Exhibit "H"
Specification for Customer-Owned 138 kV Substation Design

SPECIFICATION

FOR

CUSTOMER-OWNED 138 kV SUBSTATION DESIGN

ELECTRIC ENGINEERING DEPARTMENT

P.O. BOX 1700 HOUSTON, TEXAS 77251

REFERENCE DRAWINGS: Latest revision of
CenterPoint Energy 004-241-04, Customer-Owned Substation Line Termination Standard
CenterPoint Energy 171-190-06, Design Criteria 138 kV Standard Instrument Transformer Stand, Sh.'s 1 and 2
CenterPoint Energy 581-500-01, 138 kV Potential Transformer Schematic and Wiring Diagram

REFERENCE DOCUMENT: Latest revision of
CenterPoint Energy Transmission & Substation Outage and Clearance Coordination Procedures

REFERENCE SPECIFICATIONS: Latest revision of
CenterPoint Energy 007-400-02, Specification for Remote Telemetry of a Customer-Owned Facility

REFERENCE STANDARDS: Latest revision of

AASHTO	IEEE C57.13
AISC, "Manual of Steel Construction"	IEEE C2 (NESC)
ASCE 10	IEEE 80
ASCE 113	IEEE 519
ANSI C12.1	IEEE 837
ANSI C37.32	IEEE 1119
IEEE C37.06	IEEE 998
IEEE C37.04	IEEE 142
IEEE C37.40	IEEE 1453
IEEE C37.60	NEMA CC 1
IEEE C57.12.00	

CENTERPOINT ENERGY HOUSTON, TEXAS		
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SPECIFICATION NO.	007 231 14	

NO	DATE	ITEMS REVISED	BY	CH	APP
17	9-2-2021	Update sections 4 & 11	Var	Var	GAC
16	8-3-2017	Update Sections 8 & 9 for Telecom	cwm	Var	MDB
15	11-16-2015	Updates	Var	Var	DRS
14	7-22-2005	Change to 4000A and other updates	Var	Var	DRS

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1. SCOPE

1.1. This specification covers design criteria for a customer-owned 138 kV substation connected to the CenterPoint Energy Houston Electric, LLC (CenterPoint Energy) 138 kV transmission system. This specification is intended to apply to a new customer-owned substation or expansion of an existing customer-owned substation. However, the information in this specification may be applicable when equipment in an existing customer-owned substation is being replaced or modified.

2. GENERAL

2.1. A customer that is approved by CenterPoint Energy to receive service from the CenterPoint Energy 138 kV transmission system is required to provide a substation capable of accepting that service from CenterPoint Energy. The customer-owned substation becomes an integral part of the CenterPoint Energy transmission system network and the Electric Reliability Council of Texas (ERCOT) and, therefore, can have a significant impact on overall system reliability. The customer is obligated to meet present CenterPoint Energy design criteria and modify the customer-owned substation in the future as the CenterPoint Energy transmission system continues to evolve. When deemed necessary by CenterPoint Energy, changes may be needed to conform to industry standards, transmission system characteristics, CenterPoint Energy practices, and technological advances to maintain reliability or meet future reliability requirements.

2.2. All equipment and design shall be in accordance with designated standards of this specification, the American National Standards Institute (ANSI), the Institute of Electrical and Electronic Engineers (IEEE), the American Society of Civil Engineers (ASCE), the American Institute of Steel Construction (AISC), and the National Electrical Manufacturing Association (NEMA). In the event of conflicting requirements, the order of precedence shall be this specification, ANSI, IEEE, ASCE, AISC, and NEMA standards. All electrical clearances shall comply with the latest version of the National Electric Safety Code (NESC).

2.3. This specification is not intended to be totally comprehensive. To ensure the efficient coordination between CenterPoint Energy and the customer during the design and construction of the customer-owned substation, CenterPoint Energy requires that engineering documents be submitted to CenterPoint Energy for review before certain equipment is ordered or construction begins. All items requiring CenterPoint Energy review are listed in Article 14 of this specification and shall be submitted in writing to the designated CenterPoint Energy representative.

2.4. Any deviations from this specification or project drawings reviewed by CenterPoint Energy require written acceptance from CenterPoint Energy.

2.5. All labor and equipment shall be furnished by the customer unless otherwise stated in this specification.

2.6. Unless otherwise stated in this specification:

2.6.1. CenterPoint Energy will provide only functional reviews of completed drawings and schematics.

2.6.2. CenterPoint Energy will not verify, or correct, point-to-point wiring drawings for the customer – owned substation.

2.6.3. CenterPoint Energy requires specific tests which are to be conducted by the customer to verify the proper operation and coordination of the customer-owned substation protection and control equipment (see Article 16 of this specification).

2.7. CenterPoint Energy reserves the right to refuse to energize any customer-owned substation which fails to meet this specification.

2.8. The customer will coordinate the energization and operation of their high voltage facilities with CenterPoint Energy's Real Time Operations (RTO) Department per CenterPoint Energy's "Transmission & Substation Outage and Clearance Coordination Procedures" document.

2.9. During energization of new or existing equipment, the customer shall not disable a single level, or multiple levels, of protection that results in no protection for an energized element, such as, a transmission line, high voltage bus, or transformers.

2.9.1. The customer shall immediately notify the RTO System Controller (281-894-0491) whenever the customer becomes aware of an energized element that has no protection if the protection cannot be immediately restored.

2.9.2. The customer shall immediately notify the RTO System Controller (281-894-0491) of a protective relay that is not functional (such as a "CPU Failure" alarm) or when a protective relay is found powered down, or out of service (such as not enabled), for an energized element.

2.10. As owner of the substation, it is the customer's responsibility to comply with the applicable laws, ordinances, codes, rules, and regulations established by applicable government entities.

2.11. Because the customer-owned substation becomes an integral part of the CenterPoint Energy transmission system network, CenterPoint Energy requires access to the customer-owned substation and CenterPoint Energy right-of-ways 7 days-a-week, 24 hours-a-day, 365 days-a-year. Site access, site operating procedures and road access to the customer-owned substation by CenterPoint Energy personnel should be considered when determining the substation location.

2.12. When terminal blocks and other connections permit, ring tongue lugs shall be used instead of spade or stab-on lugs.

3. CENTERPOINT ENERGY SYSTEM CHARACTERISTICS

3.1. CenterPoint Energy's phase rotation is designated C-B-A counter-clockwise and the customer shall phase equipment accordingly. Connection of the customer's H_1-H_2-H_3 power transformer leads to CenterPoint Energy's C-B-A, B-A-C or A-C-B phases, respectively, is recommended.

3.2. The CenterPoint Energy's system operating voltage is 138kV (L-L)/79.7kV (L-G) +/- 5% for continuous operation and 138kV (L-L)/79.7kV (L-G) +5%/-8% for emergency conditions. Actual steady-state operational voltage varies around the CenterPoint Energy transmission system network,

but facilities with a means to regulate the 138 kV transmission system are typically used to control the voltage to be no more than approximately 142 kV (L-L)/82 kV (L-G) to provide a margin from the maximum 145kV (L-L)/83.7 kV (L-G). Dynamic conditions may be encountered which result in voltage exceeding this range. At a minimum, customer is required to design 138kV substation facilities that are rated for the emergency operating voltage range stated above. For the purpose of the design and rating of the substation and equipment, it shall be assumed that the maximum continuous negative sequence component of the voltage at the 138 kV bus is 2% of the positive sequence voltage. See Sub-Articles 3.4, 3.5, 4.9 and 7.1.4 of this specification for additional relevant information.

3.3. Only instrument transformers, surge arresters, station service voltage transformers, generator step-up transformers for generators without co-located non-auxiliary load, and autotransformers are allowed to be connected phase-to-ground on their 138 kV primary terminals.

3.4. As the independent system operator (ISO) for the ERCOT Region, ERCOT is responsible for maintaining frequency, which is nominally 60 Hz. Refer to ERCOT (www.ercot.com) Nodal Operating Guides and Protocols for information regarding frequency regulation.

3.5. System will experience transient voltage conditions. If the customer wants to stay in service during these transient voltage conditions, CenterPoint Energy suggests the customer at a minimum utilize the "voltage ride-through" design criteria below when designing and selecting process and control equipment. (Note: This design criteria do not supersede any regulatory voltage ride-through requirements). CenterPoint Energy shall require customers with aggregate load greater than or equal to 75MVA to meet the voltage ride-through requirements below if the disconnection of their load during transient voltage conditions significantly impact the transmission system.

3.5.1. When the point of interconnection bus voltage is below 0.5 pu, the minimum ride-through time is 0.15 seconds.

3.5.2. When the point of interconnection bus voltage is at or above 0.5 pu, the minimum ride-through time is 0.2 seconds.

3.6. Multiple-shot, staggered, voltage-supervised, automatic reclosing is utilized on the CenterPoint Energy transmission system. The first automatic reclosing attempt for a CenterPoint Energy transmission line typically occurs approximately one second after initial trip. The number of automatic reclosing attempts varies, but the total duration of the automatic reclosing sequence is typically one minute. The customer shall coordinate operation and protection of electric motors, computers and other equipment accordingly.

4. ELECTRICAL DESIGN CRITERIA

4.1. The minimum acceptable electrical design characteristics for 138 kV facilities and equipment are listed below:

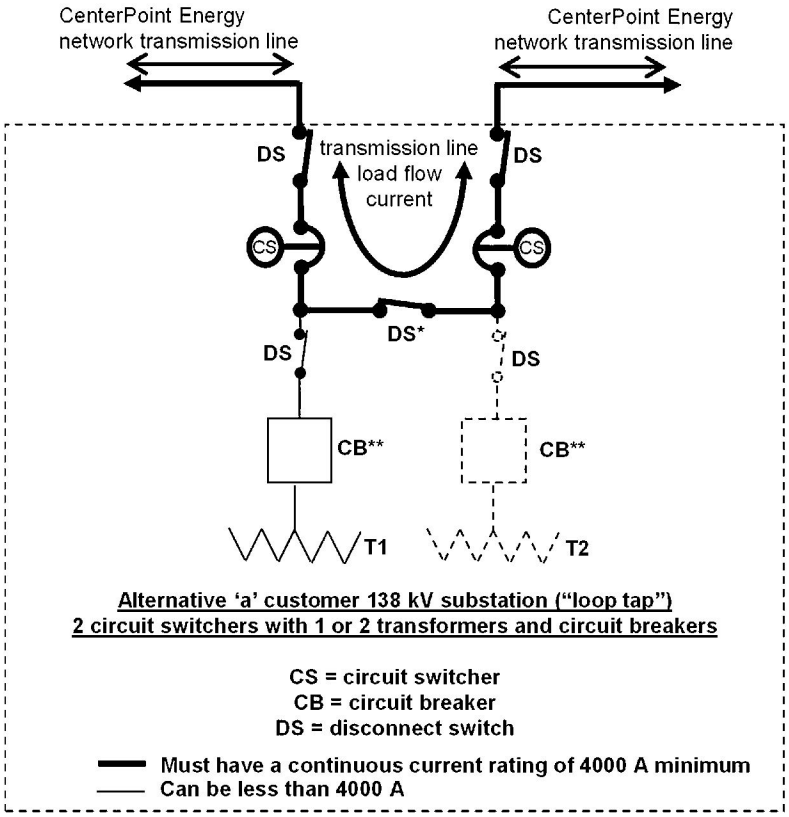
Transformer winding impulse level	550 kV BIL
Bus and switch insulators, and apparatus bushings (i.e. circuit breaker bushings, transformer bushings, coupling capacitors, capacitive voltage transformers (CVT), current transformers (CT), potential transformers (PT), surge arresters etc.)	650 kV BIL
Bus and switch insulators leakage distance	132 in. leakage distance (equivalent to extra creep 650 kV BIL or 750 kV BIL). Additionally, insulators may require 'coating' in some areas of the system to minimize the likelihood of flashover.
Apparatus bushing leakage distance (circuit breaker bushings, transformer bushings, CVT, CT, PT, surge arresters etc.)	92 in. creep (equivalent to 650 kV BIL – light contamination levels). Additionally, apparatus bushings may require 'coating' in some areas of the system to minimize the likelihood of flashover.
Phase-to-ground clearance	52 in. (metal to metal)
Phase-to-phase bus spacing (including vertical spacing at crossover point of high and low bus)	63 in. (metal to metal)
Phase-to-phase horizontal spacing at incoming line dead-end structure	144 in. (center line to center line, regardless of the line angle)

4.2. An air insulated customer-owned substation configured in a 'ring bus', 'double-breaker, double-bus' or 'breaker-and-a-half' arrangement equipped with transmission line protective relaying ("full loop") or an air insulated customer-owned substation configured in a 'loop line tap' arrangement without transmission line protective relaying ("loop tap") are allowed by CenterPoint Energy (see Figure 2 through Figure 7). 'Ring bus' configurations with more than six breakers shall not be considered.

4.3. Customer-owned substations with aggregated load equal to or greater than 75 MW shall be configured as "full loop". Customers shall convert any existing substation to "full loop" if any future load addition increases aggregate load to 75MW or more.

4.4. Based on the customer-owned substation configuration, equipment in the substation that could be subjected to transmission line load flow current (circuit breakers and disconnect switches, bus work, conductors or any series-connected, current carrying devices, such as, free-standing current transformers, protective relays, instrumentation, or hardware within the ring bus or transmission line breaker-and-a-half bay) and incoming transmission line positions (transmission line disconnect

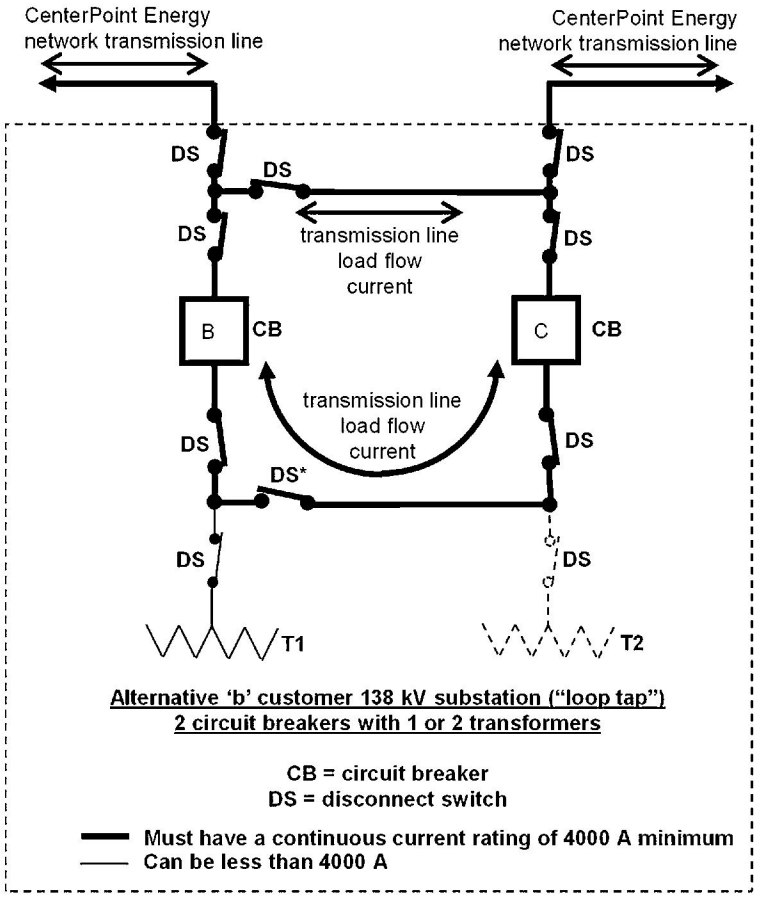
switches, line traps, etc.) shall have a minimum continuous current rating of 4000 A and shall have an overload capability of 110 percent of rated current for 2 hours, unless otherwise specified by CenterPoint Energy. The equipment in the customer-owned substation that is not subjected to transmission line load flow current is not required to be 4000 A minimum. However, operational scenarios associated with certain equipment outages could exist that would result in transmission line load current flowing on customer internal lines or buses (customer site internal 'loop line' or customer site internal 'loop bus') and potentially overload the customer's equipment if it is rated less than 4000 A. Therefore, CenterPoint Energy suggests that any customer site internal 'loop line' and customer site internal 'loop bus' (except customer site internal 'radial' line or customer transformer bus connections) be 4000 A minimum (see Figure 2 through Figure 7). For customer-owned substations connecting to four or more CenterPoint Energy 138 kV transmission lines, contact CenterPoint Energy for the required equipment rating.



