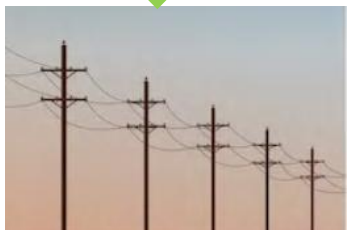
ENO Remediation Plan for 2018 Devices

FOCUS Life Cycle Process

START



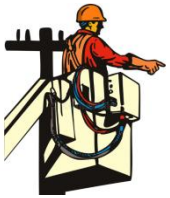
Distribution Grid

Algorithm

FOCUS List

Inspection

Design



Construction

Performance Tracking

FOCUS Program

The FOCUS Program uses outage data over the prior 2 year period and a jurisdictional algorithm, as shown below, to identify devices (*e.g.*, breakers, reclosers, line fuses, sectionalizers) and then prioritizes them on a quarterly basis based on the number of customer interruptions per circuit associated with those devices. The intent of the Program is to improve the reliability performance of FOCUS-identified devices, as well as to improve the overall distribution system by addressing specific outage causes through a focused inspection and mitigation program.

Targeted Device Flagging Algorithm

- Exclude "unavoidable" cause codes
- Exclude BLACK and RED events
- Devices experiencing multiple events in a 24 hour period are only counted once

- The new flagging algorithms based upon:

"number of outages" in "number of days" over a "period of time":

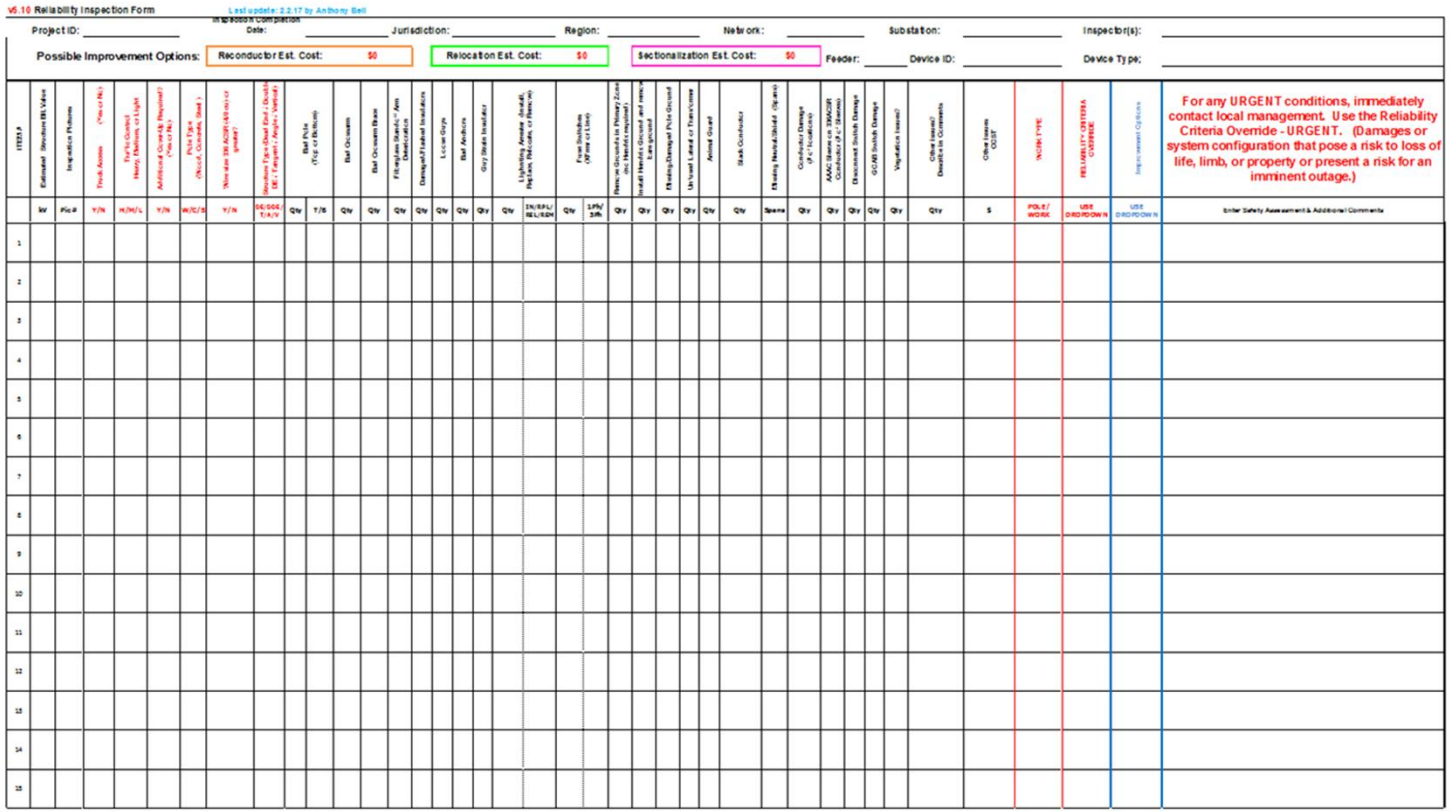
- 1000 CI's and greater, 3 outages, 18 months
- 1000 CI's and greater, 4 outages, 2 years
- 500-999 CI's, 3 outages, 15 months
- 500-999 CI's, 4 outages, 2 years
- 200-499 CI's, 3 outages, 12 months
- 200-499 CI's, 4 outages, 2 years
- 75-199 CI's, 3 outages, 9 months
- 75-199 CI's, 4 outages, 2 years
- 20-74 CI's, 3 outages, 6 months
- 20-74 CI's, 5 outages, 2 years
- 1-19 CI's, 3 outages, 4 months
- 1-19 CI's, 5 outages, 2 years

- Algorithms designed to trigger larger CI devices much faster and allow smaller CI devices **that have significant "quiet" times** the opportunity to NOT trigger a T-Flag.

Reliability Inspection Form used for FOCUS Remediation Plan

The Reliability Inspection form used in the FOCUS Inspection process, shown below, is used to identify and capture failing components, deficiencies, and issues which are potentially contributing factors to a device's poor performance. These devices are inspected on a point by point basis with the findings used to create a remediation plan of action.

Reliability Inspection Form



Reliability Inspection Form Instructions

Reliability Inspection Form Instructions

Inspection Form Layout

① Form Identification

a. **Project ID** – The specific FOCUS number used to identify this project. (E.g. FC15A001) (NOTE: Do not input text or numbers other than the actual FOCUS Project ID.)
b. **Inspection Completion Date** – The actual date when the RSM or inspector finishes the inspection of this device.
c. **Jurisdiction** - The entity where this inspection is taking place (EAI, EGSL, ELL, EMI, ENOI, or ETI)
d. **Region** – The more specific regional location within the jurisdiction where the inspection took place. Breakdown of Regions :

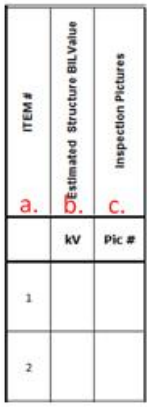
EAI	EGSL	ELL	EMI	ENOI	ETI
Northeast	East	North	Northern	Metro	East
Southeast	West	South	Central		West
Central		Southeast	Southern		
Northwest					
Southwest					

Reliability Inspection Form Instructions

e. **Network** – The location within the specified region where the inspection is taking place.
f. **Substation** – The substation sourcing the breaker and/or device being inspected.
g. **Inspector** – The individual or individuals who are actually performing the pole by pole inspection.
h. **Feeder** – The Feeder identification serving the device being inspected. (E.g. 8M06)
i. **Device ID** – The actual device identification being inspected. (E.g. 25995)
j. **Device Type** – The type of device being inspected. (Note; this is a dropdown box which allows the user to specify the device being inspected as a Breaker, Recloser, Sectionalizer, or Line Fuse.)
k. **Possible Improvement Options** –
   i. **Reconductor Est. Cost** – Provides the ability during an inspection to input an estimated dollar amount to address potential areas for reconductor behind the device being inspected. (Note: Input as an estimated cost for reconductor – E.g. $15,000)
   ii. **Relocation Est. Cost** - Provides the opportunity during an inspection to identify cost associated with potential line relocation as a viable solution to provide the optimal reliability improvement behind a device being inspected. (Note: Input as an estimated cost for relocation – E.g. $35,000)
   iii. **Sectionalization Est. Cost** – Provides an RSM or inspector the opportunity to include costs associated with potential locations for sectionalization while performing an inspection. (Note: Approved points for additional sectionalization will still be addressed and maintained through the AM Sectionalization and ALT Program)

NOTE: All Improvement Options Costs are to be estimated costs. More accurate costs will be determined based on the findings and opportunities as identified.

② Structure Identification



ITEM #	Estimated Structure BIL Value	Inspection Pictures
a.	b.	c.
	kV	Pic #
1		
2		

a. Item # - Displays a numerical value for each point of an inspection where issues have been found and work identified
b. Estimated Structure BIL Value – The Basic Insulation Level (BIL) determined for each structure where work has been identified. (Note: Reliability Inspection Cheat Sheets and BIL Calculation Guidelines in Appendix for examples)
c. Inspection Pictures – Picture(s) taken and identified at every structure

Reliability Inspection Form Instructions

③ **Conditional Attributes**

a. Truck Access (Yes or No)	b. Traffic Control Heavy, Medium, or Light	c. Additional Cover-Up Required? (Yes or No)	d. Pole Type (Wood, Concrete, Steel)	e. Wire size 336 ACSR (4/0 cu) or greater?	f. Structure Type (Dead End / Double DE / Tangent / Angle / Vertical)
Y/N	H/M/L	Y/N	W/C/S	Y/N	DE/DDE/T/A/V

a. **Truck Access (Yes or No)** – Condition to determine if the structure is accessible with the vehicles needing to complete work. (Note: Conditional factors should be included when no equipment can access a site except by using a backyard machine or where equipment access is limited such as locations where matting or dozers are necessary to get in/out of work site.)

b. **Traffic Control – (Heavy, Medium, or Light)** – Used to provide additional loading factor when work zone is designated as a location where traffic is great, moderate, or minimal. Note: (1 Traffic Control (TC) unit = 0.5 MHrs) Traffic Control needs: (10% for Light, 20% Medium, 30% Heavy; E.g. 100Mhr job with Light TC needed would need 100Mhrs x 10% = 10Mhrs = 20 TC Units)

c. **Additional Cover-Up Required? (Yes or No)** – Condition to be used when work site requires added cover to ensure safety of workers and provide additional time needed in congested work space. (E.g. Double circuit structure where top conductors are associated with device which was inspected and bottom circuit or equipment provides restrictions in being able to optimally work structure safely and timely.

d. **Pole Type (Wood, Concrete, Steel)** – Condition to designate what type of structure material has been used.

e. **Wire Size 336 ACSR (4/0 CU) or greater?** – Attribute to provide size of conductor in order to provide conditional factor for Large Conductor Handling (sizes specified) or Small Conductors Handling (less than 336 ACSR or 4/0 CU).

f. **Structure Type (DeadEnd/Double DE/Tangent/Angle/Vertical)** – Used to provide type of construction used on structures where issues and work have been identified.)

Reliability Inspection Form Instructions

④ Reliability Issue Identification

Bad Pole (Top or Bottom)		Bad Crossarm	Bad Crossarm Brace	Fiberglass Standoff Arm Deterioration	Damaged/Flashed Insulators	Loose Guys	Bad Anchors	Guy Strain Insulator	Lightning Arrester (Install, Replace, Relocate, or Remove)		Fuse Switches (XFmr or Line)		Remove Grounds in Primary Zone (no Hendrix required)	Install Hendrix Ground and remove bare ground	Missing/Damaged Pole Ground	Unfused Lateral or Transformer	Animal Guard	Slack Conductor	Missing Neutral/Shield (Spans)	Conductor Damage (# of locations)	AAAC Sleeve on 2/0AACSR Conductor (# of Sleeves)	Disconnect Switch Damage	GOAB Switch Damage	Vegetation issues?	Other issues? Describe in Comments	Other issues COST
a.		b.	c.	d.	e.	f.	g.	h.	i.		j.		k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.
Qty	T/B	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	IN/RPL/ REL/REM	Qty	1Ph/ 3Ph	Qty	Qty	Qty	Qty	Qty	Qty	Spans	Qty	Qty	Qty	Qty	Qty	Qty	$

a. **Bad Pole (Top, Bottom, or ALL)** – Used to specify a structure, upon visual inspection, which shows deterioration at Top, Bottom, or ALL of pole (decay) and needs attention. In consideration of pole work, note in Additional Comments if there is a possibility for the structure to be reinforced or bolted at top, if split. (Note: Dropdown box allows you to pick what part of pole is deteriorated. If structure shows deterioration throughout, denote in dropdown box as ALL and make note in Additional Comment section as to condition. Do not use any other identification other than Top, Bottom, or ALL)

b. **Bad Crossarm** – Used to specify an arm(s) which show significant signs of deterioration (decay, splintering, or bowing) where imminent failure is highly probable. (Note: Denote the actual quantity of arms which needs to be replaced)

c. **Bad Crossarm Brace** - Used to specify when a crossarm brace has pulled loose or failed and needs to be replaced. (Note: Denote the actual quantity of crossarm braces which needs to be replaced.)

d. **Fiberglass Standoff Arm Deterioration** – Used to specify where fiberglass arms are showing significant deterioration (E.g. Exterior coating on FG arms is showing degradation to the point where the fibers are fully exposed and contamination buildup is highly likely; therefore, presenting a path for tracking across the fiberglass – diminished BIL) (Note: Includes FG arm and insulator.)

e. **Damaged /Flashed Insulators** – Indicate number of insulators which are showing damage (flashed, chipped, cracked, or tracking.) (Note: Only denote those insulators showing damage. Older Porcelain insulators (Deadend and pin) not reflecting any damage should not be changed out by justification that they are same type as similar with damage; however, first and second generation polymer deadends (Epoxilators and Heatherlite) should ALL be replaced when identified through an inspection.

f. **Loose Guys** – Identify any guy(s) which have lost tension and are no longer supporting the structures to which they are attached.

g. **Bad Anchors** – Identify any anchors which are no longer supporting the down guy assembly on a structure.

h. **Guy Strain Insulators** – Identify locations on an inspection where a guy strain insulator(s) need to be installed

Reliability Inspection Form Instructions

i. **Lightning Arrester (Install, Replace, Relocate, Remove)** – Identify existing locations and condition of arresters which need to be addressed by installation, replacement, relocation or removal.
   - Under new construction guidelines, installing, replacing or relocating arrester(s) for line protection will no longer be a viable option but improvements in structure BIL will be viewed as the best solution.
   - Installation, replacement, and/or relocation of equipment arresters will still be utilized on the following: Reclosers, Transformers, Capacitors, Regulators, and Potheads.

   NOTE: Specify quantity needing to be addressed and identification of action required:

   IN – Install,
   RPL – Replace, and
   REL – Relocate
   } NO LONGER VIABLE Options for Line Protection

   REM- Removal ONLY code to be used with Arresters used in existing Line protection.

   IN-E – Install Equipment,
   RPL-E – Replace Equipment,
   REL-E - Relocate Equipment, and
   REM-E – Remove Equipment
   } All Equipment Arrester Codes still viable options

j. **Relocate Fuse Switch (XFmr or Line) to FG Bracket Configuration** – Identify any location where existing fuse(s) need to be relocated on a structure to provide greater separation and space.

k. **Remove Grounds In Primary Zone (no Hendrix required)** – Used to identify locations where grounds have been installed on structures and are should be removed from above the neutral (in Primary Zone). (E.g. – Arrester removal from crossarms which requires the grounds along the bottom of the arm to be removed or older type construction where grounds were installed to the top of structures as a means thought to provide lightning protection. Note: This action requires No Hendrix ground.)

l. **Install Hendrix Ground and remove bare ground** – Used to specify locations where the existing bare ground on a shielded structure needs to be replaced with a Hendrix Ground to provide greater BIL due to close proximity to 1) middle phase deadend, 2) middle phase pin insulator, 3) steel arm construction, or 4) vertical construction. (Note: Phase and conductor terminology are used interchangeably.)

m. **Missing/Damaged Pole Ground** – Used to denote structures where the existing pole grounds has been removed or damaged.

n. **Unfused Lateral or Transformer** – Specify locations where existing lateralsor transformer are not fused and would help provide reduction in customers impacted during an outage.

o. **Animal Guard** – Specify location where an animal guard installed would provide greater protection around equipment and minimize opportunities for future outages.

p. **Slack Conductor** – Denote locations where conductor(s) is slack or has lost tension and could result in potential phase slap or clearance issues.

q. **Missing Neutral/Shield (Spans)** – Indicate locations, by spans, where neutral or shield conductor are no longer in field and need to be replaced.

r. **Conductor Damage (# of locations)** – Specify locations, by number, where conductor(s) has received damage and needs to be addressed. (E.g. Damage from vegetation contact, phase slap, malicious mischief, etc.)

s. **AAAC Sleeve on 336 ACSR Conductor (# of Spans)** – Denote locations, by spans, where an improper AAAC automatic sleeve(s) has been incorrectly used on a prior issue specific to 336 ACSR conductor. (Note: The correct sleeve to be used with 336 ACSR is the 20.5" automatic sleeve with dark green inserts. Distinguishing attribute for AAAC sleeve is approximately 12" in length with light green inserts.)

Reliability Inspection Form Instructions

t. **Disconnect Switch Damage** – Identify a disconnect switch(es) which has been damaged and needs to have corrective action. (Note: Indicate quantity as either 1, 2, or 3 switches which need attention.)
u. **GOAB Switch Damage** – Identify a Gang Operate Air Break (GOAB) switch which has been damaged and needs to have corrective action.
v. **Vegetation Issues?** – Indicate any locations which would require vegetation attention to help mitigate any potential for outages behind the device being inspected.
w. **Other Issues? Describe in Comments** – Indicate any other issues which have been determined and cannot be categorized under any other components on the inspection form.
x. **Other Issues COST** – This is cost associated with those issues noted under **Other Issues** and should be input as an estimated cost for repair.

⑤ **Work Criteria/Safety Assessment/Comments**

WORK TYPE	RELIABILITY CRITERIA OVERRIDE	Improvement Options	For any URGENT conditions, immediately contact local management. Use the Reliability Criteria Override - URGENT. (Damages or system configuration that pose a risk to loss of life, limb, or property or present a risk for an imminent outage.)
a.	b.	c.	d.
POLE/ WORK	USE DROPDOWN	USE DROPDOWN	Enter Safety Assessment & Additional Comments

a. **Work Type** – Auto-populates the type of work based on entries in the Reliability Issues section of form. Entry will either show POLE or WORK dependent on whether a Bad Pole is identified or only Inspection work chosen. (NOTE: EVEN WHEN A POLE HAS BEEN IDENTIFIED AS NEEDING ATTENTION, SHOW ALL OTHER ENTRIES FOR ITEMS ON STRUCTURE WHICH HAVE BEEN IDENTIFIED AS HAVING ISSUES.)
b. **Reliability Criteria Override** – This field provides the opportunity as a dropdown box to be able to override the Work Type with only one of the following choices: NO WORK, URGENT, or POLE - 3RD PARTY. Utilization of the following codes:
   - **NO WORK** - Dropdown entry used in the inspection or review process to determine if all points will be included in the overall work plan and figured in the Patrol Cost Estimating Tool. (Note: Choosing to decide to remove any points from the inspection form should be done by using this code rather than attempting to delete any entries or rows of data. This form has formulas running behind the scenes and any attempts to delete a row of data can result in erroneous entries in other tabs used with this form.
   - **URGENT** - Dropdown entry to be used when damages or system configuration poses a risk to loss of life, limb or property or presents a risk for an imminent outage. As stated, for any URGENT condition, IMMEDIATELY contact the local management.

