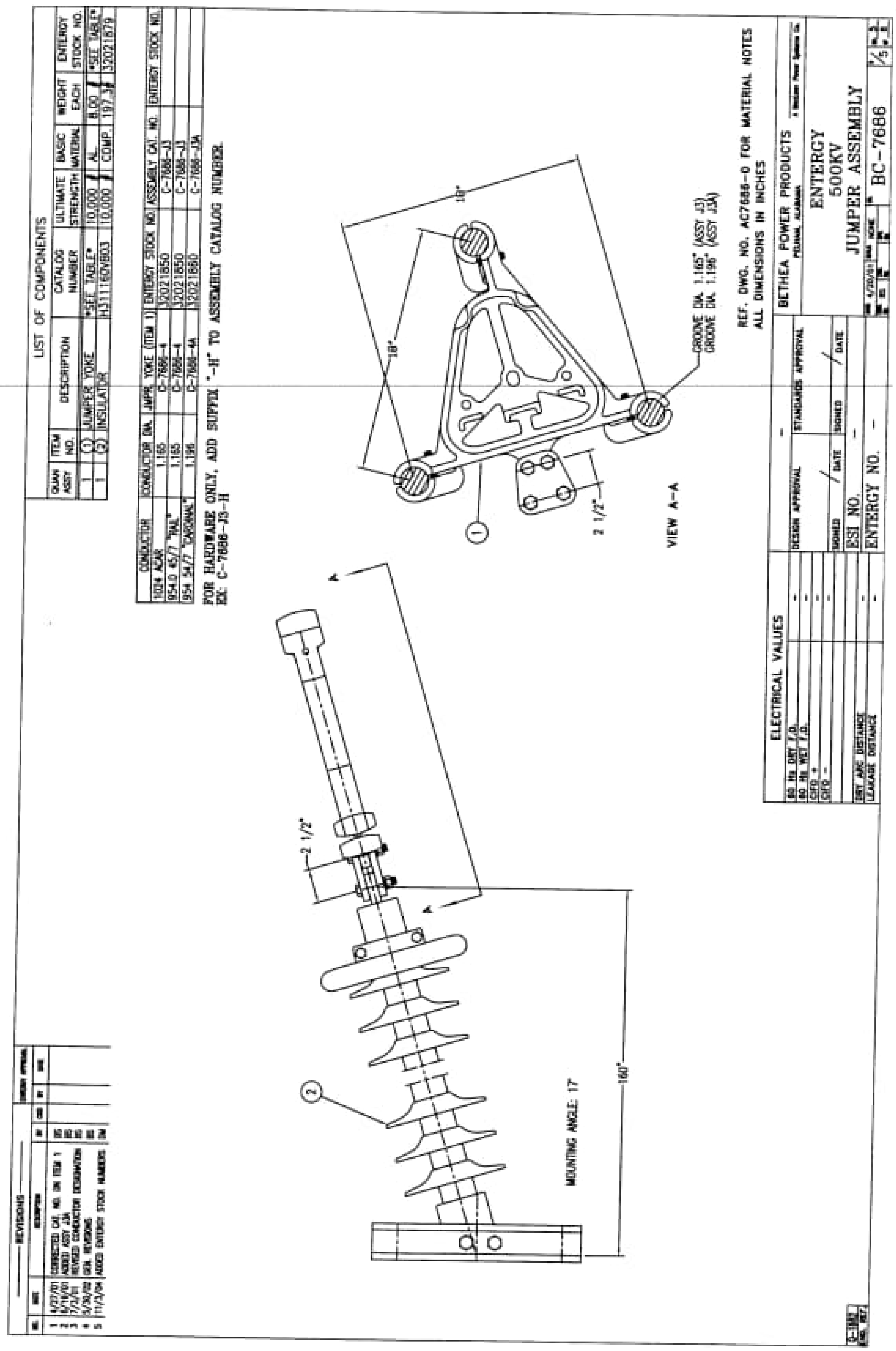

LIST OF COMPONENTS
REF. DWG. NO. AC7686-0 FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES
BETHEA POWER PRODUCTS
ENTERGY
500KV
DEAD END ASSEMBLY
BC-7686

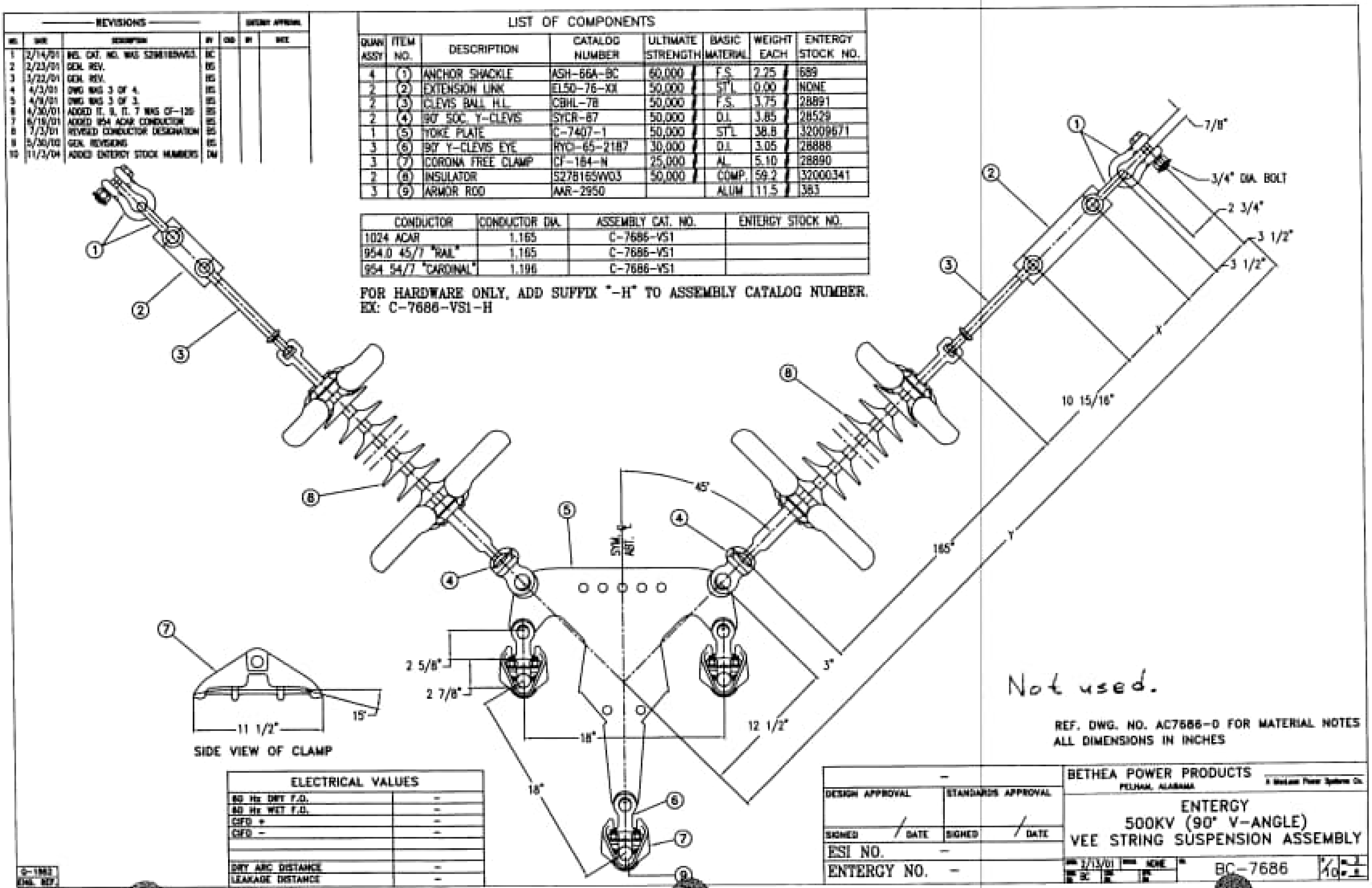


QUAN ASSY	ITEM NO.	DESCRIPTION	CATALOG NUMBER	ULTIMATE STRENGTH	BASIC MATERIAL	WEIGHT EACH	ENTERGY STOCK NO.
1	(1)	JUMPER YOKE	*SEE TABLE*	10,000 #	AL.	8.00 #	*SEE TABLE*
1	(2)	INSULATOR	H3111-60VB01	10,000 #	COMP.	197.3#	32021878

CONDUCTOR	CONDUCTOR DIA.	JMPR. YOKE (ITEM 1)	ENTERGY STOCK NO.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	C-7686-4	32021850	C-7686-J2	
954.0 45/7 "RAIL"	1.165	C-7686-4	32021850	C-7686-J2	
954- 54/7 "CARDINAL"	1.196	C-7686-4A	32021860	C-7686-J2A	


REVISIONS
1 2/12/01 TAB. INS & ADDED SH. 3. BC
2 2/14/01 ADDED UPPER RING. BC
3 2/22/01 ITEM 3 WAS F-646-2 BS
4 2/22/01 GENERAL REV. BS
5 4/3/01 DWG WAS 2 OF 4. BC
6 4/9/01 DWG WAS 2 OF 3. BS
7 6/18/01 ADDED ASSY J1A BS
8 7/3/01 REVISED CONDUCTOR DESIGNATION BS
9 8/30/02 GEN. REVISIONS BS
10 11/3/04 ADDED ENTERGY STOCK NUMBERS DM
5/8" DIA. PIN
7/8"
2 3/4"
3 3/4"
174 1/8"
165"
2 5/8"
18"
18"
1.165" DIA. GROOVE (ASSY J1)
1.196" DIA. GROOVE (ASSY J1A)
LIST OF COMPONENTS
QUAN ASSY | ITEM NO. | DESCRIPTION | CATALOG NUMBER | ULTIMATE STRENGTH | BASIC MATERIAL | WEIGHT EACH | ENTERGY STOCK NO.
1 | (1) | ANCHOR SHACKLE | ASH-55 | 30,000 # | F.S. | 1.12 # | 4466
1 | (2) | OVAL EYE BALL | OEB-55 | 35,000 # | F.S. | 1.10 # | 28889
1 | (3) | JUMPER YOKE | *SEE TABLE* | 10,000 # | AL. | 8.00 # | *SEE TABLE*
1 | (4) | INSULATOR | 5178165W06 | 25,000 # | COMP. | 49.3 # | 32000277
1 | (5) | SOCKET CLEVIS | SIC-55 | 30,000 # | D.I. | 1.97 # | 32021870
CONDUCTOR | CONDUCTOR DIA. | JMPR. YOKE (ITEM 3) | ENTERGY STOCK NO. | ASSEMBLY CAT. NO. | ENTERGY STOCK NO.
1024 ACAR | 1.165 | C-6549-3 | 32021827 | C-7686-J1 |
954.0 45/7 "RAIL" | 1.165 | C-6549-3 | 32021827 | C-7686-J1 |
954 54/7 "CARDINAL" | 1.196 | C-7686-5 | 32021863 | C-7686-J1A |
FOR HARDWARE ONLY, ADD SUFFIX "-H" TO ASSEMBLY CATALOG NUMBER.
EX: C-7686-J1-H
REF. DWG. NO. AC7686-D FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES
ELECTRICAL VALUES
60 Hz DRY F.O. -
60 Hz WET F.O. -
CIFO + -
CIFO - -
DRY ARC DISTANCE -
LEAKAGE DISTANCE -
DESIGN APPROVAL
STANDARDS APPROVAL
SIGNED / DATE
ESI NO. -
ENTERGY NO. -
BETHEA POWER PRODUCTS
PELHAM, ALABAMA
ENTERGY
500KV
JUMPER ASSEMBLY
BC-7686


LIST OF COMPONENTS
QUAN ASSY | ITEM NO. | DESCRIPTION | CATALOG NUMBER | ULTIMATE STRENGTH | BASIC MATERIAL | WEIGHT EACH | ENTERGY STOCK NO.
1 | (1) | JUMPER YOKE | *SEE TABLE* | 10,000 | AL. | 8.00 | *SEE TABLE*
1 | (2) | INSULATOR | H311160V803 | 10,000 | COMP. | 197.3 | 32021879
CONDUCTOR | CONDUCTOR DIA. | JMPR. YOKE (ITEM 1) | ENTERGY STOCK NO. | ASSEMBLY CAT. NO. | ENTERGY STOCK NO.
1024 ACAR | 1.165 | C-7686-4 | 32021850 | C-7686-J3
954.0 45/7 "RAIL" | 1.165 | C-7686-4 | 32021850 | C-7686-J3
954 54/7 "CARDINAL" | 1.196 | C-7686-4A | 32021860 | C-7686-J3A
FOR HARDWARE ONLY, ADD SUFFIX "-H" TO ASSEMBLY CATALOG NUMBER.
EX: C-7686-J3-H
REVISIONS
1 4/27/01 CORRECTED CAT. NO. ON ITEM 1
2 6/18/01 ADDED ASSY J3A
3 7/3/01 REVISED CONDUCTOR DESIGNATION
4 5/30/02 GEN. REVISIONS
5 11/3/04 ADDED ENTERGY STOCK NUMBERS
2 1/2"
A
A
MOUNTING ANGLE: 17°
160"
18"
18"
2 1/2"
VIEW A-A
GROOVE DIA. 1.165" (ASSY J3)
GROOVE DIA. 1.196" (ASSY J3A)
REF. DWG. NO. AC7686-0 FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES
ELECTRICAL VALUES
60 Hz DRY F.O.
60 Hz WET F.O.
CIFO +
CIFO -
DRY ARC DISTANCE
LEAKAGE DISTANCE
DESIGN APPROVAL
STANDARDS APPROVAL
SIGNED
DATE
ESI NO.
ENTERGY NO.
BETHEA POWER PRODUCTS
PELHAM, ALABAMA
ENTERGY
500KV
JUMPER ASSEMBLY
BC-7686



REVISIONS					ENTERGY APPROVAL	
NO.	DATE	DESCRIPTION	BY	CKD	BY	DATE
1	2/14/01	INS. CAT. NO. WAS 5278165W03.	BC			
2	2/23/01	GEN. REV.	BS			
3	3/22/01	GEN. REV.	BS			
4	4/3/01	DWG WAS 3 OF 4.	BS			
5	4/9/01	DWG WAS 3 OF 3.	BS			
6	4/30/01	ADDED IT. 9, IT. 7 WAS CF-120	BS			
7	6/19/01	ADDED 954 ACAR CONDUCTOR	BS			
8	7/3/01	REVISED CONDUCTOR DESIGNATION	BS			
9	5/30/02	GEN. REVISIONS	BS			
10	11/3/04	ADDED ENTERGY STOCK NUMBERS	DM			

LIST OF COMPONENTS

QUAN ASSY	ITEM NO.	DESCRIPTION	CATALOG NUMBER	ULTIMATE STRENGTH	BASIC MATERIAL	WEIGHT EACH	ENTERGY STOCK NO.
4	1	ANCHOR SHACKLE	ASH-66A-BC	60,000	F.S.	2.25	689
2	2	EXTENSION LINK	EL50-76-XX	50,000	ST'L	0.00	NONE
2	3	CLEVIS BALL H.L.	CBHL-78	50,000	F.S.	3.75	28891
2	4	90° SOC. Y-CLEVIS	SYCR-67	50,000	D.I.	3.85	28529
1	5	YOKE PLATE	C-7407-1	50,000	ST'L	38.8	32009671
3	6	90° Y-CLEVIS EYE	RYCI-65-2187	30,000	D.I.	3.05	28888
3	7	CORONA FREE CLAMP	CF-184-N	25,000	AL.	5.10	28890
2	8	INSULATOR	5278165W03	50,000	COMP.	59.2	32000341
3	9	ARMOR ROD	AAR-2950		ALUM	11.5	383

CONDUCTOR	CONDUCTOR DIA.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	C-7686-VS1	
954.0 45/7 "RAIL"	1.165	C-7686-VS1	
954 54/7 "CARDINAL"	1.196	C-7686-VS1	

FOR HARDWARE ONLY, ADD SUFFIX "-H" TO ASSEMBLY CATALOG NUMBER.
EX: C-7686-VS1-H

ELECTRICAL VALUES	
60 Hz DRY F.O.	-
60 Hz WET F.O.	-
CIFO +	-
CIFO -	-
DRY ARC DISTANCE	-
LEAKAGE DISTANCE	-

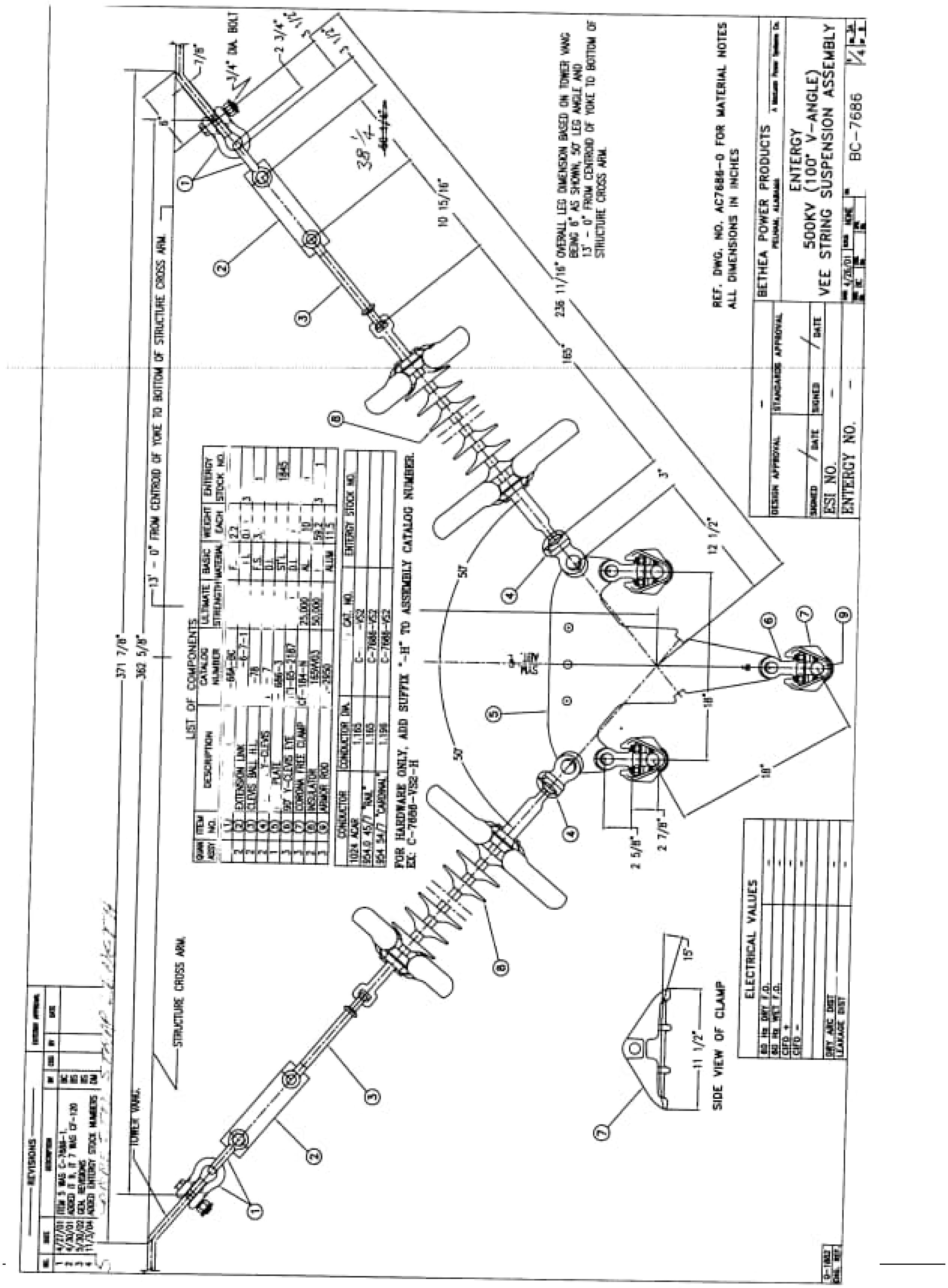
REF. DWG. NO. AC7686-D FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES

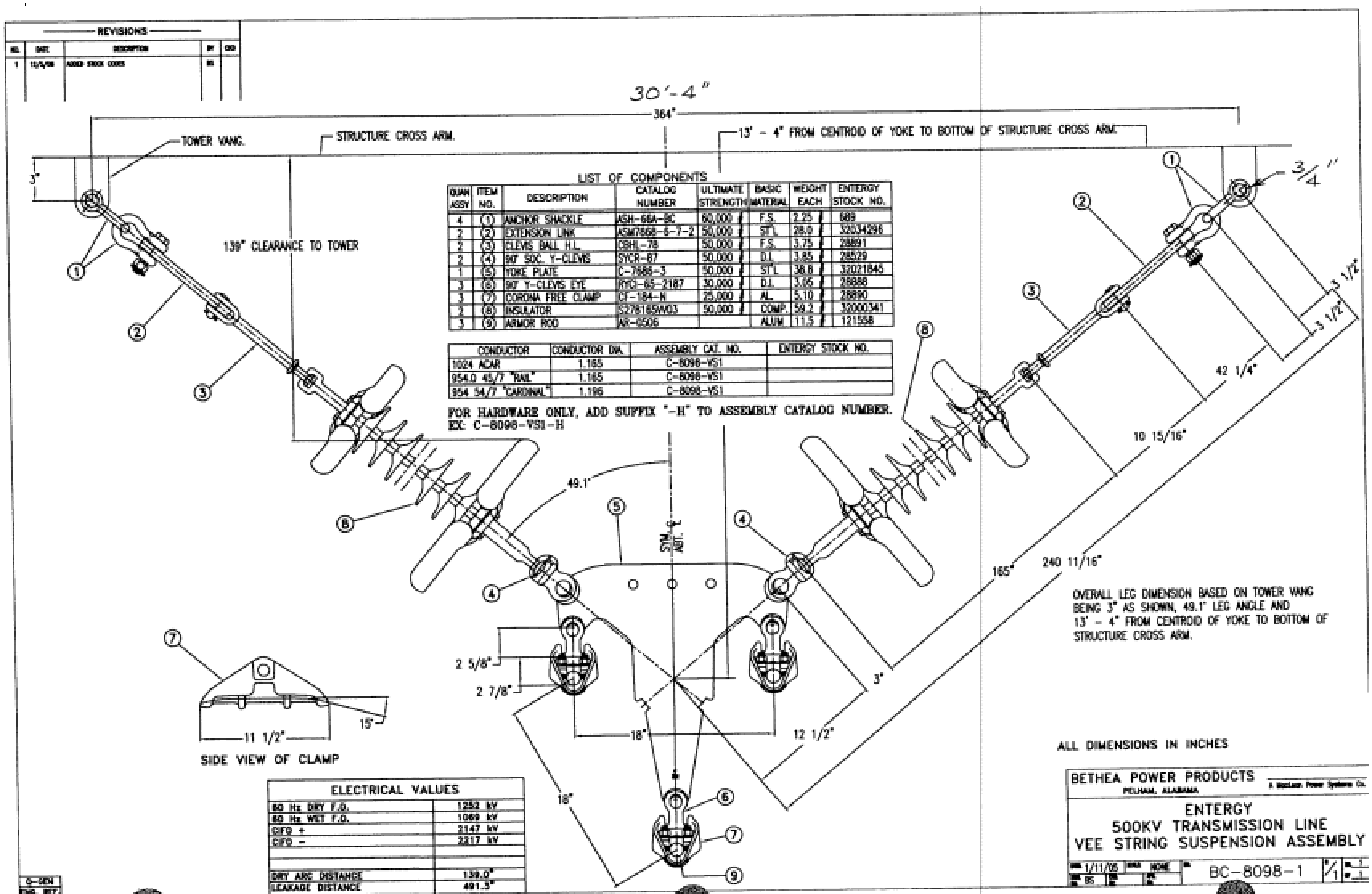
-			
DESIGN APPROVAL		STANDARDS APPROVAL	
SIGNED	/ DATE	SIGNED	/ DATE
ESI NO.	-		
ENTERGY NO.	-		

BETHEA POWER PRODUCTS
PELHAM, ALABAMA

ENTERGY
500KV (90° V-ANGLE)
VEE STRING SUSPENSION ASSEMBLY

2/13/01 NONE BC-7686


BETHEA POWER PRODUCTS
ENTERGY
500KV (100° V-ANGLE)
VEE STRING SUSPENSION ASSEMBLY
BC-7686
LIST OF COMPONENTS
SIDE VIEW OF CLAMP
ELECTRICAL VALUES
STRUCTURE CROSS ARM
TOWER VANG
REF. DWG. NO. AC7686-0 FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES
FOR HARDWARE ONLY, ADD SUFFIX "-H" TO ASSEMBLY CATALOG NUMBER.



LIST OF COMPONENTS

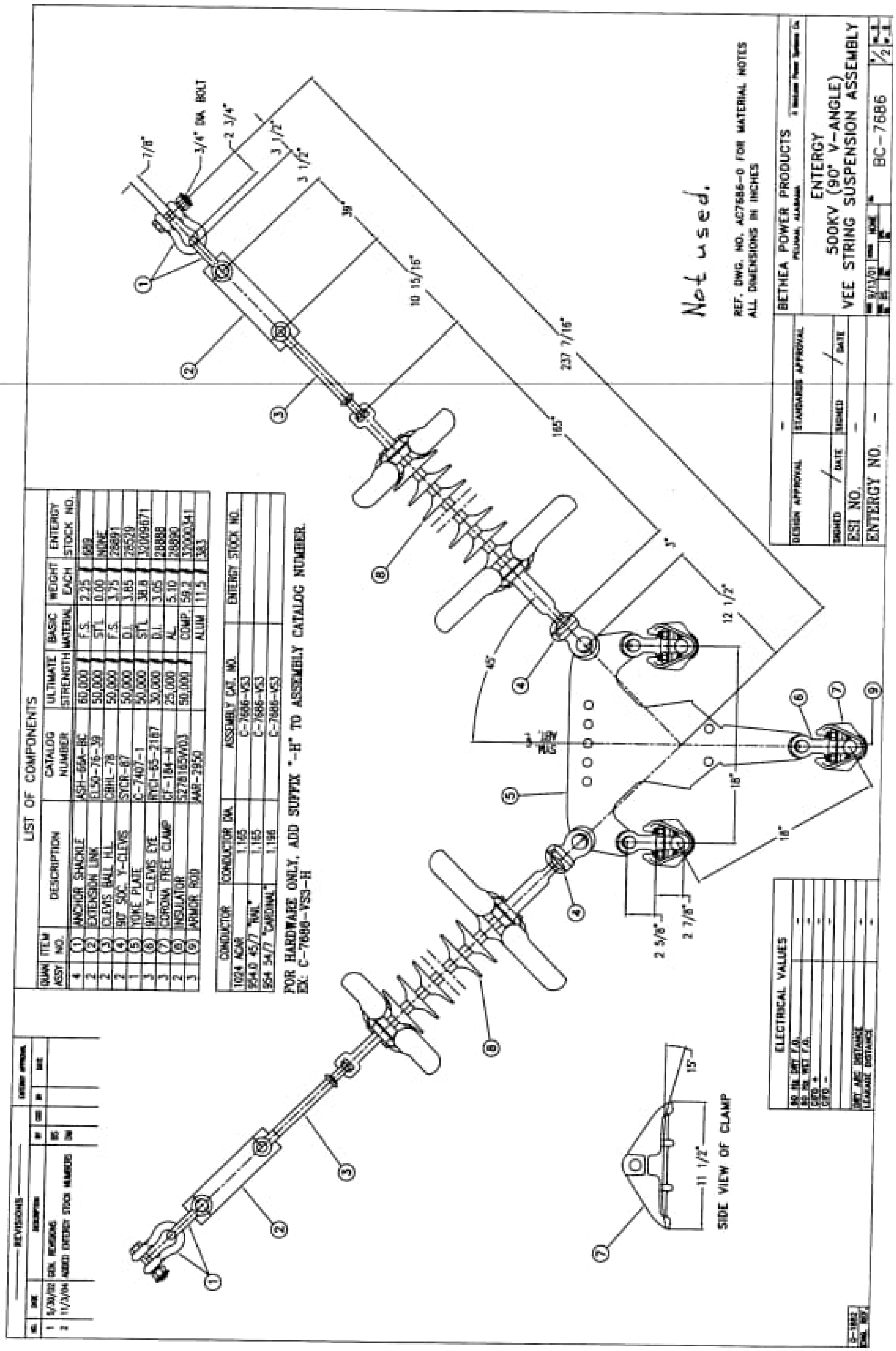
QUAN ASSY	ITEM NO.	DESCRIPTION	CATALOG NUMBER	ULTIMATE STRENGTH	BASIC MATERIAL	WEIGHT EACH	ENTERGY STOCK NO.
4	1	ANCHOR SHACKLE	ASH-66A-BC	60,000	F.S.	2.25	689
2	2	EXTENSION LINK	ASM7868-6-7-2	50,000	ST'L	28.0	32034296
2	3	CLEVIS BALL H.L.	CBHL-78	50,000	F.S.	3.75	28891
2	4	90° SOC. Y-CLEVIS	SYCR-87	50,000	D.I.	3.85	28529
1	5	YOKE PLATE	C-7686-3	50,000	ST'L	38.8	32021845
3	6	90° Y-CLEVIS EYE	RYCI-65-2187	30,000	D.I.	3.05	28888
3	7	CORONA FREE CLAMP	CF-184-N	25,000	AL.	5.10	28890
2	8	INSULATOR	S278185W03	50,000	COMP.	59.2	32000341
3	9	ARMOR ROD	AR-0506		ALUM.	11.5	121558

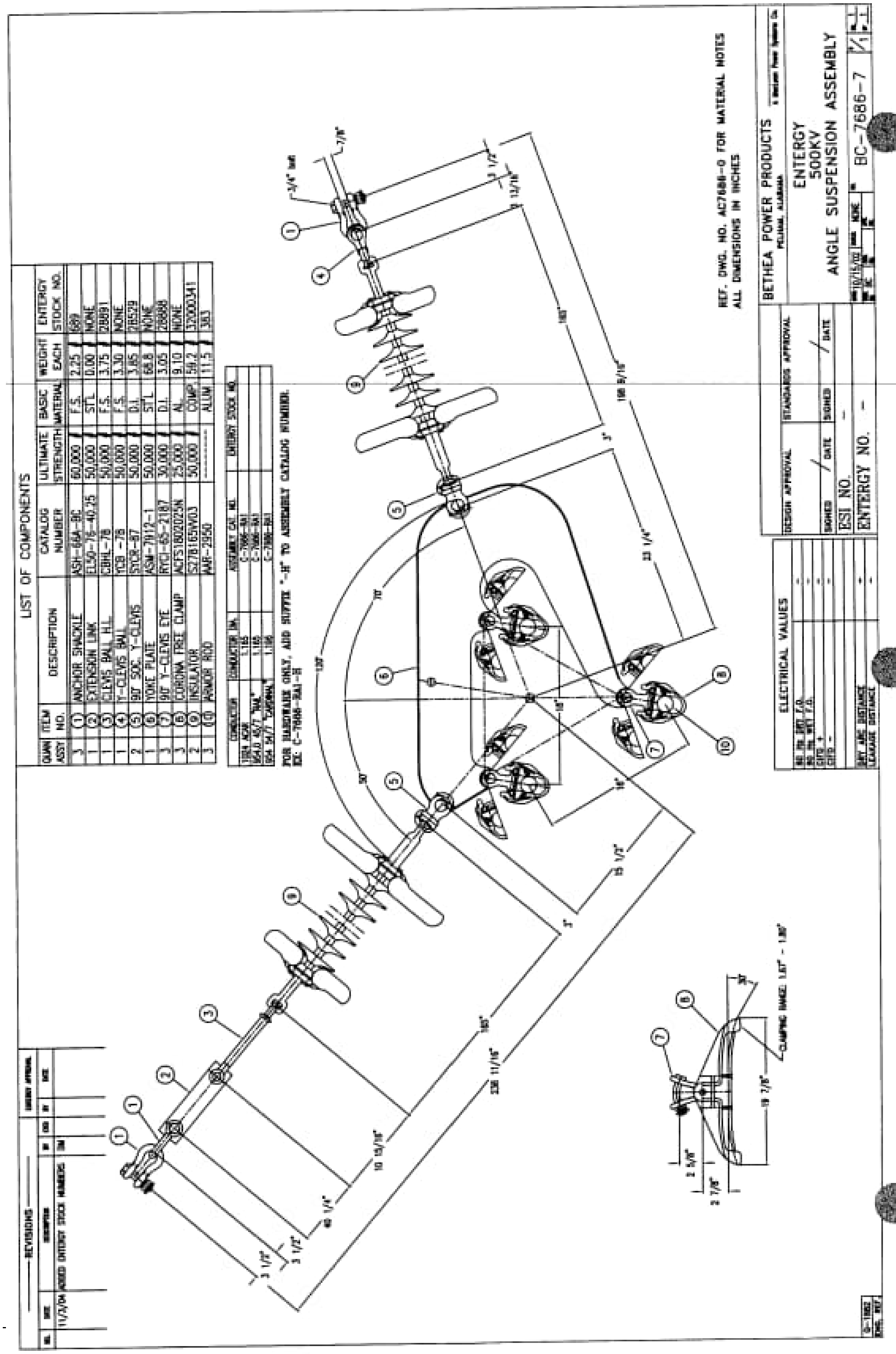
CONDUCTOR	CONDUCTOR DIA.	ASSEMBLY CAT. NO.	ENTERGY STOCK NO.
1024 ACAR	1.165	C-8098-VS1	
954.0 45/7 "RAIL"	1.165	C-8098-VS1	
954 54/7 "CARDINAL"	1.196	C-8098-VS1	

FOR HARDWARE ONLY, ADD SUFFIX "-H" TO ASSEMBLY CATALOG NUMBER.
EX: C-8098-VS1-H

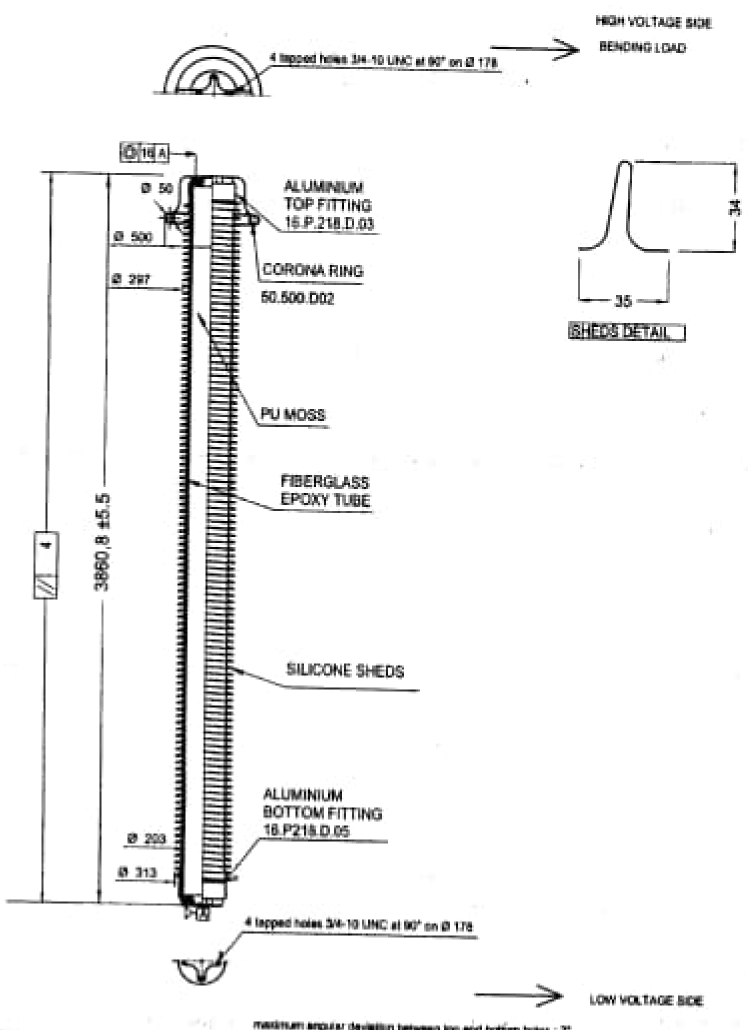
ELECTRICAL VALUES

60 Hz DRY F.O.	1252 kV
60 Hz WET F.O.	1069 kV
CIFO +	2147 kV
CIFO −	2217 kV
DRY ARC DISTANCE	139.0"
LEAKAGE DISTANCE	491.3"


Not used.
REF. DWG. NO. AC7686-0 FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES
BETHEA POWER PRODUCTS
ENTERGY
500KV (90° V-ANGLE)
VEE STRING SUSPENSION ASSEMBLY
BC-7686
ESI NO.
ENTERGY NO.
DESIGN APPROVAL
STANDARDS APPROVAL
ELECTRICAL VALUES
SIDE VIEW OF CLAMP
LIST OF COMPONENTS
QUAN ASSY | ITEM NO. | DESCRIPTION | CATALOG NUMBER | ULTIMATE STRENGTH | BASIC MATERIAL | WEIGHT EACH | ENTERGY STOCK NO.
4 | 1 | ANCHOR SHACKLE | ASH-66A-BC | 60,000 | F.S. | 2.25 | 669
2 | 2 | EXTENSION LINK | EL50-76-39 | 50,000 | STL | 0.00 | NONE
2 | 3 | CLEVIS BALL H.L. | CBHL-78 | 50,000 | F.S. | 3.75 | 28891
2 | 4 | 90° SOC. Y-CLEVIS | SYCR-87 | 50,000 | D.I. | 3.85 | 28529
1 | 5 | YOKE PLATE | C-7407-1 | 50,000 | STL | 38.8 | 32009671
3 | 6 | 90° Y-CLEVIS EYE | RYCI-65-2187 | 30,000 | D.I. | 3.05 | 28888
3 | 7 | CORONA FREE CLAMP | CF-184-H | 25,000 | AL | 5.10 | 28890
2 | 8 | INSULATOR | S27816SVV03 | 50,000 | COMP. | 59.2 | 32000341
3 | 9 | ARMOR ROD | AAR-2950 | | ALUM | 11.5 | 383
CONDUCTOR | CONDUCTOR DIA. | ASSEMBLY CAT. NO. | ENTERGY STOCK NO.
1024 ACAR | 1.165 | C-7686-VS3
954.0 45/7 "RAIL" | 1.165 | C-7686-VS3
954 54/7 "CARDINAL" | 1.196 | C-7686-VS3
FOR HARDWARE ONLY, ADD SUFFIX "-H" TO ASSEMBLY CATALOG NUMBER.
EX: C-7686-VS3-H
REVISIONS



LIST OF COMPONENTS
QUAN ASSY | ITEM NO. | DESCRIPTION | CATALOG NUMBER | ULTIMATE STRENGTH | BASIC MATERIAL | WEIGHT EACH | ENTERGY STOCK NO.
3 | 1 | ANCHOR SHACKLE | ASH-66A-BC | 60,000 | F.S. | 2.25 | 689
1 | 2 | EXTENSION LINK | EL50-76-40.25 | 50,000 | STL | 0.00 | NONE
1 | 3 | CLEVIS BALL HL | CBHL-78 | 50,000 | F.S. | 3.75 | 28891
1 | 4 | Y-CLEVIS BALL | YCB-78 | 50,000 | F.S. | 3.30 | NONE
2 | 5 | 90° SOC. Y-CLEVIS | SYCR-87 | 50,000 | D.I. | 3.85 | 28529
1 | 6 | YOKE PLATE | ASM-7912-1 | 50,000 | STL | 68.8 | NONE
3 | 7 | 90° Y-CLEVIS EYE | RYCI-65-2187 | 30,000 | D.I. | 3.05 | 28888
3 | 8 | CORONA FREE CLAMP | ACFS180202SN | 25,000 | AL | 9.10 | NONE
2 | 9 | INSULATOR | S278165W03 | 50,000 | COMP | 59.2 | 32000341
3 | 10 | ARMOR ROD | AAR-2950 | | ALUM | 11.5 | 383
FOR HARDWARE ONLY, ADD SUFFIX "-H" TO ASSEMBLY CATALOG NUMBER.
EX: C-7686-9A1-H
ELECTRICAL VALUES
REF. DWG. NO. AC7686-0 FOR MATERIAL NOTES
ALL DIMENSIONS IN INCHES
BETHEA POWER PRODUCTS
PELHAM, ALABAMA
ENTERGY
500KV
ANGLE SUSPENSION ASSEMBLY
BC-7686-7
DESIGN APPROVAL
STANDARDS APPROVAL
ESI NO.
ENTERGY NO.
REVISIONS