All disconnect switches only have arcing horns. Circuit switchers are required to be installed in this configuration. The circuit switchers are used for manual switching of the network transmission line sections.
•If two transformers are installed then this disconnect switch is installed and is 'normally closed'.
** For substation arranged for future "full loop" service, the 138 kV circuit breakers that will be in the substation 'loop' shall have a continuous current rating of 4,000 A (see figures 3 to 7)

Figure 2

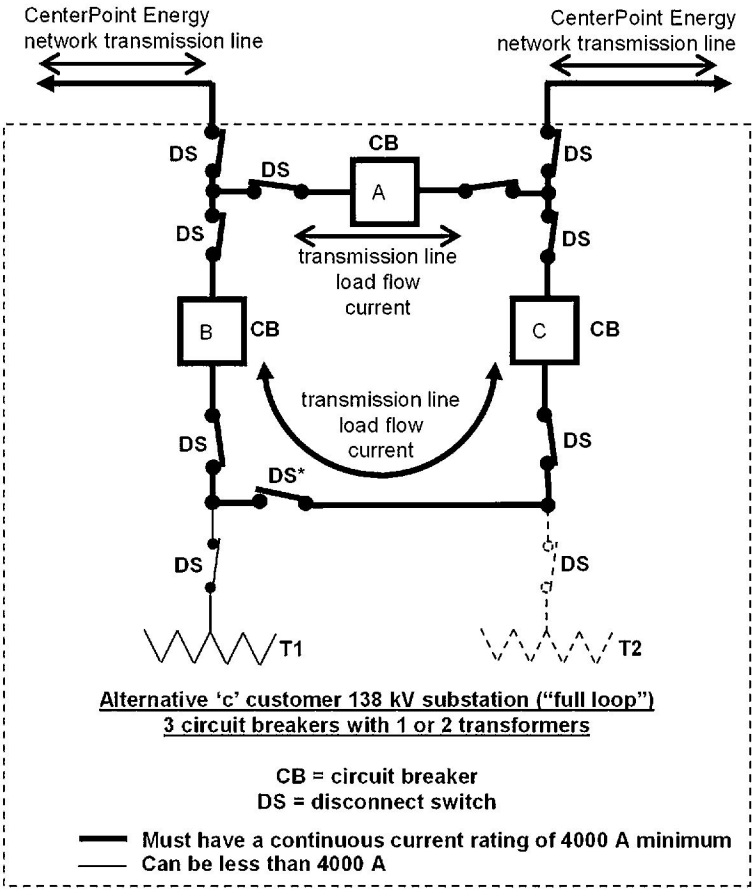
						CENTERPOINT ENERGY HOUSTON, TX		
18	9/8/2023	Updates to various sections	Var	Var	PM			
	1/5/2023	Add clarification on TIF and restriction to rings	MCK	Var	JPB	WRITTEN	4/9/74	E. C. Reid
17	9/2/2021	Update sections 4 & 11	Var	Var	GAC	CHECKED	4/10/74	L. G. Pond
16	8/3/2017	Update Sections 8 & 9 for Telecom	CWM	Var	MDB	APPROVED	7/17/74	C. S. Kayser
15	11/16/2015	Updates	Var	Var	DRS	Page 7 of 46		
NO	**DATE**	**ITEMS REVISED**	**BY**	**CH**	**APP**	SPECIFICATION No. 007-2231-14		



All disconnect switches only have arcing horns. Circuit switchers are not used for manual switching of the network transmission line sections in this configuration. The circuit breakers are used for manual switching of the network transmission line sections.

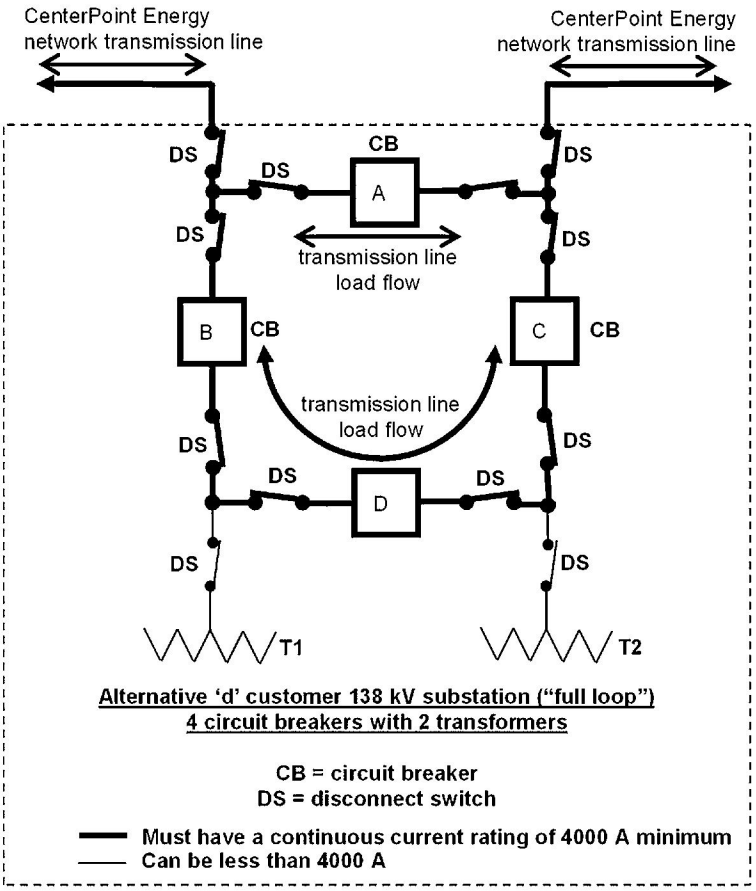
* If two transformers are installed then this disconnect switch is installed and is 'normally open'.

Figure 3



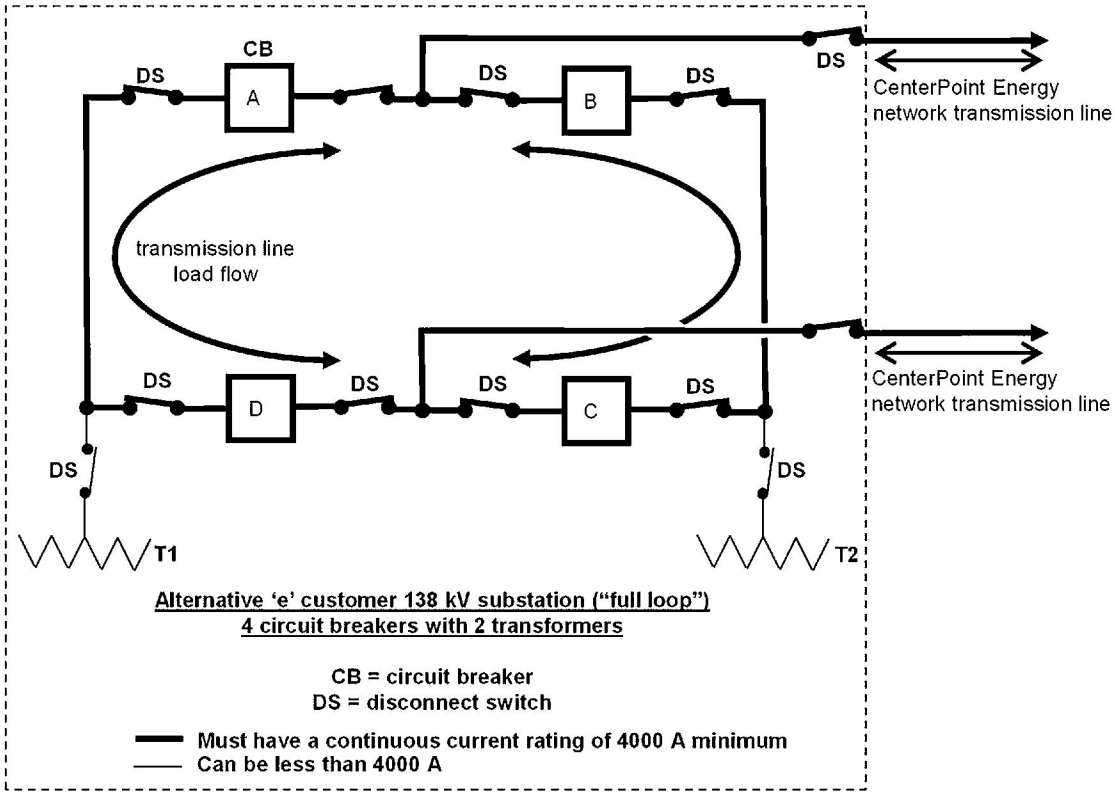
All disconnect switches only have arcing horns. Circuit switchers are not used for manual switching of the network transmission line sections in this configuration. The circuit breakers are used for manual switching of the network transmission line sections..
* If two transformers are installed then this DS is 'normally open' or 'normally closed' depending on customer operating preference.

Figure 4



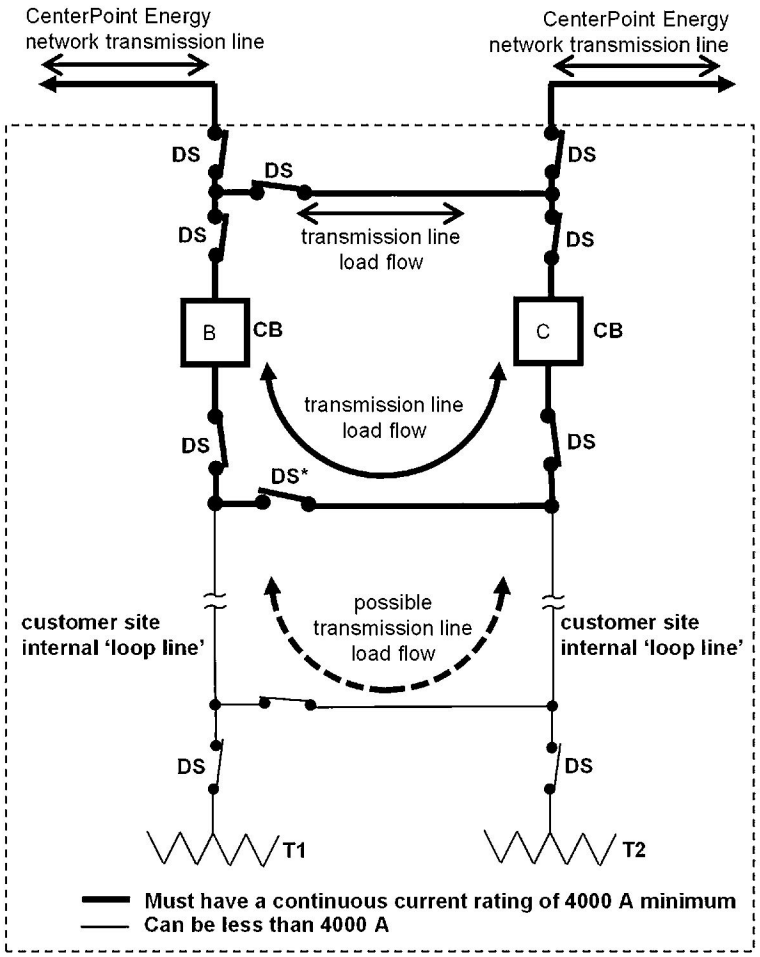
All disconnect switches only have arcing horns. Circuit switchers' are not used for manual switching of the network transmission line sections in this configuration. The circuit breakers are used for manual switching of the network transmission line sections.

Figure 5



All disconnect switches only have arcing horns. Circuit switchers' are not used for manual switching of the network transmission line sections in this configuration. The circuit breakers are used for manual switching of the network transmission line sections.

Figure 6



Any customer connection from the "full loop" substation or "loop tap" substation to the customer's transformers, customer buses, or customer lines (i.e. customer plant internal 'loop lines', etc.) are not required to be 4000 A minimum. However, operational scenarios after a scheduled outage of equipment in a customer substation could exist that would result in transmission line load current flowing on customer site internal lines or buses (customer site internal 'loop line' or 'loop bus') and potentially overload the customer's equipment if it is rated less than 4000 A. Therefore, CenterPoint Energy suggests that any customer site internal 'loop line' and customer site internal 'loop bus' (except customer site internal 'radial' line or customer transformer bus connection) be 4000 A minimum.

Figure 7

4.5. The 138 kV customer-owned substation shall be designed for a short circuit current of 63 kA rms symmetrical, with X/R ratio of 15, unless otherwise specified by CenterPoint Energy.

4.6. 138 kV customer-owned substations which are connected directly into or located within 2 miles electric distance of a CenterPoint Energy 138 kV substation that is designed for a short circuit current of 80 kA rms symmetrical, must be designed to the same short circuit current of 80 kA rms symmetrical, with X/R ratio of 15, unless otherwise explicitly specified by CenterPoint Energy.

4.7. The application of key interlock systems is not permitted on customer-owned substation 138 kV equipment.

4.8. The customer's connected load, generation and equipment shall be designed and operated to adhere to the recommended harmonic limits of IEEE 519 and limits of voltage fluctuations and associated light flicker of IEEE 1453.

4.9. The customer shall not, without CenterPoint Energy's consent, connect or operate equipment that produces voltage fluctuations, interference or distorted wave forms that adversely affect service to other customers or that may be detrimental to the CenterPoint Energy transmission system. Such equipment includes, but is not limited to, motors, arc furnaces, capacitor banks, etc. The customer is obligated to provide load and equipment information (i.e., load magnitude, peak load, load profile, amount of self- serve generation, load characteristics, motor starting data, load increase) for CenterPoint Energy interconnection study and development of interconnection requirements. CenterPoint Energy may require the installation, on customer's side of the meter, of suitable apparatus or other equipment designed specifically to reasonably limit such adverse effects.

4.10. The customer-owned substation ground mat shall be designed for a short circuit current of 63 kA rms symmetrical with X/R ratio of 15 and duration of 0.25 seconds and comply with IEEE 80 and IEEE C2 (NESC). Ground mat connections shall comply with IEEE 837, unless otherwise specified by CenterPoint Energy.

4.11. 138 kV customer-owned substations which are connected directly into or located within 2 miles electric distance of a CenterPoint Energy substation that is designed for a short circuit current of 80 kA rms symmetrical, shall design the ground mat for a short circuit current of 80 kA rms symmetrical, with X/R ratio of 15 and duration of 0.25 seconds and comply with IEEE 80 and IEEE C2 (NESC). Ground mat connections shall comply with IEEE 837, unless otherwise specified by CenterPoint Energy.