Reliability Inspection Form Instructions

- **POLE – 3rd Party** – Dropdown entry to be used to designate when a structure in an inspection needing attention is owned by another company. This allows for inspection items to still be captured with an associated transfer cost and loaders necessary and captured in the Total Project Cost. Note: The actual pole cost is not included and 3rd Party Poles should follow through the existing NJUNS process.

c. **Improvement Options** – Field provides the inspector the opportunity to designate points identified with potential Improvement Options as follows:
   - **RECON** – Denote points in inspection associated with structures identified for potential reconductor.
   - **SECT** – Denote points where additional sectionalization has been identified to reduce customer impact during an outage.
   - **RELOC** - Denote points where an area(s) behind a device being inspected provides an opportunity for relocation of line to provide greater reliability and device improvement.

   (Note: When RECON or SECT is selected, inspection work costs is included with the specified estimated cost to reconductor or sectionalize; however, when RELOC is selected, all inspection work costs associated with structures involved in potential relocation is subtracted from the estimate and only specified relocation cost is used.)

d. **Safety Assessment & Additional Comments** – Field provided to input safety concerns or add comments as related to identified issues and work on a structure or conductor to provide greater level of detail. (E.g. location and/or scope of detailed work or other issues noted.)

Main Take Away Points of Inspection Form Instructions

- Instructions provided to give clear guidance to Reliability Service Man (RSM) or inspector by defining each area of inspection form in addressing those problems found with necessary details.
- Reliability Inspection Form is a tool utilized to capture quantity and details of issues found on a device inspection to serve as source data to be uploaded into the FOCUS Database for an understanding as to the quality of inspections created.
- The full intent of the Reliability Inspection form is to capture inspection information used to create an estimated cost associated with the work identified and should not provide an expectation for true and accurate cost.

Reliability Inspection Form Instructions

i. **Lightning Arrester (Install, Replace, Relocate, Remove)** – Identify existing locations and condition of arresters which need to be addressed by installation, replacement, relocation or removal.
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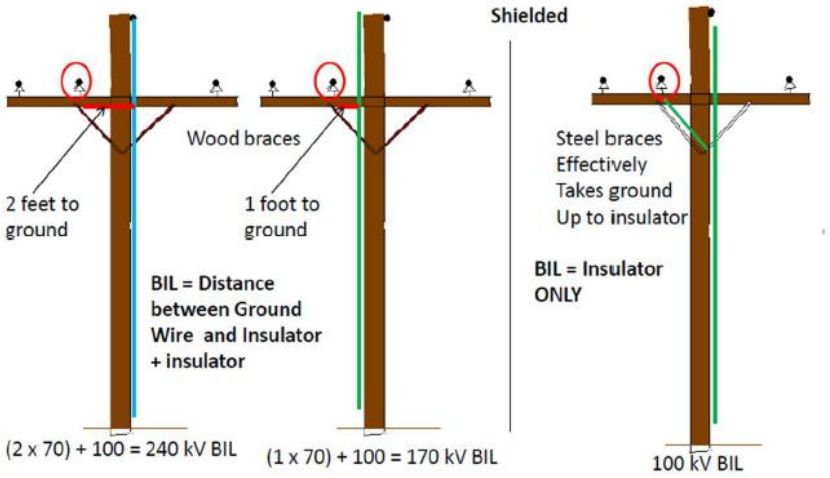
BIL Calculations used in FOCUS and BACKBONE inspections

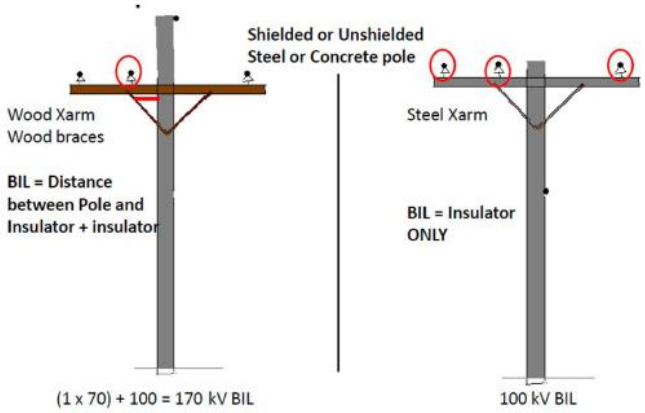
FOCUS on Reliability

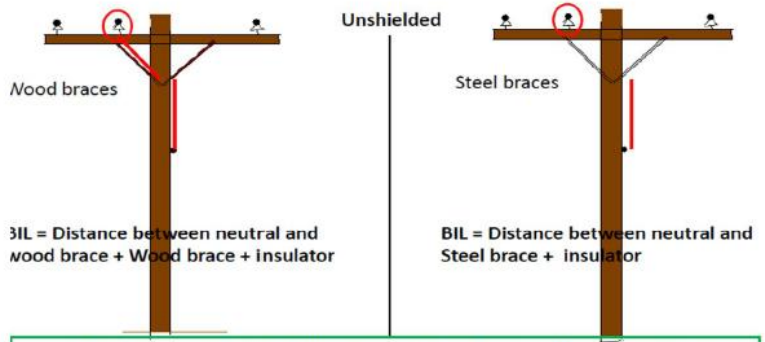
BIL Calculation Examples

Approximate BIL Values

Air:	180kV per foot
Fiberglass:	150kV per foot (GSI or Crossarm)
Wood:	70kV per foot
Insulators:	100kV Post & Fuse Switch
	150kV DE - 15kV Polymer
	200kV DE - 25kV & 35kV Polymer
18" GSI:	0kV (assumed value)







Wood 70kV per foot. If Neutral 2 foot, Brace 1 foot, 100 kV BIL insulator
(2 x 70) + (1 x 70) + 100 = 310 kV BIL (2 x 70) + 100 = 240 kV BIL

Wood 70kV per foot. If Neutral at brace, Brace 1 foot, 100 kV BIL insulator
(1 x 70) + 100 = 170 kV BIL 100 kV BIL

Increasing BIL on Concrete or Steel poles requires "OUT OF BOX" solutions

BIL Calculations used in FOCUS and BACKBONE inspections

FOCUS on Reliability

BIL Calculation Examples

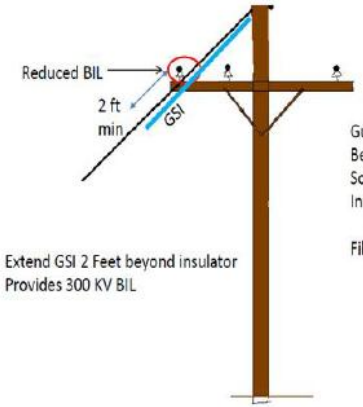
Criteria for Work Required:

1) Visible Damage
2) Potential Outage Risks
   a. Structure BIL Value <240kV
   b. Unfused lateral or transformer
   c. Specialized Material Concerns
3) Vegetation Issues

Expectations to Meet Once Work is Required:

1) Bring Structure BIL Value up to 300kV
2) Replace all 18" GSI's

Guy Wires and Guy Strain Insulators



Lightning Arresters

REMOVE ALL *LINE* LIGHTNING ARRESTERS

Equipment arresters are to be mounted on the load side of the device's switch.

FOCUS Program work

ENO's FOCUS Program consists of addressing and repairing equipment and components that have the potential of impacting a line segment's performance and may include the following:

- Installation of animal guards and/or protective covers to mitigate animal outages;
- Replacement of defective or damaged equipment such as cross-arms, insulators, conductors, switches and any other known outage potentials;
- Vegetation mitigation impacting the segment performance;
- Improve structure BIL by removing bare ground wire located in the primary zone and installing Hendrix insulated ground wire where existing shielded construction requires an electrical ground connection, and
- Protective device coordination review is performed.

Remediation Plan for FOCUS work

Remediation Plan for 2018 ENOI FOCUS devices

The remediation plan for devices targeted are based on the actual findings from the Reliability Inspection Form and reviewed for all deficiencies found as shown below. For those devices which have not yet been inspected, the outage information is used to begin understanding the types of failures that are anticipated to be found when the inspection is completed. That inspection will not only look for the root cause but will also address any other know causal factors.

Specific inspection findings for the following 10 devices in 2018

Remediation Plan for FOCUS work

FOCUS Algorithmically Determined 2 Year Outage Information used for Prioritizing Devices to be selected for inspection

Project #	SUBSTATION	FEEDER	DEVICE ID	DEVICE TYPE	AM OUTAGES (FOCUS Eligible)	AVG CUSTS	SUM CI	SUM CM	2 YR DLINE OUTAGES	2 YR MOMENTARY	2 YR CI	2 YR VEG CI	2 YR BIL CI	2 YR WOOD CI	2 YR ENG CI	2 YR OTHER CI	2 YR MAJOR CI	2 YR VEG %	2 YR BIL %	2 YR WOOD %	2 YR ENG %	2 YR OTHER %	2 YR MAJOR %	WR Count
Not Selected in FDB	NAPOLEON	1916	50679	LFUS	3	141	423	27465	3	0	423	171	252	0	0	0	0	40.4%	59.6%	0.0%	0.0%	0.0%	0.0%	0
FC18N001	CURRAN	2215	21278	LFUS	7	359	2513	267080	7	0	2516	0	2209	0	307	0	0	0.0%	87.8%	0.0%	12.2%	0.0%	0.0%	0
FC18N002	ALMONASTER	614	27700	LFUS	4	476	1904	357987	4	0	1903	0	1324	0	0	579	0	0.0%	69.6%	0.0%	0.0%	30.4%	0.0%	1
FC18N003	NAPOLEON	1915	1915	SBKR	3	1569	4707	340750	3	2	4708	0	0	2476	0	2232	0	0.0%	0.0%	52.6%	0.0%	47.4%	0.0%	2
FC18N004	NAPOLEON	1914	25172	RCLR	3	1039	3117	517577	3	0	3117	2054	0	0	1063	0	0	65.9%	0.0%	0.0%	34.1%	0.0%	0.0%	0
FC18N005	JOLIET	2026	52975	LFUS	6	198	1188	193896	6	0	1187	173	784	0	0	230	232	14.6%	66.0%	0.0%	0.0%	19.4%	19.5%	3
FC18N007	PAUGER	1705	27854	LFUS	4	218	872	67631	4	0	871	219	433	219	0	0	0	25.1%	49.7%	25.1%	0.0%	0.0%	0.0%	1
FC18N008	SHERWOOD FOREST	1612	1612	SBKR	4	714	2856	225710	4	4	2854	0	0	723	2131	0	0	0.0%	0.0%	25.3%	74.7%	0.0%	0.0%	2
FC18N009	JOLIET	2015	27723	LFUS	5	161	805	188231	5	0	807	184	406	217	0	0	0	22.8%	50.3%	26.9%	0.0%	0.0%	0.0%	0
FC18N010	JOLIET	2016	27704	LFUS	4	192	768	93816	4	0	767	172	352	243	0	0	0	22.4%	45.9%	31.7%	0.0%	0.0%	0.0%	1
FC18N011	PAUGER	1705	21256	LFUS	4	190	760	138380	4	0	758	0	519	239	0	0	0	0.0%	68.5%	31.5%	0.0%	0.0%	0.0%	1
FC18N012	JOLIET	2013	62084	LFUS	4	182	728	88229	4	0	728	474	0	254	0	0	0	65.1%	0.0%	34.9%	0.0%	0.0%	0.0%	0
FC18N013	ALMONASTER	623	21162	LFUS	6	118	708	109034	6	1	708	36	480	192	0	0	168	5.1%	67.8%	27.1%	0.0%	0.0%	23.7%	1
FC18N014	CURRAN	2211	27320-F	LFUS	4	166	664	143312	4	0	662	0	248	0	0	414	0	0.0%	37.5%	0.0%	0.0%	62.5%	0.0%	0
FC18N015	MARKET	2147	27799	LFUS	4	125	500	66619	4	0	499	244	255	0	0	0	0	48.9%	51.1%	0.0%	0.0%	0.0%	0.0%	0
FC18N016	ALMONASTER	627	86712	LFUS	3	196	588	47875	3	0	589	0	589	0	0	0	0	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	1
FC18N017	NAPOLEON	1921	21437	LFUS	4	142	568	98255	4	0	566	291	136	139	0	0	0	51.4%	24.0%	24.6%	0.0%	0.0%	0.0%	0
FC18N018	CURRAN	2212	27648	LFUS	4	125	500	25791	4	0	499	0	499	0	0	0	0	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0
FC18N019	PONTCHARTRAIN PARK	512	17538	LFUS	4	119	476	51086	4	0	476	106	212	158	0	0	106	22.3%	44.5%	33.2%	0.0%	0.0%	22.3%	0
FC18N020	NAPOLEON	1915	23891	RCLR	3	364	1092	91107	3	0	1091	0	507	584	0	0	0	0.0%	46.5%	53.5%	0.0%	0.0%	0.0%	0
FC18N021	ALMONASTER	615	36957	LFUS	4	112	448	85729	4	0	448	120	131	0	197	0	0	26.8%	29.2%	0.0%	44.0%	0.0%	0.0%	0
FC18N022	JOLIET	2026	43673	LFUS	7	61	427	59108	7	0	427	182	245	0	0	0	0	42.6%	57.4%	0.0%	0.0%	0.0%	0.0%	0
FC18N023	NAPOLEON	1914	99924	LFUS	4	105	420	59243	4	0	421	213	208	0	0	0	0	50.6%	49.4%	0.0%	0.0%	0.0%	0.0%	0
FC18N025	POYDRAS	W5925	47205	RCLR	4	333	1332	188735	4	0	1331	333	998	0	0	0	0	25.0%	75.0%	0.0%	0.0%	0.0%	0.0%	0

Columns	A	Project ID
	B-J	General Device Identification
	K-N	Qualified Outage Data used in selection alg
	O-P	ALL 2 year outages including those exclude
	Q-V	Breakdown of ALL 2 year outages in CI (Veg, BIL, Wood
	W	Outage in Q-V that occurred during Major Storm Event
	X-AB	Same as Q-V but in %
	AC	Same as W but in %
	AD	Count of Work Requests for project

Reliability Categories with Contributing Outage Cause Codes

2 Year Outage Data grouped in 5 major categories. This is to simplify the inspection process. BIL is the group that deals with the majority of the "pole top" issues.

Vegetation	BIL	Wood	Engineering	Other
Trees	Lightning	Poles	Mis-Coordination	Mylar Balloons
Limbs	Insulator	Crossarms	Overload	Public Inflicted Damage
Vines	Unknown	Braces	Contamination	Vehicle
Etc.	Conductor Failure	Etc.	Etc.	Etc.
	Animals			
	Arrester Failure			
	Etc.			

Remediation Plan for FOCUS work

**As of July 3rd, 10 of 24 FOCUS projects have completed inspections. The remaining 14 projects have ongoing inspections. Goal is to complete all repairs by YE2018*

Actual Inspection Findings for the 10 devices that are being designed or in Construction

Project ID	Total Points Identified	Bad Pole	Bad Crossarm	Bad Crossarm Brace	Fiberglass Standoff Arm Deterioration	Damaged/Flashed Insulators	Guy Strain Insulator Issues	Lightning Arrester (Install, Replace, Relocate, or Remove)	Fuse Switches (Install, Replace, Relocate, or Remove)	Remove Grounds in Primary Zone (no Hendrix required)	Install Hendrix Ground & Remove Bare Ground	Missing/Damaged Pole Ground	Animal Guard	Slack Conductor	Disconnect Switch Damage	Vegetation Issues	Other Issues
FC18N002 614 27700	25	2	64	0	0	3	6	20	20	0	23	23	43	0	0	0	0
FC18N003 1915 1915	74	8	341	6	0	3	51	35	43	0	72	0	182	0	15	0	0
FC18N005 2026 52975	48	17	160	0	3	0	24	28	29	0	47	1	29	0	0	0	0
FC18N007 1705 27854	21	2	76	0	0	0	2	17	21	0	19	0	0	0	0	0	0
FC18N008 1612 1612	29	12	91	0	0	0	9	9	19	0	29	0	0	0	9	0	5
FC18N010 2016 27704	28	5	87	0	2	0	7	13	14	1	25	0	22	0	0	9	0
FC18N011 1705 21256	33	11	66	130	0	0	9	10	23	0	26	17	0	0	0	0	0
FC18N013 623 21162	8	1	9	0	0	0	2	0	4	7	0	0	4	6	0	1	1
FC18N016 627 86712	18	2	26	52	0	0	1	7	12	0	9	3	0	0	0	0	0
FC18N018 2212 27648	16	7	11	0	0	0	5	1	2	0	9	6	5	0	0	0	2
TOTAL	300	67	931	188	5	6	116	140	187	8	259	50	285	6	24	10	8

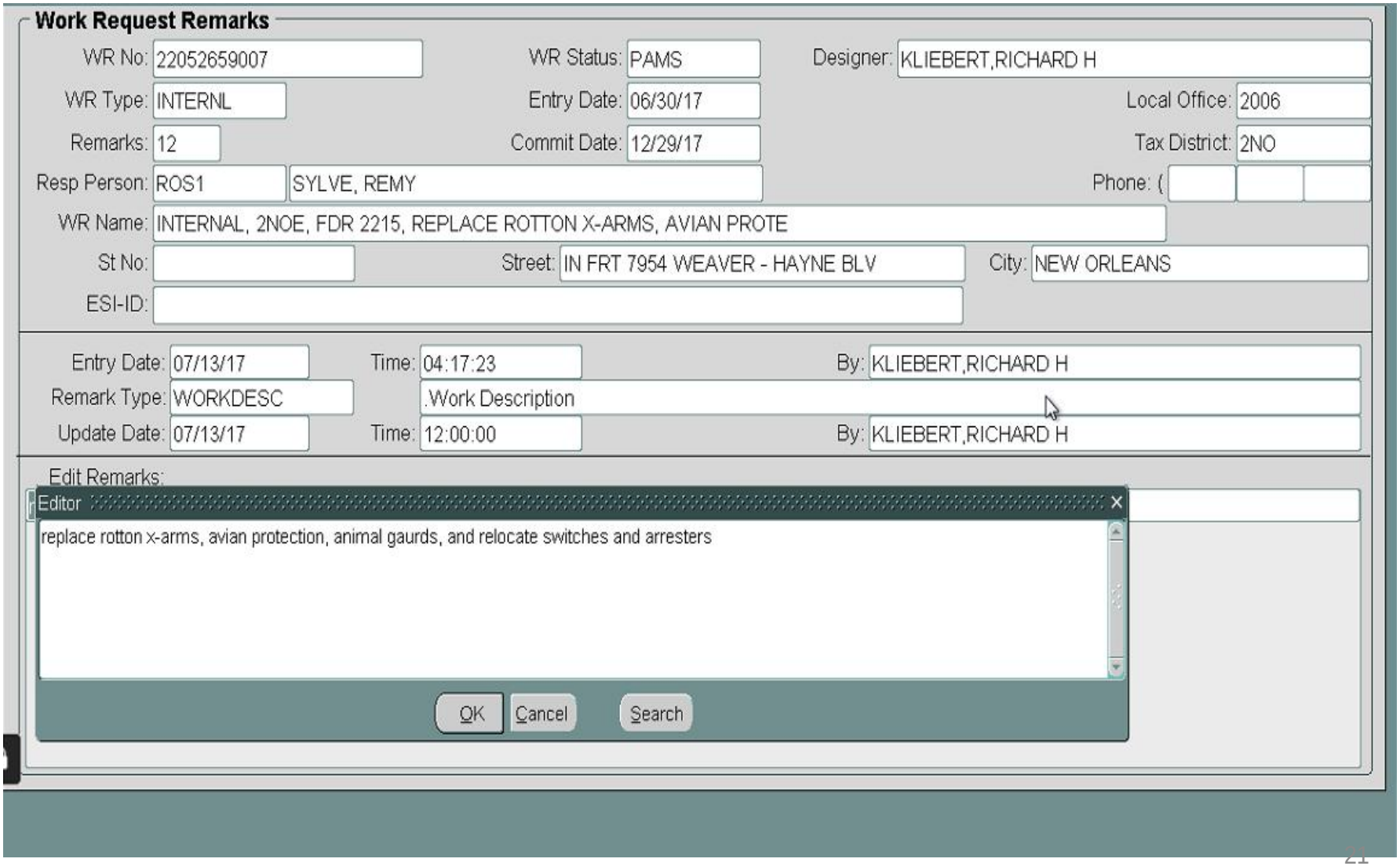
Remediation Plan for FOCUS work

3 of the remaining 14 FOCUS devices were worked under other programs but were also identified in FOCUS. To eliminate redundant work, the FOCUS projects were Cancelled or shown as No Work Required. These are described below.