COMPOSITE POLYMER POST INSULATOR
TOLERANCES OF DIMENSIONS ANSI C29.9-1983

1- ELECTRICAL SPECIFICATION	ANSI C29.9-1983-TR391	
1.1- APPLICATION	support	
1.2- RATED VOLTAGE	550 KV	-
-	-	-
2- INSULATOR MECHANICAL SPECIFICATION	-	-
2.1- BENDING WITHSTAND		
2.1.a- BENDING WITHSTAND MOMENT(1mm)	2404 daN.m	212800 inch-lbs
EQUIVALENT BENDING WITHSTAND LOAD (SML)	623 daN	1400 lbs
2.1.b- MAXIMUM DEFLECTION	100 mm	4 "
UNDER BENDING LOAD (MML)	249 daN	560 lbs
		-
2.2 TORSIONAL STRENGTH	10170 N.m	90000 inch.pounds
3- DIMENSIONS	-	
3.1- INSULATOR	-	
3.1.a- OVERALL HEIGHT OF INSULATOR	3860.8 mm	152 "
TOLERANCE ±	5.5 mm	7/32 "
3.1.b- MAX INTERNAL DIAMETER OF TUBE	203mm	8 "
3.1.c- MAX EXTERNAL DIAMETER OF SHEDS	313 mm	12" 9/32
3.2- HIGH VOLTAGE FITTING (OR TOP)	-	-
3.2.a- MAX DIAMETER	206 mm	8" 3/16
3.2.b- BOLT CIRCLE (PITCH CIRCLE DIAMETER)	178 mm	7 inches
3.2.c- NUMBER AND TYPE OF HOLES	4 Holes 3/4" 10 UNC	
3.3- LOW VOLTAGE FITTING (OR BOTTOM)	-	-
3.3.a- MAX DIAMETER	208 mm	8" 3/16
3.3.b- BOLT CIRCLE (PITCH CIRCLE DIAMETER)	178 mm	7 inches
3.3.c- NUMBER AND TYPE OF HOLES	4 Holes 3/4"-10 UNC	
3.4- APPROXIMATIVE TOTAL WEIGHT	136 kg	300 pounds
3.5- NOMINAL LEAKAGE DISTANCE	9347 mm	368 "
3.6- NOMINAL DRY ARCING DISTANCE	3540 mm	139 " 3/8"

MACLEAN POWER FRANCE
A MacLean-Fogg Company

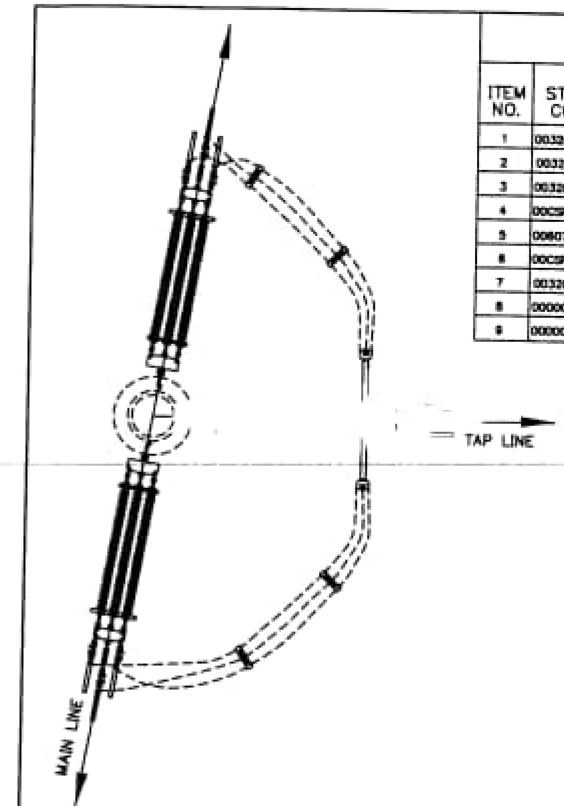
DESSINE :	23/10/2000	RV
VERIFIE :		
APPROUVE :		
DATE du TIRAGE :		
ECHELLE :		
ECH. SEC. :		

COMMERCIAL DRAWING

T-04684

N° T-04684

500KV STATION POST - ENTERGY STOCK CODE 0032034655



BILL OF MATERIAL

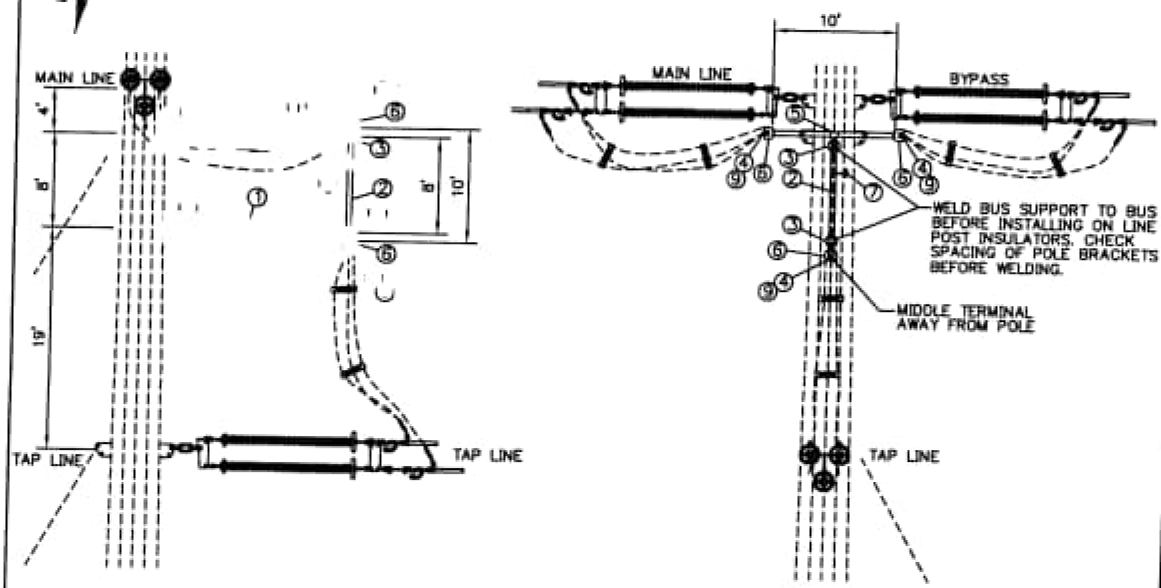
ITEM NO.	STOCK CODE	QTY.	UNIT	DESCRIPTION	MFR.	PART NO.
1	0032034655	2	EA.	STATION POST INSULATOR 500KV, 7" B.C.	MPS	T-04884
2	0032040241	20	FT.	TUBING, COND, ALUM, 5", SCH 40, EHV, 40' LG	AFL	500S40YTBE
3	0032040322	2	EA.	SUPPORT, BUS, 5" TUBE TO 7" B.C., W/ MTG HDWR	SEFCOR	MCTI-67-7-EHV
4	00CSPERCPD	3	EA.	EHV BUS COUPLER, 5" TUBING , 3-TERMINAL, 500KV	SEFCOR	WSTC3-67-40
5	00607-6810	1	EA.	CONNECTOR, TEE, 5" RUN/5" TAP, 90 DEGREE, EHV	SEFCOR	WFTT-6767
6	00CSPERHSP	9	EA.	EHV HARDWARE SHIELD, CORONA PAD COVER	SEFCOR	AA-1094
7	0032031610	1	EA.	STUD, GROUND, WELD, ALUM, FOR 3" TO 6" TUBE	SEFCOR	WTS-6084
8	0000004659	8	EA.	BOLT ASSEMBLY,3/4"X1-1/2",HEX,GALV,A394, W/NUT	ANY	3/4" X 1-1/2"
9	0000000544	38	EA.	BOLT,1/2X2-1/2, SS,W/NUT, 2 WASH, BELLV. WASH	ANY	1/2" X 2-1/2"

REFERENCE DRAWINGS:

80'-100', DE. 3-POLE HIGH-LOW, STEEL 500KV
FOUNDATION PLAN, 500KV HIGH-LOW
WIRES PLAN, 500KV HIGH-LOW

NOTES:

1. EXACT TAKE OFF ANGLE/DIRECTION OF JUMPERS TO BE FIELD FITTED TO MATCH ASSOCIATED COMPRESSION DEAD END BODIES.
2. DISCARD NUTS FURNISHED WITH ITEM 8.
3. HOLES IN POLE END OF LINE POST ARE 1-1/8" DEEP. IF BOLT BOTTOMS OUT, OBTAIN A WASHER TO PROVIDE TAKEUP OF LENGTH.
4. ORDER TOTAL FEET OF ITEM 2 NEEDED. STANDARD LENGTH PER TUBE IS 40'.
5. BUS LENGTHS SHOWN MAY BE SLIGHTLY LONGER WHEN FITTINGS ARE MADE UP. LENGTHS SHOWN ARE END-TO-END OF TUBES.



JLP-500-HL

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
BUS ASSY FOR 500kV HIGH-LOW STRUCTURE
VOLTAGE SPECIFIC ASSEMBLY DETAIL

STD NO. | SCALE: NONE

No. TFA206A0

Entergy | PLOT 1=48 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	6-15-07	CREATED	TWF	HSK	HSK

tflnc90 7/3/2007

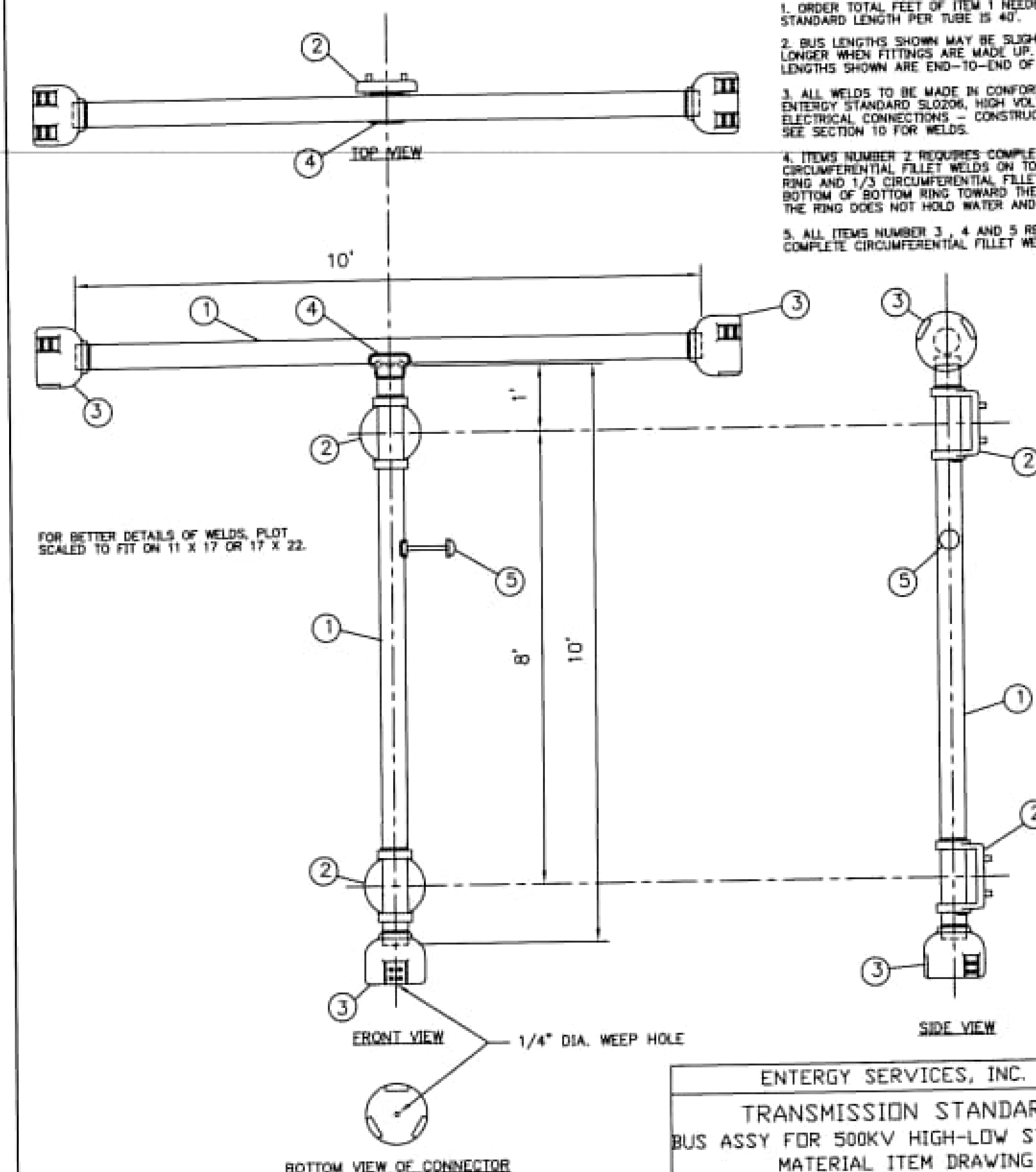
JLP-500-HL

BILL OF MATERIAL

ITEM NO.	STOCK CODE	QTY	UNIT	DESCRIPTION	MFR.	PART NO.
1	0032040241	20	FT.	TUBING, COND, ALUM, 5", SCH 40, EHV, 40' LG	AFL	500S40YT6E
2	0032040322	2	EA.	SUPPORT, BUS, 5" TUBE TO 7" B.C., W/ MTG HDWR	SEFCOR	WCTI-67-7-EHV
3	00CSPERCPD	3	EA.	EHV BUS COUPLER, 5" TUBING , 3-TERMINAL, 500KV	SEFCOR	WSTC3-67-4B
4	00607-8810	1	EA.	CONNECTOR, TEE, 5" RUN/5" TAP, 90 DEGREE, EHV	SEFCOR	WFTT-6767
5	0032031810	1	EA.	STUD, GROUND, WELD, ALUM, FOR 3" TO 6" TUBE	SEFCOR	WTS-6064

NOTES:

1. ORDER TOTAL FEET OF ITEM 1 NEEDED. STANDARD LENGTH PER TUBE IS 40'.
2. BUS LENGTHS SHOWN MAY BE SLIGHTLY LONGER WHEN FITTINGS ARE MADE UP. LENGTHS SHOWN ARE END-TO-END OF TUBES.
3. ALL WELDS TO BE MADE IN CONFORMANCE WITH ENTERGY STANDARD SL0206, HIGH VOLTAGE ELECTRICAL CONNECTIONS – CONSTRUCTION GUIDE. SEE SECTION 10 FOR WELDS.
4. ITEMS NUMBER 2 REQUIRES COMPLETE CIRCUMFERENTIAL FILLET WELDS ON TOP OF TOP RING AND 1/3 CIRCUMFERENTIAL FILLETWELDS ON BOTTOM OF BOTTOM RING TOWARD THE BASE SO THE RING DOES NOT HOLD WATER AND FREEZE.
5. ALL ITEMS NUMBER 3 , 4 AND 5 REQUIRE COMPLETE CIRCUMFERENTIAL FILLET WELDS.



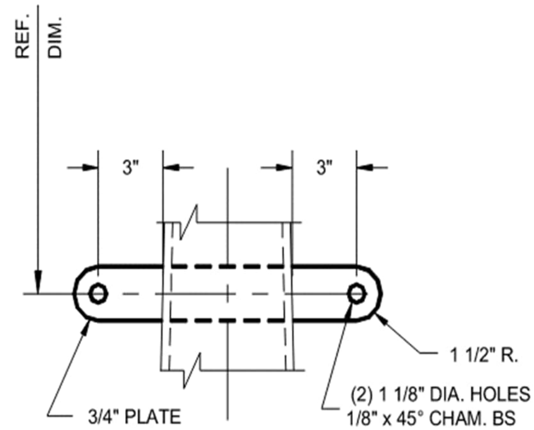
ENTERGY SERVICES, INC.

TRANSMISSION STANDARD
BUS ASSY FOR 500KV HIGH-LOW STRUCTURE
MATERIAL ITEM DRAWING

STD NO. SL0206 | SCALE: NONE

Entergy | No. TFM001A0 | PLOT 1=1 | SH. 1 OF 1

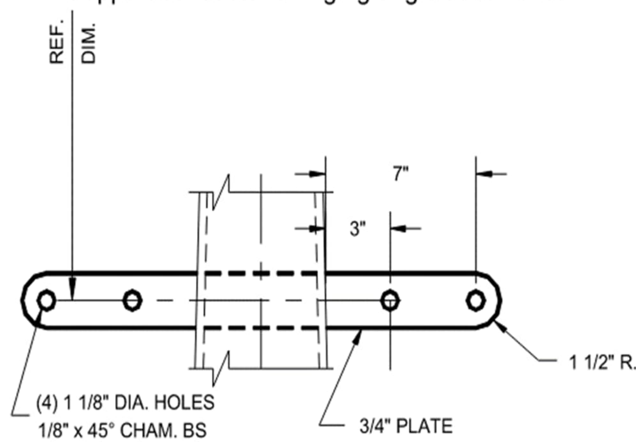
NO.	DATE	REVISION	BY	CHK	APPR
0	12-15-07	CREATED	TWF	HSK	HSK



LIGHT-DUTY 2-HOLE VANG

Primary uses:

Support shield wire span guys
Support top of braced-post insulator assemblies
Support conductor swinging angle assemblies

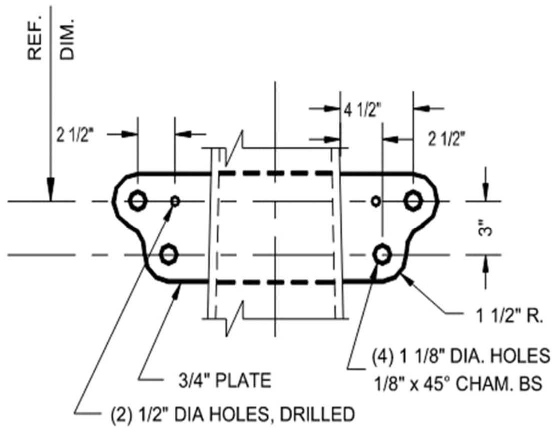


LIGHT-DUTY 4-HOLE VANG

Primary use:

Support shield wire suspension

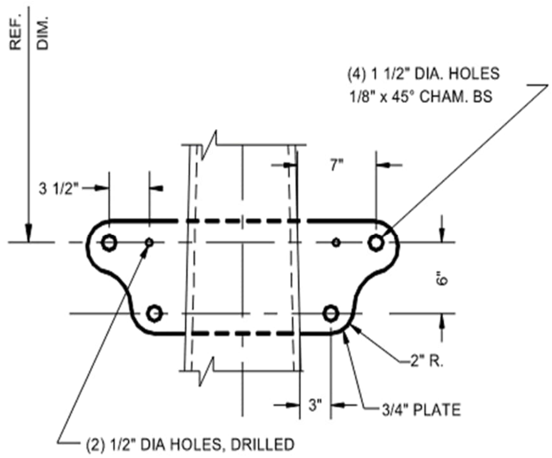
Vang Details for Steel Poles



HEAVY-DUTY 4-HOLE VANG

Primary use:

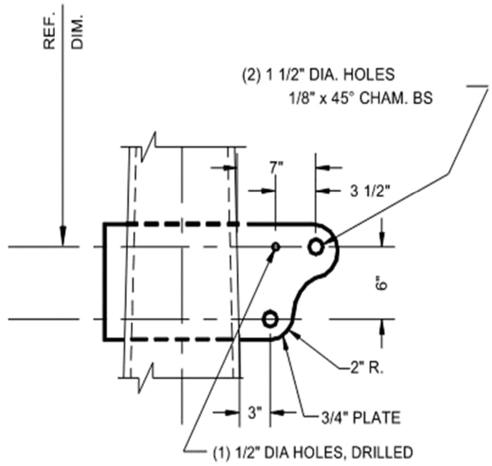
Support shield wire deadend assemblies
Support conductor deadend assemblies
Support conductor deadend down guys
Support conductor bisector down guys
Support shield wire deadend down guys
Support shield wire bisector down guys
All conductor and shield wire vangs on structures with running angle insulators (E, F and G)



HEAVY-DUTY 4-HOLE VANG FOR TRIPLE BUNDLE SINGLE POINT DEAD ENDS

Primary use:

Support 500kv conductor dead end assemblies where guys will be at the same elevation as the conductors and when guys are not specified.