4.12. The customer-owned substation direct lightning stroke shielding design shall comply with IEEE 998.

4.13. The customer shall refer to the current CenterPoint Energy tariff for retail delivery service regarding additional information pertaining to load balance, intermittent electrical loads and limitations on adverse effects, equipment sensitive to voltage and wave forms, change in retail customer's electrical load, power factor, and testing of retail customer equipment.

5. STRUCTURAL AND MECHANICAL DESIGN CRITERIA

5.1. The customer shall provide a complete structural and foundation design package for the dead-end structures (supporting the CenterPoint Energy transmission lines connected to the customer-owned substation) and the instrument transformer stands in accordance with Article 14 of this specification. The design package shall be signed and sealed by a professional engineer registered in Texas and shall include design references/codes, computer analysis, member design, connection design, foundation design, soil report, structural and foundation drawings, and all other information that documents the design of the structure(s). ASCE 113 may be used for guidance in the design of structures inside the customer-owned substation.

5.2. CenterPoint Energy transmission structures designated for CenterPoint Energy use shall be used

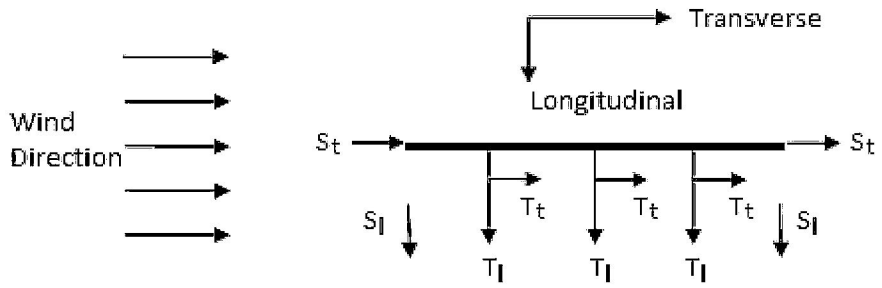
exclusively by CenterPoint Energy and will not be used to support customer equipment including customer-owned generator leads.

5.3. Design shall be based upon loadings realistically combined to cause the most unfavorable effect upon the structure or component. If the AISC ASD method is used, the 1/3 increase in allowable stress is not permitted for wind loads. The loads and overloads used in Sub-Article 5.4 of this specification must be used for the loading with Allowable Stress Design. If the AISC LRFD method is used, the structure must have a second order elastic analysis (also called a Geometric Nonlinear Analysis). Refer also to Sub- Article 5.4 and 5.5.5 of this specification.

5.4. Structures shall meet the Strength Requirements of IEEE C2 (NESC), Section 26, for grade B construction.

5.5. The minimum acceptable structural design loading criteria shall be the more severe of the following two cases (note the cases incorporate loads up to a 30° angle):

5.5.1. Case 1 - Combined Ice and Wind Loading: Reference specification IEEE C2 (NESC); minimum allowable strength factors per Section 26, Table 261-1; loading requirements per Section 25, Rule 250.B and Table 250-1; and loading components to be applied to the structure shall be according to Figure 8 of this specification. The static wire and phase wire loads shown in Case 1 include the required overload factors. The wind on the structure must include a 2.50 overload.



Wind and Ice loads are specified in Section 25 of IEEE C2

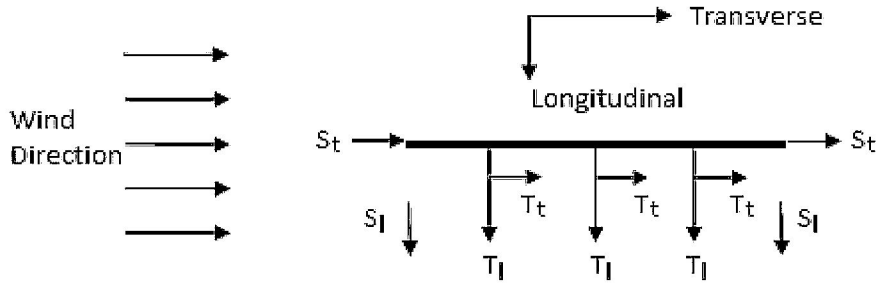
Static wire	Phase wire
S_l = 10.5 kips/wire longitudinally	T_l = 23.0 kips/phase longitudinally
S_t = 6.7 kips/wire transversely	T_t = 14.4 kips/phase transversely
S_v = 0.5 kips/wire vertically	T_v = 1.5 kips/phase vertically

CASE 1 - Combined Ice and Wind Loading – Overhead
View Static wire and Phase wire loading component
(The static wire and phase wire loads shown include the required overload factors)

Figure 8

5.5.2. Case 2 - Extreme Wind Loading: Reference specification; IEEE C2 (NESC) Section 25, Rule

250.C; minimum allowable strength factors per IEEE C2 (NESC), Section 26, Table 261-1; and magnitude and direction of static wire and phase wire loading components to be applied to the structure shall be according to Figure 9 of this specification. The static wire and phase wire loads shown in Case 2 include the required overload factors. The wind on structure loads is applied in the Transverse direction and must include a 1.1 overload factor. The extreme wind load on the structure shall be determined using the ASCE 7-22 wind maps for Exposure C, Risk Category I as a minimum. The web site https://asce7hazardtool.online/ can be used to determine the extreme wind speed at the site. Structural member shape factors shall be used from ASCE 74.



For Case 2 the following shall apply:
Basic Wind speed determined from wind map in, Exposure category C, Importance factor 1.0, Design wind pressure equation and coefficients per IEEE C2 (NESC) Rule 250.C in latest version

Static wire	Phase wire
S_l = 12.0 kips/wire longitudinally	T_l = 22.0 kips/phase longitudinally
S_t = 5.5 kips/wire transversely	T_t = 10.5 kips/phase transversely
S_v = 0.5 kips/wire vertically	T_v = 1.5 kips/phase vertically

CASE 2 - Extreme Wind Loading – Overhead View
Static wire and Phase wire loading component
(The static wire and phase wire loads shown include the required overload factors)

Figure 9

5.6. The requirements for dead-end structures are as follows:

5.6.1. Customer shall design all attachment points to ensure that sufficient electrical clearance is maintained to the customer's structure ground and equipment. CenterPoint Energy will extend the phase wires to the first item of customer's equipment or bus and will furnish, own and maintain all necessary fittings for terminating the phase wires including the tower fittings, suspension insulators, dead-end clamps and phase wire terminal fittings with NEMA CC 1 standard four-hole terminals (0.5625 in. diameter holes, 1.75 in. centers) for attachment to the first item of equipment or bus in the customer-owned substation. CenterPoint Energy will also furnish stirrup clamps or other similar devices (such as a bar on the NEMA pad that is

used with ACSS conductors) on the phase wires as required for connection of surge arresters and potential transformers. Customer will provide a grounding conductor from the customer-owned substation ground mat, up the dead-end structure, to the static wire pull-off plates. CenterPoint Energy will furnish, own and maintain all necessary fittings for terminating the static wire and for connecting the static wire to the customer provided substation ground conductor at the static wire pull-off plates including the tower fittings, dead-end clamps and static wire terminal fittings for attachment to the customer provided substation ground conductor.

5.6.2. Customer shall provide pull-off plates for terminating the phase wires and static wires which will accommodate a minimum of 1 in. pin. All pull-off plates must satisfy Equations 4.6-1 and 4.6-2 in ASCE 10. Details for division of ownership shall be in accordance with CenterPoint Energy Drawing 004-241-04 Customer-Owned Substation Line Termination Standard.

5.6.3. The height of the dead-end structure's phase wire attachment shall be in accordance with the National Electric Safety Code (IEEE C2) or 40 ft. whichever is greater, unless otherwise specified by CenterPoint Energy. The static wire height at attachment shall be at a sufficient elevation and position to provide a shield angle to the outside phase wires of 30° and 45° between two adjacent static wires (see IEEE 142).

5.6.4. CenterPoint Energy will determine if the installation of fiber optic cable is required for transmission line protective relaying and/or control purposes. The fiber optic cable installation will normally be installed underground from the transmission line protective relay requiring fiber optic communication (i.e., relay located in the substation control cubicle) to the base of the first CenterPoint Energy transmission line structure outside the substation. However, should an overhead installation be required, additional loadings will be imposed on the customer's dead- end structure. Additional design information concerning the fiber optic cable will be supplied by CenterPoint Energy when overhead fiber optic cable is to be used. The connection for the fiber optic cable is typically at least 8 feet from the nearest phase wire. If an overhead installation is required and the fiber optic cable cannot be accommodated on the dead-end structure, a single pole must be installed in the customer-owned substation to transition the fiber optic cable from overhead to underground.

5.6.5. If multiple dead-end bays are installed that share a middle column or support, the support must be designed to withstand the loads from the adjacent circuits.

5.7. When high-side (138 kV) metering is utilized, the customer shall design, provide and install stands for mounting CenterPoint Energy furnished instrument transformers (potential and current transformers). The customer shall also design and build foundations to support the stands and instrument transformers. The designs shall be in accordance with Sub-Articles 5.1- 5.4 of this specification. The extreme wind speed defined in section 5.4.2 shall be used with an appropriate member and equipment shape factor. The instrument transformer parameters to be used for the design of the instrument transformer stand are indicated on CenterPoint Energy drawing 171-190-06. Since the instrument transformer may change in the future, the stand mounting surface for the instrument transformer must be adjustable or use grating to accommodate diverse mounting bolt patterns. If a grating is used for the stand mounting surface for the instrument transformer, washer plates of sufficient size and thickness to load up 4 bars must be used on top and bottom of the grating. Design

calculations showing the load transfer from the bolt to the washer plates to the bars to the column must be provided. The customer is responsible for providing the bolts and washer plates. The customer will design a mounting stand and foundation for the hurricane wind speeds and overloads from Sub-Article 5.4.2 of this specification. If the AISC ASD design method is used, the 1/3 increase in allowable stress will not be permitted. If the AISC LRFD method is used, the structure must have a second order elastic analysis (also called a Geometric Nonlinear Analysis). The customer shall limit the horizontal deflection of the potential transformer and current transformer stand at the instrument mounting height to the mounting height divided by 100. The wind speed used for the deflection limit shall be 80 mph.

6. SITE CRITERIA

6.1. Site preparation and plot plan drawings shall be submitted to CenterPoint Energy for comment. Facilities that must be shown on this drawing include: dimensions of the customer-owned substation site, access roadways, space between the customer-owned substation and access roadways, and drainage features such as culverts, ditches and detention facilities (if required). Refer to Sub-Article 14.1.1 of this specification.

6.2. The customer shall stake the location of the dead-end structures according to Figure 10. The owner of the substation must submit drawings/documents specific to their substation to CenterPoint Energy in accordance with Article 14 of this specification. The drawings required by Sub-Articles 14.1.1 and 14.1.3 of this specification should show the customer's desired location for CenterPoint Energy phases. CenterPoint Energy will review this information along with the customer-owned substation location and CenterPoint Energy transmission line tower location and determine if the customer's desired location for CenterPoint Energy phases can be achieved.

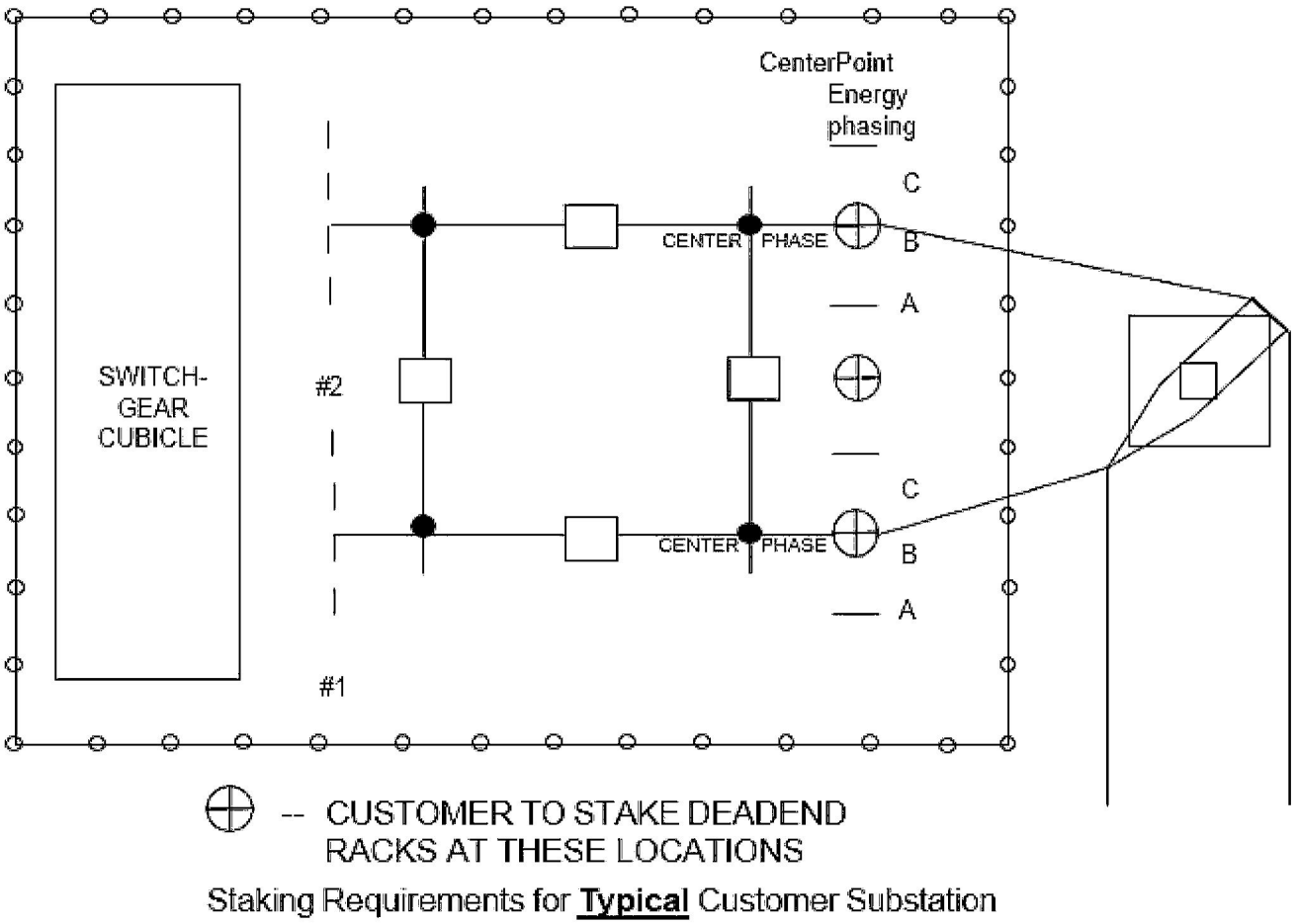


Figure 10

6.3. An all-weather access roadbed capable of supporting heavy construction vehicles shall be provided to the customer-owned substation. The areas within the customer-owned substations that need to support heavy vehicular traffic should conform to AASHTO H20 loading.

6.4. Access for CenterPoint Energy to attach its transmission line wires to the customer-owned substation dead-end structures shall be provided by either:

6.4.1. A 25 ft. wide, leveled, and unobstructed access outside the customer-owned substation site from a main road to the CenterPoint Energy right-of-way and in front of the dead-end structures with substation fencing a maximum of 20 ft. from the attachment point of the dead-ends and a 13 ft. (minimum) wide gate for access into the customer-owned substation.

6.4.2. A 25 ft. wide access inside the customer-owned substation from the substation access gate (20 ft. wide minimum) to the front of the dead-ends with substation fencing a minimum of 25 ft. from the attachment point.