Curran 2215 Line Fuse 21278 (Cancelled)

- FOCUS Work Plan was cancelled because the work was completed under Internal job prior to being selected in FOCUS Program
  - WR 22052659007
  - Internal Project

Remediation Plan for FOCUS work
Curran 2215 Line Fuse 21278



Remediation Plan for FOCUS work

Curran 2215 Line Fuse 21278

Actual to Estimate Cost

WR No:	22052659007	WR Status:	PAMS	Designer:	KLIEBERT,RICHARD H
Estimate:	1 of 1	Desc:	Internal, 2NOE, fdr 2215, replace rotton x-arms, avian protection, animal gaurds, and relocate switches and a		
WR Type:	INTERNL	Entry Date:	06/30/17	Local Office:	2006
Remarks:	12	Commit Date:	12/29/17	Tax District:	2NO
Resp.Person:	ROS1 SYLVE, REMY			Phone: ( ) -	
WR Name:	INTERNAL, 2NOE, FDR 2215, REPLACE ROTTON X-ARMS, AVIAN PROTE				
St No:		Street:	IN FRT 7954 WEAVER - HAYNE BLV	City:	NEW ORLEANS

	Estimate	As Built	Variance
Net Property Additions	$ 54197.23	$ 54084.73	$ 112.50
Total Cost Charged to Job	62848.17	62733.67	114.50
Previously Capitalized	.00	.00	.00
Retirement Value	.00	.00	.00
Total Work Request Cost	$ 62848.17	$ 62733.67	$ 114.50

Display (A)ccount allocations, (C)ontributions, (J)ustification, (L)abor, (O)verhead, (R)etirement Units, (S)ummary of Charges, (V)ouchers:

Remediation Plan for FOCUS work

Derbigny 1553 Line Fuse 66216-F (Cancelled)

- Device worked under Storm Hardening efforts; therefore, not worked under FOCUS

DERBIGNY	1553	2,991		Area 1	D.O'Neill/R.Kliebert	5/28/2017	Yes	Yes / Yes	$ 96,623	686523	REL	C
										686525	POL	WK
				Area 2	D.O'Neill/R.Kliebert	5/28/2017	Yes	Yes / Yes	$ 65,445	686528	REL	C
										696098	POL	C
										693461	POL	C
										686529	POL	A
				Area 3	D.O'Neill/R.Kliebert	5/28/2017	Yes	Yes / Yes	$ 99,549	686531	REL	A
										686534	POL	WK
				Misc				N/A		690978	POL	C
										696941	POL	A
										697062	POL	C

Remediation Plan for FOCUS work
Derbigny 1553 Line Fuse 66216-F

Specific Design Points						WORK ONLY		
POLE	OTHER	GOAB	CU Category	Compatible Unit	Description	Install	Scrap	Transfer
4	3		Labor	MANHOUR	1 MH			
6	37			SETUP	0.6 MH SETUP TIME	17		
7			All CONDHAND units should be called as "TRANSFER"	CONDHAND-LG-TAN	CONDUCTOR HANDLING LG BARE TANGE	123		
8				CONDHAND-LG-ANG	CONDUCTOR HANDLING LG BARE ANGLE			
13				CONDHAND-LG-DE	CONDUCTOR HANDLING LG BARE DE	60		
14				CONDHAND-SM-TAN	CONDUCTOR HANDLING SM BARE TAN			
29				CONDHAND-SM-ANG	CONDUCTOR HANDLING SM BARE ANGLE			
33				CONDHAND-SM-DE	CONDUCTOR HANDLING SM BARE DE	6		
34				TAILBOARD-CONF	TAILBOARD CONFERENCE LABOR	3		
35				TRAFFIC-CONTROL	0.5 MH TRAFFIC CONTROL	27		
			Pole/Line	XWBRACES	WOOD XARM BRACES (PAIR) 60" SP			
				CUTOUTBKT-FG-1P	CUTOUT BRACKET FG			
				CUTOUTBKT-FG-3P	CUTOUT BRACKET FG TRIPLE			
				GSI78	INSULATOR-GUY STRAIN 78" FG	18		
				IPIN____	13KV PIN INSULATOR WITH TIE			
				LAR10L	10KV DIST. LINE ARRESTOR			
				LSW100FG	15KV LATERAL FUSE SW SHIELDED			
				P10_____	SINGLE PHASE TANGENT			
				P12_____	SINGLE PHASE MEDIUM ANGLE			
				P14_____	SINGLE PHASE DEAD END	6	6	
				P18_____	SINGLE PHASE DOUBLE DEAD END			
				PV1_____	SINGLE PHASE VERTICAL			
				PRX30_____	THREE PHASE TAN, 10FT ARM	41	41	
				PRX32_____	THREE PHASE ANGLE, 10FT ARM			
				PRX34_____	THREE PHASE DEAD END, FG ARM	2	2	
				PRX38_____	THREE PHASE DOUBLE DEAD END	18	18	
				PV3_____	THREE PHASE VERTICAL			
				PGWREPAIR	REPAIR/ADJUST GRND WIRE	19		
				PGWHENDRIX	INST. 15' OF HENDRIX GND WIRE	26		
				ANIMALGUARD	ANIMAL GUARD FOR XFMR BUSHING	15		
				AG (ASSEMBLY)	ANCHOR & GUY ASSEMBLY (see notes)	3	3	
				GUYDN(SIZE)	DOWN GUY ASSEMBLY			21
				DWS(AMPS)-(KV)(WIRE)	DISCONNECT SWITCH			
				GSW(AMPS)-(KV)(WIRE)	GANG SWITCH			
			Equipment/Device	LSW100	15KV LATERAL FUSE SW UNSHIELDED			
				LAR10	10KV DIST. XFMR ARRESTOR			
				ARRBKT-XFMR-15	TRANSFORMER ARRESTOR BKT, 15KV			
				COVERARR	LAR ANIMAL, BIRD GUARD			

Storm Hardening Area Inspection Summary

Remediation Plan for FOCUS work
Curran 2211 Line Fuse 27320

- No Work Required per Network
- Device is pad mounted and serves underground customers
- Bad Components were replaced after outages

LF27320-F Outage History

Off Date/Time	Duration	Device	Cause	Customers	Confirmed	Phase	Remarks
3/22/2017 12:24:00	26	LFUS	HECD	229	☐	ABC	March 18, cubicle 29 & 30 hit by vehicle - while isolating more switches were opened
7/8/2016 17:02:00	169	LFUS	EPRI	40	☐	A	
6/22/2016 07:40:00	191	LFUS	ETRD	208	☑	ABC	Bad Elbow & Bad 50 Kva Transformer
4/1/2016 13:20:00	156	LFUS	ETRD	206	☐	A	changed out urd transformer / kh Only "A" phase was blown
1/31/2016 02:09:00	311	LFUS	EPRI	208	☑	A	Equipment Failure - Bad Span Between V-10 V-26 Primary Conductor
8/28/2005 21:00:00	0	LFUS	STRM	0	☐	ABC	
7/12/2004 02:53:00	337	LFUS	EPRI	201	☐	A	Bad underground primary cable between vault 25 adn 26.

Remediation Plan for FOCUS work

Design Work Request information for 2018 FOCUS devices

Project #	SUBSTATION	NETWORK	FEEDER	DEVICE ID	DEVICE TYPE	Project Status Date	Project Status	Inspection Completed	Import TS	Approval Date	Funded Date	ISD	WR_NO	WR STATUS	Design Estimate
	NAPOLEON	Orleans	1916	50679	LFUS		Documentation Error								
FC18N001	CURRAN	East Orleans	2215	21278	LFUS	27-Feb-18	Cancel Project			05-Dec-17		27-Feb-18		CANCL	
FC18N002	ALMONASTER	Orleans	614	27700	LFUS		Completed	11-Dec-17	29-Jan-18	05-Dec-17	13-Jun-18	25-Jun-18	698717	CONST	$73,254
FC18N003	NAPOLEON	Orleans	1915	1915	SBKR		Funded For Design	30-Nov-17	28-Feb-18	05-Dec-17	13-Jun-18		699044	SCHED	$160,975
													699046	SCHED	$174,936
FC18N004	NAPOLEON	Orleans	1914	25172	RCLR		Inspection			05-Dec-17					
FC18N005	JOLIET	Orleans	2026	52975	LFUS		Completed	12-Dec-17	29-Jan-18	05-Dec-17	16-Apr-18	25-May-18	696026	CONST	$53,833
													696028	CONST	$29,771
													696030	CONST	$91,241
FC18N007	PAUGER	Orleans	1705	27854	LFUS		Funded For Design	31-Dec-17	28-Feb-18	05-Dec-17	13-Jun-18		699050	DES	$63,558
FC18N008	SHERWOOD FOREST	East Orleans	1612	1612	SBKR		Funded For Design	01-Dec-17	31-Jan-18	05-Dec-17	13-Jun-18		635591	CLOSE	$12,126
													696173	SCHED	$56,377
													696183	SCHED	$76,656
FC18N009	JOLIET	Orleans	2015	27723	LFUS		Inspection			05-Dec-17					
FC18N010	JOLIET	Orleans	2016	27704	LFUS		Completed	11-Dec-17	29-Jan-18	05-Dec-17	16-Apr-18	11-May-18	696180	CONST	$90,220
FC18N011	PAUGER	Orleans	1705	21256	LFUS		Completed	30-Dec-17	02-Feb-18	05-Dec-17	13-Jun-18	25-May-18	699055	CONST	$65,949
FC18N012	JOLIET	Orleans	2013	62084	LFUS		Inspection			05-Dec-17					
FC18N013	ALMONASTER	East Orleans	623	21162	LFUS		Funded For Design	07-Dec-17	29-Jan-18	05-Dec-17	13-Jun-18		696184	DES	$20,331
FC18N014	CURRAN	East Orleans	2211	27320-F	LFUS	27-Feb-18	No Work Needed			05-Dec-17		27-Feb-18		CANCL	
FC18N015	MARKET	Orleans	2147	27799	LFUS		Inspection			05-Dec-17					
FC18N016	ALMONASTER	Orleans	627	86712	LFUS		Funded For Design	02-Feb-18	05-Mar-18	05-Dec-17	13-Jun-18		696067	DES	
FC18N017	NAPOLEON	Orleans	1921	21437	LFUS		Inspection			05-Dec-17					
FC18N018	CURRAN	East Orleans	2212	27648	LFUS		Inspection Complete	06-Dec-17	29-Jan-18	05-Dec-17					
FC18N019	PONTCHARTRAIN PARK	Orleans	512	17538	LFUS		Inspection			05-Dec-17					
FC18N020	NAPOLEON	Orleans	1915	23891	RCLR		Inspection			05-Dec-17					
FC18N021	ALMONASTER	Orleans	615	36957	LFUS		Inspection			05-Dec-17					
FC18N022	JOLIET	Orleans	2026	43673	LFUS		Inspection			05-Dec-17					
FC18N023	NAPOLEON	Orleans	1914	99924	LFUS		Inspection			05-Dec-17					
FC18N025	POYDRAS	Chalmette	W5925	47205	RCLR	22-May-18	Inspection			22-May-18					

Historical Performance of Past Reliability Work involving Targeted Circuit (pre 2015) work and FOCUS (2015 to present)

2011 TC Devices	Outage Cases																		Unique Devicie View		Outages 2 or less
	2012			2013			2014			2015			2016			2017					
23	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	17
Devices with No Outages	19	82.61%		16	69.57%		17	73.91%		16	69.57%		15	65.22%		15	65.22%		4	17.39%	
Devices w/1 Outage	3	13.04%	1,689	6	26.09%	5,971	6	26.09%	2,898	5	21.74%	4,094	5	21.74%	2,886	5	21.74%	1,490	3	13.04%	
Devices w/2 Outages	1	4.35%	3,339	1	4.35%	328	0	0.00%		0	0.00%		2	8.70%	669	1	4.35%	472	10	43.48%	73.91%
Devices w/3+ Outages	0	0.00%		0	0.00%		0	0.00%		2	8.70%	6,312	1	4.35%	7,138	2	8.70%	1,963	6	26.09%	

2012 TC Devices	Outage Cases										Unique Devicie View		Outages 2 or less
	2013			2014			2015			2016					
25	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	16
Devices with No Outages	20	80.00%		19	76.00%		15	60.00%		11	44.00%		15	60.00%		1	4.00%	
Devices w/1 Outage	3	12.00%	3,283	5	20.00%	4,360	6	24.00%	9,372	8	32.00%	8,033	8	32.00%	3,520	8	32.00%	
Devices w/2 Outages	2	8.00%	4,466	1	4.00%	463	2	8.00%	3,586	4	16.00%	7,790	2	8.00%	2,714	7	28.00%	64.00%
Devices w/3+ Outages	0	0.00%			0.00%		2	8.00%	6,782	2	8.00%	7,745	0	0.00%		9	36.00%	

2013 TC Devices	Outage Cases									Unique Devicie View		Outages 2 or less
	2014			2015			2016			2017					
42	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	20
Devices with No Outages	28	66.67%		27	64.29%		18	42.86%		22	52.38%		8	19.05%	
Devices w/1 Outage	11	26.19%	11,188	6	14.29%	8,514	13	30.95%	10,338	8	19.05%	3,931	8	19.05%	
Devices w/2 Outages	3	7.14%	2,824	3	7.14%	1,448	4	9.52%	11,002	8	19.05%	13,847	4	9.52%	47.62%
Devices w/3+ Outages	0	0.00%		6	14.29%	12,168	7	16.67%	23,742	4	9.52%	9,433	22	52.38%	

2014 TC Devices	Outage Cases									Unique Devicie View		Outages 2 or less
	2015			2016			2017					
27	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	22
Devices with No Outages	18	66.67%		16	59.26%		18	66.67%		8	29.63%	
Devices w/1 Outage	6	22.22%	3,514	9	33.33%	9,280	7	25.93%	6,775	10	37.04%	
Devices w/2 Outages	3	11.11%	2,596	1	3.70%	2,248	1	3.70%	2,121	4	14.81%	81.48%
Devices w/3+ Outages	0	0.00%		1	3.70%	3,072	1	3.70%	1,306	5	18.52%	

2015 FC Devices	Outage Cases						Unique Devicie View		Outages 2 or less
	2016			2017					
12	Count	%	CI's	Count	%	CI's	Count	%	9
Devices with No Outages	7	58.33%		5	41.67%		4	33.33%	
Devices w/1 Outage	3	25.00%	1,437	5	41.67%	2,684	4	33.33%	
Devices w/2 Outages	2	16.67%	2,955	2	16.67%	1,363	1	8.33%	75.00%
Devices w/3+ Outages	0	0.00%		0	0.00%		3	25.00%	

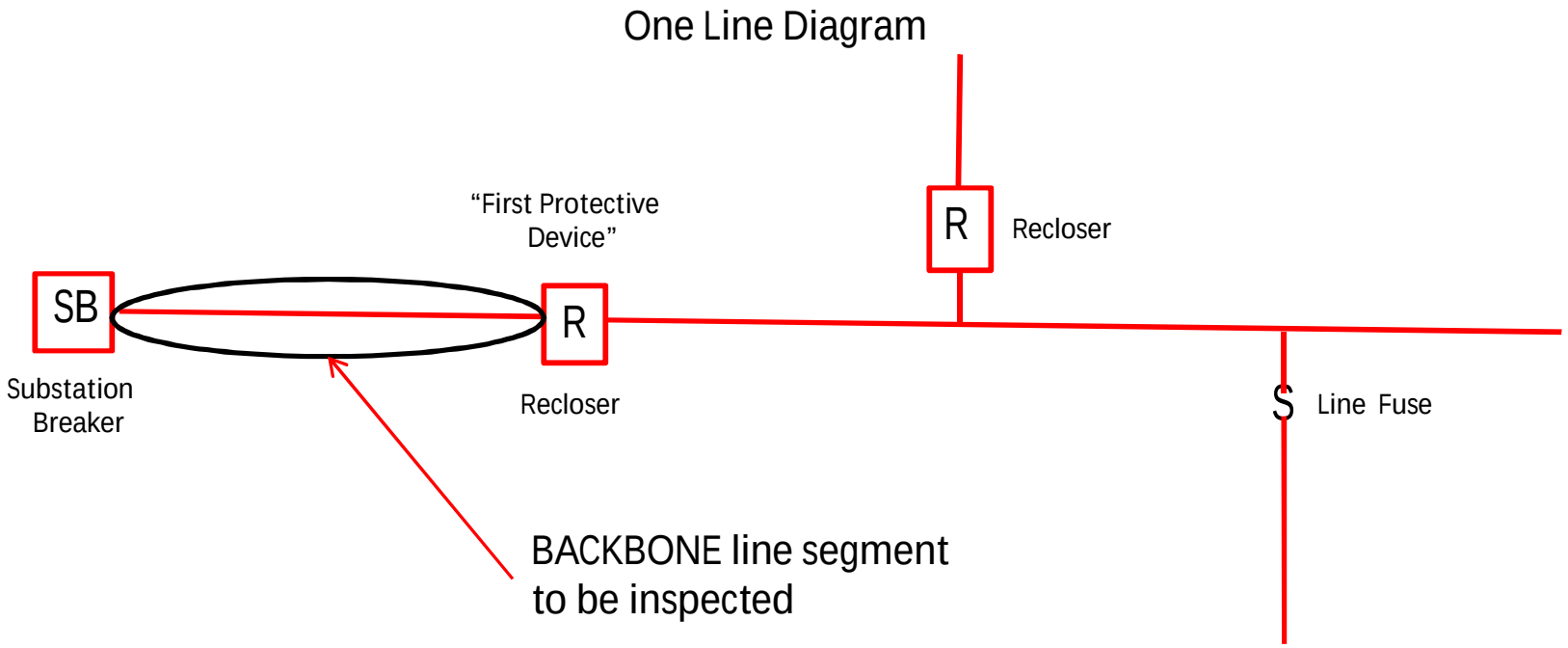
2016 FC Devices	Outage Cases			Unique Devicie View		Outages 2 or less
	2017					
5	Count	%	CI's	Count	%	3
Devices with No Outages	3	60.00%		3	60.00%	
Devices w/1 Outage	0	0.00%		0	0.00%	
Devices w/2 Outages	0	0.00%		0	0.00%	60.00%
Devices w/3+ Outages	2	40.00%	9,889	2	40.00%	

Chart Explanation

In 2011, 23 devices were inspected and worked.
Each column represents outages on those devices in the next calendar year. In 2012, the 23 devices completed in 2011 had 19 devices with 0 outages in 2012, 3 devices had 1 outage, and 1 device had 2 outages.
The right hand column represents the total number of years after work completion. Since 2011, 4 devices have had 0 outages, 2 devices with 1 outage, and 10 devices have had 2 outages, and 6 devices have had 3 or more. 73% of the devices have had 2 or fewer in the past 6 years

BACKBONE Program

The Backbone Program is a proactive infrastructure program designed to inspect and address only the portion of the circuit that has the largest potential for customer impact. This generally limits the inspection to a walk-down from the substation breaker up to and including the first protective device that has the responsibility of isolating the remainder of the circuit. The intent of the Backbone Program is to inspect a predetermined number of multi-customer feeders within a defined territory each year.