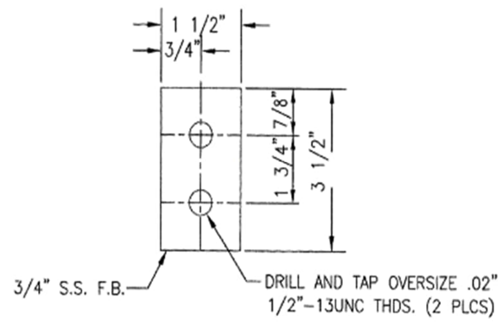


HEAVY-DUTY 2-HOLE VANG FOR TRIPLE BUNDLE SINGLE POINT DEAD ENDS

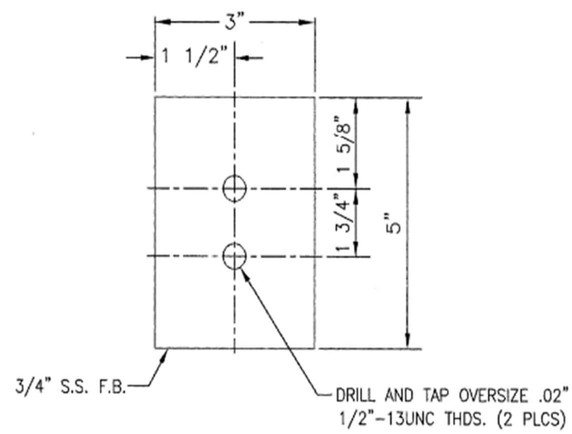
Primary use:

Support 500kv conductor dead end assemblies and guys where guys are specified and will attach at locations below the conductors. Do not install guy vangs on unguyed structures with this type of vang unless specified by Entergy.

NEMA Pad Details for Steel Poles or Caissons

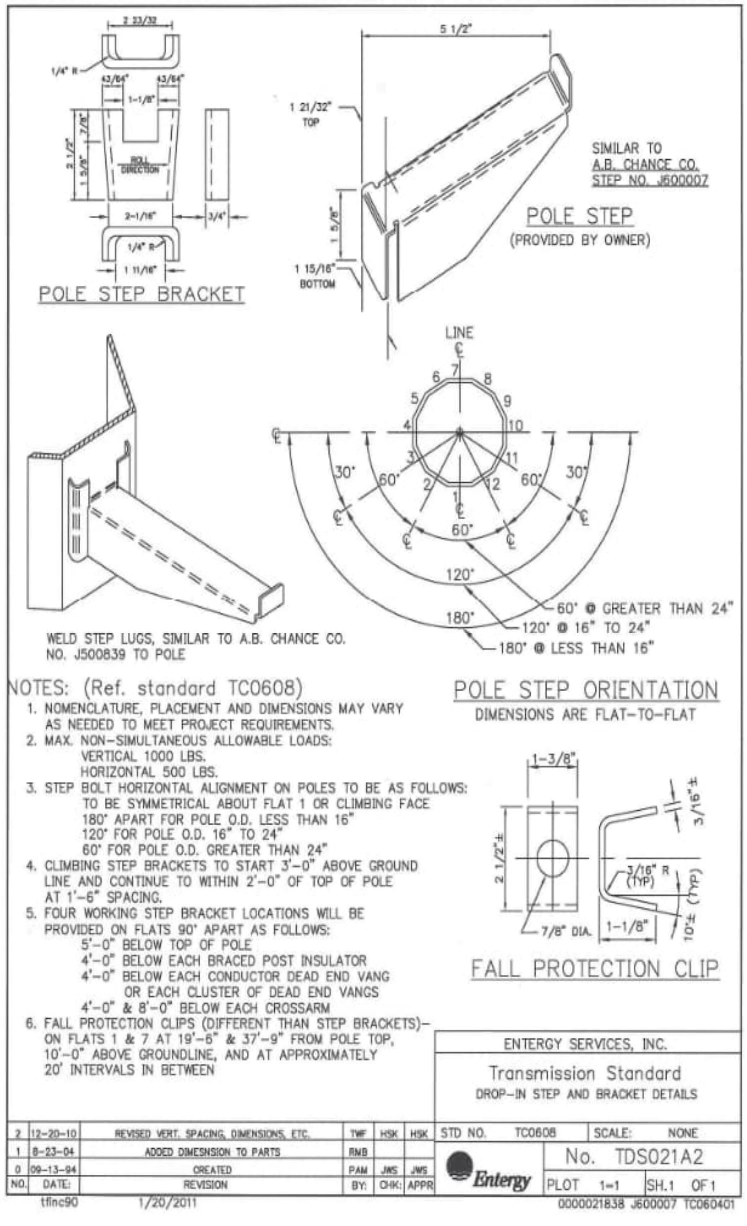


SMALL NEMA 2-HOLE PAD



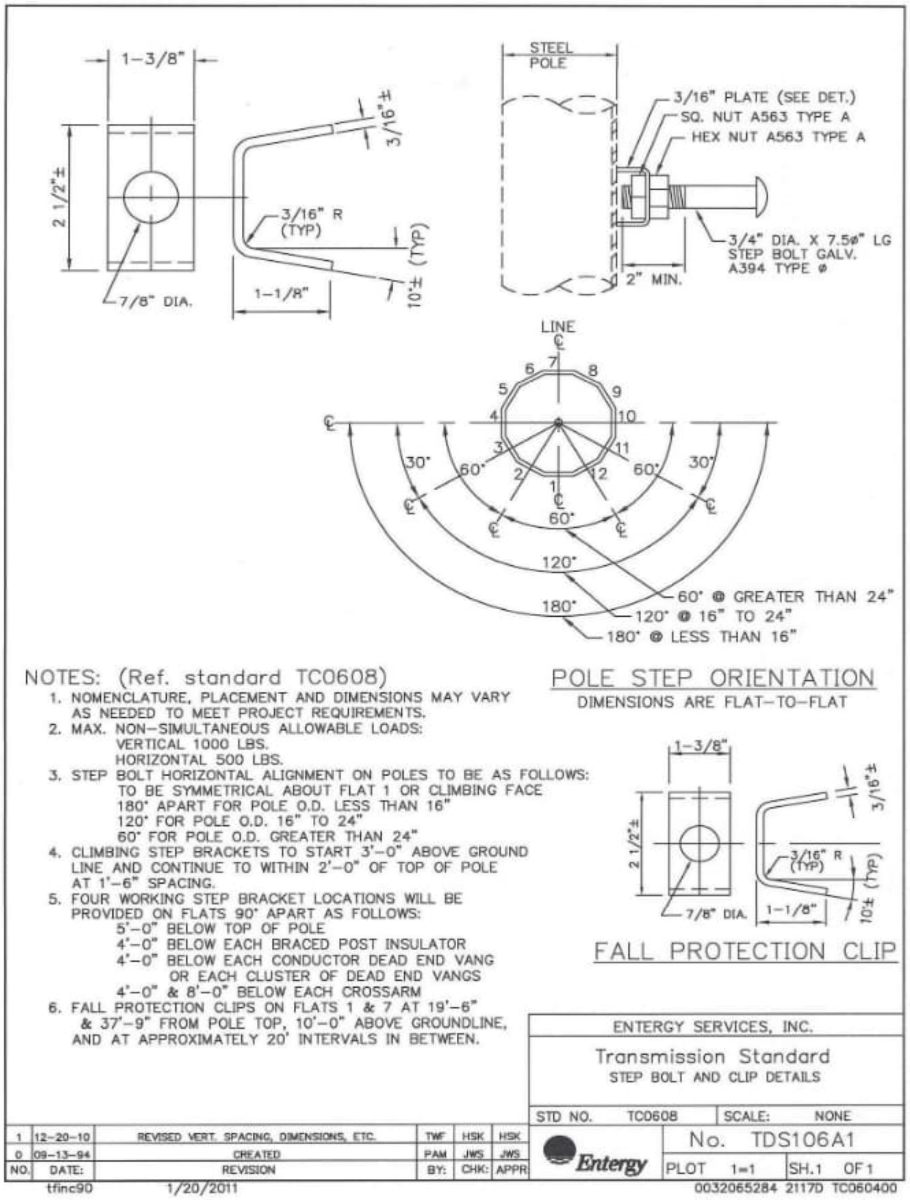
LARGE NEMA 2-HOLE PAD

TDS021A1, Step and Bracket Details, represents the Entergy specifications for drop-in steps.



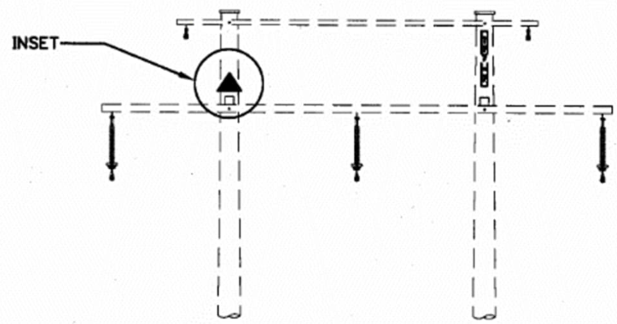
Climbing Details

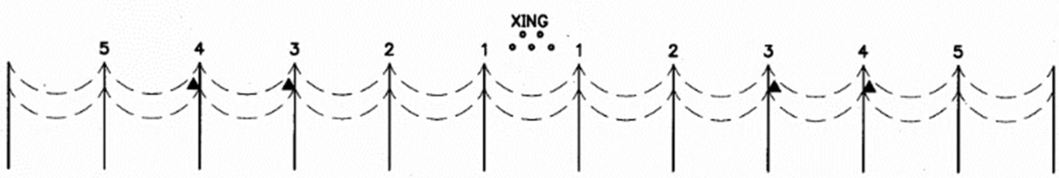
TDS106A1, Step Bolt Details, represents the Entergy specifications for pole steps.



BILL OF MATERIAL

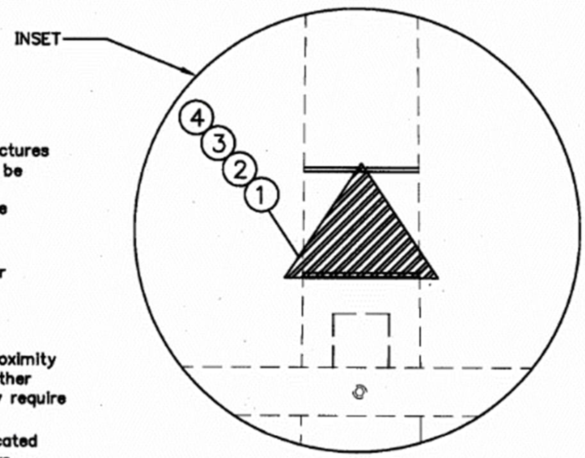
ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	NONE	SIGN, SLOW-VEHICLE, ACQUIRED BY LOCAL PURCHASE
2	8 FT.	0000017124	BAND, STRAPPING, 3/4" WD X 100FT LG ROLL, STAINLESS STEEL, 201
3	2	0032047234	BRACKET, BANDING, FLARED LEG, SS, WITH ONE 5/16"-18 X 3/4" HEX HEAD SS BOLT AND FIBER WASHER, 3/4" SLOT, SHIPPED 50/BOX
4	2	0000017123	BOLT, CLAMP ASSEMBLY, CARRIAGE HD, GALVANIZED STEEL, HIGH STRENGTH, ASTM B221 MILITARY QQ-A-200/8, 5 GR, 3/8" DIA, 6" LG HIGH STR CARR BOLT, WASH AND NUT.





NOTES:

1) This installation is optional with the grids, and represents a standard for uniformity across the system wherever it is used.
2) Install one slow-vehicle sign on <u>third & fourth</u> structures on each side of overhead line crossings of lines to be patrolled by helicopter to provide advance warning of aerial hazard ahead. Additional structures may be marked where sight distance or visibility is limited.
3) Place the markers near the pole tops and away from the hazard so it will be seen as the helicopter approaches the line crossing.
4) Slow-vehicle signs are available for local purchase at farm supply stores and major hardware stores.
5) If there are two overhead line crossings in close proximity of each other, install two markers one above the other on each structure. Some structures in between may require single markers on both sides of each structure.
6) Fasten markers to poles with 3/4" banding as indicated in the Bill of Material above. Wooden poles may have the markers fastened with galvanized lag screws, 1/4" by 2-1/2" and washers. Additional holes or enlarged holes may be necessary in the marker.
7) On wooden poles, do not install hardware cloth over the face of the markers.



SGN-HAZ-XNG

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
LINE CROSSING HAZARD MARKING
STRUCTURAL ASSEMBLY DETAIL

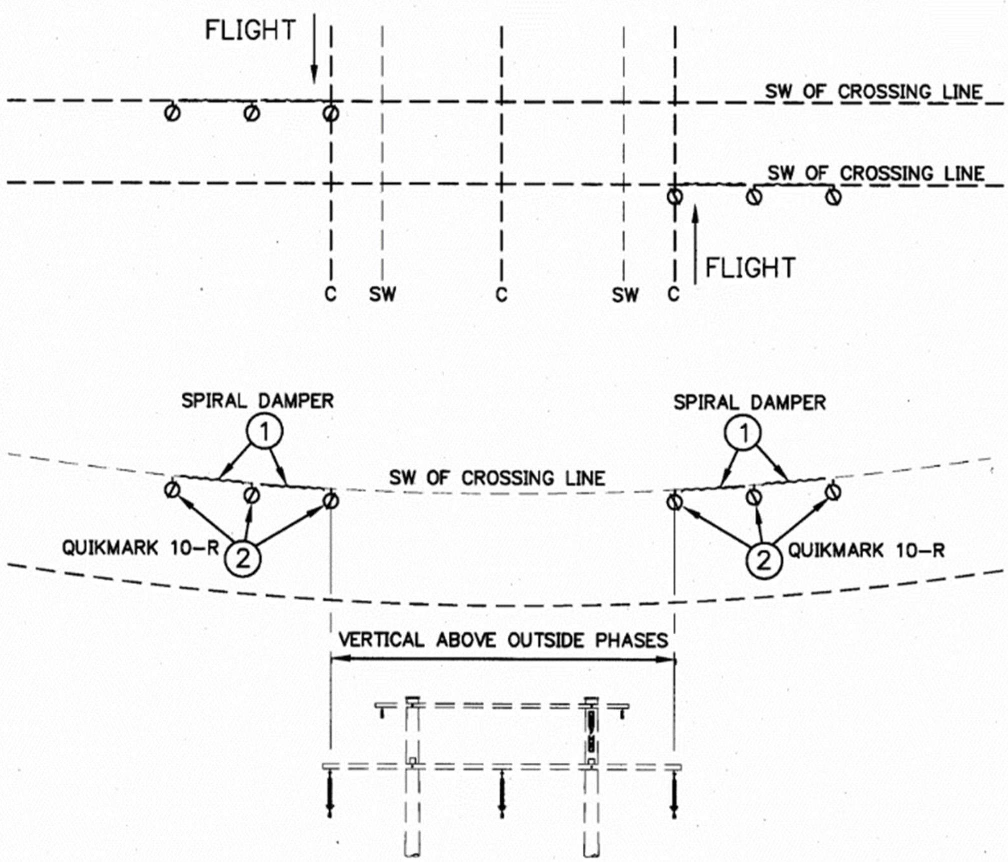
STD NO.		SCALE:	NONE
Entergy	No. TMD407A0		
	PLOT 1=1	SH. 1 OF 1	

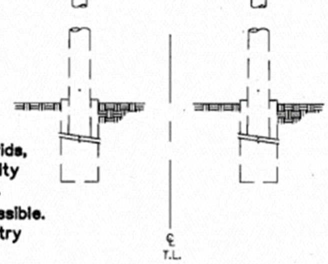
NO.	DATE:	REVISION	BY:	CHK:	APPR
0	12-10-08	CREATED	TWF	HSK	HSK

tflnc90 12/11/2008 SGN-HAZ-XNG

BILL OF MATERIAL

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	4	0032045036	DAMPER, VIBRATION, SPIRAL, YELLOW, FOR 3/8" HSG & 7#7 AW CDR
2	6	0032054555	PROTECTOR, WILDLIFE, BIRD, 10" DIA, PLASTIC,ORANGE COLOR WITH REFLECTIVE PANELS ON BOTH SIDES, AND CONDUCTOR CLAMPS. QUIKMARK 10-R





NOTES:

1) This installation is optional with the grids, and represents a standard for uniformity across the system wherever it is used.
2) Install these exact quantities when possible. If variance is needed, maintain symmetry about the centerline.
3) Place the inside QUIKMARK 10-R's immediately above the outside conductors, but not closer than 15 feet apart.
4) Place the dampers between the QUIKMARK 10-R's and about 1 feet from them.
5) If there are 2 overhead shield wires crossing the Entergy line, place half the devices on each wire unless the owner specifies differently.

SGN-HAZ-OHG

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
OVERHEAD GROUND HAZARD MARKING
STRUCTURAL ASSEMBLY DETAIL

STD NO. | SCALE: NONE

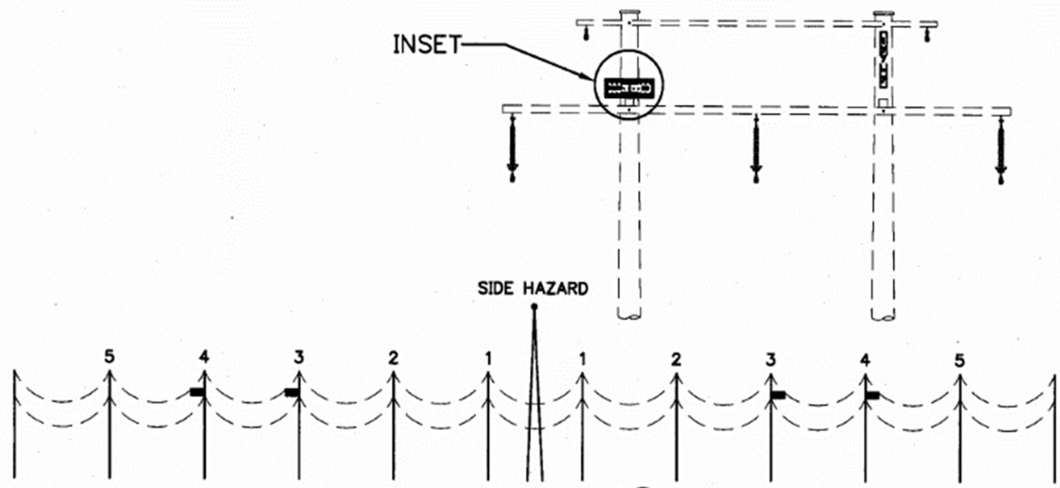
Entergy | No. TMD406A0 | PLOT 1=1 | SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	12-10-08	CREATED	TWF	HSK	HSK

tflnc90 12/11/2008 SGN-HAZ-OHG

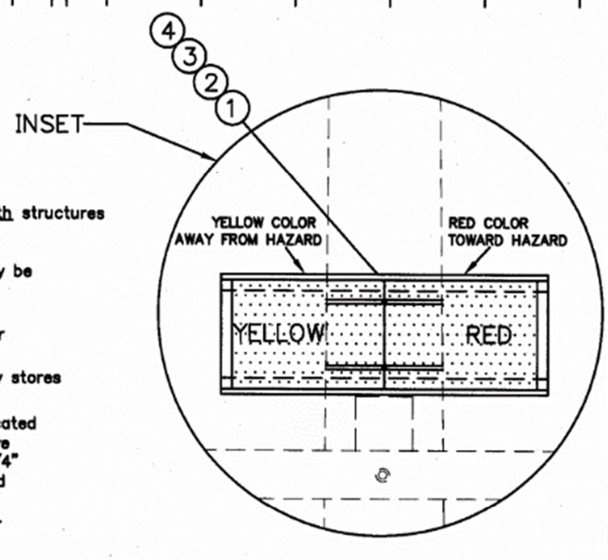
BILL OF MATERIAL

ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0032048218	NUMBER, BLANK, 10" X 14", POLYPROPYLENE, ALL YELLOW BACKGROUND, 0.23" TH
2	1	0032048221	NUMBER, BLANK, 10" X 14", POLYPROPYLENE, ALL RED BACKGROUND, 0.23" TH
3	1	0032048222	BRACKET, AERIAL NUMBER, ALUM, 30" LG, FOR 2 10"X14" EVERLAST PLAQUES
4	8 FT.	0000017124	BAND, STRAPPING, 3/4" WD X 100FT LG ROLL, STAINLESS STEEL, 201
5	2	0032047234	BRACKET, BANDING, FLARED LEG, SS, WITH ONE 5/16"–18 X 3/4" HEX HEAD SS BOLT AND FIBER WASHER, 3/4" SLOT, SHIPPED 50/BOX
6	2	0000017123	BOLT, CLAMP ASSEMBLY, CARRIAGE HD, GALVANIZED STEEL, HIGH STRENGTH, ASTM B221 MILITARY QQ–A–200/8, 5 GR, 3/8" DIA, 6" LG HIGH STR CARR BOLT, WASH AND NUT.