6.5. Access and space shall be provided for installation and future replacement of high voltage equipment including metering instrument transformers.

6.6. The design elevation of the customer-owned substation site, equipment and control cubicle should take into consideration locating essential components above flood and storm surge levels.

7. HIGH VOLTAGE EQUIPMENT

7.1. The requirements for power transformers are as follows:

7.1.1. Transformers serving load shall have a delta winding for connection to the 138 kV system. Power transformers shall conform to IEEE C57.12.00. Power transformers should be equipped with sudden pressure and low oil level detection devices.

7.1.2. Power transformers shall have a minimum of two 600:5 A multi-ratio bushing current transformers (BCTs) per 138 kV bushing. Each BCT shall have IEEE C57.13 accuracy C400 or better. Where applications require additional BCTs and/or different ratios, CenterPoint Energy shall provide ratios to support equipment purchase schedule. The secondary resistance of power transformer BCTs shall not exceed 0.0025 ohms per turn. The power transformer BCT secondary rated continuous current shall be 10 A minimum. The power transformer BCT rating factor (R.F.) shall equal 2.0.

7.1.3. High-side surge arresters shall be provided in accordance with Sub-Article 7.4 of this specification.

7.1.4. The customer shall determine the need for, and if applicable, settings for a transformer tap changer for de-energized operation (no load tap) and automatic on-load tap changer. CenterPoint Energy recommends power transformers be equipped with an automatic on-load tap changer.

7.2. The requirements for circuit breakers are as follows:

7.2.1. Circuit breakers shall be of the three-pole, outdoor type, 138 kV nominal, in accordance with IEEE C37.06, C37.60, C37.04 and C37.40.

7.2.2. For a "full loop" customer-owned substation, "loop tap" substation, or a substation arranged for future "full loop" service, the 138 kV circuit breakers that are or will be in the substation 'loop' shall have a continuous current rating of 4,000 A, an overload capability of 110 percent of the rated current for 2 hours and a rated isolated capacitor bank current switching capability of 600 A.

For customer-owned substations connecting to four or more 138 kV CenterPoint Energy transmission lines, circuit breakers may be required to have a higher continuous rating. The three-phase symmetrical short circuit current interrupting capability of all 138 kV circuit breakers shall be 63 kA rms symmetrical. The rated interrupting time of all 138 kV circuit breakers shall be three cycles or less. In some applications, the installation of TRV shaping capacitors may be required in order to achieve the circuit breaker interrupting capability of 63 kA rms symmetrical for line faults. CenterPoint Energy shall determine the placement of

TRV shaping capacitors, when required for line faults.

7.2.3. Each 138 kV circuit breaker shall be equipped with two 4000:5 A multi-ratio BCTs per 138 kV bushing. Each circuit breaker BCT shall have a relaying accuracy class of C800 on the 4000:5 A tap in accordance with IEEE C57.13. The secondary resistance of the circuit breaker BCT shall not exceed 0.0025 ohms per turn. The circuit breaker BCT secondary rated continuous current shall be 10 A minimum. The circuit breaker BCT rating factor (R.F.) shall equal 2.0.

For the replacement or addition of a 138 kV circuit breaker in an existing customer-owned substation that already has other 138 kV circuit breakers that do not have a continuous current rating of 4,000 A, the following applies to the replacement or addition circuit breaker (i.e., the following requirement is to accommodate interface of the 4000 A replacement or addition 138 kV circuit breaker with any existing circuit breakers that have 2000:5 multi-ratio BCT's in an existing substation while maintaining the design capability for 4000 ampere operation in the future). Each replacement or addition 138 kV circuit breaker shall be equipped with two 3000:5 A multi-ratio BCTs per 138 kV bushing. Each circuit breaker BCT shall have a relaying accuracy class of C800 on the 2000:5 A tap (equivalent to C1200 on the full ratio 3000:5) in accordance with IEEE C57.13. The secondary resistance of circuit breaker BCTs shall not exceed 0.0025 ohms per turn. Circuit breaker BCT secondary rated continuous current shall be 10 A minimum. Circuit breaker BCT rating factor (R.F.) shall equal 2.0.

7.2.4. Two trip circuits shall be provided with independent 125 V DC control circuits. If two trip coils operate a single armature, both coils shall be designed or marked in such a way as to prevent their being connected in a manner that would result in the circuit breaker not tripping in the event that both coils are energized simultaneously.

7.2.5. Trip circuit or close circuit DC current shall not exceed 15 A (instantaneous and steady state) for the circuit breaker trip or close circuit. If electromechanical protective relays with DC operated 'target and seal-in' units are used in the substation, then the circuit breaker trip circuit shall not draw less than 4 A DC current and a circuit breaker close circuit shall not draw less than 2 A DC current in order ensure reliable 'target and seal-in' unit operation.

7.2.6. The DC negative of a trip circuit shall not be fused or use a circuit breaker inside the circuit breaker control cabinet.

7.2.7. Surge suppression shall be provided on each trip and close coil. Reference CenterPoint Energy 007-400-02 Specification for Remote Telemetry of a Customer-Owned Facility.

7.2.8. The circuit breaker operating mechanism shall be both mechanically and electrically trip-free in any position. For oil circuit breakers, a latch check switch shall be provided.

7.2.9. Circuit breakers with air closing mechanisms shall have stored energy for at least 5 close-open operations. Circuit breakers with spring closing mechanisms shall have the spring charging motor circuit connected to a 125 V DC battery source utilizing a DC supply cable dedicated for this purpose. Voltage rollover from AC to DC shall not be installed for the spring charging motor circuit for circuit breakers.

7.2.10. Gas circuit breakers shall have low SF6 gas pressure alarm and close inhibit contacts.

The customer shall indicate on the relay and metering one-line diagram whether the low SF6 gas pressure wiring is set to 'BLOCK TRIP' or to 'AUTO TRIP' the circuit breaker.

7.2.11. Circuit breaker internal time delay circuitry for reclosing shall not be utilized. External time delayed automatic reclosing, when utilized, shall be wired/connected directly to the circuit breaker close circuit. External time delay for the circuit breaker closing circuit is to be provided by the automatic reclosing scheme.

7.2.12. The circuit breaker internal close and trip circuits shall not go through a 'local/remote' control switch in the circuit breaker. However, if a circuit breaker comes from the manufacturer with a 'local/remote' control switch installed in the circuit breaker, then the 'remote' contact of the control switch that is wired in series with the close and trip circuits must be 'shorted out' or 'by-passed'.

7.3. The requirements for air break switches are as follows:

7.3.1. Transmission line disconnect switches and all disconnect switches in the customer-owned substation 'loop' shall be of the outdoor, three pole, gang operated type rated 138 kV nominal, and shall have minimum continuous current rating of 4000 A, an overload capability of 110 percent of rated current for 2 hours and a rated minimum withstand capability of 164 kA peak for at least 1.5 seconds. Disconnect switches that are not in the substation 'loop' (i.e., transformer high-side disconnect switch) may be rated for less than 4000 A continuous, but must have a rated minimum withstand capability of 164 kA peak. The switch air gap BIL shall coordinate with the BIL rating of the switch insulators. For customer-owned substations connecting to four or more CenterPoint Energy 138 kV transmission lines, contact CenterPoint Energy for the required rating of switches.

7.3.2. Transmission line disconnect switches are required for all substation types.

7.3.3. "Loop tap" substations must be configured and designed with equipment to permit switching for the scheduled outage of either transmission line section without interrupting service to the customer's load. An interrupting device attached to a disconnect switch in a "loop tap" substation for transmission line load breaking, loop switching or line dropping is not acceptable.

7.3.4. CenterPoint Energy does not require any 138 kV disconnect switch auxiliary contacts except as indicated in Sub-Article 9.1.5 of this specification.

7.3.5. Grounding switches are not permitted on 138 kV equipment. A 'grounding stud' or fabricated attachment for the application of temporary grounding cables may be installed if desired.

7.4. The requirements for surge arresters are as follows:

7.4.1. Surge arresters must be installed on 138 kV power transformers and in the substation on the incoming transmission line positions to protect substation 138 kV equipment including 138 kV coupling capacitors, line traps, instrument transformers, circuit breakers, etc.

7.4.2. All surge arresters shall be metal oxide type, 108 kV class minimum, with a minimum required maximum continuous over-voltage (MCOV) rating of 88 kV. The minimum required energy absorption capability is 7 kilojoules/ kV of MCOV rating. The surge arrester

must have a minimum required pressure relief capability of 63 kA rms symmetrical (or short circuit current rating of 63 kA rms symmetrical). In addition to meeting the CenterPoint Energy minimum requirements, a surge arrester with well-designed directional pressure relief ports can provide a benefit. In the event of a surge arrester internal short circuit, a surge arrester with well-designed directional pressure relief vent ports, and with the vent ports pointed in the appropriate direction, can minimize the possibility that the ionized gas emitted from the surge arrester will propagate into a multiphase fault and can minimize the possibility of the ionized gas, and possibly other materials emitted from the surge arrester from causing damage to other equipment.

7.4.3. All 138 kV surge arresters must be connected with a copper bond wire from the bottom flange of the arrester to the substation ground mat. If the customer desires to allow for grading / leakage current monitoring, the surge arresters may be mounted on plates using insulated spacers and associated hardware. The insulated copper ground conductor from the bottom flange of the arrester must be isolated from any other ground until it passes the point where a tong ammeter reading can be taken. The independent, insulated ground leads should be adequately marked to indicate A, B, and C phases.

7.5. The requirements for coupling capacitors or CVTs and line tuners are as follows:

7.5.1. CenterPoint Energy shall specify vendor and vendor style number for the coupling capacitor or CVT devices that are used for transmission line protective relaying or CenterPoint Energy supervisory control and data acquisition (SCADA) remote telemetry monitoring of CenterPoint Energy transmission lines according to CenterPoint Energy provided bill of materials. CenterPoint Energy shall specify vendor and vendor style number for the line tuners that are used for transmission line protective relaying according to CenterPoint Energy provided bill of materials.

7.5.2. The line tuner must be mounted at a level suitable for adjusting and testing while standing on the ground. The line tuner must be mounted at the base of the coupling capacitor stand to minimize the length of the carrier lead-in conductor connected between the line tuner and the coupling capacitor to reduce the stray capacitance and leakage to ground that will increase the losses of the tuner and affect the bandwidth.

7.5.3. The coupling capacitor or CVT shall not be used to structurally support the line trap. Refer to Sub-Article 7.6.3 of this specification.

7.6. The requirements for line traps are as follows:

7.6.1. CenterPoint Energy shall specify vendor and vendor style number for line trap devices that are used for transmission line protective relaying according to CenterPoint Energy provided bill of materials.

7.6.2. The line trap shall have a minimum continuous current rating of 4,000 A, and an overload capability of 110 percent of the rated current for 2 hours.

7.6.3. The line trap shall not be structurally supported by a coupling capacitor or CVT. Refer to Sub- Article 7.5.3 of this specification.

8. CONTROL CUBICLE

8.1. The control cubicle shall be a permanent, weatherproof structure constructed on a concrete foundation and scheduled for completion well in advance of the remainder of the substation to allow for adequate check out and testing. The ambient conditions inside the control cubicle shall not exceed 32°C (90°F) and 85% relative humidity. Adequate lighting shall be provided.

8.2. Wall space for metering boxes shall be provided in accordance with Sub-Article 9.1.3.1 of this specification.

8.3. If CenterPoint Energy has specified that transmission line protective relaying with power line carrier and/or fiber optic communication is utilized, power line carrier transmitter/receiver sets shall be procured by the customer according to CenterPoint Energy provided bill of material and/or the customer will provide wall space or floor space for a CenterPoint Energy provided fiber optic cable distribution box.

8.4. The customer shall provide space for the CenterPoint Energy remote telemetry equipment that will be installed in accordance with Sub-Article 12.1 of this specification.

8.5. A separate 120 V AC, 20 A circuit shall be provided to each of the following: (a) one of the metering boxes, (b) the power line carrier equipment location, and (c) the SCADA RTU cabinet (see CenterPoint Energy 007-400-02 Specification for Remote Telemetry of a Customer-Owned Facility).

8.6. One 120 V AC, 20 A outlet for protective relay testing equipment shall be located near the transmission line protective relays in the substation control cubicle.

8.7. A separate 130 V DC, 15 A circuit shall be provided to each of the following: (a) one of the metering boxes, and (b) the SCADA RTU cabinet (see CenterPoint Energy 007-400-02 Specification for Remote Telemetry of a Customer-Owned Facility).

8.8. If CenterPoint Energy transmission line fault location traveling wave system (TWS) equipment is to be installed, CenterPoint Energy will provide requirements.

9. METERING EQUIPMENT

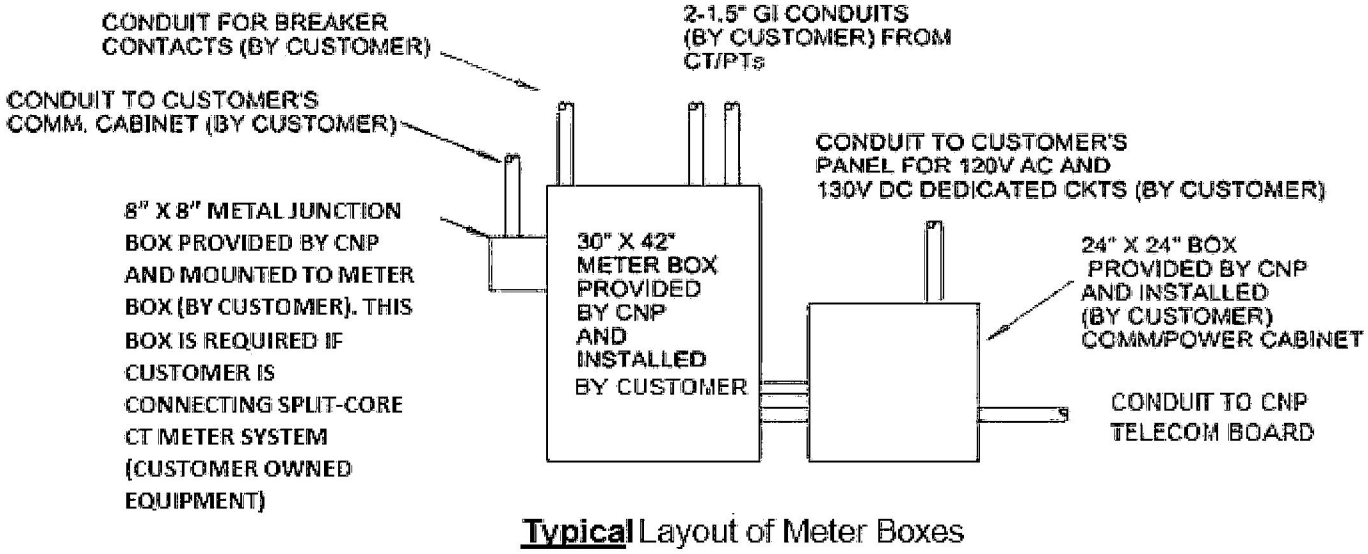
9.1. The requirements for metering are as follows:

9.1.1. Any part of the metering system that is installed by the customer or his agent shall conform to ANSI C12.1 at minimum, unless otherwise specified by CenterPoint Energy.

9.1.2. The customer shall submit a one-line diagram of the proposed substation configuration to CenterPoint Energy in accordance with Article 14 of this specification. CenterPoint Energy will designate on the one-line diagram the location of all metering instrument transformers (including, without limitation, quantity, transformation ratios, voltage class - high-side or low-side and ratings). The metering instrument transformers shall be connected to the transformer low-side or to the 138 kV substation bus by the customer as specified by CenterPoint Energy.