BACKBONE Program work

The Program will consist of repairing or replacing equipment identified through an inspection process on a cyclical basis with the intent to eliminate and prevent breaker outages.

The Backbone Program will typically consist of inspections including infrared cameras, removals, and/or replacement-in-kind, including the following examples:

- Installation of animal guards and/or protective covers to mitigate animal outages;
- Replacement of defective or damaged equipment such as cross-arms, insulators, conductors, switches and any other known outage potentials;
- Vegetation mitigation impacting the segment performance;
- Improve structure BIL by removing bare ground wire located in the primary zone and installing Hendrix insulated ground wire where existing shielded construction requires an electrical ground connection,

Remediation Plan for BACKBONE work

BACKBONE Algorithmically Determined Ranking of Feeder Breakers in a Prioritized Manner that is different from FOCUS in that "time" last inspected is more heavily weighted than outage data. The BACKBONE program is not outage based but designed to be more proactive than reactive.

Project ID	SUBSTATION	NETWORK	Backbone Details.FEEDER	DEVICE ID	DEVICE TYPE	Budget Yr	AM OUTAGES	AVG CUSTS	SUM CI	SUM CM	2 YR DLINE OUTAGES	2 YR MOMENTARY	2 YR CI	2 YR VEG CI	2 YR BIL CI	2 YR WOOD CI	2 YR ENG CI	2 YR OTHER CI	2 YR MAJOR CI	2 YR VEG %	2 YR BIL %	2 YR WOOD %	2 YR ENG %	2 YR OTHER %	2 YR MAJOR %
BB18L009	FOREST	Orleans	1604	1604	SBKR	2018	1	1436	1436	22976	1	2	1436	0	1436	0	0	0	0	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
BB18L003	FOREST	Orleans	1610	1610	SBKR	2018	2	1056	2111	76108	2	7	2111	0	2111	0	0	0	0	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
BB18L003	FOREST	Orleans	1610	1610	SBKR	2018	2	1056	2111	76108	2	7	2111	0	2111	0	0	0	0	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
BB18L003	FOREST	Orleans	1610	1610	SBKR	2018	2	1056	2111	76108	2	7	2111	0	2111	0	0	0	0	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
BB18L004	NAPOLEON	Orleans	1912	1912	SBKR	2018	1	2049	2049	190557	1	1	2049	0	2049	0	0	0	0	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
BB18L008	NAPOLEON	Orleans	1913	1913	SBKR	2018	1	1639	1639	93423	2	3	3243	0	1639	0	0	1604	1604	0.0%	50.5%	0.0%	0.0%	49.5%	49.5%
BB18L007	JOLIET	Orleans	2013	2013	SBKR	2018	1	1682	1682	146334	1	3	1682	0	1682	0	0	0	0	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
BB18L002	JOLIET	Orleans	2016	2016	SBKR	2018	1	2121	2121	135744	1	2	2121	0	0	0	0	2121	0	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
BB18L001	MARKET	Orleans	2132	2132	SBKR	2018	2	2212	4424	204868	2	1	4424	0	0	0	0	4424	0	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
BB18L006	MARKET	Orleans	2146	2146	SBKR	2018	1	1759	1759	199987	1	4	1759	0	0	0	0	0	0	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
BB18L005	AVENUE C	Orleans	408	408	SBKR	2018	4	491	1964	116773	4	0	1964	0	1130	0	0	827	0	0.0%	57.5%	0.4%	0.0%	42.1%	0.0%

Columns		
	A	Project Status
	B	Project ID
	C-K	General Device Identification
	L-O	Qualified Outage Data used in selection algorithms
	P-R	algorithms
	S-W	Breakdown of ALL 2 year outages in CI (Veg, BIL, Wood, Eng, Other)
	X	Outage in S-W that occurred during Major Storm Events (Red and Black
	Y-AC	Same as S-W but in %
	AD	Same as X but in %

Remediation Plan for BACKBONE work

**As of July 3rd, 3 of 9 FOCUS projects have completed inspections. The remaining 6 projects have ongoing inspections. Goal is to complete all repairs by YE2018*

Project ID	Total Points Identified	Bad Pole	Bad Crossarm	Bad Crossarm Brace	Loose Guys	Guy Strain Insulator Issues	Lightning Arrester (Install, Replace, Relocate, or Remove)	Fuse Switches (Install, Replace, Relocate, or Remove)	Install Hendrix Ground & Remove Bare Ground	Missing/Damaged Pole Ground	Animal Guard	Conductor Damage (# of locations	Disconnect Switch Damage	Vegetation Issues	Other Issues
BB18L003 1610	47	22	109	0	0	5	11	29	45	0	0	1	9	3	5
BB18L005 408	26	7	83	157	0	8	15	17	26	15	0	0	3	1	0
BB18L159 W5524	28	0	10	22	2	0	1	6	10	1	6	0	0	1	4
TOTAL	101	29	202	179	2	13	27	52	81	16	6	1	12	5	9

Remediation Plan for BACKBONE work

Design Work Request information for 2018 BACKBONE devices

Project ID	ENOI Backbone.FEEDER	SUBSTATION	NETWORK	Backbone Details. FEEDER	DEVICE ID	DEVICE TYPE	WR_NO	WR_DESC	WR_NAME	WR STATUS	Design Estimate
BB18L009	1604	FOREST	Orleans	1604	1604	SBKR					
BB18L003	1610	FOREST	Orleans	1610	1610	SBKR	699063	BB18L003 BACKBONE 1610 3 OF 3	BB18L003 BACKBONE 1610 3 OF 3	CONST	$58,621
BB18L003	1610	FOREST	Orleans	1610	1610	SBKR	699061	BB18L003 BACKBONE 1610 2 OF 3	BB18L003 BACKBONE 1610 2 OF 3	CONST	$33,544
BB18L003	1610	FOREST	Orleans	1610	1610	SBKR	699059	BB18L003 BACKBONE 1610 1 OF 3	BB18L003 BACKBONE 1610 1 OF 3	SCHED	$44,794
BB18L004	1912	NAPOLEON	Orleans	1912	1912	SBKR					
BB18L008	1913	NAPOLEON	Orleans	1913	1913	SBKR					
BB18L007	2013	JOLIET	Orleans	2013	2013	SBKR					
BB18L002	2016	JOLIET	Orleans	2016	2016	SBKR					
BB18L001	2132	MARKET	Orleans	2132	2132	SBKR					
BB18L006	2146	MARKET	Orleans	2146	2146	SBKR	8.002E+10	FOCUS-2015-CP TRAC#FC15T5-NC1;	RELIABILITY REQUEST	CLOSE	$4,090
BB18L005	408	AVENUE C	Orleans	408	408	SBKR	699070			DES	

Historical Performance of Past Reliability Work involving BACKBONE work (2011 to present)

2011 BB Breakers	Outage Cases														
	2012			2013			2014			2015			2016			2017		
21	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's
Devices w/0 Outages	11	52.38%		13	61.90%		13	61.90%		17	80.95%		7	33.33%		12	57.14%	
Devices w/1 Outage	5	23.81%	4,976	3	14.29%	2,833	7	33.33%	9,519	1	4.76%	1,439	7	33.33%	6,235	5	23.81%	6,831
Devices w/2 Outages	3	14.29%	4,184	4	19.05%	10,955	1	4.76%	757	1	4.76%	106	5	23.81%	12,893	3	14.29%	5,296
Devices w/3+ Outages	2	9.52%	7,093	1	4.76%	1,452	0	0.00%	-	2	9.52%	7,251	2	9.52%	7,672	1	4.76%	1,189

Unique Breaker View		Outages 2 or less
Count	%	7
0	0.00%	
3	14.29%	
4	19.05%	33.33%
14	66.67%	

2012 BB Breakers	Outage Cases											
	2013			2014			2015			2016			2017		
17	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's
Devices with No Outages	16	94.12%		7	41.18%		14	82.35%		5	29.41%			0.00%	
Devices w/1 Outage	0	0.00%		7	41.18%	8,582	3	17.65%	7,623	7	41.18%	6,901	5	29.41%	6,407
Devices w/2 Outages	1	5.88%	1,979	2	11.76%	3,832	0	0.00%		2	11.76%	7,123	3	17.65%	11,042
Devices w/3+ Outages	0	0.00%		1	5.88%	3,457	0	0.00%		3	17.65%	9,999	1	5.88%	2,558

Unique Breaker View		Outages 2 or less
Count	%	8
1	5.88%	
4	23.53%	
3	17.65%	47.06%
9	52.94%	

2013 BB Breakers	Outage Cases											
	2014			2015			2016			2017		
16	Count	%	CI's	Count	%	CI's	Count	%	CI's	Count	%	CI's
Devices with No Outages	11	68.75%		7	43.75%		5	31.25%		9	56.25%	
Devices w/1 Outage	2	12.50%	1,296	8	50.00%	11,145	7	43.75%	9,857	6	37.50%	10,300
Devices w/2 Outages	2	12.50%	6,127	1	6.25%	4,423	2	12.50%	9,192	0	0.00%	-
Devices w/3+ Outages	1	6.25%	9,225	0	0.00%		2	12.50%	5,420	1	6.25%	5,817

Unique Breaker View		Outages 2 or less
Count	%	10
3	18.75%	
2	12.50%	
5	31.25%	62.50%
6	37.50%	

2014 BB Breakers	Outage Cases								
	2015			2016			2017		
18	Count	%	CI's	Count	%	CI's	Count	%	CI's
Devices with No Outages	16	88.89%		11	61.11%		8	44.44%	
Devices w/1 Outage	2	11.11%	836	6	33.33%	3,845	5	27.78%	1,147
Devices w/2 Outages	0	0.00%		1	5.56%	1,415	4	22.22%	2,103
Devices w/3+ Outages	0	0.00%		0	0.00%		1	5.56%	2,167

Unique Breaker View		Outages 2 or less
Count	%	16
5	27.78%	
5	27.78%	
6	33.33%	88.89%
2	11.11%	

2015 BB Breakers	Outage Cases					
	2016			2017		
22	Count	%	CI's	Count	%	CI's
Devices with No Outages	11	50.00%		10	45.45%	
Devices w/1 Outage	9	40.91%	7,469	6	27.27%	4,178
Devices w/2 Outages	2	9.09%	1,429	3	13.64%	1,393
Devices w/3+ Outages	0	0.00%		3	13.64%	8,045

Unique Breaker View		Outages 2 or less
Count	%	19
4	18.18%	
8	36.36%	
7	31.82%	86.36%
3	13.64%	

2016 BB Breakers	Outage Cases		
	2017		
10	Count	%	CI's
Devices with No Outages	7	70.00%	
Devices w/1 Outage	2	20.00%	1,487
Devices w/2 Outages	0	0.00%	
Devices w/3+ Outages	1	10.00%	1,088

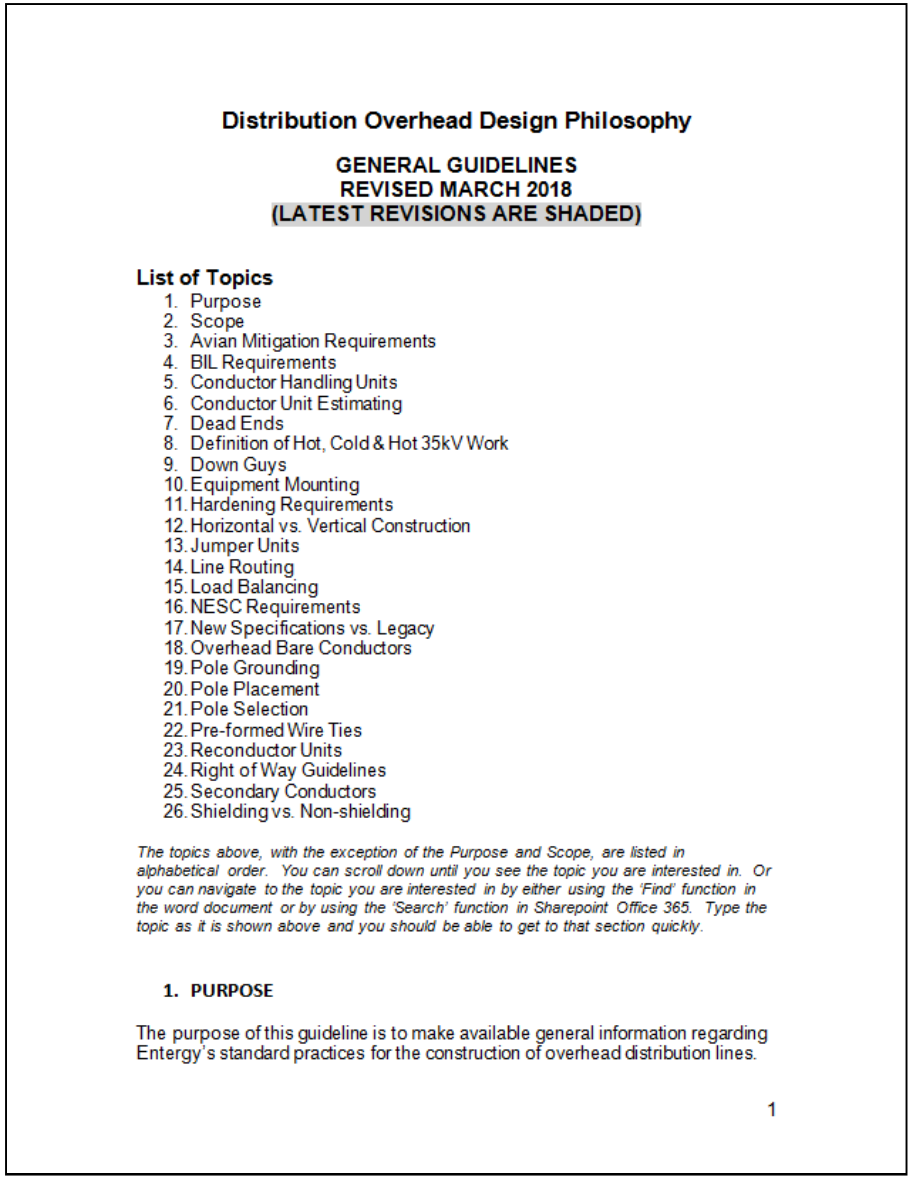
Unique Breaker View		Outages 2 or less
Count	%	9
7	70.00%	
2	20.00%	
0	0.00%	90.00%
1	10.00%	

See Slide 27 for explanation of Chart.

Note. In 2014, a process change in the BACKBONE program to perform the same work plan as FOCUS. Prior to 2014, the performance improvement are less than desired. Since implementing change, the performance has improved resulting in fewer outages.

Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

Distribution Overhead Design Philosophy



Distribution Overhead Design Philosophy

GENERAL GUIDELINES
REVISED MARCH 2018
(LATEST REVISIONS ARE SHADED)

List of Topics

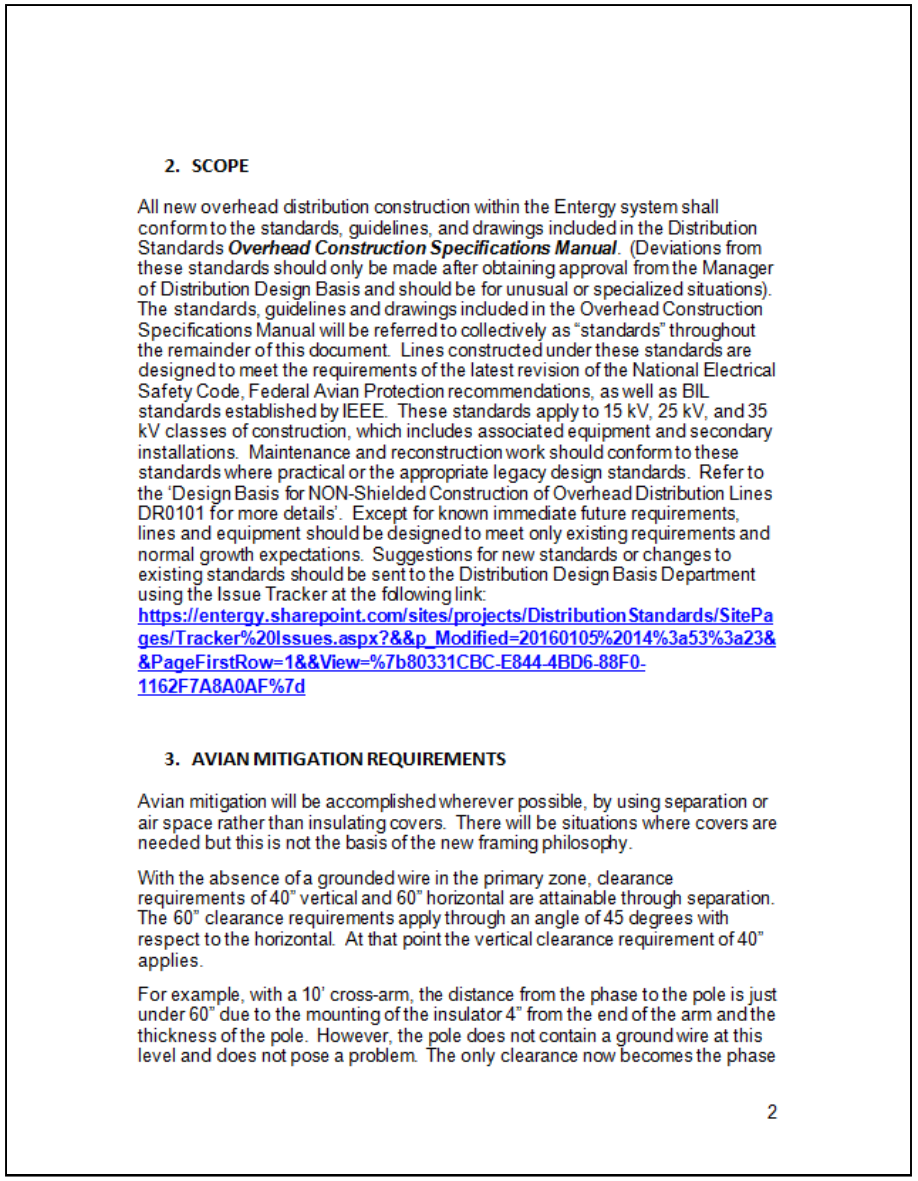
The topics above, with the exception of the Purpose and Scope, are listed in alphabetical order. You can scroll down until you see the topic you are interested in. Or you can navigate to the topic you are interested in by either using the 'Find' function in the word document or by using the 'Search' function in Sharepoint Office 365. Type the topic as it is shown above and you should be able to get to that section quickly.