NOTES:

1) This installation is optional with the grids, and represents a standard for uniformity across the system wherever it is used.
2) Install one adjacent hazard marker on <u>third & fourth</u> structures on each side of the hazard adjacent to lines to be patrolled by helicopter to provide advance warning of adjacent hazard ahead. Additional structures may be marked where sight distance or visibility is limited.
3) Place the markers near the pole tops and away from the hazard so it will be seen as the helicopter approaches the hazard.
4) Adjacent–hazard markers are available from Entergy stores or directly from Tech Products, Inc., by white–req.
5) Fasten markers to poles with 3/4" banding as indicated in the Bill of Material above. Wooden poles may have the markers fastened with galvanized lag screws, 1/4" by 2–1/2" and washers. Additional holes or enlarged holes may be necessary in the plastic marker.
6) On wooden poles, do not install hardware cloth over the face of the markers.



SGN–HAZ–ADJ

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
ADJACENT HAZARD MARKING
STRUCTURAL ASSEMBLY DETAIL

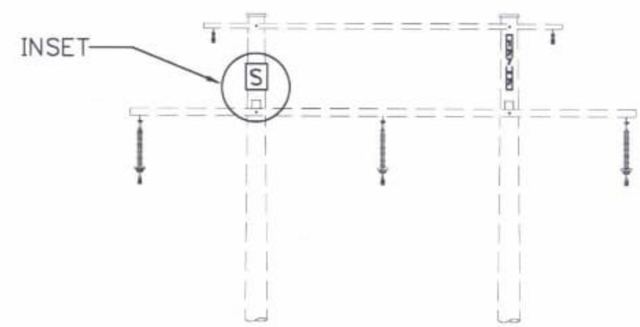
STD NO.		SCALE:	NONE
Entergy	No. TMD408A0		
	PLOT 1=1	SH. 1 OF 1	

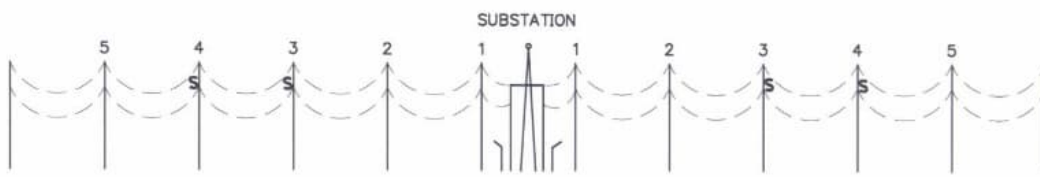
NO.	DATE:	REVISION	BY:	CHK:	APPR
0	12–10–08	CREATED	TWF	HSK	HSK

tfinc90 12/11/2008 SGN–HAZ–ADJ

BILL OF MATERIAL

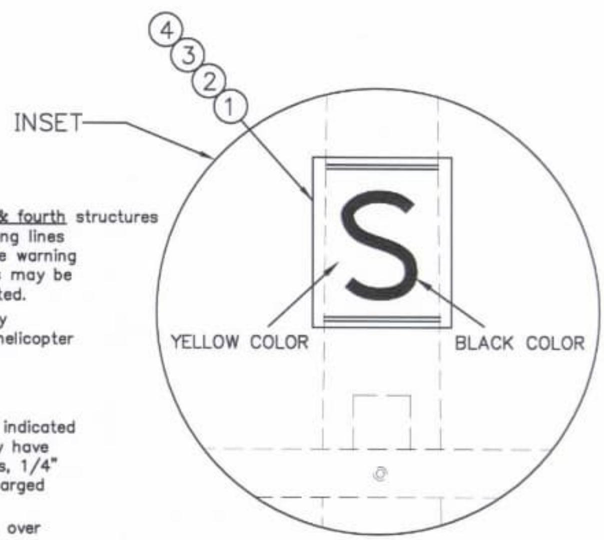
ITEM	QTY.	STOCK NO.	DESCRIPTION
1	1	0032054553	LETTER, "S", 10" X 14", BLACK ON YELLOW, TECH PRODUCTS PART NUMBER EL 12KYS
2	8 FT.	0000017124	BAND, STRAPPING, 3/4" WD X 100FT LG ROLL, STAINLESS STEEL, 201
3	2	0032047234	BRACKET, BANDING, FLARED LEG, SS, WITH ONE 5/16"-18 X 3/4" HEX HEAD SS BOLT AND FIBER WASHER, 3/4" SLOT, SHIPPED 50/BOX
4	2	0000017123	BOLT, CLAMP ASSEMBLY, CARRIAGE HD, GALVANIZED STEEL, HIGH STRENGTH, ASTM B221 MILITARY QQ-A-200/8, 5 GR, 3/8" DIA, 6" LG HIGH STR CARR BOLT, WASH AND NUT.





NOTES:

1) This installation is optional with the grids, and represents a standard for uniformity across the system wherever it is used.
2) Install one substation hazard marker on third & fourth structures on each side of the substation with hazard along lines to be patrolled by helicopter to provide advance warning of potential hazard ahead. Additional structures may be marked where sight distance or visibility is limited.
3) Place the markers near the pole tops and away from the substation so it will be seen as the helicopter approaches the substation
4) Substation hazard markers are available from Tech Products, Inc., EL12KYS.
5) Fasten markers to poles with 3/4" banding as indicated in the Bill of Material above. Wooden poles may have the markers fastened with galvanized lag screws, 1/4" by 2-1/2" and washers. Additional holes or enlarged holes may be necessary in the marker.
6) On wooden poles, do not install hardware cloth over the face of the markers.



SGN-HAZ-SUB

ENTERGY SERVICES, INC.

Transmission LineDesign Standard
SUBSTATION HAZARD MARKINGS
STRUCTURAL ASSEMBLY DETAIL

STD NO.	SCALE: NONE
Entergy	No. TMD409A0
	PLOT 1=1 SH. 1 OF 1

NO.	DATE:	REVISION	BY:	CHK:	APPR
0	12-10-08	CREATED	TWF	HSK	HSK

tfinc90 12/11/2008 SGN-HAZ-SUB

ATTACHMENT 2
NESC AND ENTERGY CLEARANCE REQUIREMENTS

Basic NESC Clearance Requirements

Rule 230A2, Emergency Vertical Clearances to Ground							
	69	115	138	161	230	345	500
Truck Accessible	16.2	17.1	17.6	18.0	19.4	21.7	24.9
Pedestrian Only	9.7	10.6	11.1	11.5	12.9	15.2	18.4

RULE 232B&C - Vertical Clearance over Ground, Roadway, Rail or Water Surfaces							
	69	**115**	**138**	**161**	**230**	**345**	**500**
Railroad	27.16	28.09	28.56	29.02	30.41	32.74	35.87
Roads	19.16	20.09	20.56	21.02	22.41	24.74	27.87
Other Area Traversed by Vehicles	19.16	20.09	20.56	21.02	22.41	24.74	27.87
Accessible to Pedestrian Traffic Only	15.16	16.09	16.56	17.02	18.41	20.74	23.87

RULE 233C - Vertical Clearance over Another Wire With or Without Wind							
	69	**115**	**138**	**161**	**230**	**345**	**500**
0	2.66	3.59	4.06	4.52	5.91	8.24	11.85
13.8	2.93	3.86	4.32	4.79	6.18	8.50	12.12
34.5	3.32	4.25	4.72	5.18	6.58	8.90	12.52
69	4.06	4.98	5.45	5.91	7.31	9.63	13.25
115	4.98	5.91	6.38	6.84	8.24	10.56	14.18
138	5.45	6.38	6.84	7.31	8.70	11.03	14.64
161	5.91	6.84	7.31	7.77	9.17	11.49	15.10
230	7.31	8.24	8.70	9.17	10.56	12.89	16.50
345	9.63	10.56	11.03	11.49	12.89	15.21	18.82
500	13.25	14.18	14.64	15.10	16.50	18.82	22.44

RULE 234B, C & G - Vertical Clearance over Various Structures							
	69	115	138	161	230	345	500
Lighting Supports	5.23	6.16	6.62	7.09	8.48	10.80	13.94
Traffic Signal Supports	5.23	6.16	6.62	7.09	8.48	10.80	13.94
Supporting Structures of Other Lines	5.23	6.16	6.62	7.09	8.48	10.80	13.94
Intermediate Poles in Skip-Span Construction	5.23	6.16	6.62	7.09	8.48	10.80	13.94
Building Roofs not Accessible to Pedestrians	13.16	14.09	14.56	15.02	16.41	18.74	21.87
Building Areas Accessible to Pedestrians	14.16	15.09	15.56	16.02	17.41	19.74	22.87

Building Areas Accessible to Vehicles (not Trucks)	14.16	15.09	15.56	16.02	17.41	19.74	22.87
Building Areas Accessible to Trucks	19.16	20.09	20.56	21.02	22.41	24.74	27.87
Signs, Chimneys, Billboards, Radio and TV antennas, Flagpoles and Flags, Banners, Tanks with Catwalks	14.16	15.09	15.56	16.02	17.41	19.74	22.87
Signs, Chimneys, Billboards, Radio and TV antennas, Flagpoles and Flags, Banners, Tanks without Catwalks	8.66	9.59	10.06	10.52	11.91	14.24	17.37

RULE 234B, C & G - Horizontal Clearance to Various Structures with No Wind							
	69	**115**	**138**	**161**	**230**	**345**	**500**
Lighting Supports	5.00	5.66	6.12	6.59	7.98	10.30	13.44
Traffic Signal Supports	5.00	5.66	6.12	6.59	7.98	10.30	13.44
Supporting Structures of Other Lines	5.00	5.66	6.12	6.59	7.98	10.30	13.44
Intermediate Poles in Skip Span Construction	5.00	5.66	6.12	6.59	7.98	10.30	13.44
Buildings	8.16	9.09	9.56	10.02	11.41	13.74	16.87
Signs, Chimneys, Billboards,	8.16	9.09	9.56	10.02	11.41	13.74	16.87
Radio and TV Antennas, Flagpoles & Flags	8.16	9.09	9.56	10.02	11.41	13.74	16.87
Banners, Tanks	8.16	9.09	9.56	10.02	11.41	13.74	16.87

RULE 234B, C & G - Horizontal Clearance to Various Structures with Wind							
	69	**115**	**138**	**161**	**230**	**345**	**500**

Lighting Supports	5.16	6.09	6.56	7.02	8.41	10.74	13.87
Traffic Signal Supports	5.16	6.09	6.56	7.02	8.41	10.74	13.87
Supporting Structures of Other Lines	5.16	6.09	6.56	7.02	8.41	10.74	13.87
Intermediate Poles in Skip Span Construction	5.16	6.09	6.56	7.02	8.41	10.74	13.87
Buildings	5.16	6.09	6.56	7.02	8.41	10.74	13.87
Signs, Chimneys, Billboards,	5.16	6.09	6.56	7.02	8.41	10.74	13.87
Radio and TV Antennas, Flagpoles & Flags	5.16	6.09	6.56	7.02	8.41	10.74	13.87
Banners, Tanks	5.16	6.09	6.56	7.02	8.41	10.74	13.87

RULE 235C2b1 - Vertical Clearance Between Wires Supported at Different Levels on the Same Structures

	69	**115**	**138**	**161**	**230**	**345**	**500**
0	2.03	2.58	3.02	3.47	4.79	7.01	9.99
13.8	2.03	2.85	3.29	3.73	5.06	7.27	10.25
34.5	2.36	3.24	3.69	4.13	5.46	7.67	10.65
69	3.02	3.91	4.35	4.79	6.12	8.33	11.32
115	3.91	4.79	5.24	5.68	7.01	9.22	12.20
138	4.35	5.24	5.68	6.12	7.45	9.66	12.64
161	4.79	5.68	6.12	6.56	7.89	10.10	13.09
230	6.12	7.01	7.45	7.89	9.22	11.43	14.42
345	8.33	9.22	9.66	10.10	11.43	13.65	16.63
500	11.32	12.20	12.64	13.09	14.42	16.63	19.61

RULE 235B - Horizontal Clearance Between Wires Supported on the Same Structure							
	69	**115**	**138**	**161**	**230**	**345**	**500**
0	2.08	2.96	3.41	3.85	5.18	7.39	10.37
13.8	2.34	3.23	3.67	4.11	5.44	7.66	10.64
34.5	2.74	3.63	4.07	4.51	5.84	8.05	11.04
69	3.41	4.29	4.73	5.18	6.50	8.72	11.70
115	4.29	5.18	5.62	6.06	7.39	9.60	12.59
138	4.73	5.62	6.06	6.50	7.83	10.05	13.03
161	5.18	6.06	6.50	6.95	8.27	10.49	13.47
230	6.50	7.39	7.83	8.27	9.60	11.82	14.80
345	8.72	9.60	10.05	10.49	11.82	14.03	17.01
500	11.70	12.59	13.03	13.47	14.80	17.01	20.00

RULE 233B1 - Horizontal Clearance to Other Wires (With or without Wind)							
	69	115	138	161	230	345	500
0	5.66	6.59	7.06	7.52	8.91	11.24	14.37
13.8	5.94	6.87	7.33	7.80	9.19	11.52	14.65
34.5	6.36	7.29	7.75	8.22	9.61	11.94	15.07
69	7.06	7.98	8.45	8.91	10.31	12.63	15.76
115	7.98	8.91	9.38	9.84	11.24	13.56	16.69
138	8.45	9.38	9.84	10.31	11.70	14.03	17.16
161	8.91	9.84	10.31	10.77	12.17	14.49	17.62
230	10.31	11.24	11.70	12.17	13.56	15.89	19.02
345	12.63	13.56	14.03	14.49	15.89	18.21	21.34

500	15.76	16.69	17.16	17.62	19.02	21.34	24.47

Vertical Clearance Requirements; NESC 2012 & Entergy Design Clearance

	69 kV(1)		115/138/161 kV(1)		230 kV(1)		345 kV(1)		500 kV(1) (3)	
	NESC(2) @ Max. Sag(ft.)	ETR @ Max. Sag(ft.)	NESC(2) @ Max. Sag(ft.)	ETR @ Max. Sag(ft.)	NESC(2) @ Max. Sag(ft.)	ETR @ Max. Sag(ft.)	NESC(2) @ Max. Sag(ft.)	ETR @ Max. Sag(ft.)	NESC(2) @ Max. Sag(ft.)	ETR @ Max. Sag(ft.)
Railroads	27.16	33.00	29.02	35.00	30.41	37.00	32.74	41.00	35.87	48.00
Roads	19.16	28.00	21.02	30.00	22.41	32.00	24.74	33.00	27.87	40.00
Other Land Traversed by any kind of Vehicle	19.16	24.00	21.02	26.00	22.41	28.00	24.74	33.00	27.87	40.00
Cultivated Farmland	19.16	27.00	21.02	29.00	22.41	31.00	24.74	33.00	27.87	40.00
Land accessible to pedestrians only	15.16	24.00	17.02	26.00	18.41	28.00	20.74	29.00	23.87	36.00
Water Areas Suitable for sailboats:										
Less than 20 acres	21.16	24.00	23.02	26.00	24.41	28.00	26.74	35.00	29.87	42.00
20-200 acres	29.16	32.00	31.02	34.00	32.41	36.00	34.74	43.00	37.87	50.00
200-2000 acres	35.16	37.00	37.02	40.00	38.41	42.00	40.74	49.00	43.87	56.00
Over 2000 acres	41.16	44.00	43.02	46.00	44.41	48.00	46.74	55.00	49.87	62.00
Sailboat launch sites adjacent to water: Add 5'										
Less than 20 acres	26.16	29.00	28.02	31.00	29.41	33.00	31.74	40.00	34.87	47.00
20-200 acres	34.16	37.00	36.02	39.00	37.41	41.00	39.74	48.00	42.87	53.00

200-2000 acres	40.16	43.00	42.02	45.00	43.41	47.00	45.74	54.00	48.87	61.00
Over 2000 acres	46.16	49.00	48.02	51.00	49.41	53.00	51.74	60.00	54.87	67.00
Other supply lines 34.5kV and under	2.66	8.00	4.52	10.00	5.91	15.00	8.24	17.00	11.85	23.00
Other supply lines:										
69 kV	4.06	10.00	5.91	11.00	7.31	16.00	9.63	18.00	13.25	20.00
115/138/161 kV	5.91	11.00	7.77	13.00	9.17	18.00	11.49	20.00	15.10	22.00
230 kV	7.31	16.00	9.17	18.00	10.56	20.00	12.89	22.00	16.50	24.00
345 kV	9.63	18.00	11.49	20.00	12.89	22.00	15.21	24.00	18.82	26.00
500 kV	13.25	20.00	15.10	22.00	16.50	24.00	18.82	26.00	22.44	28.00
Guys, Neutrals and shield wires	2.66	8.00	4.52	10.00	5.91	15.00	8.24	17.00	11.85	19.00
Communications lines	5.66	10.00	7.52	12.00	8.91	15.00	11.24	17.00	14.37	19.00

Notes:

(1) Conductor Temperature: 100°C for ACSR, see table 7.1(b) for other conductor types
(2) NESC Vertical Clearance = Basic Clearance + Voltage Adder; Voltage Adder = 0.4”/kV in excess of 22kV; refer to 2012 NESC Clearance Calculations.
(3) For 500 kV, the NESC clearance is approximately equal to the clearance requirements derived from a Switching Surge factor of 2.6.