9.1.3. Metering boxes shall be located inside an environmentally controlled cubicle.

9.1.3.1. Each metering box is 30 inches wide, 42 inches high, 12 inches deep, wall mounted and approximately 36 inch from the floor. Wall space 3.0 ft. wide and 8.0 ft. high measured from the floor with 4.0 ft. (from wall) front clearance shall be provided for installation and maintenance of each metering box as illustrated in **Figure 11**. Metering boxes will be furnished by CenterPoint Energy and installed by the customer. The number of metering boxes will be determined by the metering scheme to be used.



Typical Layout of Meter Boxes

Figure 11

9.1.3.2. A customer requesting metering data shall provide all conduits and wiring necessary to connect to a meter comm/power box provided by CenterPoint Energy and mounted on the metering installation.

9.1.3.3. The customer shall provide a conduit from the CenterPoint Energy telecom board to the metering comm/power box.

9.1.4. CenterPoint Energy personnel will make all meter connections. For metering equipment details, consult the CenterPoint Energy project representative.

9.1.5. When high-side metering is used in a "full loop" alternative 'c' or alternative 'd' type substation (see Figure 4 and Figure 5), the customer shall provide and wire two auxiliary '52a' contacts from the circuit breaker between the two transmission lines ('A' circuit breaker) and a single auxiliary '52a' contact for each of the other two transmission line circuit breakers ('B' and 'C' circuit breakers) to the CenterPoint Energy high voltage metering box. Also, in a "full loop" alternative 'c' type substation (see Figure 4) with two transformer substation, two auxiliary '89a' contacts shall be provided on the disconnect switch between transformers and wired to the CenterPoint Energy high voltage metering box. When high-side metering is used in a "full loop" alternative 'e' type substation (see Figure 6), the customer shall provide

and wire a single auxiliary '52a' contact for each of the other two transmission line circuit breakers ('A', 'B', 'C' and 'D' circuit breakers) to the CenterPoint Energy high voltage metering box. When high-side metering is used in a "loop tap" alternative 'b' type substation (see Figure 3), the customer shall provide two auxiliary '89a' contacts from the disconnect switch located in the substation bus between the transmission line connections and a single auxiliary '52a' contact from each of the circuit breakers. The customer shall provide and install cable from these contacts to the metering location (routed via the protective relay panels) for 'rollover' of the metering potential to a second set of potential transformers.

9.1.6. When low-side metering is utilized, as determined by CenterPoint Energy, customer shall provide and install 138 kV CVT devices in accordance with Sub-Article 7.5 of this specification.

9.2. The requirements for switchgear mounted metering instrument transformers are as follows:

9.2.1. Where low-side metering is used, as determined by CenterPoint Energy, the customer shall install CenterPoint Energy specified metering instrument transformers in their switchgear.

9.2.1.1. The customer shall purchase and install the CenterPoint Energy specified metering instrument transformers.

9.2.1.2. Original certified test data shall be provided to CenterPoint Energy for each metering instrument transformer installed.

9.2.2. Metering current transformers shall be located in the incoming main breaker cubicle. The metering current transformers shall be installed by the customer.

9.2.3. Metering potential transformers shall be located in roll-out boxes. The potential transformers shall be installed by the customer.

9.2.3.1. The secondary windings shall be used only for CenterPoint Energy metering.

9.2.3.2. Potential transformers shall be equipped with 1 A, current limiting primary fuses.

9.2.4. The customer shall install a 1.5 in. rigid galvanized steel conduit from each instrument transformer cubicle to the meter box.

9.2.5. CenterPoint Energy shall supply cable for all metering instrument transformer secondary connections. The customer shall pull the CenterPoint Energy provided cable. CenterPoint Energy shall make all metering instrument transformer secondary connections.

9.2.6. The customer shall supply copper ground wire from the customer's switchgear to the CenterPoint Energy meter box.

9.3. The requirements for 138 kV metering instrument transformers are as follows:

9.3.1. When 138 kV metering is used, CenterPoint Energy will furnish all 138 kV metering instrument transformers (i.e., separate 138 kV 'free-standing' current and potential transformers) required for CenterPoint Energy revenue metering or ERCOT Polled

Settlement metering ("EPS").

9.3.2. CenterPoint Energy will mount the instrument transformers on stands provided by the customer in accordance with Sub-Article 5.6 of this specification. The substation layout and location of the 138 kV metering instrument transformers shall incorporate the requirement of vehicle access up to the instrument transformers for installation, testing and future replacement (i.e., vehicle access not obstructed by substation bus, cable tray, etc.). The customer shall furnish flexible connections from the substation bus to the instrument transformers with NEMA CC 1 standard four-hole terminals (0.5625 in. diameter holes on 1.75 in. centers). CenterPoint Energy personnel will bolt the flexible connections to the instrument transformers.

9.3.3. The customer shall utilize rigid galvanized steel conduit, flexible metallic conduit and pull boxes, including pull string, for the cables/conductors from the metering instrument transformers to the metering box location.

9.3.3.1. For each set of current or potential transformer stands, 1.50 in. rigid galvanized steel conduit shall be used to connect the individual instrument transformers to a common junction box for this set of instrument transformers (i.e., one common junction box for each set of current or potential transformer stands) located on or near the base of one of the instrument transformer stands. The 1.50 in. conduit shall terminate within 12 in. from the top of each instrument transformer stand. A 2.00 in. rigid galvanized steel conduit shall be used from each common junction box located at the base of one of the instrument transformer stands to the metering box.

9.3.3.2. All 2.00 in. rigid galvanized steel conduit shall terminate at the base of the primary metering box. No more than four conduits are to be terminated in a metering box. Contact CenterPoint Energy if additional conduits are required.

9.3.3.3. Flexible metallic conduit shall be used as needed to complete the installation to the instrument transformers, common junction boxes, and the metering box(es).

9.3.4. Potential transformers for revenue metering located in the 138 kV substation yard shall be furnished and installed by CenterPoint Energy on instrument transformer stands provided by the customer. The potential transformers will be rated 80,500/115-67.08 V for use on 138 kV grounded neutral system in accordance with IEEE C57.13.

9.3.4.1. The potential transformers will have three secondary windings (i.e., "X", "Y", and "Z"). The "X" and "Z" windings will be used for transmission line protective relaying, SCADA and the customer's equipment. The "Y" winding will be used exclusively for CenterPoint Energy metering.

9.3.4.2. A minimum 16 inches wide, 14 inches high, 6 inches deep potential transformer common junction box and secondary fuses shall be provided and installed by the customer and located at the base of one of the potential transformer stands. Each secondary winding shall be separately fused at the potential transformer junction box to provide circuit isolation and short circuit protection; except that neutrals shall not be fused (brass or copper dummy fuses required).

9.3.4.3. CenterPoint Energy shall supply cable/conductors for the potential transformers "Y" winding secondary connections. The customer shall supply cable/conductors for the potential transformers "X" and "Z" windings secondary connections. The customer shall pull the CenterPoint Energy provided cable/conductors and customer supplied cable/conductors. CenterPoint Energy shall make the potential transformers "Y" winding secondary connections. The customer shall make the potential transformers "X" and "Z" windings secondary connections. The potential transformer cables/conductors shall be connected as shown on CenterPoint Energy drawing 581-500-01 138 kV Potential Transformer Schematic and Wiring Diagram.

9.3.4.4. The potential transformer primary shall be wye connected with a solid ground connection at the potential transformer location. The potential transformer secondary windings shall be wye connected with one neutral conductor per set of "X" and "Z" windings carried to the transmission line protective relay panel and another neutral conductor for the "Y" winding will be carried to the meter box, as shown on CenterPoint Energy Drawing 581- 500-01 138 kV Potential Transformer Schematic and Wiring Diagram. These neutral conductors shall be grounded at the transmission line protective relay panel and meter box only.

9.3.4.5. If any 138 kV potential transformer "X" or "Z" winding of any phase is not used for any relaying, SCADA or customer's equipment, the secondary "3" terminal of any unused winding must be connected to a conductor that is grounded at a panel in the control cubicle.

9.3.5. Metering current transformers located in the 138 kV substation yard shall be furnished and installed by CenterPoint Energy on instrument transformer stands provided by customer.

9.3.5.1. CenterPoint Energy shall supply cable for the metering current transformer's secondary connections. The customer shall pull the CenterPoint Energy provided cable. CenterPoint Energy shall make the metering current transformer's secondary connections.

9.3.5.2. A minimum 16 inches wide, 14 inches high, 6 inches deep current transformer common junction box shall be provided and installed by the customer and located at the base of one of the current transformer stands.

9.3.6. The customer shall provide a copper bond wire from the ground mat to the case of each instrument transformer. The wire shall be sized equal to the ground mat. CenterPoint Energy will terminate and connect the wire at the instrument transformer case.

10. FUSING AND CONNECTION OF PROTECTION AND CONTROL AND METERING CIRCUITS

10.1. Mersen Ferraz Shawmut type A2Y, A2K or A2D or Littelfuse type KLNR fuses shall be used for fusing of the 138 kV potential transformers secondary relaying and metering circuits of less than 250 V AC as follows:

10.1.1. 138 kV potential transformers secondary "X" winding and "Z" winding shall be fused with 30 A fuses at the potential transformer junction box in the yard except that neutrals shall not

be fused (brass or copper dummy fuses required).

10.1.2. 138 kV potential transformers secondary "Y" windings shall be fused with 60 A fuses at the potential transformer junction box in the yard except that neutrals shall not be fused (brass or copper dummy fuses required).

10.1.3. 15 A fuses shall be used for protective relaying potential branch circuits.

10.1.4. 6 A fuses shall be used for instrumentation potential branch circuits.

10.2. Mersen Ferraz Shawmut type A2Y, A2K or A2D or Littelfuse type KLNR fuses shall be used for fusing of 138 kV coupling CVT secondary relaying and instrumentation circuits of less than 250 V AC as follows:

10.2.1. CVT secondary windings shall be fused with 6 A secondary fuses at the CVT junction box in the yard except that neutrals shall not be fused.

10.2.2. 3 A fuses shall be used for protective relaying potential branch circuits.

10.3. Mersen Ferraz Shawmut type A2Y, A2K or A2D or Littelfuse type KLNR fuses shall be used for fusing of relaying DC circuits of less than 250 V DC as follows:

10.3.1. The trip circuit connection from the control cubicle panel to each 138 kV breaker trip coil shall be fused with a 15 A panel mounted fuse located on the appropriate control cubicle panel.

10.3.2. 30 A fuses shall be used for the CenterPoint Energy SCADA control positive.

10.4. The voltage drop from the control cubicle to the trip circuit at the circuit breakers shall not exceed 10% of rated battery voltage under normal expected operating conditions.

10.4.1. With outdoor circuit breakers and indoor protective relay and control panels, a routing method herein called "radial", shall be used since the dc circuitry to the circuit breakers radiates outward from the control cubicle. Routing of the conductors is from the dc supply to the protective relay and control panels or switchboards and then on to the circuit breakers. Positive and negative conductors are carefully routed together so that sudden changes in current, such as those from tripping a circuit breaker, do not result in large magnetic coupling to other control and measuring conductors. The effects of external magnetic fields tend to cancel when the "go" and "return" conductors are in close proximity. All wires of a circuit should be contained in the same cable so that all are affected similarly by any inductive coupling.

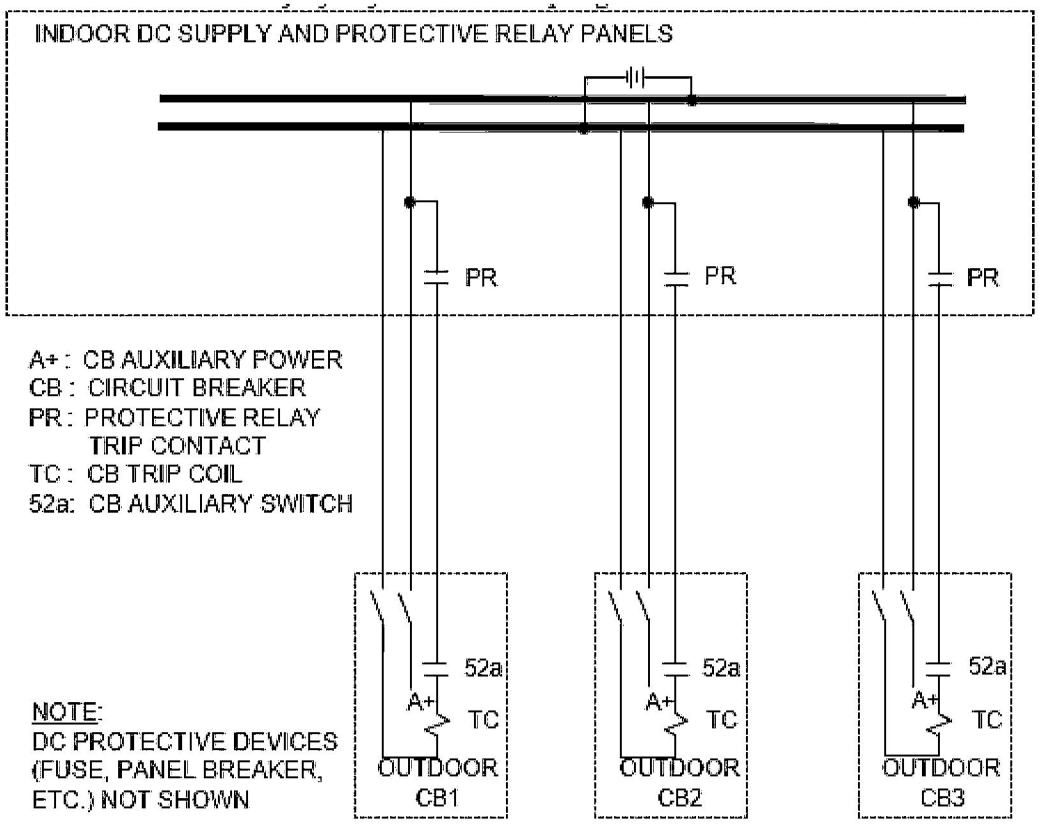


Figure 12

11. PROTECTIVE RELAYING FOR HIGH VOLTAGE (138 KV)

11.1. The customer will procure and own all the protective relays in the substation. A "full loop" substation configuration requires 138 kV transmission line protective relaying (including transmission line protective relay communication channels), 138 kV transmission line automatic reclosing and local breaker failure relaying for all 138 kV circuit breakers. CenterPoint Energy will specify in a bill of materials, as indicated in Sub-Article 11.3 of this specification, the protective relay style numbers for the multifunction (i.e., 138 kV transmission line protective relaying, circuit breaker automatic reclosing and local breaker failure relaying) microprocessor 138 kV transmission line protective relays. If the customer desires to install single function protective relays that are dedicated for breaker failure relaying, then the customer must consult CenterPoint Energy during the development of the relaying and metering one line diagram regarding which relays CenterPoint Energy personnel will calculate relay settings, apply the settings and test. CenterPoint Energy will specify in a bill of materials, as indicated in Sub-Article 11.3 of this specification, the manufacturer and protective relay type for the single function protective relays that are dedicated for breaker failure relaying. CenterPoint Energy will calculate and implement relay settings for customer-owned 138 kV transmission line protective relays, for single function protective relays that are dedicated for breaker failure relaying for only the circuit breakers that switch the CenterPoint Energy transmission lines and for customer-owned 138 kV relays installed to prevent back- energizing CenterPoint Energy's

transmission system from generation installed on the low-side of customer power transformers. CenterPoint Energy will not consider customer requests for programing additional items in the transmission line protective relay for customers use (i.e., relay elements, inputs or outputs, etc.). The customer may request information be exported from the transmission line protective relay that are CenterPoint Energy's standard programing of the relay (i.e., metering values, events, relay elements, inputs or outputs, etc.) via a communication port to the CenterPoint Energy SCADA RTU. On a case-by-case basis, CenterPoint Energy may issue settings for other customer-owned relays. In accordance with Sub-Articles 11.2 and 11.3, and 11.5 of this specification, the customer will propose 138 kV bus, 138 kV transformer protective relay schemes and, for "full loop" substation configurations, breaker failure relaying for all circuit breakers that do not switch the CenterPoint Energy transmission lines. The customer shall submit to CenterPoint Energy the customer calculated relay settings for, and allow CenterPoint Energy to observe the functional testing of, the 138 kV bus and 138 kV transformer protective relay schemes and breaker failure relaying for all circuit breakers that do not switch the CenterPoint Energy transmission lines.