1. PURPOSE

The purpose of this guideline is to make available general information regarding Entergy's standard practices for the construction of overhead distribution lines.

1

Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified



2. SCOPE

All new overhead distribution construction within the Entergy system shall conform to the standards, guidelines, and drawings included in the Distribution Standards ***Overhead Construction Specifications Manual***. (Deviations from these standards should only be made after obtaining approval from the Manager of Distribution Design Basis and should be for unusual or specialized situations). The standards, guidelines and drawings included in the Overhead Construction Specifications Manual will be referred to collectively as "standards" throughout the remainder of this document. Lines constructed under these standards are designed to meet the requirements of the latest revision of the National Electrical Safety Code, Federal Avian Protection recommendations, as well as BIL standards established by IEEE. These standards apply to 15 kV, 25 kV, and 35 kV classes of construction, which includes associated equipment and secondary installations. Maintenance and reconstruction work should conform to these standards where practical or the appropriate legacy design standards. Refer to the 'Design Basis for NON-Shielded Construction of Overhead Distribution Lines DR0101 for more details'. Except for known immediate future requirements, lines and equipment should be designed to meet only existing requirements and normal growth expectations. Suggestions for new standards or changes to existing standards should be sent to the Distribution Design Basis Department using the Issue Tracker at the following link:
https://entergy.sharepoint.com/sites/projects/DistributionStandards/SitePages/Tracker%20Issues.aspx?&&p_Modified=20160105%2014%3a53%3a23&&PageFirstRow=1&&View=%7b80331CBC-E844-4BD6-88F0-1162F7A8A0AF%7d

3. AVIAN MITIGATION REQUIREMENTS

Avian mitigation will be accomplished wherever possible, by using separation or air space rather than insulating covers. There will be situations where covers are needed but this is not the basis of the new framing philosophy.

With the absence of a grounded wire in the primary zone, clearance requirements of 40" vertical and 60" horizontal are attainable through separation. The 60" clearance requirements apply through an angle of 45 degrees with respect to the horizontal. At that point the vertical clearance requirement of 40" applies.

For example, with a 10' cross-arm, the distance from the phase to the pole is just under 60" due to the mounting of the insulator 4" from the end of the arm and the thickness of the pole. However, the pole does not contain a ground wire at this level and does not pose a problem. The only clearance now becomes the phase

2

Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

to phase clearance between the phases on the arm and the phase on the pole top pin. With the arm mounted 30" from the top of the pole, the clearance requirement of 60" is met.

With vertical framing and the top phase on a ridge pin on top of the pole, the next phase can be mounted 30" from the pole top with the third phase mounted 40" below that to satisfy all clearance requirements.

With all vertical standoffs the top phase can be mounted 5" from the pole top with all others separated by 40".

More details are available at the Avian Mitigation link below:
https://entergy.sharepoint.com/sites/projects/DistributionStandards/OHCS%202016/Forms/OHCS%2015_0.aspx

4. BIL REQUIREMENTS

Lightning will be mitigated by increasing the structure BIL while at the same time keeping the ground plane as far away from the energized conductors as possible. To do this some framing revisions are needed.
To increase BIL, insulator placement and framing configurations have changed. We have increased the amount of air and wood between the energized conductors and the ground plane. Air is the most efficient insulator and wood not only has insulating properties but arc quenching properties as well. By moving the shield wire into the neutral position we can increase the amount of wood in the path, which in turn raises the BIL. The 2 most important things we are trying to accomplish.

Line arresters will no longer be used for lightning mitigation. IEEE 1410 covers the failure rate of these arresters and when combined with the lack of maintenance, they are of no use. Equipment arresters will continue to be installed according to the current specifications.

Where shield wires are installed, where allowed by the exceptions in the Design Basis for NON-Shielded Construction of Overhead Distribution Lines (Standard DR0101; Section 4.5.2), IEEE 1410 recommends a shielding angle of 30 degrees as opposed to the old standard of 45 degrees. For this reason, a 10' cross-arm must be installed a minimum of 9' below the top of the pole. Special consideration must be given to pole height especially when Joint Use provisions must be made.

Multiple paths to ground are important for lightning mitigation. For this reason ground rods will be driven, not installed in the pole hole but driven, at every new pole set. It is also recommended that ground rods be driven at every pole that requires a truck set-up to work if one doesn't already exist.

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Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

The following units have been created to facilitate transitioning from shielded construction to neutral construction:

PGWTRANS-20-A10	Shield to neutral transition using 20' of A10-35kV spacer cable.
PGWTRANS-25-A10	Shield to neutral transition using 25' of A10-35kV spacer cable.
PGWTRANS-20-A336	Shield to neutral transition using 20' of A336-35kV spacer cable.
PGWTRANS-25-A336	Shield to neutral transition using 25' of A336-35kV spacer cable.

As the EDC is not set up to cut short lengths of conductor, they will place the spacer cable on small reels and have this available in local storerooms where it can be cut to length by the crews.

5. CONDUCTOR HANDLING UNITS

Conductor handling units are applied when attaching and/or unattaching an **existing** conductor to a unit that is installed, removed, or transferred and the conductor is moved to the final attachment point without having been lowered to the ground. Conductor handling units are **not** applied when conductor is installed or removed, since the conductor install or conductor remove units cover the costs of attaching and detaching the conductor to the supporting structure. Additionally, conductor handling units are not used in conjunction with ***reconductor*** units (refer to the explanation of reconductor units later in this document).

Conductor handling units are similar to the "transfer span" units currently used in some areas of Entergy. Conductor handling units can have all possible labor variations (i.e. Cold Install, Cold Remove, Cold Transfer, Hot Install Hot Remove, and Hot Transfer). They are applied on a "per conductor" basis. The conductor handling units have the following variations:

- Large or Small Conductor ("large" is 336 and larger wire size)
- Bare wire or Cable Secondary
- Tangent, Angle, or Dead End

Typical situations requiring conductor handling units include:

- Setting a pole midspan
- Cutting in a double dead end at an existing tangent structure
- Replacing an existing pole
- Replacing an insulator on an existing pole

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Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

- Raising a conductor attachment for additional clearance

Use the following guide to determine whether conductor handling units should be installed, removed, or transferred.

- Use the **install** units when setting a new pole within an existing route.
- Use the **remove** units when removing a pole from an existing route.
- Use the **transfer** units when changing out an existing pole, as long as the conductors remain within 5 feet of the original height.
- Use both the **install** and **remove** units when the replacement of an existing pole places the conductors 5 feet or more higher or lower than the original height.
- Use the **transfer** units when moving an existing conductor less than 5 feet on the same pole.
- Use both the **install** and **remove** units when moving an existing conductor 5 feet or more on the same pole.

The conductor handling units available in DIS are listed below.

CONDHAND-LG-TAN	large, bare, tangent
CONDHAND-LG-ANG	large, bare, angle
CONDHAND-LG-DE	large, bare, dead end
CONDHAND-LG-SEC-TAN	large, cable, tangent
CONDHAND-LG-SEC-ANG	large, cable, angle
CONDHAND-LG-SEC-DE	large, cable, dead end
CONDHAND-LG-OTH-TAN	large, foreign attachment, tangent
CONDHAND-LG-OTH-ANG	large, foreign attachment, angle
CONDHAND-LG-OTH-DE	large, foreign attachment, dead end
CONDHAND-SM-TAN	small, bare, tangent
CONDHAND-SM-ANG	small, bare, angle
CONDHAND-SM-DE	small, bare, dead end
CONDHAND-SM-SEC-TAN	small, cable, tangent
CONDHAND-SM-SEC-ANG	small, cable, angle
CONDHAND-SM-SEC-DE	small, cable, dead end
CONDHAND-SM-OTH-TAN	small, foreign attachment, tangent
CONDHAND-SM-OTH-ANG	small, foreign attachment, angle
CONDHAND-SM-OTH-DE	small, foreign attachment, dead end

6. CONDUCTOR UNIT ESTIMATING

The DIS units for installing conductor include all of the labor required to pull in the conductor and tie the conductor to the conductor supports. No additional labor units are required. However, when **existing** conductor is involved, such as when replacing a pole, conductor handling units may be required to provide the labor to

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Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

handle the existing conductor. Refer to the conductor handling unit explanation below.

7. DEAD ENDS

Shackles are necessary and are included in every dead end assembly due to the forces that can act on the assembly under certain situations. Without a shackle the polymer dead end is free to move in 2 directions (either up and down or side to side). However under certain conditions such as wind and downstream faults, the conductor could move in both planes (all four directions). Without a shackle, the polymer will be held rigid placing extreme shear forces near the end fitting resulting in a break near where the metal end fitting and the polymer material meet. This could result in a phase or multiple phases detaching from the structure and falling to the ground.

8. DEFINITION OF HOT, COLD, AND HOT 35kV WORK

HOT WORK: Work performed on a pole which supports energized primary conductor(s) will be considered HOT work. Conductors energized at a nominal phase to phase voltage of 2400 volts or higher are considered energized primary conductors. The HOT labor hour rates will be applied to all units installed, removed, or transferred on poles supporting energized primary conductor(s).

COLD WORK: Work performed on a pole which does not support energized primary conductor(s) will be considered COLD work. The COLD labor hour rates will be applied to all units installed, removed, or transferred on poles that do not support energized primary conductor(s).

HOT 34 WORK: Work performed on a pole which supports at least two phase conductors (of different phases) energized at a nominal phase to phase voltage of 34.5 KV will be considered HOT 34 work. Note that two phases must be present at the pole in order to apply the HOT 34 labor rates. The HOT 34 labor hour rates will be applied to all units installed, removed, or transferred on poles supporting at least two phase conductors (of different phases) energized at a nominal voltage of 34.5 KV.
Note: When "hot 34" work is applicable, the "hot 34" rates are used in place of the "hot" rates, rather than being added to the "hot" rates. In other words, "hot 34" is a separate rate by itself, and not an "adder".

9. DOWN GUYS

Down guys and anchors shall be designed to meet the strength requirements of the NESC. Refer to the guying and anchoring guideline included in the

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Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

Engineering Design / Practices Manual for more specific information. All down guys will be installed with at least one fiberglass guy strain insulator at the pole end of the down guy. Additionally, guy strain insulator(s) of sufficient length must be installed to prevent the down guy from inadvertently becoming energized by contact with conductors if it comes loose from the anchor. Down guys shall **not** be connected to the pole ground, since this creates a galvanic circuit path which can lead to corrosion of the anchor.
No pole shall be guyed at the neutral location only.

10. EQUIPMENT MOUNTING

It is the intention of our equipment mounting specifications, which are covered in Sections 10 through 14 of this manual, to install equipment in such a way as to comply with all safety requirements, BIL issues, Avian mitigation etc… that will allow the safest and most efficient operation of all of our facilities.
An example is in the installation of the transformers on the quarter of the pole with the cutout also on a pole quarter, 90 degrees from the transformer mounting. This allows enough space between the transformer and cutout for bucket/jib access to the transformer for maintenance purposes. This keeps both the transformer bushing and the cutout from being directly under an energized phase conductor during the installation and change out processes. It also prohibits the installation of the cutout directly above the transformer bushing which has created operating problems in the past.

Equipment tag requirements are included in the pole section of this manual (section 5; subsection titled "Equipment Tags on Poles). Details are on drawing OH-PL007 indicating location numbers and in some cases equipment identification tags such as with sectionalizing devices (switches, reclosers, etc…). These are required to fulfill our obligation to the various councils regarding reliability reporting guidelines whereby outage levels are monitored and corrected in order to maintain SAIDI and SAIFI within levels prescribed by the authority having jurisdiction. It is also critical to our asset management and distribution facilities mapping systems.

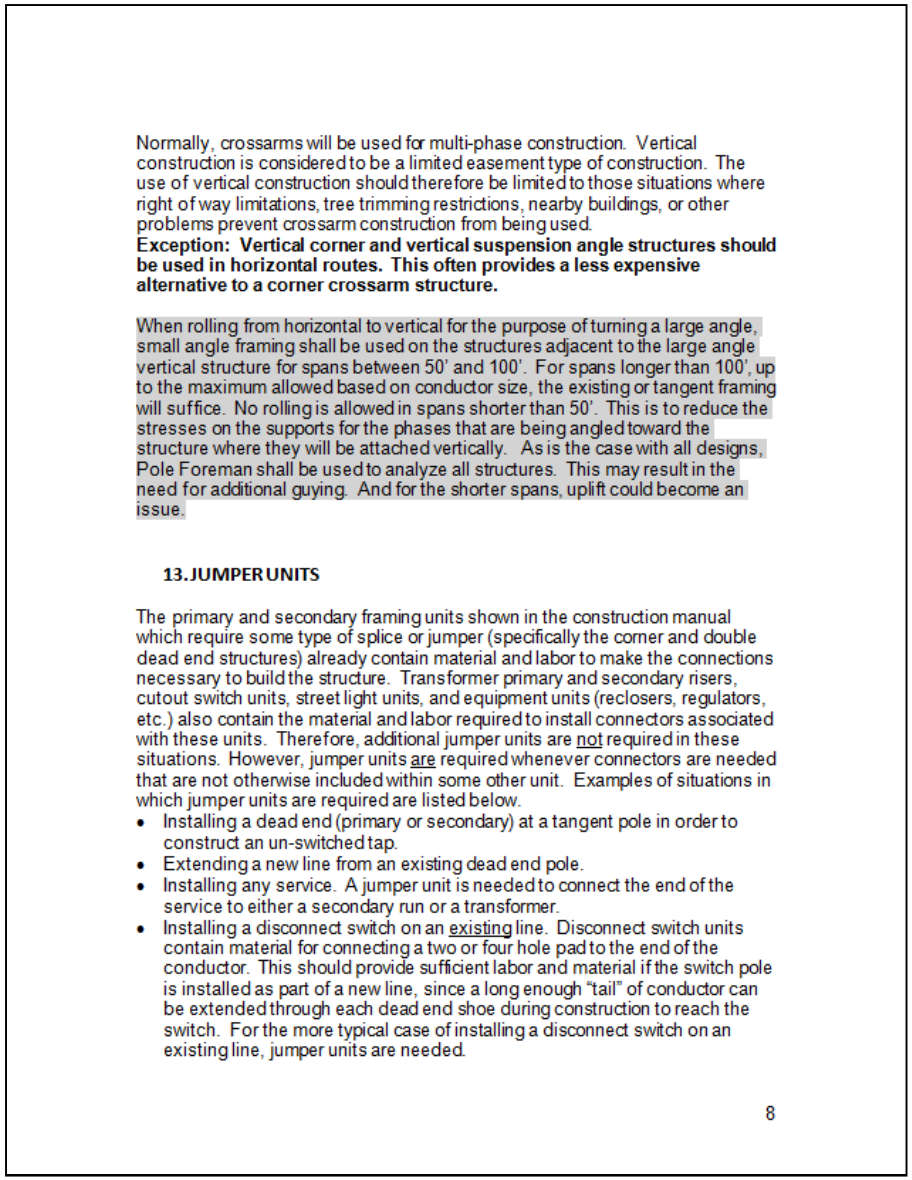
11. HARDENING REQUIREMENTS

Asset hardening requirements including but not limited to minimum class 3 poles, storm guying, polymer cutouts and insulators are covered in more detail at the following site:
https://entergy.sharepoint.com/:w:/s/projects/DistributionStandards/EXDZSlhTU5tLkxtZLQK_QBABjdC58sNZkMG3eQqFtqgVHw

12. HORIZONTAL VS. VERTICAL CONSTRUCTION

7

Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified



Normally, crossarms will be used for multi-phase construction. Vertical construction is considered to be a limited easement type of construction. The use of vertical construction should therefore be limited to those situations where right of way limitations, tree trimming restrictions, nearby buildings, or other problems prevent crossarm construction from being used.
Exception: Vertical corner and vertical suspension angle structures should be used in horizontal routes. This often provides a less expensive alternative to a corner crossarm structure.

When rolling from horizontal to vertical for the purpose of turning a large angle, small angle framing shall be used on the structures adjacent to the large angle vertical structure for spans between 50' and 100'. For spans longer than 100', up to the maximum allowed based on conductor size, the existing or tangent framing will suffice. No rolling is allowed in spans shorter than 50'. This is to reduce the stresses on the supports for the phases that are being angled toward the structure where they will be attached vertically. As is the case with all designs, Pole Foreman shall be used to analyze all structures. This may result in the need for additional guying. And for the shorter spans, uplift could become an issue.

13. JUMPER UNITS

The primary and secondary framing units shown in the construction manual which require some type of splice or jumper (specifically the corner and double dead end structures) already contain material and labor to make the connections necessary to build the structure. Transformer primary and secondary risers, cutout switch units, street light units, and equipment units (reclosers, regulators, etc.) also contain the material and labor required to install connectors associated with these units. Therefore, additional jumper units are not required in these situations. However, jumper units are required whenever connectors are needed that are not otherwise included within some other unit. Examples of situations in which jumper units are required are listed below.

- Installing a dead end (primary or secondary) at a tangent pole in order to construct an un-switched tap.
- Extending a new line from an existing dead end pole.
- Installing any service. A jumper unit is needed to connect the end of the service to either a secondary run or a transformer.
- Installing a disconnect switch on an existing line. Disconnect switch units contain material for connecting a two or four hole pad to the end of the conductor. This should provide sufficient labor and material if the switch pole is installed as part of a new line, since a long enough "tail" of conductor can be extended through each dead end shoe during construction to reach the switch. For the more typical case of installing a disconnect switch on an existing line, jumper units are needed.