ATTACHMENT 3
QUICK ESTIMATING CORONA LOSS CURVES

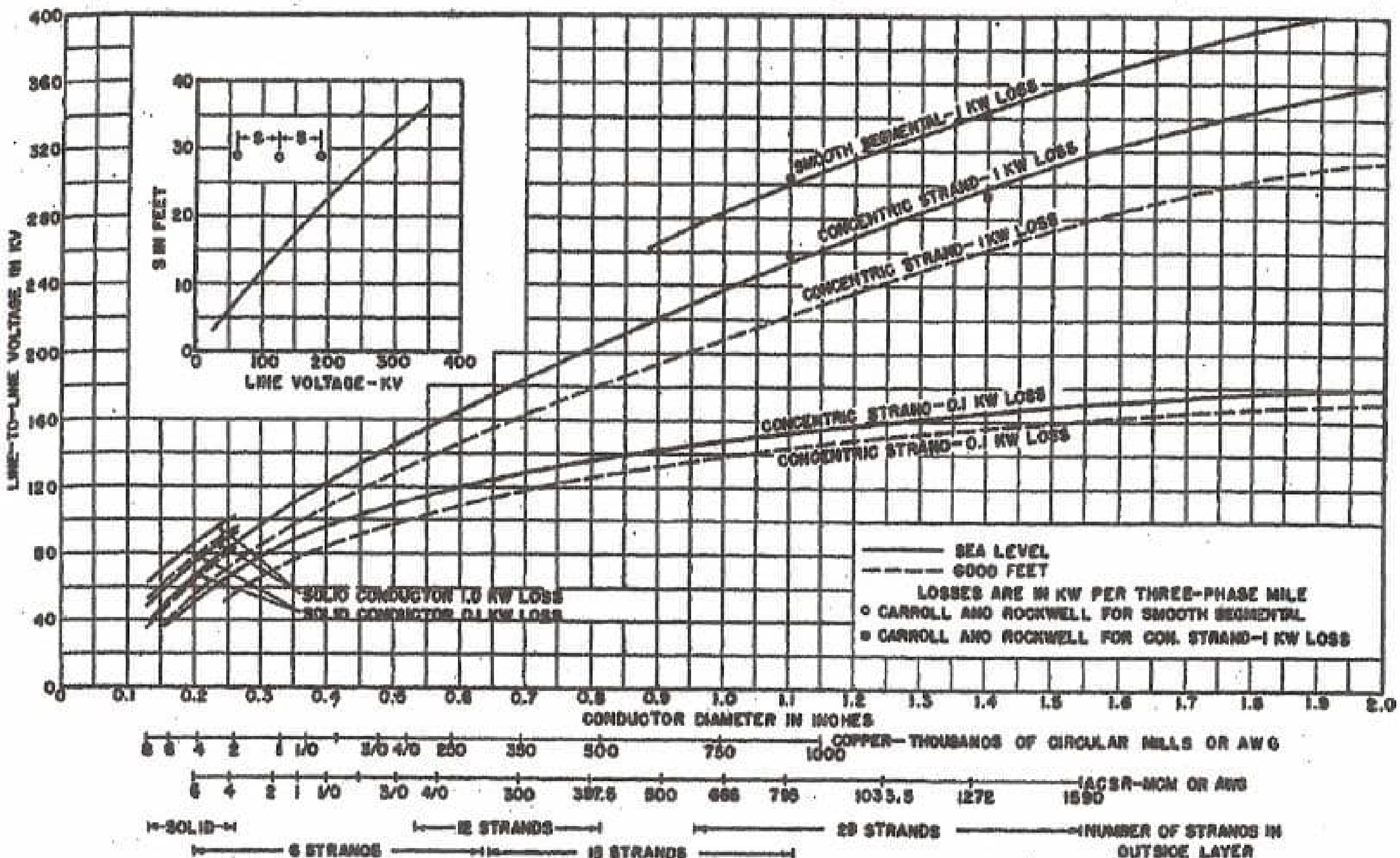
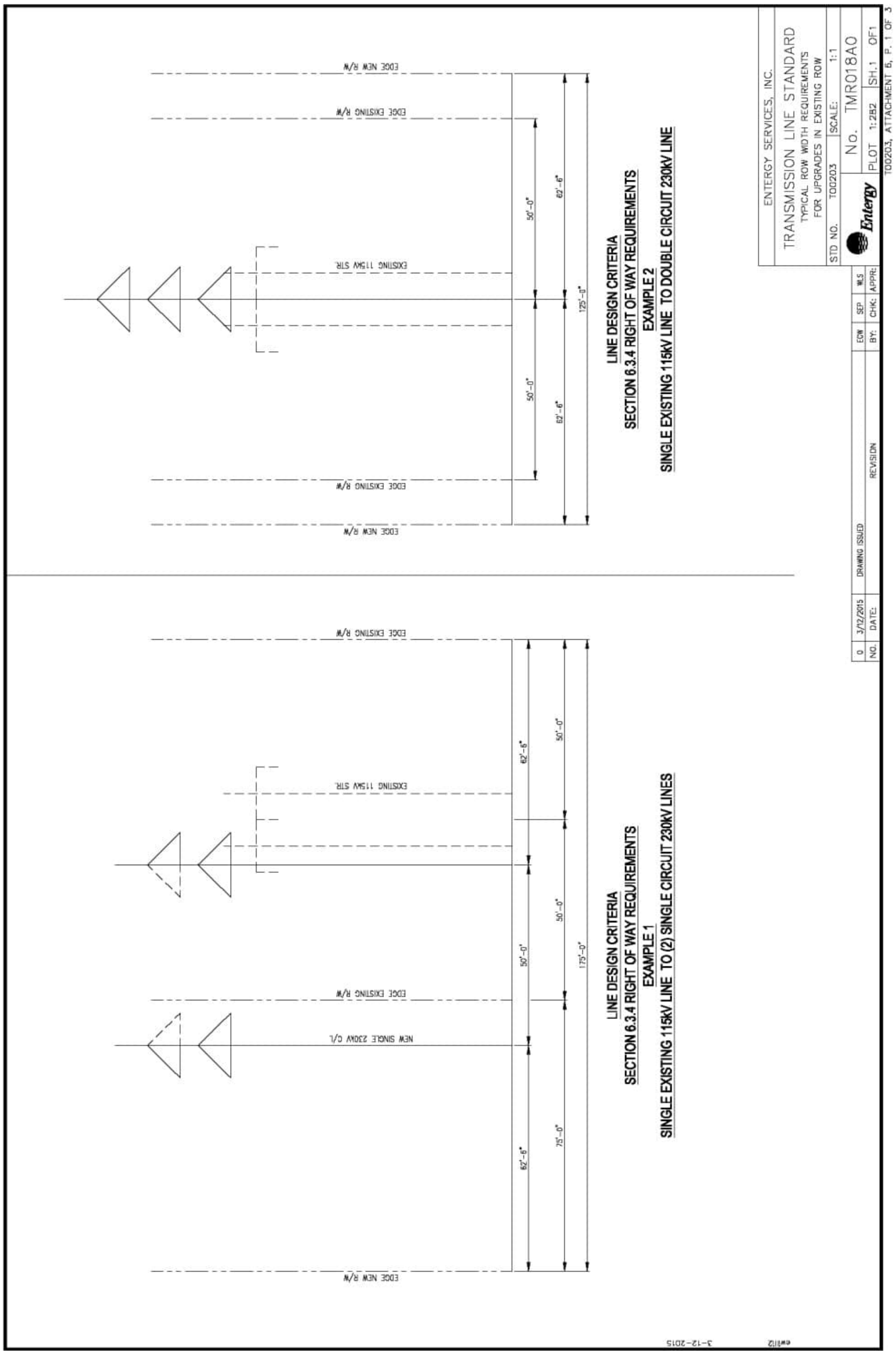
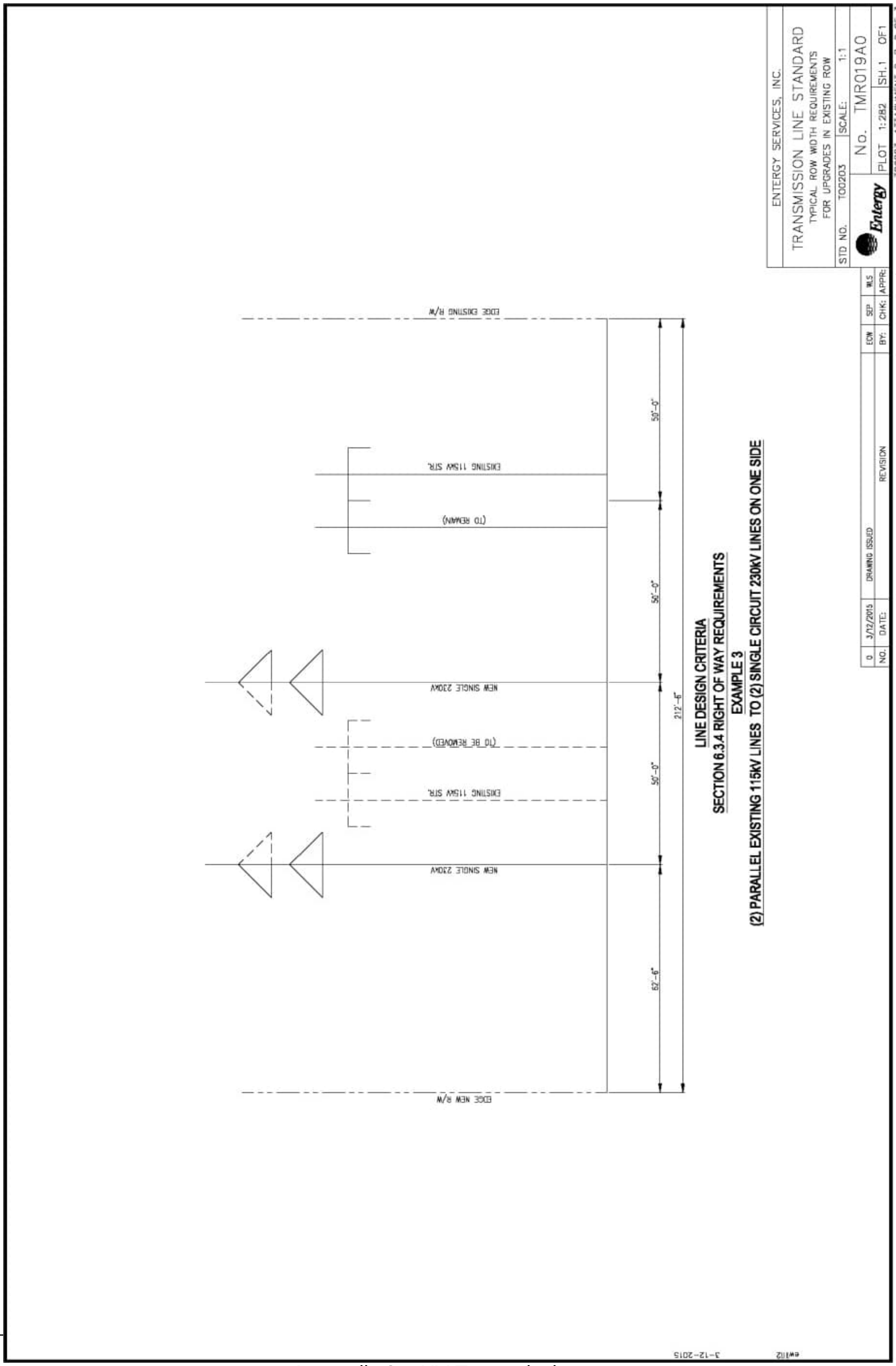
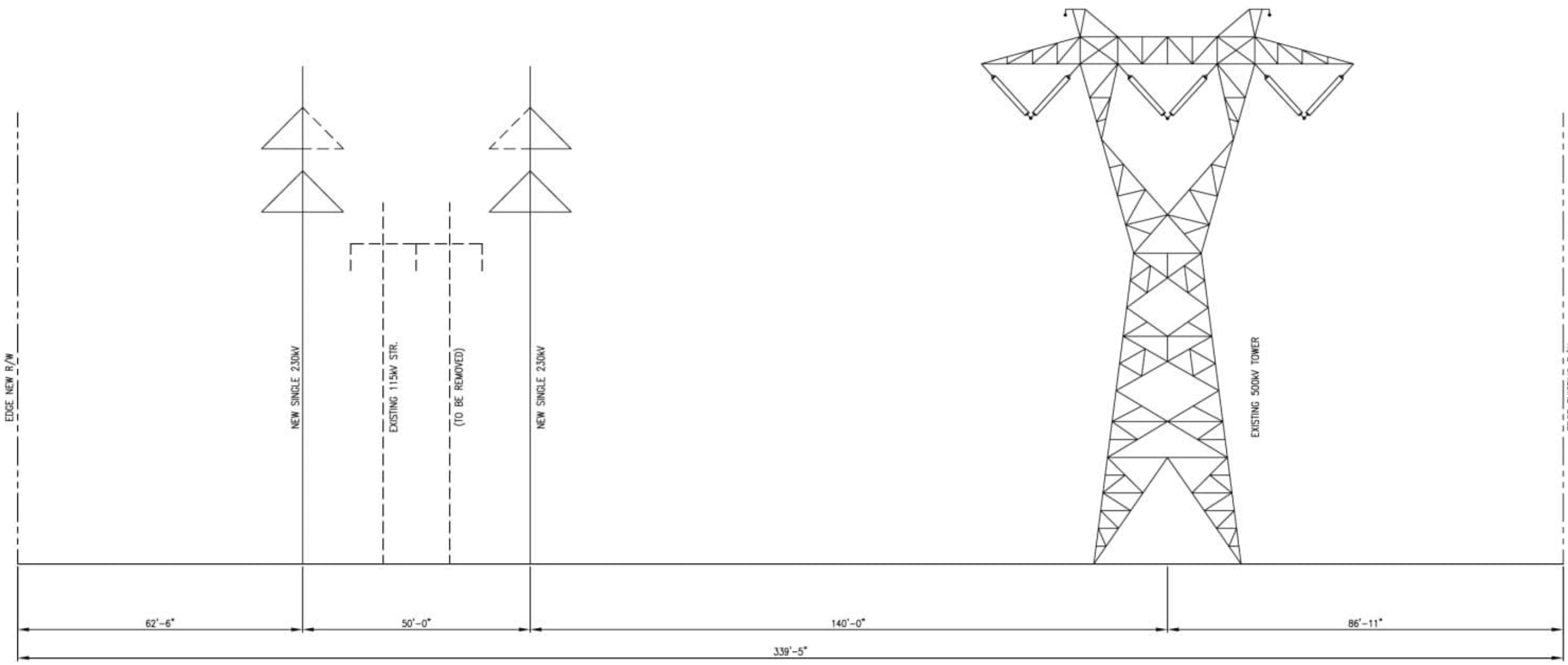


Fig. 31—Quick-Estimating Corona-Loss Curves. Curves based on Peterson's formula with a few check points from the Carrol and Rockwell paper for comparison.

ATTACHMENT 4
EXAMPLE ROW


EDGE NEW R/W
EDGE EXISTING R/W
EXISTING 115KV STR.
50'-0"
62'-6"
125'-0"
LINE DESIGN CRITERIA
SECTION 6.3.4 RIGHT OF WAY REQUIREMENTS
EXAMPLE 2
SINGLE EXISTING 115KV LINE TO DOUBLE CIRCUIT 230KV LINE
NEW SINGLE 230KV C/L
75'-0"
175'-0"
LINE DESIGN CRITERIA
SECTION 6.3.4 RIGHT OF WAY REQUIREMENTS
EXAMPLE 1
SINGLE EXISTING 115KV LINE TO (2) SINGLE CIRCUIT 230KV LINES
ENTERGY SERVICES, INC.
TRANSMISSION LINE STANDARD
TYPICAL ROW WIDTH REQUIREMENTS
FOR UPGRADES IN EXISTING ROW
STD NO. TD0203
SCALE: 1:1
No. TMR018AO
PLOT 1:282
SH.1 OF1
TD0203, ATTACHMENT 6, P. 1 OF 3
0
3/12/2015
DRAWING ISSUED
EDW
SEP
WLS
NO.
DATE:
REVISION
BY:
CHK:
APPR:
3-12-2015


EDGE EXISTING R/W
EXISTING 115KV STR.
(TO REMAIN)
NEW SINGLE 230KV
(TO BE REMOVED)
EXISTING 115KV STR.
NEW SINGLE 230KV
EDGE NEW R/W
50'-0"
50'-0"
50'-0"
62'-6"
212'-6"
LINE DESIGN CRITERIA
SECTION 6.3.4 RIGHT OF WAY REQUIREMENTS
EXAMPLE 3
(2) PARALLEL EXISTING 115KV LINES TO (2) SINGLE CIRCUIT 230KV LINES ON ONE SIDE
0
3/12/2015
DRAWING ISSUED
ECW
SEP
WLS
NO.
DATE:
REVISION
BY:
CHK:
APPR:
ENTERGY SERVICES, INC.
TRANSMISSION LINE STANDARD
TYPICAL ROW WIDTH REQUIREMENTS
FOR UPGRADES IN EXISTING ROW
STD NO.
T00203
SCALE:
1:1
No. TMR019A0
Entergy
PLOT 1:282
SH.1
OF1
T00203, ATTACHMENT 6, P. 2 OF 3
3-12-2015



LINE DESIGN CRITERIA
SECTION 6.3.4 RIGHT OF WAY REQUIREMENTS
EXAMPLE 4
SINGLE 115kV LINE PARALLEL TO EXISTING 500kV LINE TO (2) SINGLE CIRCUIT 230kV LINES ON ONE SIDE

NO.	DATE:	REVISION	BY:	CHK:	APPR:
1	11/15/2016	REVISED C-C DIMENSION, 500 KV TOWER TO ADJACENT STRUCTURE	ECW	DJR	WLS
0	3/12/2015	DRAWING ISSUED	ECW	SEP	WLS

ENTERGY SERVICES, INC.
Transmission Standard
Typical ROW Widths
STD NO. T00203 SCALE: 1:1
Entergy No. TMR020A0
PLOT 1:282 SH.11 OF1

ewilli2 10/27/2016

ATTACHMENT 5
APPROVED VENDOR LIST

Lead Time

Date last updated: August 22, 2023

Purchase Spec.	Class	Description	Qualifier	Approved Manufacturer(s) ( )-Preferred	Preferred Supplier
SA0102	Arresters	Arrester, Surge		(Cooper), Siemens, Hitachi Energy	Series 2000
PM0202	Battery	Batteries	CC	(Enersys)	Exponential Power
PM0201	Battery	Batteries	EC	(Enersys)	Exponential Power
PM0301	Battery	Battery Charger AT-10		(Hindle)	Exponential Power
PM0301	Battery	Battery Charger ATEVO		(Hindle)	Exponential Power
	Battery	Battery Fiberglass Enclosure with A/C		(Exponential)	Exponential Power
PM0303	Battery	Battery Rack		(Enersys)	Exponential Power
	Bolts	Bolts Anchor		Valmont, Threaded Fasteners	
	Bolts	Bolts Anchor cage for Substation Steel		Valmont, Threaded Fasteners (size limit)	
SD0203	Breaker	Breaker, EHV	345/500kV (Live Tank)	Hitachi Energy	
SD0203	Breaker	Breaker, EHV	345/500kV (Dead Tank)	(MEPPI), Hitachi Energy	MEPPI
SD0202	Breaker	Breaker, HV	69kv	(Siemens), MEPPI, Hitachi Energy	Siemens
SD0202	Breaker	Breaker, HV	115kV - 40kA	(Siemens), MEPPI, Hitachi Energy	Siemens
SD0202	Breaker	Breaker, HV	115kV - 63kA	(Siemens), MEPPI, Hitachi Energy	Siemens
SD0202	Breaker	Breaker, HV	161kV - 40kA	(Siemens), MEPPI, Hitachi Energy	Siemens
SD0202	Breaker	Breaker, HV	161kV - 63kA	(Siemens), MEPPI, Hitachi Energy	Siemens
SD0202	Breaker	Breaker, HV	245kV	(Siemens), MEPPI, Hitachi Energy	Siemens
SD0202	Breaker	Brekaer, HV	245KV, 80ka	(Siemens), MEPPI, Hitachi Energy	Siemens
SD0201	Breaker	Breaker, MV	15 kV- 27kV	(ABB INC.) MEPPI	ABB Inc. Approval drawings 5 wks from issue date of po
SD0201	Breaker	Breaker, MV	34.5 kV	(ABB INC.)	ABB Inc. Approval drawings 5 wks from issue date of po
SB0101	Bus	Bus, Aluminum Pipe		(Three D Metals) AFL	Three D Metals
PB0401	Cable, Control	Control Cable -Shielded and Non-Shielded		(Southwire), Priority	Southwire
SA0303	Capacitor Bank	Capacitor Banks, Series		Cooper, Hitachi Energy	Cooper Approval drawings 4 wks from issue date of po
SA0301	Capacitor Bank	Capacitor Banks, Shunt		Cooper, GE, Hitachi Energy	Cooper Approval drawings 4 wks from issue date of po
	Capacitor Bank	Capacitor Cans	Capacitor Cans	Cooper, GE, Hitachi Energy	
	Capswitcher	Capswitcher	34.5kV and below	(Southern States)	Preferred Sales Approval drawings 4-6 wks from issue date of po
	Capswitcher	Capswitcher	245kV - 362kV	(Southern States)	Preferred Sales Approval drawings 4-6 wks from issue date of po
	Capswitcher	Capswitcher	115kV and above	(Southern States)	Preferred Sales Approval drawings 4-6 wks from issue date of po
	Capswitcher	Capswitcher	69kV	(Southern States)	Preferred Sales Approval drawings 4-6 wks from issue date of po
	Carrier	Power line Carrier	UPLC	Pulsar	Ametek
PN0201	CCVT	CCVT	69kV - 500kV	(Ritz), GE, Trench, Hitachi Energy	Aertker Approval drawings 2 wks from issue date of po