11.2. Protective relaying for elements that compose the 138 kV facilities (i.e., 138 kV transmission lines, 138 kV buses, 138 kV power transformers, etc.) shall consist of two independent schemes for the protection of each element. The protective relays associated with the first scheme shall be connected to a different set of current transformers than the relays associated with the second scheme. The DC branch circuit associated with one relaying scheme (i.e., relay power supply, input, outputs, etc.) shall be a different DC branch circuit than the DC branch circuit associated with the second relaying scheme (i.e., independent DC branch circuit). Each of the two schemes shall energize both trip coils of a circuit breaker using appropriate DC separation and separate output contacts.

11.3. To ensure coordination with other transmission system protective relaying for a "full loop" substation configuration, CenterPoint Energy will furnish typical AC and DC schematics and a minimum required bill of materials for the protective relay style numbers for the multifunction (i.e., 138 kV transmission line protective relaying, circuit breaker automatic reclosing and local breaker failure relaying) microprocessor 138 kV transmission line protective relays including protective relay communication channel equipment. The customer shall indicate the CenterPoint Energy specified transmission line protective relaying schemes and proposed relaying schemes for each 138 kV bus (including 138 kV transformer high-side bus) and transformer protection on a substation relaying and metering one line diagram. Once CenterPoint Energy has reviewed these schemes, the customer shall submit the appropriate relaying drawings and customer's bill of materials to CenterPoint Energy for functional review. After these drawings and the bill of materials are reviewed by CenterPoint Energy, the customer shall order the appropriate equipment and install these schemes. CenterPoint Energy personnel will calculate set points for the multifunction microprocessor 138 kV transmission line protective relays, apply the settings and test the transmission line protection relays after the customer has completed point- to-point wiring checks of protective relaying and control panels and verified protective relaying control circuits by performing functional trip and close testing as described in Article 16 of this specification. The customer shall calculate set points for the 138 kV bus and transformer protection relays and submit this information to CenterPoint Energy for review. After CenterPoint Energy has reviewed the 138 kV bus and transformer protection set points, the customer will apply the settings and test the relays after the customer has completed point-to-point wiring checks of protective relaying and control panels and verified protective relaying control circuits by performing functional trip and close testing as described in Article 16 of this specification. IT SHALL BE THE CUSTOMER'S RESPONSIBILITY TO INSTALL ALL WIRING AND PEFORM ALL POINT-TO-POINT WIRING CHECKS AND CORRECT ANY WIRING

ERRORS.

11.4. A 'Sync Panel' is required only for a "full loop" substation configuration. The Sync Panel consists of a synchroscope, a voltmeter and three sync lights. The 'Sync Panel' typically consists of a small subpanel mounted on hinges to one of the substation protection and control panels and must be visible from the location of the 138 kV circuit breaker control switches. Other arrangements may be acceptable (i.e., 'Sync Panel' components mounted on the same protection and control panel that all of the 138 kV circuit breaker control switches are mounted on). CenterPoint Energy will specify the 'Sync Panel' requirements in a bill of materials referenced in Sub-Article 14.1.2 of this specification.

11.5. For "full loop" substations equipped with transmission line protective relaying, the current carrying capability of the components in the protective relaying schemes (relay devices, auxiliary current transformers, monitoring devices, current test switches, terminal connectors, switchboard panel wiring, cable, etc.) shall meet a minimum continuous secondary current rating equivalent to a primary continuous ampere rating of 4,000A and 2-hr emergency ampere rating of 4,400A, unless otherwise specified by CenterPoint Energy. For substations with four or more 138kV transmission lines, the continuous and 2-hr emergency ratings of this equipment may be required to be greater than these values.

11.6. The following are minimum requirements for 138 kV bus and transformer protection:

11.6.1. Bus protection shall include two independent instantaneous bus differential protective relays (device function 87). A power transformer connected to a bus position will utilize the same two sets of power transformer high-side BCTs (Sub-Article 7.1.2) for both the bus differential protective relays and the power transformer protective relays (Sub-Article 11.6.2). For a Figure 2 substation configuration, instantaneous overcurrent protective relays (device function 50) may be utilized for protection of the bus between the 138 kV circuit breaker and the 138 kV transformer high-side.

11.6.2. Each power transformer shall be protected by two protective relays. As a minimum, one of the power transformer protective relays shall be a transformer differential relay (device function 87T), which shall be connected to one of the two sets of power transformer high-side BCTs and the other power transformer protective relay shall have instantaneous and time overcurrent relay (device function 50/51) which shall be connected to a different set of power transformer high- side BCTs than the transformer differential relay. If two multifunction microprocessor current differential protective relays are utilized, CenterPoint Energy does not object to the implementation of both a transformer differential function and a transformer instantaneous/time overcurrent function in each of the two protective relays.

11.6.3. The three-line AC schematic drawing(s) showing bus differential protective relay connections and transformer protective relay connections should clearly indicate polarity markings on all current transformers and all protective relay current inputs.

11.6.4. Power transformer sudden pressure relay and oil level device(s) should be connected for alarming and tripping. The sudden pressure relay and oil level device(s) should be connected to a different, independent DC branch circuit than the transformer differential relay.

11.6.5. If auxiliary relays (device function 94) or lockout relays (device function 86) are used for

tripping, then two independent relays are required for each tripping zone. The auxiliary relays or lockout relays should be connected to different, independent DC branch circuits.

11.7. All 138 kV circuit breakers connected to a new 138 kV "full loop" substation are required to incorporate local breaker failure relaying. Local breaker failure relaying may be required for each 138 kV circuit breaker at existing substations when deemed necessary by CenterPoint Energy. When practical, the protective relay performing the breaker failure function shall directly trip all appropriate 138 kV circuit breakers (i.e., not utilize an auxiliary relay, a lockout relay or another protection relay to trip the appropriate 138 kV circuit breakers). CenterPoint Energy personnel will calculate set points, apply the settings and test the breaker failure scheme if it is incorporated in transmission line protective relays. If the customer desires to install single function protective relays that are dedicated for breaker failure relaying, then the customer must consult CenterPoint Energy during the development of the relaying and metering one line diagram (described in Sub-Article 14.1.2 of this specification) regarding which relays CenterPoint Energy personnel will calculate set points, apply the settings and test. CenterPoint Energy personnel will calculate set points, apply the settings and test the breaker failure scheme if it is incorporated in single function protective relays that are dedicated for breaker failure relaying but only for the circuit breakers that switch the CenterPoint Energy transmission lines. Testing of the breaker failure scheme in relays set by CenterPoint Energy will occur after the customer has completed the installation and has satisfactorily performed the system operational tests provided in Article 16 of this specification. IT SHALL BE THE CUSTOMER'S RESPONSIBILITY TO INSTALL ALL WIRING AND PEFORM ALL POINT-TO-POINT WIRING CHECKS AND CORRECT ANY WIRING ERRORS.

11.8. The following are specified for connections pertaining to protection and control cables:

11.8.1. Connections from one panel to another panel should be made from the terminal blocks on one panel to terminal blocks on the other panel (rather than directly from a device on one panel to a device on a different panel)

11.8.2. Protection and control cables should be color-coded and clearly marked to facilitate wire checking and troubleshooting.

11.8.3. Current transformer secondary cables shall be grounded only at the relay panels on the non-polarity side of the wye-connected current transformer.

11.9. CenterPoint Energy encourages the use of sequence of events recorders (SERs) and digital fault recorders (DFRs). The application of these systems involves trade-offs between the desire to monitor and record as much information as possible and the need to minimize the number of devices in protective relaying circuits to ensure reliable operation. Any customer planning to install one of these systems is encouraged to discuss their application philosophy with CenterPoint Energy early in the project and to show these devices in the appropriate relaying and SCADA AC and DC schematics when those drawings are submitted for CenterPoint Energy review.

11.10. Customer-owned Intelligent Electronic Devices (IEDs) with settings maintained by CenterPoint Energy (i.e. protective relays associated with CenterPoint Energy transmission network) are not allowed to be monitored directly by the customer. The data from these IEDs can be provided to the customer from a serial port on the CenterPoint Energy SCADA RTU.

11.10.1. The customer is permitted to connect directly (routable or non-routable communications) to IEDs with settings not maintained by CenterPoint Energy including SCADA electronic meters and microprocessor relays.

11.11. The following are specified for protective relay communication channels:

11.11.1. If the transmission line protective relaying utilized requires power line carrier communication, the power line carrier transmitter/receiver sets shall be located inside the substation control cubicle. The associated power line carrier coaxial cable utilized for making the connection from the substation control cubicle to the line tuner located near the 138 kV coupling capacitor shall be type RG-8/U, 11 AWG, stranded (7/19) bare copper, polyethylene dielectric, 50 ohm nominal impedance, with polyethylene outer jacket. (Note: If an alternate cable is used, an outer jacket with "Excellent" or "Outstanding" water resistance characteristic is required – PVC jacket is not acceptable). The line turner requires separate mounting at the base of the coupling capacitor stand. A single conductor must be run as directly as possible between this line turner and the coupling capacitor base housing. The single conductor must be 4 AWG stranded, 5 kV, non- shielded, XLP insulation. The single conductor must be mounted on insulators and fed through bushings at each end. The single conductor insulation should be unbroken between its ends to maintain low leakage. The single conductor must not be directly up against or touching the coupling capacitor support column or other metal components. The insulated single conductor lead-in can be installed in a PVC or other plastic conduit which should be supported on stand- offs or insulators.

11.11.2. When power line carrier communication is utilized, CenterPoint Energy shall determine the frequency for the power line carrier communication. The customer shall procure the power line carrier transmitter/receiver set with an automatic carrier tester according to CenterPoint Energy provided bill of material as indicated in Sub-Article 7.5 and 7.6 of this specification.

11.11.3. If transmission line protective relaying with fiber optics communication is utilized, the customer is required to provide a raceway for the fiber optic cable installation from the transmission line protective relay that requires the fiber optic communication (i.e., relay located in the substation control cubicle) to the base of the first CenterPoint Energy transmission line structure outside the substation. See Sub-Article 5.5.4 of this specification for cases where fiber optic cable comes in overhead. A dedicated raceway (conduit) is required for the fiber optic cable, however a dedicated inner duct installed in a cable trench or a dedicated conduit in a duct bank is acceptable. CenterPoint Energy shall be responsible for supplying, pulling and splicing of the fiber optic cable.

The following guidelines are for the customer provided raceway:

11.11.3.1. Flexible steel conduit 1.50 in. diameter, from the splice box, that is provided and mounted by CenterPoint Energy at the base of the first CenterPoint Energy transmission structure outside of the substation, to the end of the underground conduit provided by the customer.

11.11.3.2. Below grade conduit shall be a minimum 1.50 in. diameter PVC, Schedule 40 with "pull line" (continuous fiber polyolefin, 200 lbs. tensile strength) installed. Conduit shall be at least 18.00 in. below grade, with a protective concrete barrier. The minimum

bending radius shall be 24.00 in.

11.11.3.3. Pull boxes at grade level shall be provided along the cable raceway route at intervals not more than 300 ft. or two 90° bends. A cable pull box in the raceway route is required just inside the substation fence. Pull box shall be 30 in. x 60 in. x 30 in. (Quazite Style No. PG3060BB30 and PG3060HA).

11.11.3.4. The customer shall provide 5 in. x 19 in. x 12 in. rack space close to the transmission line protective relaying that utilizes fiber optics communication to accommodate a fiber optic cable distribution box. CenterPoint Energy will provide and install the fiber optic cable distribution box.

11.11.3.5. In cases where railroad tracks exist between the substation and the first CenterPoint Energy transmission structure outside of the substation, CenterPoint Energy will give site-specific requirements.

11.11.3.6. Customer shall submit drawings and other documents as necessary showing the raceway routing and construction details of the conduit according to Article 14 of this specification.

11.11.3.7. Actual designs shall be reviewed by CenterPoint Energy before construction starts.

12. REMOTE TELEMETRY

12.1. For remote telemetry requirements (i.e., SCADA), refer to CenterPoint Energy 007-400-02 Specification for Remote Telemetry of a Customer-Owned Facility.

13. GENERATION

13.1. Customers desiring to install and/or operate generation rated 1 MW or larger shall follow the Generation Interconnection or Modification Process (http://www.ercot.com). Generators shall comply with ERCOT Nodal Operating Guides and Protocols, ERCOT Planning Guides, and CenterPoint Energy engineering specifications and requirements.

13.2. CenterPoint Energy will construct new interconnection facilities or expand existing interconnection facilities depending on space and reliability need to serve as the Point of Interconnection Bus (POIB) for the customer as per the signed Standard Generation Interconnection Agreement (SGIA). Substation interconnecting facilities shall be in 'breaker-and-a-half' or 'ring' configuration and will be determined based on reliability need. If generation will be interconnected to existing facilities not entirely owned or operated by CenterPoint Energy, additional engineering and operational criteria will be considered to determine the feasibility.

13.3. For customers desiring to install and/or operate generation less than or equal to the customer's load (i.e., 'self-serve'), the requirements for relay and generation/load islanding schemes are as follows:

13.3.1. The customer shall be responsible for installing protective relays to ensure the customer's generators do not sustain a fault on the CenterPoint Energy transmission system. In addition,

customer generation shall not keep any portion of the CenterPoint Energy transmission system energized in the event that a portion of the CenterPoint Energy transmission system along with the customer's facilities becomes isolated from the rest of the CenterPoint Energy system. The transmission customer shall be responsible for installing protective relays to ensure the customer's generation does not interfere with the automatic reclosing system associated with the CenterPoint Energy transmission system (i.e., The first automatic reclosing attempt on CenterPoint Energy transmission line will occur a minimum of one second after initial trip. See Sub-Article 3.6). CenterPoint Energy will inform the customer of required changes to the automatic reclosing system at other substations associated with the CenterPoint Energy transmission system as a result of the operation of the customer's generators in parallel with the CenterPoint Energy transmission system. CenterPoint Energy will calculate and implement all settings for customer-owned relays installed for the protection and automatic reclosing of CenterPoint Energy transmission lines and for customer-owned 138 kV relays installed to prevent back- energizing a fault on the CenterPoint Energy's system from generation installed on the low-side of customer's power transformers.

13.3.2. The customer shall be responsible for installing controls to synchronize the customer's generators with the CenterPoint Energy's system.

13.3.3. The customer shall not intentionally impose additional load on the CenterPoint Energy transmission network during an under-frequency disturbance.