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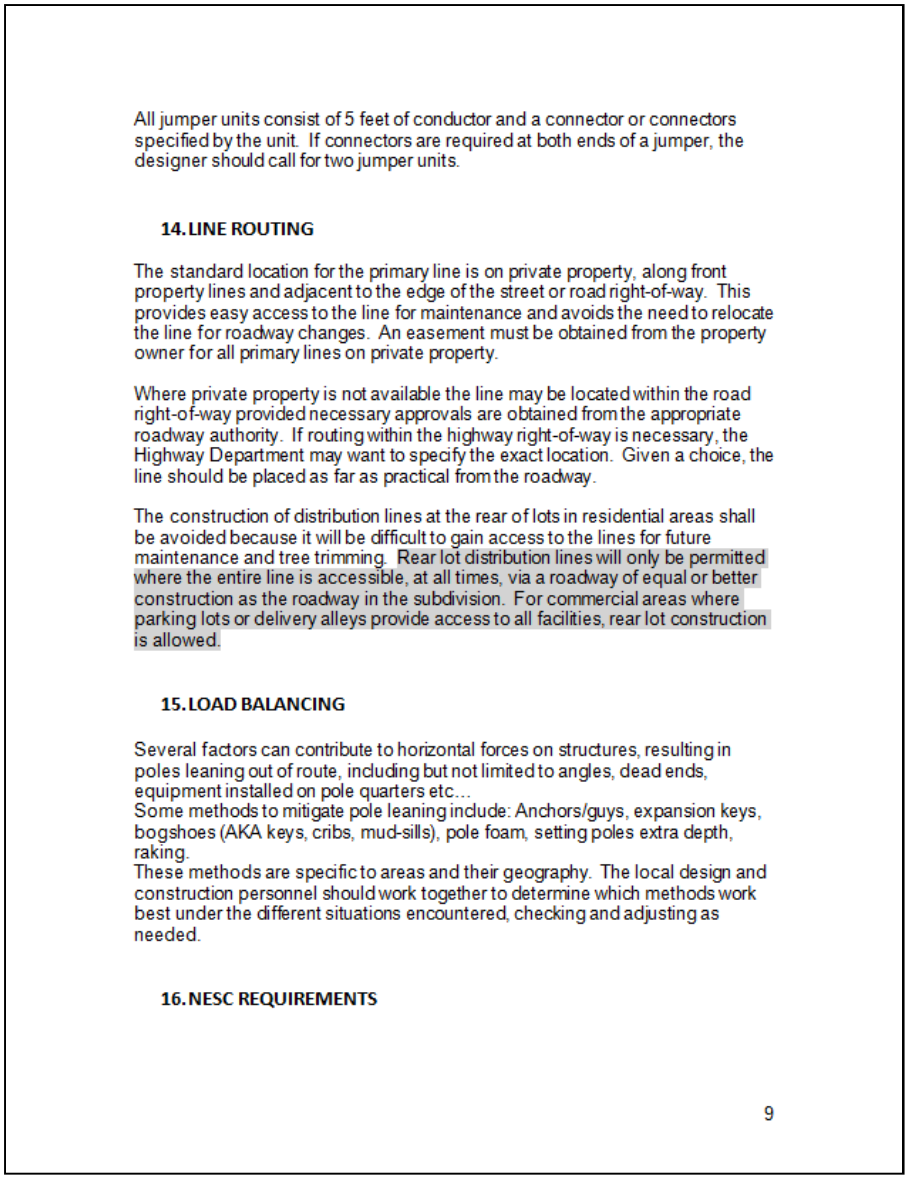
Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified



All jumper units consist of 5 feet of conductor and a connector or connectors specified by the unit. If connectors are required at both ends of a jumper, the designer should call for two jumper units.

14. LINE ROUTING

The standard location for the primary line is on private property, along front property lines and adjacent to the edge of the street or road right-of-way. This provides easy access to the line for maintenance and avoids the need to relocate the line for roadway changes. An easement must be obtained from the property owner for all primary lines on private property.

Where private property is not available the line may be located within the road right-of-way provided necessary approvals are obtained from the appropriate roadway authority. If routing within the highway right-of-way is necessary, the Highway Department may want to specify the exact location. Given a choice, the line should be placed as far as practical from the roadway.

The construction of distribution lines at the rear of lots in residential areas shall be avoided because it will be difficult to gain access to the lines for future maintenance and tree trimming. Rear lot distribution lines will only be permitted where the entire line is accessible, at all times, via a roadway of equal or better construction as the roadway in the subdivision. For commercial areas where parking lots or delivery alleys provide access to all facilities, rear lot construction is allowed.

15. LOAD BALANCING

Several factors can contribute to horizontal forces on structures, resulting in poles leaning out of route, including but not limited to angles, dead ends, equipment installed on pole quarters etc…
Some methods to mitigate pole leaning include: Anchors/guys, expansion keys, bogshoes (AKA keys, cribs, mud-sills), pole foam, setting poles extra depth, raking.
These methods are specific to areas and their geography. The local design and construction personnel should work together to determine which methods work best under the different situations encountered, checking and adjusting as needed.

16. NESC REQUIREMENTS

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Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

Entergy's distribution lines shall be designed to meet the requirements of the National Electrical Safety Code. Lines may be built to grade C construction requirements except at crossings over railroads and limited access highways, where grade B construction is required. NESC horizontal and vertical clearance requirements shall be maintained. Refer to the drawings at the following site: http://distributionstandards.entergy.com/Technical_Manual_and_Publications/Appendix_A.html

17. NEW SPECIFICATIONS VS. LEGACY

Background:
All new construction shall be to the new specifications. The BIL, avian and slap improvements are built-in to the new standards. (300kV BIL or more, Avian spacing or cover, increased spacing for slap). The new standards comply with avian requirements using spacing (40" and 60") wherever possible. In all other cases cover is required.

The increased BIL and increased spacing for avian and slap issues help our system in regards to reliability, safety and asset life. These are significant improvements to the system; however the total realization of the benefit cannot be immediately seen since we have such a large (and old) asset base. For this reason the legacy drawings are provided to help renew and gain the benefits of the new standards without requiring costly rebuilds.

Definition of Legacy:
The legacy drawings are provided for your guidance. They take into account the old framing practices, but incorporate the new goals of our current standards.

When the current standard cannot be applied, the accepted practice becomes legacy **not In-Kind** replacement. **In-Kind** replacement is not the same as **Legacy**. In-Kind is not applicable to our construction methods.
The term In-Kind is the replacement of like parts and like structures.
The legacy drawings utilize the current parts with added requirements with regard to BIL, Avian, and Slap.

To reinforce the above, the Legacy drawings include the following notes:

BIL
Target structure BIL is 300kV minimum. All pole grounds in the primary zone MUST be Hendrix insulated pole ground wire. The insulated pole ground should continue to a minimum of 5' below the lowest primary mounting hardware such as cross-arm mounting bolts or standoff bracket bolts or 36" minimum below the attachment point of the cross-arm braces.

Avian Mitigation
Avian mitigation requires 60" horizontal and 40" vertical clearance between any phase and any grounded component. When those clearances cannot be met, Avian covers MUST be

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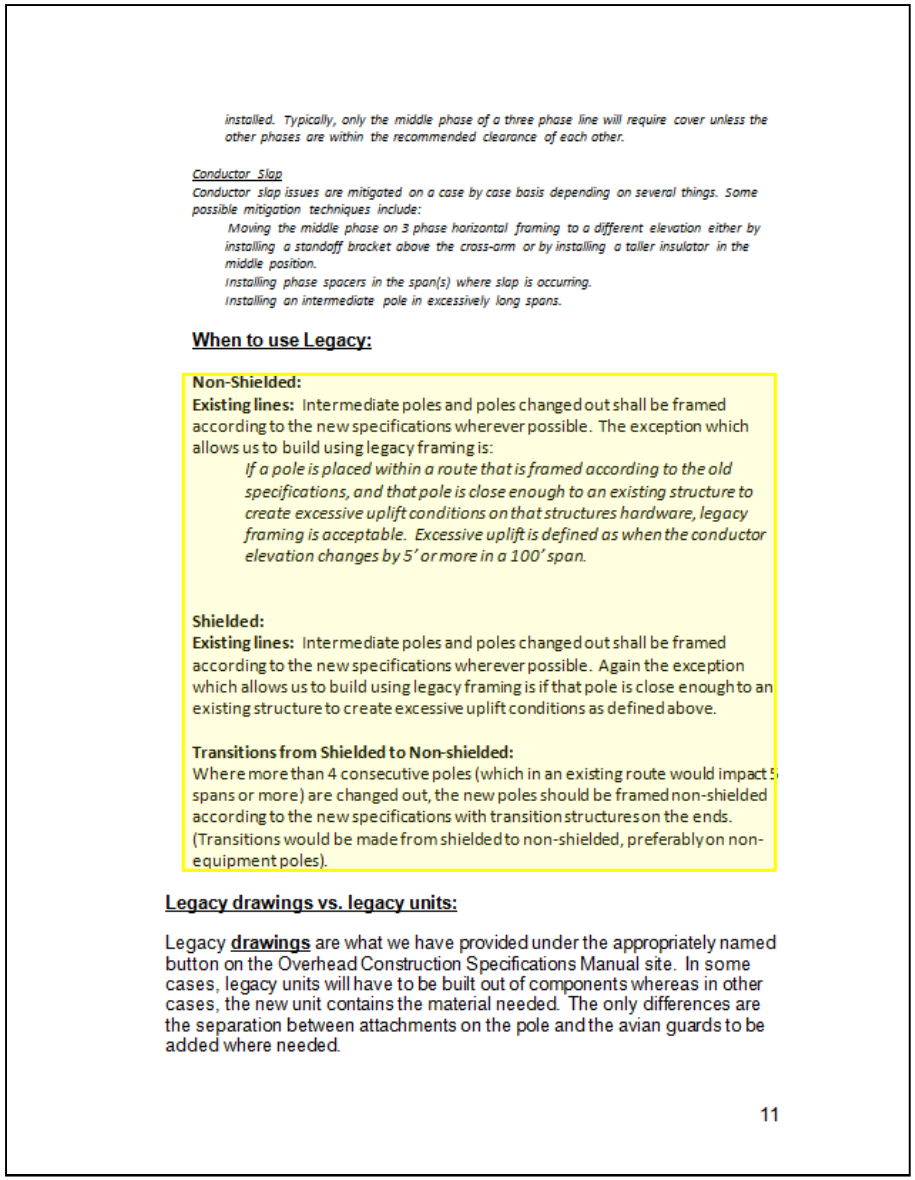
Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified



installed. Typically, only the middle phase of a three phase line will require cover unless the other phases are within the recommended clearance of each other.

Conductor Slap

Conductor slap issues are mitigated on a case by case basis depending on several things. Some possible mitigation techniques include:

Moving the middle phase on 3 phase horizontal framing to a different elevation either by installing a standoff bracket above the cross-arm or by installing a taller insulator in the middle position.

Installing phase spacers in the span(s) where slap is occurring.

Installing an intermediate pole in excessively long spans.

When to use Legacy:

Non-Shielded:

Existing lines: Intermediate poles and poles changed out shall be framed according to the new specifications wherever possible. The exception which allows us to build using legacy framing is:

If a pole is placed within a route that is framed according to the old specifications, and that pole is close enough to an existing structure to create excessive uplift conditions on that structures hardware, legacy framing is acceptable. Excessive uplift is defined as when the conductor elevation changes by 5' or more in a 100' span.

Shielded:

Existing lines: Intermediate poles and poles changed out shall be framed according to the new specifications wherever possible. Again the exception which allows us to build using legacy framing is if that pole is close enough to an existing structure to create excessive uplift conditions as defined above.

Transitions from Shielded to Non-shielded:

Where more than 4 consecutive poles (which in an existing route would impact 5 spans or more) are changed out, the new poles should be framed non-shielded according to the new specifications with transition structures on the ends. (Transitions would be made from shielded to non-shielded, preferably on non-equipment poles).

Legacy drawings vs. legacy units:

Legacy **drawings** are what we have provided under the appropriately named button on the Overhead Construction Specifications Manual site. In some cases, legacy units will have to be built out of components whereas in other cases, the new unit contains the material needed. The only differences are the separation between attachments on the pole and the avian guards to be added where needed.

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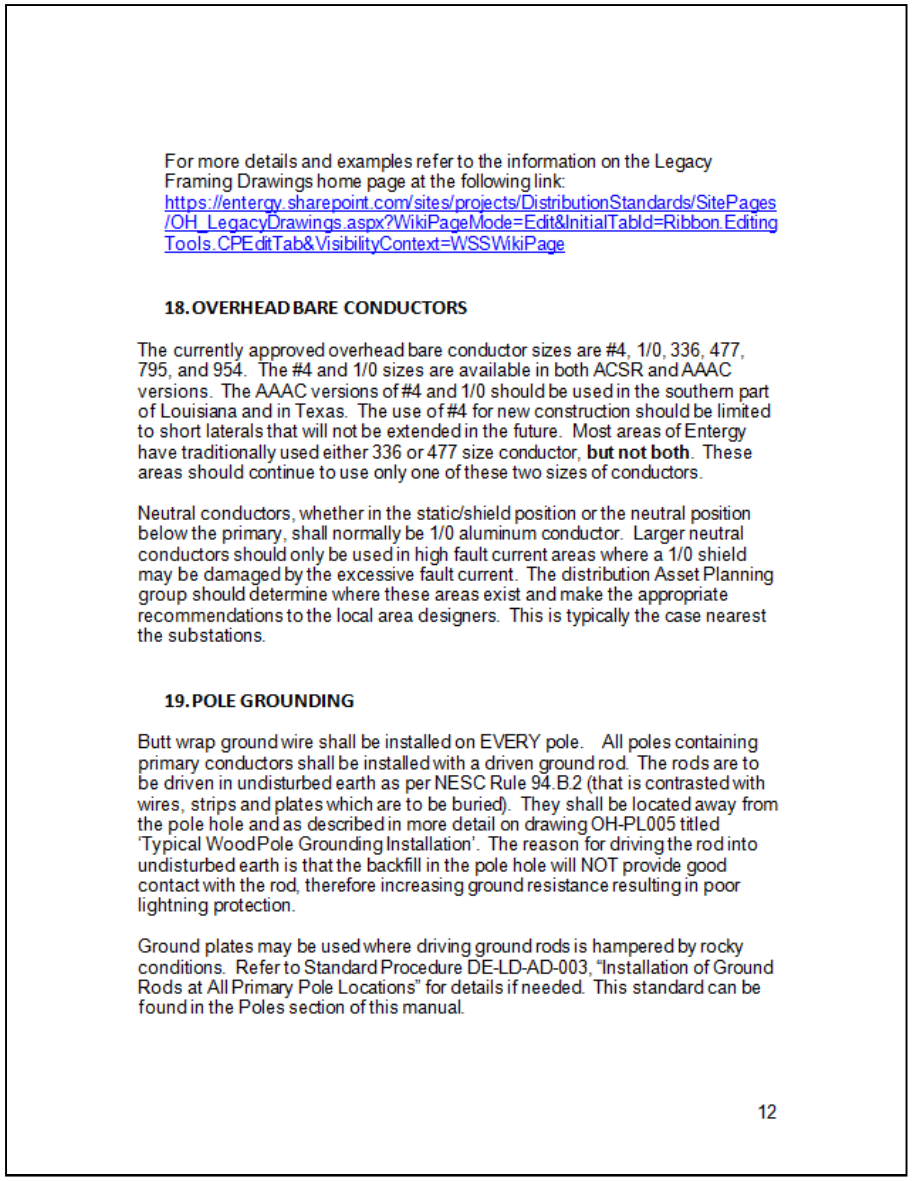
Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified



For more details and examples refer to the information on the Legacy Framing Drawings home page at the following link: https://entergy.sharepoint.com/sites/projects/DistributionStandards/SitePages/OH_LegacyDrawings.aspx?WikiPageMode=Edit&InitialTabId=Ribbon.EditingTools.CPEditTab&VisibilityContext=WSSWikiPage

18. OVERHEAD BARE CONDUCTORS

The currently approved overhead bare conductor sizes are #4, 1/0, 336, 477, 795, and 954. The #4 and 1/0 sizes are available in both ACSR and AAAC versions. The AAAC versions of #4 and 1/0 should be used in the southern part of Louisiana and in Texas. The use of #4 for new construction should be limited to short laterals that will not be extended in the future. Most areas of Entergy have traditionally used either 336 or 477 size conductor, **but not both**. These areas should continue to use only one of these two sizes of conductors.

Neutral conductors, whether in the static/shield position or the neutral position below the primary, shall normally be 1/0 aluminum conductor. Larger neutral conductors should only be used in high fault current areas where a 1/0 shield may be damaged by the excessive fault current. The distribution Asset Planning group should determine where these areas exist and make the appropriate recommendations to the local area designers. This is typically the case nearest the substations.

19. POLE GROUNDING

Butt wrap ground wire shall be installed on EVERY pole. All poles containing primary conductors shall be installed with a driven ground rod. The rods are to be driven in undisturbed earth as per NESC Rule 94.B.2 (that is contrasted with wires, strips and plates which are to be buried). They shall be located away from the pole hole and as described in more detail on drawing OH-PL005 titled 'Typical Wood Pole Grounding Installation'. The reason for driving the rod into undisturbed earth is that the backfill in the pole hole will NOT provide good contact with the rod, therefore increasing ground resistance resulting in poor lightning protection.

Ground plates may be used where driving ground rods is hampered by rocky conditions. Refer to Standard Procedure DE-LD-AD-003, "Installation of Ground Rods at All Primary Pole Locations" for details if needed. This standard can be found in the Poles section of this manual.

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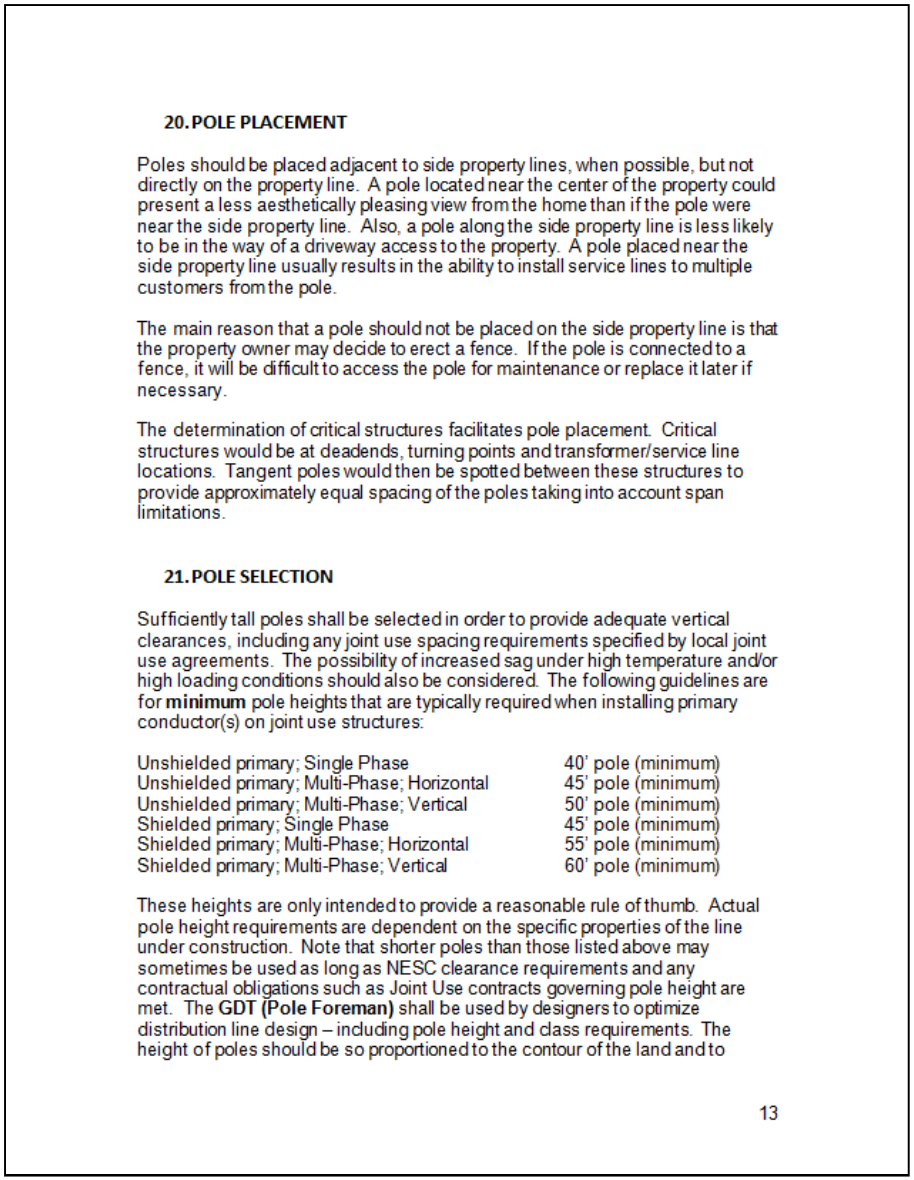
Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified



20. POLE PLACEMENT

Poles should be placed adjacent to side property lines, when possible, but not directly on the property line. A pole located near the center of the property could present a less aesthetically pleasing view from the home than if the pole were near the side property line. Also, a pole along the side property line is less likely to be in the way of a driveway access to the property. A pole placed near the side property line usually results in the ability to install service lines to multiple customers from the pole.