Lead Time

Date last updated: August 22, 2023

Purchase Spec.	Class	Description	Qualifier	Approved Manufacturer(s) ( )-Preferred	Preferred Supplier
SD1801	Circuit Switcher	Circuit Switcher	Series 2000	(S&C)	Curtis Stout Approval drawings 3 wks from issue date of po
SD1802	Circuit Switcher	Circuit Switcher	Mark V	(S&C)	Curtis Stout Approval drawings 3 wks from issue date of po
	Conductor	Cable, Aluminum	ACSS, ACSR	(General Cable) - Southwire	Aertker co
	Conductor	Cable, Copper (Not Control cable)		Copperweld /Alcoa	Stuart Irby
	Conductor	Cable, Fiber	OPT-GW	AFL	Preferred Sales
	Conductor	Cable, Fiber	ADSS	AFL	Preferred Sales
	Conduit	Conduit & Accessories		Cantex, Carlon	Stuart Irby
	Connector	Connectors line	ACSS	AFL	Preferred Sales
	Connector	Connectors line (Fiber, OPGW, ACSR)	Fiber, OPGW, ACSR	AFL	Preferred Sales
	Connector	Connectors, Trans. Line - Insulator Assemblies		(Maclean Power Sys)	Preferred Sales
	Connectors/Fittings	Connectors/Fittings - Substation		Any Approved Manufacturer	Stuart Irby
SL0403	Control House	Control House	Drop-In (turnkey)	VFP	VFP
SL0403	Control House	Control House		(Modular Connections), AZZ Inc., Trachte, VFP	Modular Connections
PN0301	CT	CT	15kV - 34.5kV	ABB Inc, Ritz	
PN0301	CT	CT	69kv - 138kv	GE, Trench, Hitachi Energy, Ritz	
PN0301	CT	CT	161kV -230kV	GE, Trench, Hitachi Energy, Ritz	
PN0301	CT	CT	345kv - 500kV	GE, Trench, Hitachi Energy	
	CT	CT	Slipover only	ITEC, ABB Inc., Meramec	ITEC Approval drawings 2-3 wks from issue date of po
	DFR	DFR (Digital Fault Recorder)		MehtaTech	Louisiana, Mississippi, Arkansas only
	DFR	DFR (Digital Fault Recorder)		Qualitrol	Texas only
	Fittings	Conductor Fittings Compression		AFL, Sefcor, Anderson, Hubell	Stuart Irby
	Grounds Rods Clamps	Ground Rods, Clamps, & Anodes		Any Approved Manufacturer	Stuart Irby
	Helical Piles	Foundation Piling		Hubbell, Cyntech	
TA0504	Insulators	Insulator, Line, Polymer		(Maclean Power Sys)	Preferred Sales
TA0504	Insulators	Insulator, Line, Polymer	(Polymer Insulator Only)	(Maclean Power Sys)	Preferred Sales
TA0504	Insulators	Insulator, Line, Polymer	(Polymer Insulator Assembly)	(Maclean Power Sys)	Preferred Sales
TA0504	Insulators	Insulator, Line, Polymer	Hardware Assembly Only	(Maclean Power Sys)	Preferred Sales

Lead Time | Date last updated: August 22, 2023

Purchase Spec.	Class	Description	Qualifier	Approved Manufacturer(s) ( )-Preferred	Preferred Supplier
SA0502	Insulators	Insulator, Station Post, Porcelain	161kV (Porcelain)	(Hubbell), Victor, Lapp,NGK, Newell, Vanguard, Seves	Hubbell Power Systems
SA0502	Insulators	Insulator, Station Post, Porcelain	345/500kV (Porcelain) HI / EXTRA HIGH STRENGTH	Hubbell, Victor, Lapp,NGK, Newell, Vanguard, Seves	
SA0502	Insulators	Insulator, Station Post, Porcelain	230kV (Porcelain) STANDARD STRENGTH	(Hubbell), Victor, Lapp,NGK, Newell, Vanguard, Seves	Hubbell Power Systems
SA0502	Insulators	Insulator, Station Post, Porcelain	69kV, 115kV, (Porcelain)	(Hubbell), Victor, Lapp,NGK, Newell, Vanguard, Seves	Hubbell Power Systems
SA0502	Insulators	Insulator, Station Post, Porcelain	230kV (Porcelain) HI / EXTRA HIGH STRENGTH	Hubbell, Victor, Lapp,NGK, Newell, Vanguard, Seves	
	Insulators	Insulator, Station Post, Porcelain	34.5kV and below (Porcelain)	(Vanguard), Victor, Lapp,NGK, Newell, Seves , Hubbell	Preferred Sales
SA0502	Insulators	Insulator, Station Post, Polymer	15kV - 230kV	(Maclean Power Sys)	Preferred Sales
	Interrupter	Interrupter, Joslyn		Joslyn	Ruffin
	Interrupter	Switches LLS I		(Southern States)	Preferred Sales
	Interrupter	Switches LLS II		(Southern States)	Preferred Sales
	Interrupter	Whip		(Southern States)	Preferred Sales
	Interrupter	Interrupter		S&C	Curtis Stout
	Junction Box	Junction Boxes		MMR, Premier Control, SEL	All Junction Boxes – (2) weeks before Entergy's delivery date as stated on the PO
	Panel	Panel - Battery Switching		MMR, SEL, Premier Control	(4) weeks before Entergy's delivery date as stated on the PO.
	Panel	Panel - Communication rack		MMR, SEL, Premier Control	(3) weeks before Entergy's delivery date as stated on the PO.
PM0101	Panel	Panel - AC & DC Cabinets		MMR, SEL, Premier Control, Peterson Panel	(4) weeks before Entergy's delivery date as stated on the PO.
	Panel	Panel - Breaker Line		MMR, SEL, Premier Control	(4) weeks before Entergy's delivery date as stated on the PO.
PM0602	Panel	Panel - Bus Differential		MMR, SEL, Premier Control	Bus Diff/XFMR Diff/ Breaker Control/ACDC Breaker – (3) weeks before Entergy's delivery date as stated on the PO.
PM1803	Panel	Panel - Line Protection		MMR, SEL, Premier Control	(4) weeks before Entergy's delivery date as stated on the PO.
	Panel	Panel - Meter		MMR, SEL, Premier Control	(4) weeks before Entergy's delivery date as stated on the PO.

Lead Time | Date last updated: August 22, 2023

Purchase Spec.	Class	Description	Qualifier	Approved Manufacturer(s) ( )-Preferred	Preferred Supplier
	Poles	Pole Caissons	T-Line - after approval	(Valmont)	Preferred Sales
TC0609	Poles	Pole, Concrete		(Valmont)	Preferred Sales
TC0608	Poles	Pole, Steel	after approval	Valmont)	Preferred Sales
PN0701	PT	PT	15kV - 34.5kV	ABB Inc, GE, Ritz	
PN0701	PT	PT	69kv - 230kv	Hitachi Energy, GE, Trench,	
SN0903	Reactor	Reactor, Dry Type Shunt	Below 230kV	Hitachi Energy, Coil Innovations, Trench	
SN0902	Reactor	Reactor, Limiting		Hitachi Energy, Coil Innovations, Trench	
SN0904	Reactor	Reactor, Oil filled Shunt	230kV, 500kV	Hitachi Energy, Prolec GE, MEPPI, Siemens, SMIT	
SN1002	Regulators	Regulator		Pennsylvania Transformers	Curtis Stout
	Relay	SEL Relays	SEL Relay	SEL	Power Connection
	Relay	SEL cables	Cable & Fiber	SEL	Power Connection
	RTU	ACS RTU - Peripherals	NTX-U20 & Upgrades	ACS (Automated Control Systems)	Ruffin & Associates
	RTU	ACS Cables	NTX cables	ACS (Automated Control Systems)	Ruffin & Associates
	RTU	GE Parts	Accessories & Cables	G.E. Grid Solutions	Perferred Sales
PM3002	RTU	RTU	IO cabinet standard RTU	G.E. Grid Solutions	Perferred Sales
PM3002	RTU	RTU - Kits & Parts	D400, D20, DNPIO Kits & Parts	G.E. Grid Solutions	Perferred Sales
	Rupter	Rupters/S&C ALDUTI 15 kV Vac		(S&C)	Curtis Stout Approval drawings 5 wks from issue date of po
SL1301	Signs	Signs - Entergy Substation Switchyard		Impco	Impco
	Signs	Signs - General		Stuart Irby	Stuart Irby

Lead Time

Date last updated: August 22, 2023

Purchase Spec.	Class	Description	Qualifier	Approved Manufacturer(s) ( )-Preferred	Preferred Supplier
SC0401, SL0505	Structure	Steel	Substation, Octagonal	(Distran), Valmont	Distran
SC0401, SL0505	Structure	Steel	Substation, Lattice	(Distran), Industrial Steel	Distran
	Structure	Steel	MISC Substation Steel	Distran, Industrial Steel	
	Structure	Steel Standard and Tapered Tubular	Substation, existing details	(Distran),Valmont	Distran
	Structure	Steel Standard and Tapered Tubular	(Design Required)	(Distran), Valmont Note: * Pending approval	Distran
PM3401	Switch	ASCO ATS (Automatic Transfer Switch)		Utility and Industrial Supply,LLC, WESCO	
	Switch	Switch, T-Line	Switch group operated 245kV and below	SEECO	Southern Utility Sales Agency
SD1501	Switch	Switch, Disconnect	115 & 230kV Air Break	(Southern States), USCO, Pascor Atlantic	Preferred Sales Approval drawings 4-6 wks from issue date of po
SD1501	Switch	Switch, Disconnect	69kV - 230kV	(Southern States), USCO, Pascor Atlantic	Preferred Sales Approval drawings 4-6 wks from issue date of po
SD1501	Switch	Switch, Disconnect	69kV Air Break	(Southern States), USCO, Pascor Atlantic	Preferred Sales Approval drawings 4-6 wks from issue date of po
SD0601	Switch	Switch, Disconnect	15kV - 34.5kV	(Southern States), USCO	Preferred Sales Approval drawings 4-6 wks from issue date of po
SD1502	Switch	Switch, Disconnect	345/500kV	(Southern States), Pascor Atlantic	Preferred Sales Approval drawings 4-6 wks from issue date of po
SD0701	Switch	Switch, Disconnect, Hookstick	15kV - 34.5kV	(Southern States), USCO	Preferred Sales Approval drawings 4-6 wks from issue date of po
	Switch	Switch, Fuse (SMD style)	15 kV	(S&C)	Curtis Stout Approval drawings 5 wks from issue date of po
SD1601	Switch/Motor Operators	Motor Operator	Southern States MO	(Southern States)	Preferred Sales
	Switch/Motor Operators	Motor Operator	S&C MO	(S&C)	Curtis Stout Approval drawings 5 wks from issue date of po
SN1101	Transformer	SSVT; Station Service Voltage Transformer	230kV	Trench, Hitachi Energy	
SN1101	Transformer	SSVT; Station Service Voltage Transformer	46kV -161kV	Trench, Hitachi Energy	Hitachi 46

Lead Time

Date last updated: August 22, 2023

Purchase Spec.	Class	Description	Qualifier	Approved Manufacturer(s) ( )-Preferred	Preferred Supplier
SN0103, SN0104	Transformer	Transformer, Auto	230kV and Above 100MVA	Hitachi Energy, MEPPI, Siemens, SMIT, Waukesha	
SN0102	Transformer	Transformer, Small Auto	below 230kv and 100MVA	(Waukesha), Hitachi Energy, Delta Star	Aertker Co. Approval drawings 16 wks from issue date of po
	Transrupter	Transrupter II		(S&C)	Curtis Stout Approval drawings 5 wks from issue date of po
PM0802	Trap	Trap, Line Carrier		Trench (No other supplier approved)	Curtis Stout Approval drawings 4-5 wks from issue date of po
	Trench			(Concast), Trenway, Old Castle	GHMR
PM0804	Tuner	Tuner, Line Carrier		Trench	Curtis Stout Approval drawings 4-5 wks from issue date of po

TWO-WINDING & AUTO-TRANSFORMERS RATED < 100MVA (3-phase) and HV ≤ 230kV

Production Facility & Location	Currently qualifying or already qualified	Maximum ratings approved by Entergy		Capabilities reported by facility	
		MVA (3ø)	KV	MVA (3ø)	KV
ABB / Crystal Springs, MS USA	qualified	50 (MS)	161 (MS)	~60 (MS)	161 (MS)
Delta Star / Lynchburg, VA	qualified	100	230	~200	230
Waukesha Electric (SPX), Goldsboro, NC & Waukesha, WI USA	qualified	80 (NC), 100 (WI)	230 (NC), 230 (WI)	~80 (NC), 800 (WI)	230 (NC), 345 (WI)

AUTO-TRANSFORMERS RATED ≥ 100MVA (3-phase) or HV > 230kV

Production Facility & Location	Currently qualifying or already qualified	Maximum ratings approved by Entergy		Capabilities reported by facility	
		MVA (3ø)	KV	MVA (3ø)	KV
ABB / Varennes, Quebec, Canada; Guarulhos, Brazil; Cordoba, Spain	qualified	1000 (Can), 500 (Br), 800 (Sp)	500 (Can), 500 (Br), 500 (Sp)	1200 (Can), 600 (Br), 800 (Sp)	765 (Can), 765 (Br), 500 (Sp)
Mitsubishi / Ako, Japan	qualified	~1000	500	~1500	1000+
Siemens / Linz & Weiz, Austria; Nuremburg, Germany; Jundiai, Brazil; Bogota, Colombia	qualified	1000 (Aus, Ger), 800 (Br), 200 (Col)	500 (Aus, Ger, Br), 230 (Col)	2000 (Aus), 1100 (Ger), 1000 (Br), 250 (Col)	765 (Aus), 1000+ (Ger), 765 (Br), 345 (Col)
SMIT / Nijmegen, Netherlands	qualified	~800	500	~1200	765
Waukesha Electric (SPX), Waukesha, WI USA	qualified	~600	345	~800	345

ATTACHMENT 6
ENTERGY LOADING DISTRICTS

State	County	Extreme Wind mph	NESC District			Extreme Ice inches	Entergy Load Case
			Light	Medium	Heavy		
AR	Arkansas	100		M		1	LC-2
AR	Ashley	100		M		1	LC-2
AR	Baxter	100			H	1	LC-1
AR	Benton	100			H	1	LC-1
AR	Boone	100			H	1	LC-1
AR	Bradley	100		M		1	LC-2
AR	Calhoun	100		M		1	LC-2
AR	Carroll	100			H	1	LC-1
AR	Chicot	100		M		1	LC-2
AR	Clark	100			H	1	LC-1
AR	Clay	100			H	1	LC-1
AR	Cleburne	100			H	1	LC-1
AR	Cleveland	100		M		1	LC-2
AR	Columbia	100		M		1	LC-2
AR	Conway	100			H	1	LC-1
AR	Craighead	100		M		1	LC-2
AR	Crawford	100			H	1	LC-1
AR	Crittenden	100		M		1	LC-2
AR	Cross	100		M		1	LC-2
AR	Dallas	100		M		1	LC-2
AR	Desha	100		M		1	LC-2
AR	Drew	100		M		1	LC-2
AR	Faulkner	100			H	1	LC-1
AR	Franklin	100			H	1	LC-1
AR	Fulton	100			H	1	LC-1
AR	Garland	100			H	1	LC-1
AR	Grant	100		M		1	LC-2
AR	Greene	100			H	1	LC-1
AR	Hempstead	100			H	1	LC-1
AR	Hot Spring	100			H	1	LC-1
AR	Howard	100			H	1	LC-1
AR	Independence	100			H	1	LC-1
AR	Izard	100			H	1	LC-1
AR	Jackson	100			H	1	LC-1
AR	Jefferson	100		M		1	LC-2

State	County	Extreme Wind mph	NESC District			Extreme Ice inches	Entergy Load Case
			Light	Medium	Heavy		
AR	Johnson	100			H	1	LC-1
AR	Lafayette	100		M		1	LC-2
AR	Lawrence	100			H	1	LC-1
AR	Lee	100		M		1	LC-2
AR	Lincoln	100		M		1	LC-2
AR	Little River	100			H	1	LC-1
AR	Logan	100			H	1	LC-1
AR	Lonoke	100		M		1	LC-2
AR	Madison	100			H	1	LC-1
AR	Marion	100			H	1	LC-1
AR	Miller	100		M		1	LC-2
AR	Mississippi	100		M		1	LC-2
AR	Monroe	100		M		1	LC-2
AR	Montgomery	100			H	1	LC-1
AR	Nevada	100		M		1	LC-2
AR	Newton	100			H	1	LC-1
AR	Ouachita	100		M		1	LC-2
AR	Perry	100			H	1	LC-1
AR	Phillips	100		M		1	LC-2
AR	Pike	100			H	1	LC-1
AR	Poinsett	100		M		1	LC-2
AR	Polk	100			H	1	LC-1
AR	Pope	100			H	1	LC-1
AR	Prairie	100		M		1	LC-2
AR	Pulaski	100			H	1	LC-1
AR	Randolph	100			H	1	LC-1
AR	St. Francis	100		M		1	LC-2
AR	Saline	100			H	1	LC-1
AR	Scott	100			H	1	LC-1
AR	Searcy	100			H	1	LC-1
AR	Sebastian	100			H	1	LC-1
AR	Sevier	100			H	1	LC-1
AR	Sharp	100			H	1	LC-1
AR	Stone	100			H	1	LC-1
AR	Union	100		M		1	LC-2
AR	Van Buren	100			H	1	LC-1
AR	Washington	100			H	1	LC-1
AR	White	100			H	1	LC-1
AR	Woodruff	100		M		1	LC-2
AR	Yell	100			H	1	LC-1
MO	Dunklin	100			H	1	LC-1
MO	New Madrid	100			H	1	LC-1
MO	Oregon	100			H	1	LC-1
MO	Pemiscot	100			H	1	LC-1
MO	Stoddard	100			H	1	LC-1
MO	Taney	100			H	1	LC-1