13.3.4. Customer may island their load and generation from CenterPoint Energy transmission system in one of the following manners (Note: This does not supersede any regulatory frequency ride-through requirements):

13.3.4.1. Customer may island their generation and load from the CenterPoint Energy transmission system if the frequency exceeds 61.8 Hz or goes below 57.5 Hz.

13.3.4.2. Customer may island its generation and a portion of its load from the CenterPoint Energy transmission system at any frequency, provided provisions are installed to ensure that any remaining load imposed on the CenterPoint Energy transmission system is not greater than the load prior to the beginning of the disturbance.

13.3.5. Verification of the implementation of the above requirements shall be in accordance with Article 14 of this specification.

14. DRAWING AND DOCUMENTATION COMPLIANCE REVIEW AND COMMENTS

14.1. The following completed engineering documents shall be submitted in the order shown below for CenterPoint Energy comments, functional review, and compliance with CenterPoint Energy specifications in accordance with Sub-Articles 14.2 through 14.6 of this specification:

14.1.1. Site preparation and plot plan drawings shall be submitted to CenterPoint Energy for comment. Facilities that must be shown on this drawing include the dimensions of the substation site, dead- end structure location, access roadways to substation, space around the outside of the substation, (roadways, railroad tracks, walks, pipe racks, etc.), drainage features such as culverts, ditches and detention facilities (if required). Additionally, the elevation of

the substation site should be indicated on these drawings (See Article 6 of this specification).

14.1.2. Relaying and metering one-line diagram of high voltage relaying and including generator protection one-line diagram for customers with parallel generation. The diagram shall indicate the maximum current transformer ratio and the current transformer tap ratio being utilized. The diagram shall indicate whether the 138 kV circuit breaker low SF6 gas pressure wiring is set to 'BLOCK TRIP' or to 'AUTO TRIP' the circuit breaker.

CenterPoint Energy shall indicate incoming 138 kV transmission lines designation, power line carrier frequencies (if applicable), location and ratings of metering instrument transformers (high- side or low-side), CenterPoint Energy designations for circuit breakers, switches, power transformers, generators (if applicable) and the CenterPoint Energy assigned long name and 3-character substation identification. CenterPoint Energy will provide a bill of materials as indicated in Sub- Article 11.3 of this specification.

The drawing shall then be revised to show the information provided by CenterPoint Energy and resubmitted to the CenterPoint Energy designated representative. (See Articles 9 and 11 of this specification).

14.1.3. Substation plan, profile and section view drawings, including bus and bus supports with material callouts. The plan and profiles must indicate the geographical base lines, center line of dead-end structure and height of static wire and phase wire pull off on the dead-end structure with coordinates and the CenterPoint Energy circuit name and circuit number for incoming 138 kV transmission lines. Material callouts including conductor size, type, and quantity shall be provided in sufficient detail to allow for determination of the continuous and emergency substation facility ratings (See Articles 4 and 5 of this specification).

14.1.4. Final/complete relaying and metering one-line diagrams, including generator protection one-line diagram for customers with parallel generation.

14.1.5. When the interconnection agreement indicates that the customer must install equipment (i.e., motor soft start, variable frequency drive (VFD), etc.) in order to satisfy the CenterPoint Energy interconnection requirements of Sub-Article 4.88 of this specification, drawings and documentation of equipment to be installed shall be submitted for CenterPoint Energy review.

14.1.6. Equipment specification for all major pieces of equipment such as power transformers, 138 kV circuit breakers, surge arresters, disconnect switches, coupling capacitors and line traps. (See Articles 4 and 7 of this specification).

14.1.7. The foundation location plan. (See Articles 5 and 6 of this specification).

14.1.8. Design calculations, drawings and associated documents for the substation dead-end structures, instrument transformer stands, and foundations. These documents shall be submitted 30 days prior to the scheduled fabrication start.

14.1.9. AC and DC schematics of high voltage relaying, control and SCADA schemes. AC and DC panel board drawings. These drawings shall be submitted after the documents required in Sub- Article 14.1.2 of this specification have been approved.

14.1.10. Where low-side metering is used, as determined by CenterPoint Energy, original certified test data in PDF electronic file shall be provided to CenterPoint Energy for each metering instrument transformer installed (See Sub-Articles 9.2.1.2 of this specification).

14.1.11. The power transformer AC schematic, breaker schematics and BCT curves.

14.1.12. Power transformer and 138 kV circuit breaker nameplate drawings, line trap instruction book and drawings and line tuner instruction book and drawings.

14.1.13. Relaying, control and SCADA bill of materials. These documents shall be submitted after the documents required in Sub-Article 14.1.4 of this specification have been approved.

14.1.14. Cable and conduit list and routing layout.

14.1.15. Front and Back View of high voltage relay and control panels including interconnections.

14.1.16. Substation control cubicle layout drawing. (See Article 8 of this specification).

14.1.17. Detail (point-to-point) wiring diagrams shall be submitted, not for approval, but for use in accordance with Article 11 of this specification.

14.1.18. The customer calculated relay settings for the 138 kV bus and 138 kV transformer protective relay schemes and 138 kV circuit breaker failure relaying.

14.2. A PDF electronic file of each of the drawings indicated in Sub-Article 14.1 of this specification shall be sent, for review/comments, to the CenterPoint Energy designated representative unless a different format is specifically requested by CenterPoint Energy. Certain types of engineering documents depend upon finalization of other documents. For example, relay panel drawings cannot be prepared until the relaying AC and DC schematics are finalized. Therefore, engineering documents shall be submitted for CenterPoint Energy comments or approval in the proper sequence.

14.3. Customer drawings should be 100% complete when given to CenterPoint Energy to review. If a functional review cannot be done, CenterPoint Energy shall comment on compliance with CenterPoint Energy specifications and return to customer. The drawings shall then be resubmitted with CenterPoint Energy comments incorporated when 100% complete. The customer shall then proceed with drawing submittal in accordance with Sub-Article 14.4 of this specification.

14.4. Customer drawings that are 100% complete and marked "For Approval" shall be functionally reviewed by CenterPoint Energy for compliance with CenterPoint Energy specifications. If additional comments are made by CenterPoint Energy on the 100% complete drawings, the customer may:

14.4.1. Incorporate the CenterPoint Energy comments and resubmit these drawings for further review of compliance with CenterPoint Energy specifications, or

14.4.2. Send a letter to the CenterPoint Energy designated representative acknowledging that CenterPoint Energy comments were received and shall be incorporated into the "For Construction" drawings.

14.5. Should the customer disagree with comments by CenterPoint Energy, the customer shall send a letter to the CenterPoint Energy designated representative explaining why revisions are not necessary.

14.6. Once all issues are resolved, the final set of drawings shall be marked "For Construction." After, the substation is energized a PDF electronic file of each of the drawings indicated in Sub-Article 14.1 of this specification, "As Built" drawings of the substation shall be sent to the CenterPoint Energy designated representative within 90 days.

15. EQUIPMENT INSTALLATION

15.1. The protective enclosure around the substation including gates and grounding shall be installed in accordance with the National Electrical Safety Code (IEEE C2), IEEE 1119 and IEEE 80.

15.2. CenterPoint Energy shall assign a long name and a 3-character substation identification to the customer-owned substation. CenterPoint Energy shall post the long name and 3-character substation identification on the door of the substation control cubicle and on the entrance gate of the substation. The long name and/or the 3-character substation identification shall be used to identify the customer-owned substation for any communications or correspondence. The 3-character mnemonic shall be used to identify the facility in the ERCOT Operations model.

15.3. The customer shall install all substation equipment and make all connections, except as otherwise noted in this specification. The customer shall make all equipment installation checks required by Article 16 of this specification and shall make all required measurements and readings available to CenterPoint Energy personnel if requested.

15.4. CenterPoint Energy will verify that the 138 kV switches operate correctly.

15.5. CenterPoint Energy will have the sole responsibility for calculating relay set points, applying relay settings and "out of case" testing of the following relays:

15.5.1. Transmission line relaying and tuning components of the associated power line carrier equipment communication channel,

15.5.2. Relays for 138 kV transmission line automatic reclosing, and

15.5.3. Relays for 138 kV breaker failure protection when specified by CenterPoint Energy.

Note: The appropriate operation of protective relays and control circuits by performing trip and close testing from devices of Sub-Articles 15.5.1 through 15.5.3 of this specification above shall be conducted with CenterPoint Energy present to direct and observe test (24 hr. advance notice required).

15.6. CenterPoint Energy will furnish locks which shall remain in series with customer locks for all 138 kV disconnect switches, substation control cubicle doors and gates(s) to and from the substation.

15.7. The 138 kV circuit breakers, air switches and power transformers will be assigned numbers in accordance with CenterPoint Energy dispatching numbers. The numbers are to be shown on the one-line diagram and shall be marked on the circuit breaker tanks, switch handles and power transformers.

15.8. CenterPoint Energy will coordinate and provide the procedures for energizing the customer-owned substation 138 kV equipment.

16. REQUIRED TESTS AND INSPECTIONS

16.1. During installation but prior to energizing the equipment, the customer shall perform the following tests and inspections. CenterPoint Energy will observe the tests below that are marked with an asterisk (*).

16.1.1. Diagnostic testing (e.g., insulation power factor ("Doble testing", etc.), insulation resistance ("Megger", etc.) of all equipment (e.g., arresters, coupling capacitors, etc.), including all tests as specified by manufacturer.

16.1.2. The required tests and inspections for control cables and panels are as follows:

16.1.2.1. Check continuity and perform insulation resistance test conductor-to-ground and conductor-to-conductor.

16.1.2.2. Perform a point-to-point wiring check of protective relaying and control panels.

16.1.2.3. Verify protective relaying control circuits by performing functional trip and close testing.*

16.1.2.4. Inject current from current transformers through relays.*

16.1.2.5. CenterPoint Energy personnel will calculate the set points, apply the settings and test the multi-function transmission line protection relays after the customer has completed point- to-point wiring checks of protective relaying and control panels and verified protective relaying control circuits by performing functional trip and close testing.

16.1.3. The required tests and inspections for power cables are as follows:

16.1.3.1. Check continuity and phasing sequence.

16.1.3.2. Perform insulation resistance test of cables.

16.1.3.3. High-pot.

16.1.4. The required tests and inspections for circuit breakers are as follows:

16.1.4.1. Inspect and adjust main auxiliary switch assembly per manufacturer's instructions.

16.1.4.2. Inspect, adjust, and lubricate operating mechanism per manufacturer's instructions.

16.1.4.3. Ratio check, excitation test, insulation resistance test, and polarity on all current transformers. Leave un-used current transformers shorted and grounded on secondary terminals.

16.1.4.4. Check resistance of close, trip and trip free coils.

16.1.4.5. Perform insulation resistance test of main contact assembly and bushings. Measure main contact resistance ("Ductor").

16.1.4.6. Make dielectric insulation and power factor tests on main contact assembly and bushings.

16.1.4.7. Perform insulation resistance test of control circuits conductor-to-ground and conductor- to-conductor.

16.1.4.8. Record all measurements and readings.

16.1.4.9. Make time-travel recordings to verify proper opening speed.

16.1.5. The required tests and inspections for disconnects and switches are as follows:

16.1.5.1. Check and adjust contact alignment and wipe.*

16.1.5.2. Adjust operating linkage to obtain full open and close positions and tighten all clamps and set screws.*

16.1.5.3. Check and tighten all electrical connections.

16.1.5.4. Lubricate linkage and bearings, if required.

16.1.5.5. Clean all grease from contacts.

16.1.6. The required tests and inspections for batteries and charger are as follows:

16.1.6.1. Assemble batteries per manufacturer's instructions.

16.1.6.2. Coat all connections on battery terminals with no-oxide grease.

16.1.6.3. Install, connect, and adjust charger per manufacturer's instructions.

16.1.6.4. Put batteries on equalize charge until the specific gravity of all cells is within the limits set by manufacturer.

16.1.6.5. Read and record the float voltage and specific gravity of each cell.

17. RECOMMENDED TESTS AND INSPECTIONS

17.1. During installation but prior to energizing the equipment, CenterPoint Energy recommends that the customer perform the following tests and inspections, as a minimum. This list is not considered to be exhaustive or all-inclusive.

17.1.1. For low-side equipment, test relays, check transformer and bus automatic reclosing and check operations indicators when tripping through the panel with current.

Note: CenterPoint Energy will calculate and implement all settings for customer-owned relays installed for the protection and automatic reclosing of CNP transmission lines and for customer-owned 138 kV relays installed to prevent back-energizing CNP's system from generation installed on the low-side of customer power transformers. On a case-by-case basis, CNP may issue settings for other customer-owned relays.

17.1.2. The recommended tests and inspections for all substation equipment are as follows:

17.1.2.1. Clean rusted surfaces, prime all bare metal surfaces, and touch up with paint matching the finish coat.

17.1.3. The recommended tests and inspections for control work are as follows:

17.1.3.1. Wire check all cables to current transformers and perform insulation resistance test of cables.

17.1.3.2. In the following order:

17.1.3.2.1. Polarity check current transformers.

17.1.3.2.2. Ratio check current transformers.

17.1.3.2.3. Excitation test current transformers.

17.1.3.2.4. Insulation resistance test current transformers.

17.1.3.3. Check cable connections to panels.

17.1.3.4. Wires check panels.

17.1.4. The recommended tests and inspections for switchgear are as follows:

17.1.4.1. Check all bolted bus connections.

17.1.4.2. High-pot cable with 25 kV DC.

17.1.4.3. Ensure that all exposed bus work is properly insulated.

17.1.4.4. Bridge all bus work.

17.1.4.5. Perform dielectric insulation and power factor tests on all bus work.

17.1.4.6. Check breaker-lifting devices for alignment and adjust limit switches, if necessary.

17.1.4.7. Adjust auxiliary and cell switches.

17.1.4.8. Check continuity for all AC, DC control, and current transformer circuits.

17.1.5. The recommended tests and inspections for transformers are as follows:

17.1.5.1. Visually inspect for internal shipping damage and check all internal connections.

17.1.5.2. Install bushing and accessories per manufacturer's instructions.

17.1.5.3. Inspect load tap changer (LTC) compartment and adjust per manufacturer's instruction and check LTC operation, if applicable.

17.1.5.4. Bridge primary and secondary windings on all tap positions and a final check on the tap position that will be used.

17.1.5.5. Ratio check, excitation test, perform insulation resistance test, and check polarity on all current transformers. Leave unused current transformers shorted and grounded on the secondary.

17.1.5.6. Vacuum fill per manufacturer's instructions.

17.1.5.7. Check for oil and gas leaks. (This may be done prior to vacuum filling).

17.1.5.8. Test oil before and after filling. (Maximum power factor, minimum dielectric strength, color, acidity, and interfacial tension).

17.1.5.9. Test oil for dissolved combustible gas and moisture content (Note: This test is to be performed 24 to 48 hours after the substation has been energized).

17.1.5.10. Check voltage regulating relay and controls.

17.1.5.11. Check cooling equipment and controls.

17.1.5.12. Check nitrogen-regulating equipment and adjust per manufacturer's instructions.

17.1.5.13. Check sudden pressure relay and associated circuits.

17.1.5.14. Check and connect desired alarm circuits.

17.1.5.15. Perform insulation resistance test and insulation power factor test of bushing and windings (e.g., "Doble testing").