The main reason that a pole should not be placed on the side property line is that the property owner may decide to erect a fence. If the pole is connected to a fence, it will be difficult to access the pole for maintenance or replace it later if necessary.

The determination of critical structures facilitates pole placement. Critical structures would be at deadends, turning points and transformer/service line locations. Tangent poles would then be spotted between these structures to provide approximately equal spacing of the poles taking into account span limitations.

21. POLE SELECTION

Sufficiently tall poles shall be selected in order to provide adequate vertical clearances, including any joint use spacing requirements specified by local joint use agreements. The possibility of increased sag under high temperature and/or high loading conditions should also be considered. The following guidelines are for **minimum** pole heights that are typically required when installing primary conductor(s) on joint use structures:

Unshielded primary; Single Phase	40' pole (minimum)
Unshielded primary; Multi-Phase; Horizontal	45' pole (minimum)
Unshielded primary; Multi-Phase; Vertical	50' pole (minimum)
Shielded primary; Single Phase	45' pole (minimum)
Shielded primary; Multi-Phase; Horizontal	55' pole (minimum)
Shielded primary; Multi-Phase; Vertical	60' pole (minimum)

These heights are only intended to provide a reasonable rule of thumb. Actual pole height requirements are dependent on the specific properties of the line under construction. Note that shorter poles than those listed above may sometimes be used as long as NESC clearance requirements and any contractual obligations such as Joint Use contracts governing pole height are met. The **GDT (Pole Foreman)** shall be used by designers to optimize distribution line design – including pole height and class requirements. The height of poles should be so proportioned to the contour of the land and to

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Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

adjacent poles so that abrupt changes in the elevation of the conductors will not occur. The difference in level of conductors of two adjacent poles should not exceed 5 feet per 100 feet of span length. Uplift on pin type insulators should be avoided.

Pole 'Ownership' tags are required by the various authorities having jurisdiction over the operating utilities such as the Louisiana Public Service Commission, Public Utility Commission of Texas, Arkansas Public Service Commission, Mississippi Public Service Commission and the New Orleans City Council. These tags are critical for determining pole ownership for joint use issues, pole rental by third parties and to determine line ownership when determining the company's rights to serve a customer based on the 300' rule. Pole ownership tags are also helpful in determining what company should respond to, and handle, public damage claims or pole failures. These tags are described in the Distribution Standard DC0103.

22. PRE-FORMED WIRE TIES

Formed wire ties should be used to attach overhead bare conductors to pin and post insulators. Single top, single side, double side, and spool ties are available for all of the standard conductors, and for selected non-standard conductors (specifically #2 and 636). Two single top ties should be used at double arm tangent structures. Formed wire ties are stand-alone items requiring no tie wire or armor rods. #4 aluminum tie wire should be used only for nonstandard aluminum conductors for which no formed wire tie is available. The conductor code variation of ATW (for aluminum tie wire) should be used with the framing units to cover this situation. #6 copper tie wire should be used for copper conductors. The conductor code variation of CTW (for copper tie wire) should be used with the framing units to cover this situation.
Only the Entergy standard wire size variations are included in those units involving dead end shoes. No non-standard conductor sizes are available to the designers. However, since dead end shoes are range taking, the proper material can still be specified by choosing a unit which provides the correct dead end shoe to fit the non-standard wire.

23. RECONDUCTOR UNITS

Reconductor units are used to account for the additional labor required to temporarily re-arrange existing conductors in order to install new conductors during reconductor jobs. A construction crew may use a variety of methods to "spread out" or otherwise rearrange the existing conductors in order to facilitate the installation of the new conductors. The crew may even temporarily disconnect and insulate the shield wire in order to use it as a temporary phase conductor. The exact method used by a crew to accomplish any particular

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Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

reconductor job will often be unknown to the designer during the design estimating phase of the job. The reconductor units were created to simplify the work of the designer and to take much of the guesswork out of estimating reconductor jobs. The designer will need to call for the installation of the new conductor(s), removal of the old conductor(s), and the appropriate reconductor units. No additional conductor handling units or temporary crossarm extension units should be called for on the estimate, since these are covered by the reconductor units. **Exception:** The designer should call for the usual conductor handling units associated with pole and crossarm replacement work done in preparation for the reconductor job.

The designer should call for the reconductor units on a per pole basis. The "install" version of these units should always be used. Reconductor units have been created for one, two, or three phases. This refers to the total number of phases to be reconductored, and not the number of phases that must be physically relocated (the designer should not be concerned with the exact method used by the crew to spread out the phases). It is anticipated that the three phase versions of the reconductor units will be called for in the vast majority of reconductor jobs.

The reconductor units vary according to the type of structure involved. However, the only two choices available are "tangent" and "dead end". The tangent units should be used for all tangent and small angle structures. The dead end units should be used for all dead end and suspension angle structures. The double dead end units should be used at corner structures and double dead end structures, since two sets of dead ends are involved. The vertical units should be used at tangent and small angle vertical structures.

The reconductor units available in DIS are listed below.

RECON-1P-TAN	single phase, tangent or small angle
RECON-1P-DE	single phase, dead end or suspension angle
RECON-1P-DDE	single phase, double dead end or corner structure
RECON-2P-TAN	two phase, tangent or small angle
RECON-2P-TAN-VERT	two phase, tangent or small angle, vertical
RECON-2P-DE	two phase, dead end or suspension angle
RECON-2P-DDE	two phase, double dead end or corner structure
RECON-3P-TAN	three phase, tangent or small angle
RECON-3P-TAN-VERT	three phase, tangent or small angle, vertical
RECON-3P-DE	three phase, dead end or suspension angle
RECON-3P-DDE	three phase, double dead end or corner structure

24. RIGHT OF WAY GUIDELINES

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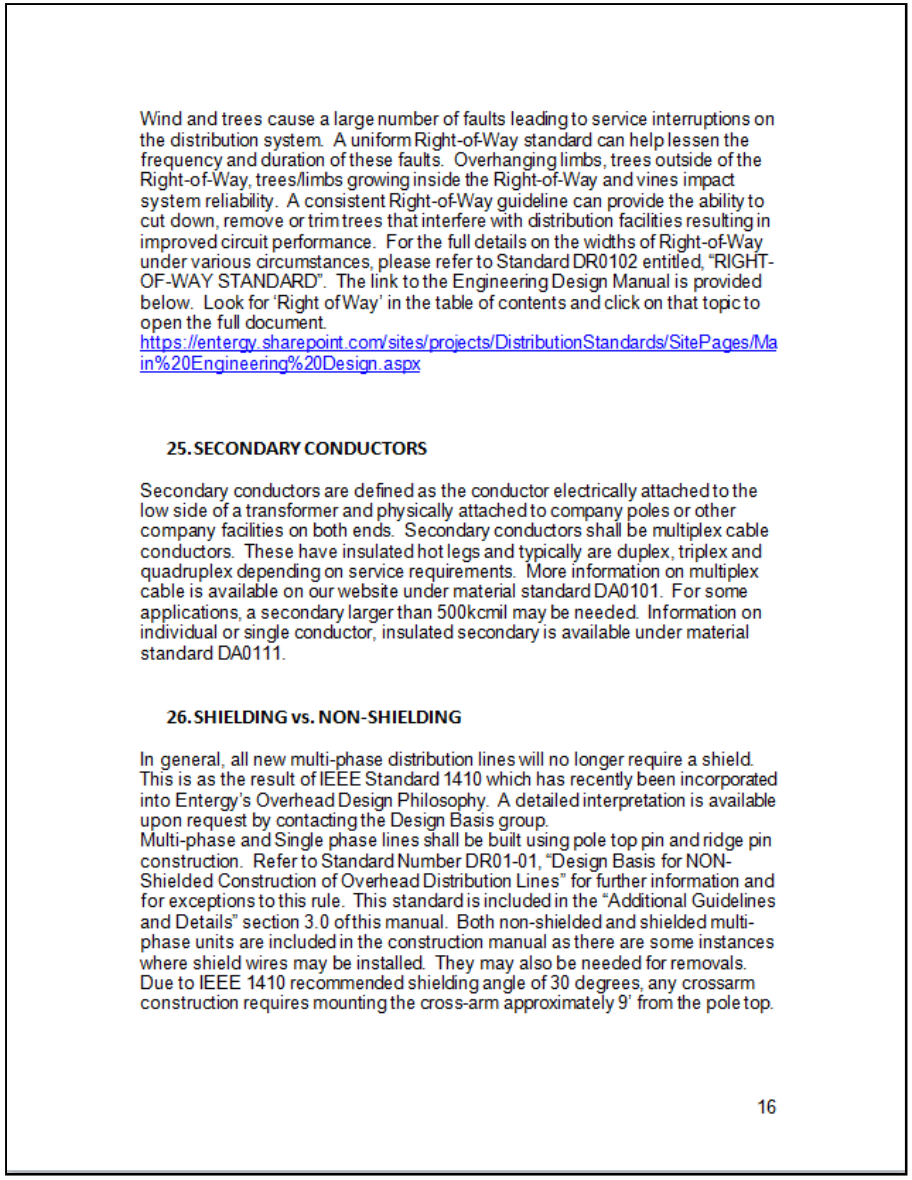

Wind and trees cause a large number of faults leading to service interruptions on the distribution system. A uniform Right-of-Way standard can help lessen the frequency and duration of these faults. Overhanging limbs, trees outside of the Right-of-Way, trees/limbs growing inside the Right-of-Way and vines impact system reliability. A consistent Right-of-Way guideline can provide the ability to cut down, remove or trim trees that interfere with distribution facilities resulting in improved circuit performance. For the full details on the widths of Right-of-Way under various circumstances, please refer to Standard DR0102 entitled, "RIGHT-OF-WAY STANDARD". The link to the Engineering Design Manual is provided below. Look for 'Right of Way' in the table of contents and click on that topic to open the full document.
https://entergy.sharepoint.com/sites/projects/DistributionStandards/SitePages/Main%20Engineering%20Design.aspx

25. SECONDARY CONDUCTORS

Secondary conductors are defined as the conductor electrically attached to the low side of a transformer and physically attached to company poles or other company facilities on both ends. Secondary conductors shall be multiplex cable conductors. These have insulated hot legs and typically are duplex, triplex and quadruplex depending on service requirements. More information on multiplex cable is available on our website under material standard DA0101. For some applications, a secondary larger than 500kcmil may be needed. Information on individual or single conductor, insulated secondary is available under material standard DA0111.

26. SHIELDING vs. NON-SHIELDING

In general, all new multi-phase distribution lines will no longer require a shield. This is as the result of IEEE Standard 1410 which has recently been incorporated into Entergy's Overhead Design Philosophy. A detailed interpretation is available upon request by contacting the Design Basis group.
Multi-phase and Single phase lines shall be built using pole top pin and ridge pin construction. Refer to Standard Number DR01-01, "Design Basis for NON-Shielded Construction of Overhead Distribution Lines" for further information and for exceptions to this rule. This standard is included in the "Additional Guidelines and Details" section 3.0 of this manual. Both non-shielded and shielded multi-phase units are included in the construction manual as there are some instances where shield wires may be installed. They may also be needed for removals. Due to IEEE 1410 recommended shielding angle of 30 degrees, any crossarm construction requires mounting the cross-arm approximately 9' from the pole top.

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Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

Design Basis for NON-Shielded Construction of Overhead Distribution Lines

Entergy

Utility Operations
Distribution Engineering
Distribution Standards

TITLE: Design Basis for NON-Shielded Construction of Overhead Distribution Lines	STANDARD NUMBER: DR0101 Rev. 08	EFFECTIVE DATE: October 2017
PREPARED BY: Kevin J. Mohr, Distribution Design Basis	APPROVED BY: James R. Hickman, Manager of Distribution Standards	

Contents

Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

TITLE: Design Basis for NON-Shielded Construction of Overhead Distribution Lines	STANDARD NUMBER: DR0101 Rev. 08	EFFECTIVE DATE: October 2017

1 Introduction

1.1 Purpose

The purpose of this standard is to establish a uniform policy for the framing of overhead distribution lines providing the basis for NON-Shielded construction..

1.2 Scope

This standard applies to all existing and proposed overhead distribution lines throughout the Entergy system.

1.3 Changes in this Revision

Lightning mitigation philosophy has changed as a result of IEEE Standard 1410-2010 which stresses high BIL along with multiple grounds on the system neutral to improve lightning performance of distribution circuits.

1.4 Training and Awareness

All those involved with design, construction, operation and maintenance of the distribution lines at Entergy should be made aware of this revision.

2 Definitions & Terminology

BIL - Basic Lightning Impulse Insulation Level: For self-restoring insulation, such as porcelain insulators, a test surge with standard waveshape and at a magnitude equal to the rated BIL of the insulator will have a 10% chance of causing a flashover.

Distribution - low voltage (34.5kV and below) lines and facilities which begin outside the substation fence.

Flashover - Insulation failure caused by application of a voltage which exceeds the withstand capability of the insulator. Flashovers of distribution line primary insulators will normally result in at least a temporary outage due to the fact that the power fault current which flows through the arc established by the flashover must be interrupted by some device such as a fuse, recloser, or substation breaker.

Shield - a grounded neutral wire installed in a position above the primary conductor or conductors with the purpose of intercepting direct lightning strokes to the circuit. The shield wire may or may not be the sole neutral wire for the circuit.

3 References

Standard Number	Standard Title
IEEE Standard 1410	IEEE Guide for Improving the Lightning Performance of Electric Overhead Distribution Lines.

Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

TITLE: Design Basis for NON-Shielded Construction of Overhead Distribution Lines	STANDARD NUMBER: DR0101 Rev. 08	EFFECTIVE DATE: October 2017

4 Design Specifications

4.1 Background

4.1.1 In January 2011, IEEE released Standard 1410-2010 which brought about a major adjustment in Entergy's Lightning Mitigation Philosophy. A team made up of representatives from the Design Basis and Asset Management group interpreted the IEEE standard to place more emphasis on high BIL and multiple grounds rather than shielding. That team's interpretation is the basis of these revised guidelines.

4.2 New Construction

4.2.1 New multi-phase distribution lines shall be built using unshielded construction. New single phase distribution lines should also not be shielded. Refer to specific exceptions to these rules below.

4.3 Unshielded taps on shielded structures

4.3.1 The pole in the shielded line from which an unshielded tap originates will be modified to bring the structure up to the new standards with BIL levels above 300kV. Pole grounds in the primary zone will be replaced with insulated, Hendrix ground wire from a point even with the shield wire to a point even with the neutral wire; but not less than 60" below the lowest energized conductor or support point for the lowest energized conductor including crossarm mountings and brace attachment points.

4.3.2 Lightning arresters shall no longer be installed at unshielded taps fed from existing shielded circuits.

4.4 Structure BIL

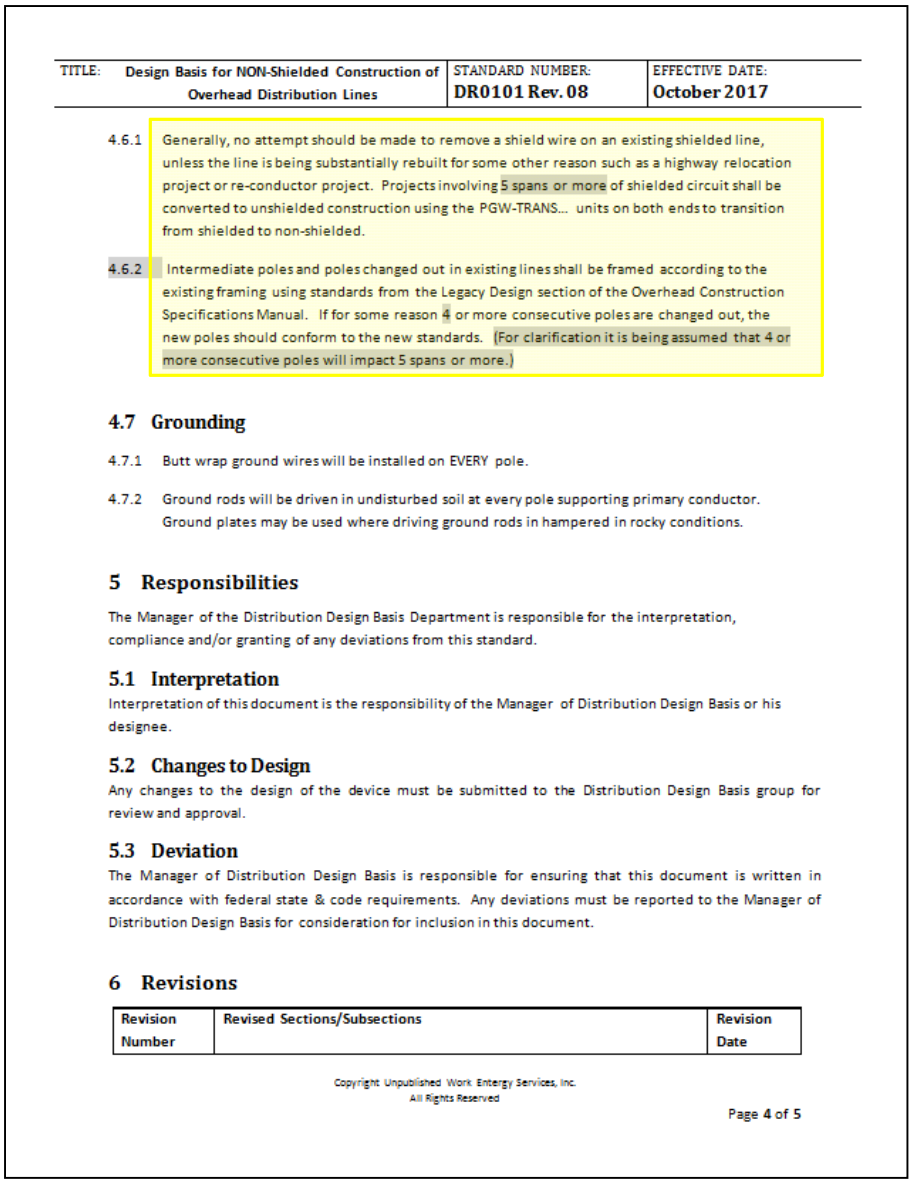
4.4.1 The overall BIL of distribution structures must remain above 300kV in all cases. It is preferred to have the BIL above 400kV in areas of higher ground resistance as is the case in the higher elevations in the northern part of the service territory. For shielded structures, the ground wire passing through the primary zone must be insulated Hendrix ground wire which is rated at 350kV BIL. The primary zone is considered from the top of the pole to the normal neutral location.

4.5 Exceptions

4.5.1 Short multi-phase taps fed from existing shielded lines may be built with a shield for the sake of uniformity of appearance. However, all new multi-phase taps, 5 spans or more in length, shall be unshielded.

4.6 Existing Lines

Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified



TITLE: Design Basis for NON-Shielded Construction of Overhead Distribution Lines	STANDARD NUMBER: DR0101 Rev. 08	EFFECTIVE DATE: October 2017

4.6.1 Generally, no attempt should be made to remove a shield wire on an existing shielded line, unless the line is being substantially rebuilt for some other reason such as a highway relocation project or re-conductor project. Projects involving 5 spans or more of shielded circuit shall be converted to unshielded construction using the PGW-TRANS... units on both ends to transition from shielded to non-shielded.