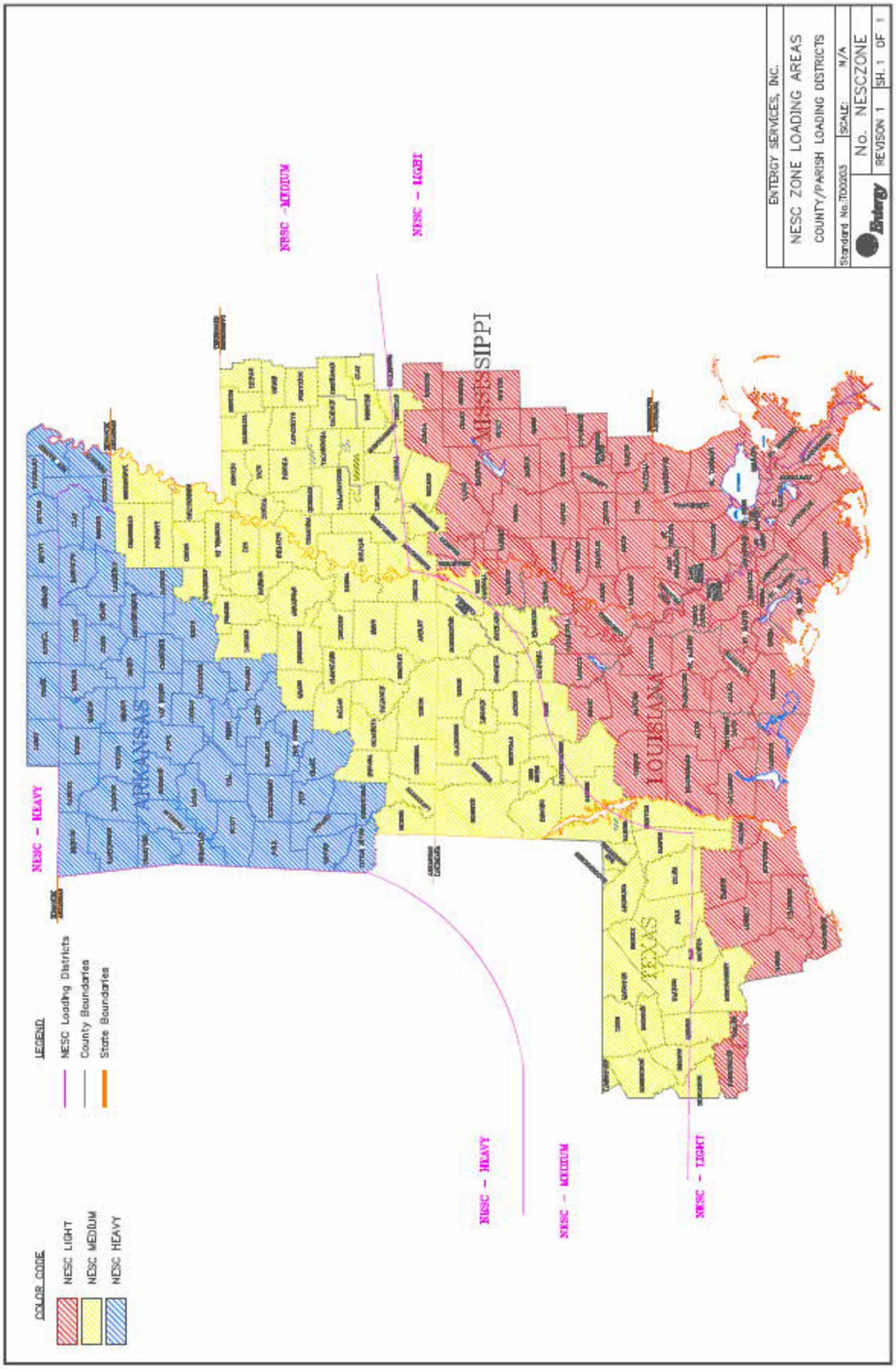
State	Parish	Extreme Wind mph	NESC District			Extreme Ice inches	Entergy Load Case
			Light	Medium	Heavy		
LA	Acadia	150	L			0.5	LC-3D
LA	Allen	125	L			0.5	LC-3B
LA	Ascension	150	L			0.5	LC-3D
LA	Assumption	150	L			0.5	LC-3D
LA	Avoyelles	110	L			0.5	LC-3F
LA	Beauregard	125	L			0.5	LC-3B
LA	Bienville	100		M		0.75	LC-2D
LA	Bossier	100		M		0.75	LC-2D
LA	Calcasieu	150	L			0.5	LC-3D
LA	Caldwell	100		M		0.75	LC-2D
LA	Cameron	150	L			0.5	LC-3D
LA	Catahoula	100	L			0.5	LC-3E
LA	Claiborne	100		M		0.75	LC-2D
LA	Concordia	100	L			0.5	LC-3E
LA	Desoto	100		M		0.75	LC-2D
LA	East Baton Rouge	150	L			0.5	LC-3D
LA	East Carrol	100		M		0.75	LC-2D
LA	East Feliciana	125	L			0.5	LC-3B
LA	Evangeline	125	L			0.5	LC-3B
LA	Franklin	100		M		0.75	LC-2D
LA	Grant	100	L			0.75	LC-2C
LA	Iberia	150	L			0.5	LC-3D
LA	Iberville	150	L			0.5	LC-3D
LA	Jackson	100		M		0.75	LC-2D
LA	Jefferson	150	L			0.5	LC-3D
LA	Jefferson Davis	150	L			0.5	LC-3D
LA	Lafayette	150	L			0.5	LC-3D
LA	Lafourche	150	L			0.5	LC-3D
LA	Lasalle	100	L			0.75	LC-3C
LA	Lincoln	100		M		0.75	LC-2D
LA	Livingston	150	L			0.5	LC-3D
LA	Madison	100	L			0.75	LC-3C
LA	Morehouse	100		M		0.75	LC-2D
LA	Natchitoches	100		M		0.75	LC-2D
LA	Orleans	150	L			0.5	LC-3D
LA	Ouachita	100		M		0.75	LC-2D
LA	Plaquemines	150	L			0.5	LC-3D
LA	Point Coupee	125	L			0.5	LC-3B
LA	Rapides	100	L			0.5	LC-3E
LA	Red River	100		M		0.75	LC-2D
LA	Richland	100		M		0.75	LC-2D
LA	Sabine	100		M		0.75	LC-2D
LA	St. Bernard	150	L			0.5	LC-3D
LA	St. Charles	150	L			0.5	LC-3D

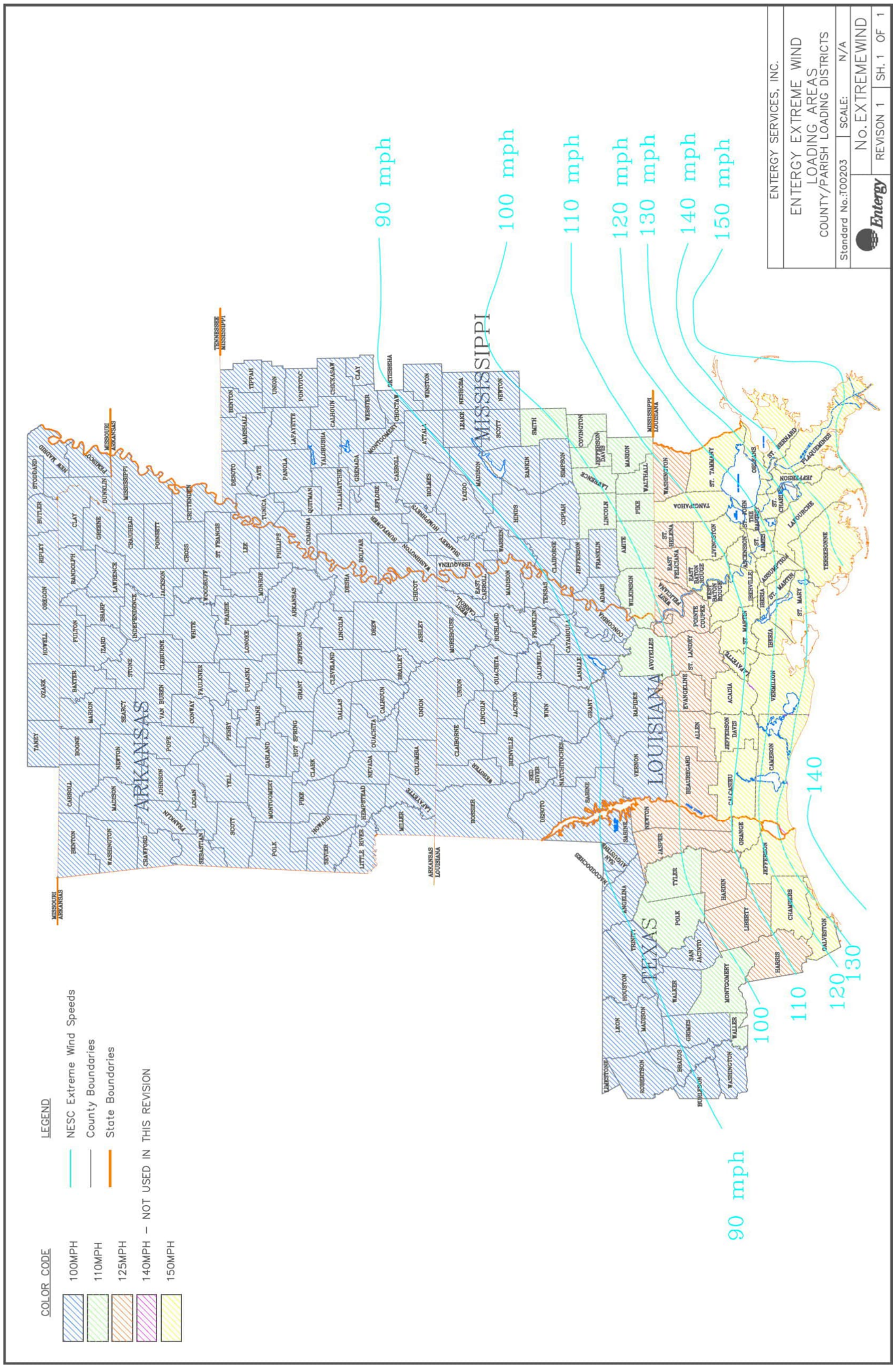
State	Parish	Extreme Wind mph	NESC District			Extreme Ice inches	Entergy Load Case
			Light	Medium	Heavy		
LA	St. Helena	125	L			0.5	LC-3B
LA	St. James	150	L			0. 5	LC-3D
LA	St. John the Baptist	150	L			0.5	LC-3D
LA	St. Landry	125	L			0.5	LC-3B
LA	St. Martin, North	150	L			0.5	LC-3D
LA	St. Martin, South	150	L			0.5	LC-3D
LA	St. Mary	150	L			0.5	LC-3D
LA	St. Tammany	150	L			0.5	LC-3D
LA	Tangipahoa	150	L			0.5	LC-3D
LA	Tensas	100	L			0.5	LC-3E
LA	Terrebonne	150	L			0.5	LC-3D
LA	Union	100		M		0.75	LC-2D
LA	Vermillion	150	L			0.5	LC-3D
LA	Vernon	100	L			0.5	LC-3E
LA	Washington	125	L			0.5	LC-3B
LA	Webster	100		M		0.75	LC-2D
LA	West Baton Rouge	150	L			0.5	LC-3D
LA	West Carrol	100		M		0.75	LC-2D
LA	West Feliciana	125	L			0.5	LC-3B
LA	Winn	100		M		0.75	LC-2D

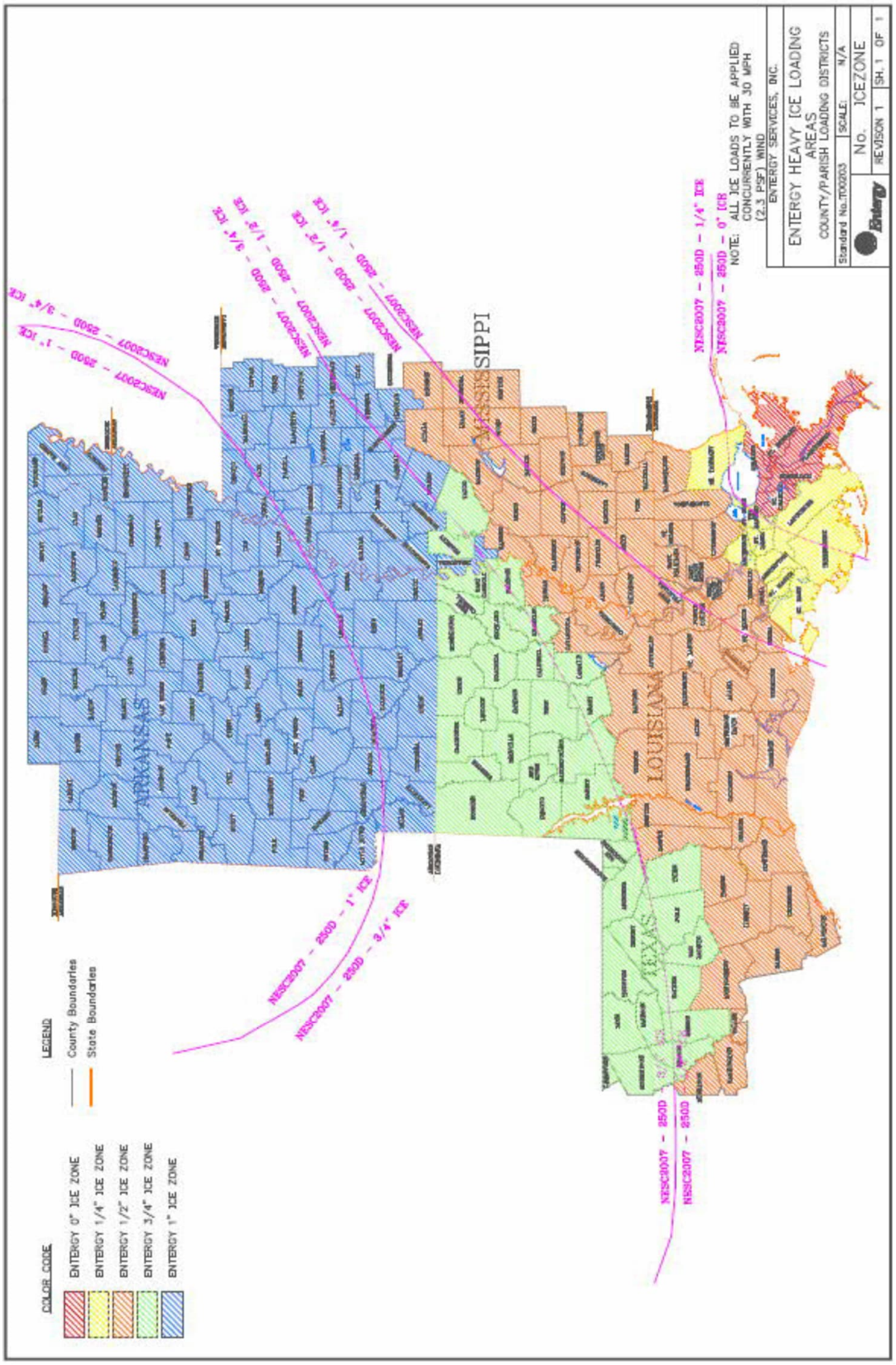
State	County	Extreme	NESC District			Extreme	Entergy
		Wind mph	Light	Medium	Heavy	Ice inches	Load Case
MS	Adams	100	L			0.5	LC-3E
MS	Amite	110	L			0.5	LC-3F
MS	Attala	100	L			0.5	LC-3E
MS	Benton	100		M		1	LC-2
MS	Bolivar	100		M		1	LC-2
MS	Calhoun	100		M		1	LC-2
MS	Carrol	100		M		1	LC-2
MS	Chickasaw	100		M		1	LC-2
MS	Choctaw	100		M		1	LC-2
MS	Claiborne	100	L			0.5	LC-3E
MS	Clay	100		M		1	LC-2
MS	Coahoma	100		M		1	LC-2
MS	Copiah	100	L			0.5	LC-3E
MS	Covington	110	L			0.5	LC-3F
MS	Desoto	100		M		1	LC-2
MS	Franklin	100	L			0.5	LC-3E
MS	Grenada	100		M		1	LC-2
MS	Hinds	100	L			0.5	LC-3E
MS	Holmes	100		M		1	LC-2
MS	Humphreys	100		M		1	LC-2
MS	Issaquena	100	L			1	LC-3G
MS	Jefferson	100	L			0.5	LC-3E
MS	Jefferson Davis	110	L			0.5	LC-3F
MS	Lafayette	100		M		1	LC-2
MS	Lawrence	110	L			0.5	LC-3F
MS	Leake	100	L			0.5	LC-3E
MS	Leflore	100		M		1	LC-2
MS	Lincoln	110	L			0.5	LC-3F
MS	Madison	100	L			0.5	LC-3E
MS	Marion	110	L			0.5	LC-3F
MS	Marshall	100		M		1	LC-2
MS	Montgomery	100		M		1	LC-2
MS	Neshoba	100	L			0.5	LC-3E
MS	Newton	100	L			0.5	LC-3E
MS	Panola	100		M		1	LC-2
MS	Pike	110	L			0.5	LC-3F
MS	Ponotoc	100		M		1	LC-2
MS	Quitman	100		M		1	LC-2
MS	Rankin	100	L			0.5	LC-3E
MS	Scott	100	L			0.5	LC-3E
MS	Sharkey	100	L			0.75	LC-3C
MS	Simpson	100	L			0.5	LC-3E
MS	Smith	110	L			0.5	LC-3F

State	County	Extreme	NESC District			Extreme	Entergy
		Wind mph	Light	Medium	Heavy	Ice inches	Load Case
MS	Sunflower	100		M		1	LC-2
MS	Tallahatchie	100		M		1	LC-2
MS	Tate	100		M		1	LC-2
MS	Tippah	100		M		1	LC-2
MS	Tunica	100		M		1	LC-2
MS	Union	100		M		1	LC-2
MS	Walthall	110	L			0.5	LC-3F
MS	Warren	100	L			0.5	LC-3E
MS	Washington	100		M		1	LC-2
MS	Webster	100		M		1	LC-2
MS	Wilkinson	110	L			0.5	LC-3F
MS	Winston	100	L			0.5	LC-3E
MS	Yalobusha	100		M		1	LC-2
MS	Yazoo	100	L			0.75	LC-3C

State	**County**	**Extreme**	**NESC District**			**Extreme**	**Entergy**
		Wind mph	**Light**	**Medium**	**Heavy**	**Ice inches**	**Load Case**
TX	Angelina	100		M		0.75	LC-2D
TX	Brazos	100		M		0.75	LC-2D
TX	Burleson	100		M		0.5	LC-2B
TX	Chambers	150	L			0.5	LC-3D
TX	Galveston	150	L			0.5	LC-3D
TX	Grimes	100		M		0.75	LC-2D
TX	Hardin	125	L			0.5	LC-3B
TX	Harris	125	L			0.5	LC-3B
TX	Houston	100		M		0.75	LC-2D
TX	Jasper	125		M		0.5	LC-2C
TX	Jefferson	150	L			0.5	LC-3D
TX	Leon	100		M		0.75	LC-2D
TX	Liberty	125	L			0.5	LC-3B
TX	Limestone	100		M		0.75	LC-2D
TX	Madison	100		M		0.75	LC-2D
TX	Montgomery	110		M		0.5	LC-2A
TX	Nacoqdoches	100		M		0.75	LC-2D
TX	Newton	125		M		0.5	LC-2C
TX	Orange	150	L			0.5	LC-3D
TX	Polk	110		M		0.75	LC-2E
TX	Robertson	100		M		0.75	LC-2D
TX	Sabine	100		M		0.75	LC-2D
TX	San Augustine	100		M		0.75	LC-2D
TX	San Jacinto	100		M		0.75	LC-2D
TX	Trinity	100		M		0.75	LC-2D
TX	Tyler	110		M		0.75	LC-2E
TX	Walker	100		M		0.75	LC-2D
TX	Waller	110	L			0.5	LC-3F
TX	Washington	100	L			0.5	LC-3E


ENTERGY SERVICES, INC.
NESC ZONE LOADING AREAS
COUNTY/PARISH LOADING DISTRICTS
SCALE: N/A
No. NESCZONE
REVISION 1
SH. 1 OF 1
NESC - HEAVY
NESC - MEDIUM
NESC - LIGHT
NESC - HEAVY
NESC - MEDIUM
NESC - LIGHT
ARKANSAS
LOUISIANA
TEXAS
COLOR CODE
NESC LIGHT
NESC MEDIUM
NESC HEAVY
LEGEND
NESC Loading Districts
County Boundaries
State Boundaries


ENTERGY SERVICES, INC.
ENTERGY EXTREME WIND
LOADING AREAS
COUNTY/PARISH LOADING DISTRICTS
Standard No.:T00203
SCALE: N/A
No. EXTREMEWIND
REVISON 1
SH. 1 OF 1
Entergy
90 mph
100 mph
110 mph
120 mph
130 mph
140 mph
150 mph
ARKANSAS
LOUISIANA
MISSISSIPPI
TEXAS
COLOR CODE
100MPH
110MPH
125MPH
140MPH - NOT USED IN THIS REVISION
150MPH
LEGEND
NESC Extreme Wind Speeds
County Boundaries
State Boundaries



***** END OF APPENDIX 2*****