4.6.2 Intermediate poles and poles changed out in existing lines shall be framed according to the existing framing using standards from the Legacy Design section of the Overhead Construction Specifications Manual. If for some reason 4 or more consecutive poles are changed out, the new poles should conform to the new standards. (For clarification it is being assumed that 4 or more consecutive poles will impact 5 spans or more.)

4.7 Grounding

4.7.1 Butt wrap ground wires will be installed on EVERY pole.

4.7.2 Ground rods will be driven in undisturbed soil at every pole supporting primary conductor. Ground plates may be used where driving ground rods in hampered in rocky conditions.

5 Responsibilities

The Manager of the Distribution Design Basis Department is responsible for the interpretation, compliance and/or granting of any deviations from this standard.

5.1 Interpretation

Interpretation of this document is the responsibility of the Manager of Distribution Design Basis or his designee.

5.2 Changes to Design

Any changes to the design of the device must be submitted to the Distribution Design Basis group for review and approval.

5.3 Deviation

The Manager of Distribution Design Basis is responsible for ensuring that this document is written in accordance with federal state & code requirements. Any deviations must be reported to the Manager of Distribution Design Basis for consideration for inclusion in this document.

6 Revisions

Revision Number	Revised Sections/Subsections	Revision Date

Utilization of Standards Procedures and Drawings as Governance over Reliability Work Identified

TITLE: Design Basis for NON-Shielded Construction of Overhead Distribution Lines	STANDARD NUMBER: DR0101 Rev. 08	EFFECTIVE DATE: October 2017

Revision Number	Revised Sections/Subsections	Revision Date
03	All sections/subsections rewritten to incorporate the new lightning mitigation standards.	May 2015
04	Removal of requirement for line arresters below the lateral switch of unshielded taps taking off of shielded lines	July 2015
05	Updated table of contents and included requirement for ground rods at every pole supporting primary conductor instead of EVERY pole.	February 2016
06	Included notes on butt wraps and ground plates in section 4.7. Also added '…over 5 spans…' rule to the conversion decision on shielded to un-shielded in section 4.6.1	May 2016
07	Added guidelines on when to use legacy drawings vs. new specs.	Dec -2016
08	Revised document title and clarified some words and definitions	Oct - 2017

7 Acknowledgments

8 Appendices

8.1 NONE

Design Basis Drawings as Governance over Reliability Work Identified

Avian Mitigation

Requirements for Avian Mitigation:

1.) For small birds the incident pole is covered to prevent further incidents from occurring. For small birds, covering primary insulators is usually not needed. Covering the switches, arresters, equipment bushings, riser wire, etc. will correct most small bird contact problems.
2.) For medium to large birds the incident pole and 3 spans in each direction are covered to prevent future incidents from occurring.
3.) For Raptors, the incident pole and 5 spans in each direction are covered to prevent future incidents from occurring.
4.) Areas containing aquaculture farms (catfish farms, crawfish farms, etc.) or areas frequented by birds for nesting, feeding, or breeding purposes shall require all poles adjacent to the aquaculture farm to be retrofitted. The number of poles to be retrofitted may be greater than the specified requirements in this standard.
5.) For mid span collisions, flight deverters shall be used.
6.) Hendrix insulated conductor shall be used as pole ground through the primary zone of all shielded construction (11 ft. & 15 ft. precut lengths with 6" skinned on each end or per foot for longer lengths for double circuit or corner poles are used). See Compatible Unit section in the beginning of this chapter.
7.) No ground connections are to be made on the Hendrix insulated wire portion of the pole ground. All ground connections to be made above or below this conductor to maintain structure BIL.
8.) Any metal brackets shall be replaced with fiberglass brackets.
9.) Fusion Tape shall be used to cover any exposed areas that do not have molded covers or to cover gaps in covering. For 25KV and less, one layer of 2/3 overlap applied Fusion Tape shall be used. For 35KV, two layers of 2/3 overlap shall be used. Fusion Tape does not bond to parts being covered, it bonds to itself only. Check shelf life date before use.
CU: TAPEFUSION

NO.	DATE:	REVISION	BY:	APPR:
3	03/03/16	DAS 04501 to OH-AV001	JCJ	JRH
2	3/17/11	Added note 4 for aquaculture farms requirements	DAT	JRH
1	2/22/11	Changed drawing number to DAS04501	DAT	JRH

ENTERGY SERVICES, INC.

AVIAN MITIGATION

PROTECTION REQUIREMENTS

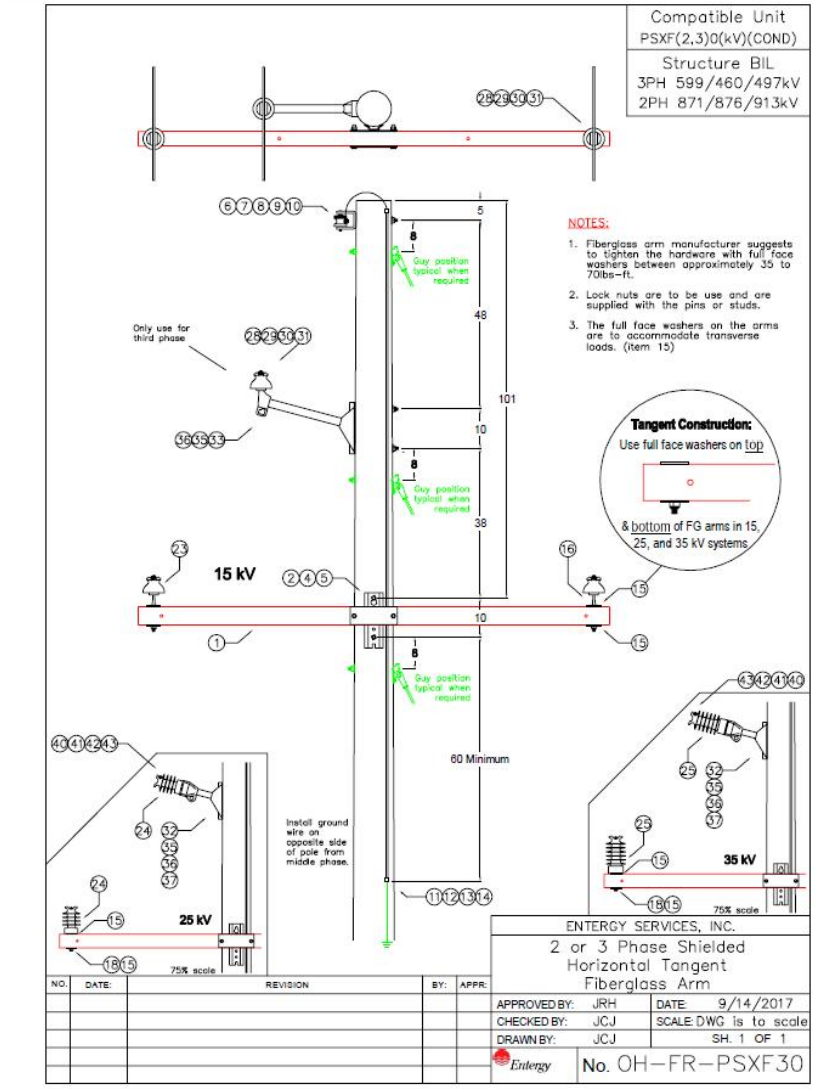
APPROVED BY:	JRH	DATE:	03-03-16
CHECKED BY:	KJM	SCALE:	N.T.S.
DRAWN BY:	JCJ		

ENTERGY

No. OH-AV001

PLOT 1=24 SH. 1 OF 1

Design Basis Drawings as Governance over Reliability Work Identified



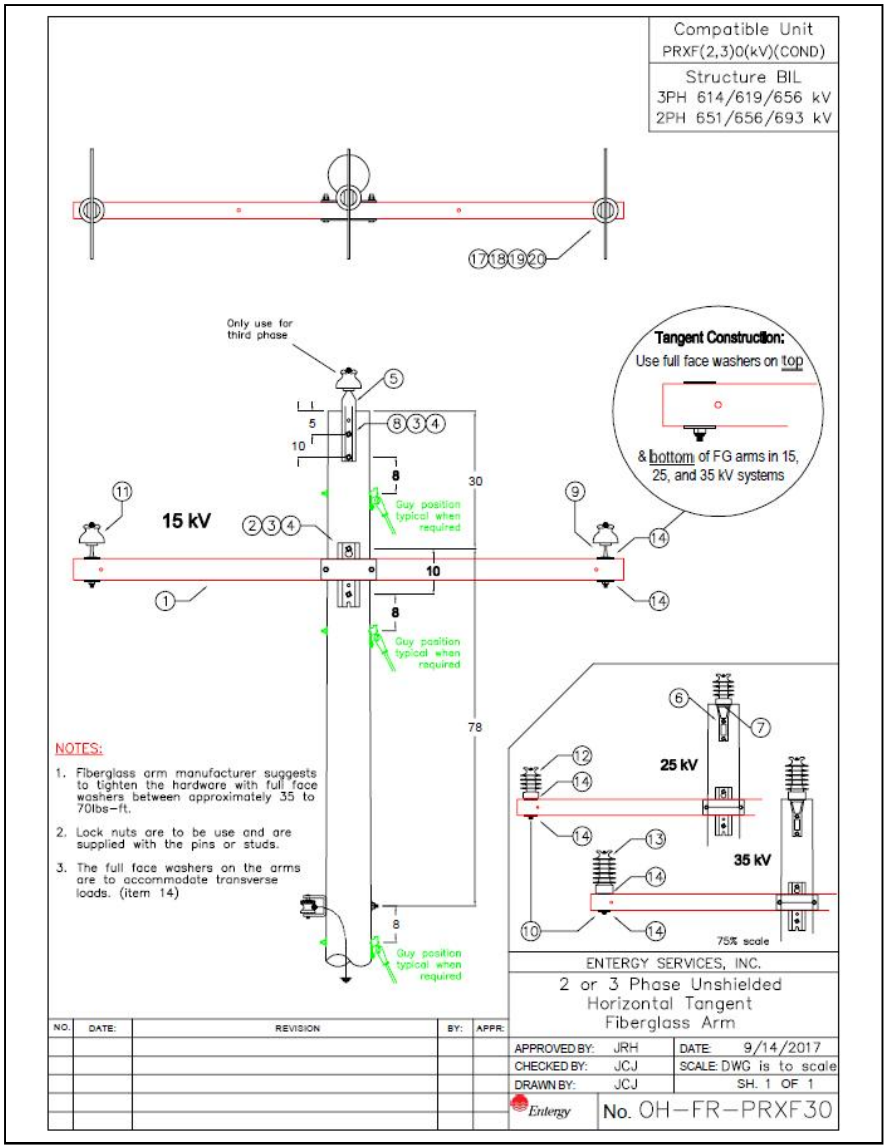
Design Basis Drawings as Governance over Reliability Work Identified

3 PHASE HORIZONTAL UNSHIELDED TANGENT (FG)

PSXF30(KV)(CONDUCTOR)

ITEM NUMBER	STOCK CODE	DESCRIPTION	UNIT	FIXED ITEMS	VOLTAGE DEPENDENT ITEMS			CONDUCTOR DEPENDENT ITEMS					
					15 KV	25 KV	35 KV	STANDARD CONDUCTOR					
						-25	-35	A4	A10	A336	A477	A795	A954
1	EN027740	CROSSARM, 10' FIBERGLASS	EA	1									
2	EN003303	BOLT, 5/8 x 14 INCH	EA	2									
3	EN001080	BOLT, 5/8 x 22 INCH DA	EA	0									
4	EN008912	WASHER 2 x 2 SQ.	EA	3									
5	EN000449	LOCKNUT, 5/8	EA	2									
6	EN003304	BOLT, 5/8 x 12 INCH	EA	1									
7	EN009770	SECONDARY BRACKET	EA	1									
8	EN012862	SPOOL TIE, 1/0	EA	1									
9	EN009835	COMPCON2-10/6-2	EA	1									
10	EN003258	SPOOL INSULATOR	EA	1									
11	EN010242	COMPCON 2-10/6-2	EA	1									
12	EN022352	COMPCON 8-6/6-4	EA	1									
13	EN32000099	CABLE 15FT	EA	1									
14	EN32110742	STAPLE	EA	7									
15	EN32167570	WASHER 3 1/2 SQ 1/4" THICK	EA	4									
16	EN024564	PIN, XARM, STRAIGHT 6.5"	EA		2								
17	EN009850	PIN, XARM, ANGLE	EA										
18	EN011839	STUD, POST INS., 7"	EA			2	2						
20	EN003306	BOLT, 5/8 x 8 INCH	EA										
21	EN009938	BRACKET, XARM, ANGLE	EA										
22	EN011840	STUD, POST INS., 1-3/4"	EA										
23	EN000504	15 KV PIN INSULATOR	EA		3								
24	EN005742	25 KV POST INSULATOR	EA			3							
25	EN006099	35 KV POST INSULATOR	EA				3						
26	EN012800	SINGLE TOP TIE, #4	EA										
27	EN012836	SINGLE TOP TIE, 1/0	EA										
28	EN012837	SINGLE TOP TIE, 336	EA							2			
29	EN012838	SINGLE TOP TIE, 477	EA								2		
30	EN012840	SINGLE TOP TIE, 795	EA									2	
31	EN012841	SINGLE TOP TIE, 954	EA										2
32	EN012517	FG STANDOFFBKT POST	EA			1	1						
33	EN012518	FG STANDOFFBKT PIN	EA		1								
34	EN018822	FG STANDOFF SUSP	EA										
35	EN008912	WASHER 2 x 2 SQ.	EA	2									
36	EN003304	BOLT, 5/8 x 12 INCH	EA	2									
37	EN011840	STUD, POST INS., 1-3/4"	EA			1	1						
38	EN012842	SINGLE SIDE TIE, #4	EA										
39	EN012844	SINGLE SIDE TIE, 1/0	EA										
40	EN012850	SINGLE SIDE TIE, 336	EA		0					1			
41	EN012851	SINGLE SIDE TIE, 477	EA		0						1		
42	EN012852	SINGLE SIDE TIE, 795	EA		0							1	
43	EN012853	SINGLE SIDE TIE, 954	EA		0								1

Design Basis Drawings as Governance over Reliability Work Identified



Design Basis Drawings as Governance over Reliability Work Identified

3 PHASE HORIZONTAL UNSHIELDED TANGENT (FG)

PRXF30(KV)(CONDUCTOR)

ITEM NUMBER	STOCK CODE	DESCRIPTION	UNIT	FIXED ITEMS	VOLTAGE DEPENDENT ITEMS			CONDUCTOR DEPENDENT ITEMS					
					15 KV	25 KV	35 KV	STANDARD CONDUCTOR					
						-25	-35	A4	A10	A336	A477	A795	A954
1	EN027740	CROSSARM, 10' FIBERGLASS	EA	1									
2	EN003303	BOLT, 5/8 X 14 INCH	EA	2									
3	EN008912	WASHER 2 X 2 SQ. 1/8" THICK	EA	4									
4	EN000449	LOCKNUT, 5/8	EA	2									
5	EN009773	POLE TOP PIN, 18 "	EA		1								
6	EN009851	POST INS. BRACKET	EA			1	1						
7	EN011840	STUD, POST INS., 1-3/4"	EA			1	1						
8	EN003304	BOLT, 5/8 X 12 INCH	EA	2									
9	EN024564	PIN, XARM, STRAIGHT 6.5"	EA		2								
10	EN011839	STUD, POST INS., 7"	EA			2	2						
11	EN000504	15 KV PIN INSULATOR	EA		3								
12	EN005742	25 KV POST INSULATOR	EA			3							
13	EN006099	35 KV POST INSULATOR	EA				3						
14	EN32167570	WASHER 3 1/2 SQ 1/4" THICK	EA	4									
15	EN012800	SINGLE TOP TIE, #4	EA	0									
16	EN012836	SINGLE TOP TIE, 1/0	EA	0									
17	EN012837	SINGLE TOP TIE, 336	EA							3			
18	EN012838	SINGLE TOP TIE, 477	EA								3		
19	EN012840	SINGLE TOP TIE, 795	EA									3	
20	EN012841	SINGLE TOP TIE, 954	EA										3

2 PHASE HORIZONTAL UNSHIELDED TANGENT (FG)

PRXF20(KV)(CONDUCTOR)

ITEM NUMBER	STOCK CODE	DESCRIPTION	UNIT	FIXED ITEMS	VOLTAGE DEPENDENT ITEMS			CONDUCTOR DEPENDENT ITEMS					
					15 KV	25 KV	35 KV	STANDARD CONDUCTOR					
						-25	-35	A4	A10	A336	A477	A795	A954
1	EN027740	CROSSARM, 10' FIBERGLASS	EA	1									
2	EN003303	BOLT, 5/8 X 14 INCH	EA	2									
3	EN008912	WASHER 2 X 2 SQ. 1/8" THICK	EA	2									
4	EN000449	LOCKNUT, 5/8	EA	2									
5	EN009773	POLE TOP PIN, 18 "	EA	0									
6	EN009851	POST INS. BRACKET	EA	0									
7	EN011840	STUD, POST INS., 1-3/4"	EA	0									
8	EN003304	BOLT, 5/8 X 12 INCH	EA	0									
9	EN024564	PIN, XARM, STRAIGHT 6.5"	EA		2								
10	EN011839	STUD, POST INS., 7"	EA			2	2						
11	EN000504	15 KV PIN INSULATOR	EA		2								
12	EN005742	25 KV POST INSULATOR	EA			2							
13	EN006099	35 KV POST INSULATOR	EA				2						
14	EN32167570	WASHER 3 1/2 SQ 1/4" THICK	EA	4									
15	EN012800	SINGLE TOP TIE, #4	EA										
16	EN012836	SINGLE TOP TIE, 1/0	EA										
17	EN012837	SINGLE TOP TIE, 336	EA							2			
18	EN012838	SINGLE TOP TIE, 477	EA								2		
19	EN012840	SINGLE TOP TIE, 795	EA									2	
20	EN012841	SINGLE TOP TIE, 954	EA										2

Remediation Strategies for Top 20 Outage Cause Codes

Lightning – BIL Strategy and R1 Strategy
Equipment Failure Transformers – Failed Transformers are replaced at time of Failure
Scheduled Interruptions – Method used to minimize outage duration for planned repairs due to imminent failure
Equipment Failure Primary Conductor – BIL Strategy and strategic replacement projects
Secondary/Service Conductor – Repair as needed or as identified
Equipment Failure Crossarm – BIL Strategy, R1 Strategy, and as imminent failure
Equipment Failure Connector/Sleeve – Repaired as needed or as identified
Unknown – BIL Strategy
Equipment Failure Fuse Link – Essentially an unknown outage. Fuse performed as designed
Vehicle – No known solutions
Animal/Squirrel - BIL Strategy and R1 Strategy
Foreign Object Other - No known solutions
Vines Growing into Lines – Vegetation Management strategies
Overhanging Limb - Vegetation Management strategies
Equipment Failure Arrester - BIL Strategy and R1 Strategy
Tree/Limb Growing inside ROW - Vegetation Management strategies
Equipment Failure Fuse Switch - BIL Strategy and R1 Strategy
Tree On Line Outside ROW - Vegetation Management strategies
Equipment Failure Other – No known solutions
Equipment Failure Pole - Osmose pole inspection and Strategic replacement projects when identified.