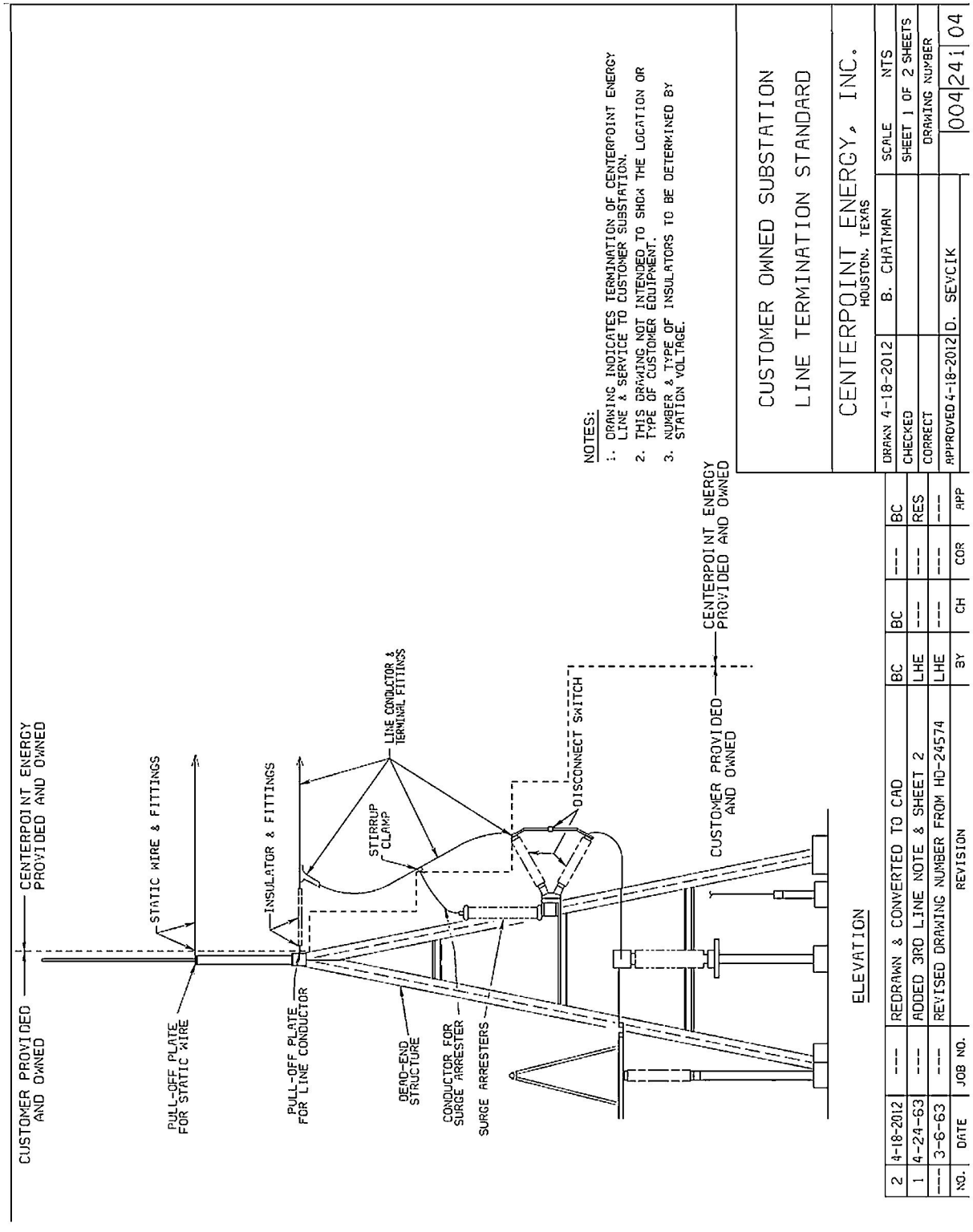
17.1.5.16. Check all bushings to bus connections.

17.1.5.17. Check all current transformers and control circuit connections.

17.1.5.18. Record all measurements and readings.

17.1.5.19. Check core ground.

18. REFERENCE DRAWINGS

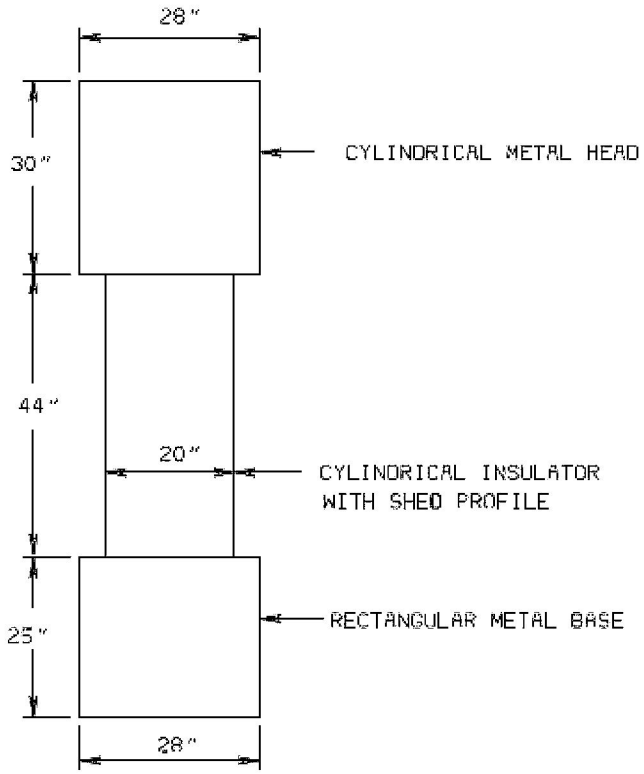


THIS DIAGRAM REPRESENTS THE MAXIMUM DIMENSIONS, AND MAXIMUM WEIGHT OF POSSIBLE 138 KV CT'S OR PT'S THAT CENTERPOINT ENERGY WILL PROVIDE FOR THE 138 KV BILLING METER.

THIS DIAGRAM PROVIDES THE NECESSARY STRUCTURAL AND MECHANICAL DESIGN PARAMETERS TO BE USED FOR THE INSTRUMENT TRANSFORMER FOUNDATIONS AND STANDS THAT WILL SUPPORT 138 KV CT'S OR PT'S THAT CENTERPOINT ENERGY WILL PROVIDE.

THIS DIAGRAM MUST ALSO BE USED, IN CONJUNCTION WITH SUBSTATION BUS PROFILE DIMENSIONS, TO DETERMINE THE HEIGHT OF THE STANDS THAT WILL SUPPORT THE INSTRUMENT TRANSFORMERS THAT CNP WOULD PROVIDE FOR THE 138 KV BILLING METERING.

AFTER THE INSTRUMENT TRANSFORMER STAND HEIGHT HAS BEEN DETERMINED BASED ON THE ABOVE INFORMATION, THE MANUFACTURER'S OUTLINE DRAWING FOR THE ACTUAL 138 KV CT'S AND PT'S THAT CENTERPOINT ENERGY WILL PROVIDE MUST BE USED TO DETERMINE THE DETAILS OF THE PRIMARY CONNECTION(S) AND SECONDARY TERMINAL BOX CONDUIT CONNECTION.



WEIGHT = 1500 LBS

NO.	DATE	JOB NO.	REVISION	DRS BY	CH	GDH	BC DATE
1	7-3-14		CHANGED DESIGN PARAMETERS				

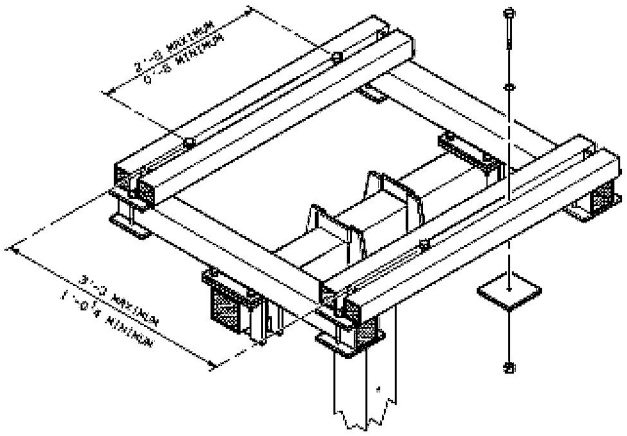
DESIGN CRITERIA
138KV STANDARD
INSTRUMENT TRANSFORMER STAND

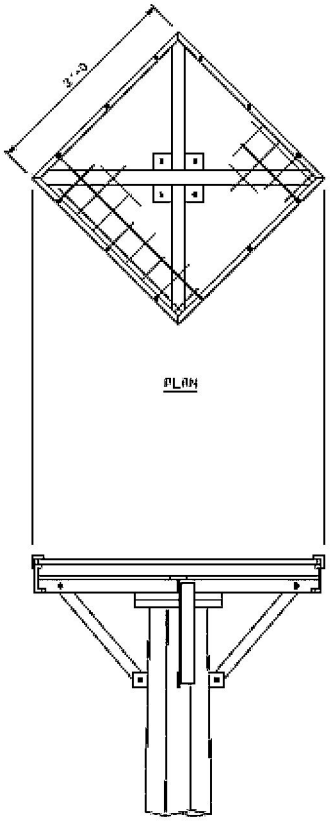
CENTERPOINT ENERGY, INC.
HOUSTON, TEXAS

DRAWN 1-24-94	REK	SCALE NTS
CHECKED 1-24-94	REK	SHEET 1 OF 2 SHEETS
CORRECT		DRAWING NUMBER
APPROVED		171 190 06

CENTERPOINT ENERGY
HOUSTON, TX

NO	DATE	ITEMS REVISED	BY	CH	APP			
18	9/8/2023	Updates to various sections	Var	Var	PM			
	1/5/2023	Add clarification on TIF and restriction to rings	MCK	Var	JPB	WRITTEN	4/9/74	E. C. Reid
17	9/2/2021	Update sections 4 & 11	Var	Var	GAC	CHECKED	4/10/74	L. G. Pond
16	8/3/2017	Update Sections 8 & 9 for Telecom	CWM	Var	MDB	APPROVED	7/17/74	C. S. Kayser
15	11/16/2015	Updates	Var	Var	DRS	Page 44 of 46		
NO	DATE	ITEMS REVISED	BY	CH	APP	SPECIFICATION No. 007-2231-14		





THE INSTRUMENT TRANSFORMER STAND MOUNTING SURFACE FOR THE 138 KV CT & PT THAT CENTERPOINT ENERGY WILL PROVIDE FOR THE 138 KV BILLING METERING MUST BE ADJUSTABLE OR USE GRATING TO ACCOMMODATE DIVERSE INSTRUMENT TRANSFORMER MOUNTING BOLT PATTERNS.

NO.	DATE	JOB NO.	REVISION	DRS BY	CH	CDR	BC APP
1	7-3-14		CHANGED MOUNTING BASE OPTIONS	DRS			BC

DESIGN CRITERIA
138KV STANDARD
INSTRUMENT TRANSFORMER STAND
CENTERPOINT ENERGY, INC.
HOUSTON, TEXAS

DRAWN 1-24-94	REK	SCALE NTS
CHECKED 1-24-94	REK	SHEET 2 OF 2 SHEETS
CORRECT		DRAWING NUMBER
APPROVED		171 190 06

CENTERPOINT ENERGY
HOUSTON, TX

NO	DATE	ITEMS REVISED	BY	CH	APP			
18	9/8/2023	Updates to various sections	Var	Var	PM			
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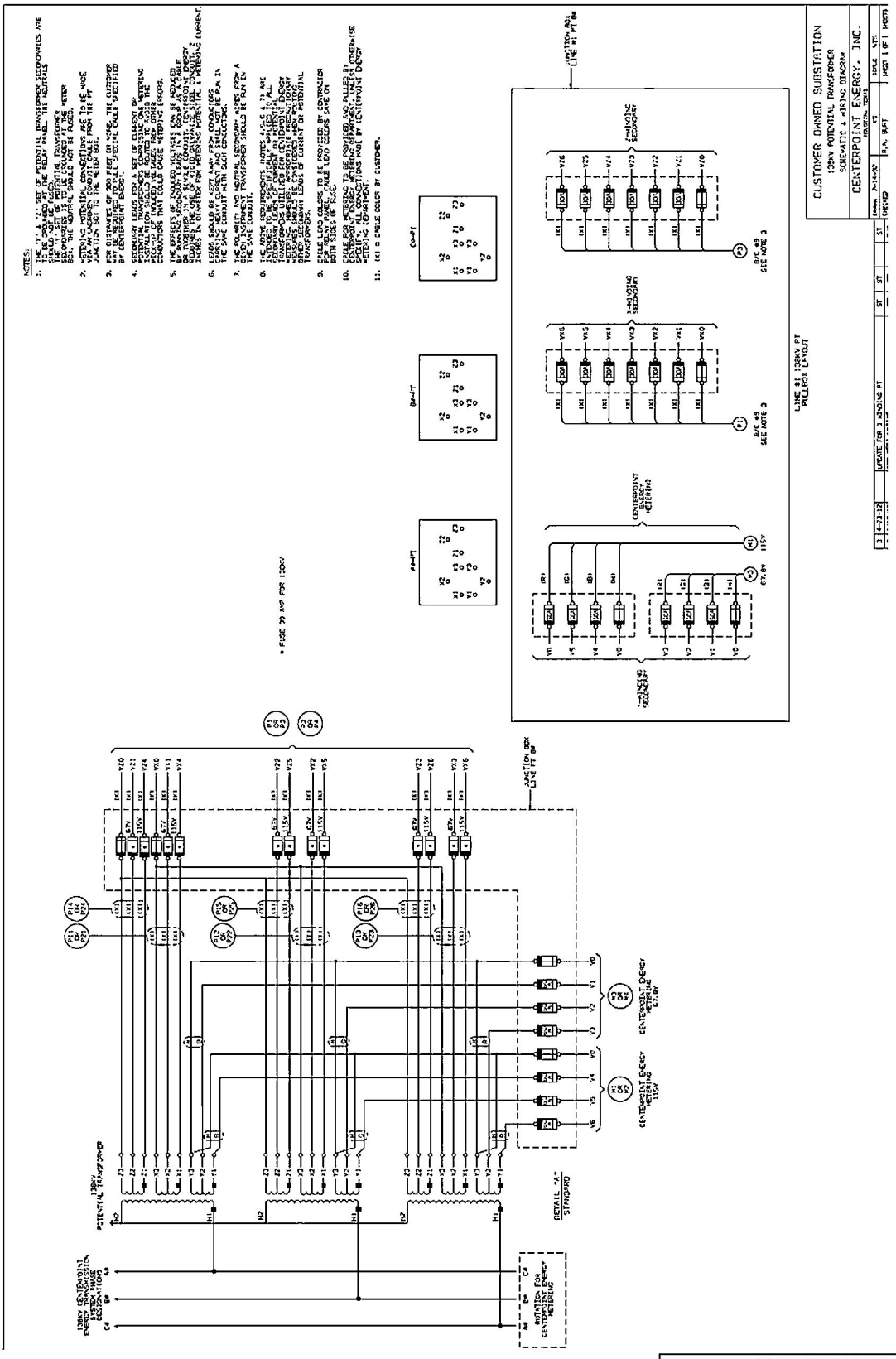
15	11/16/2015	Updates	Var	Var	DRS	Page 45 of 46		
						SPECIFICATION No. 007-2231-14		



						CENTERPOINT ENERGY HOUSTON, TX		
18	9/8/2023	Updates to various sections	Var	Var	PM			
	1/5/2023	Add clarification on TIF and restriction to rings	MCK	Var	JPB	WRITTEN	4/9/74	E. C. Reid
17	9/2/2021	Update sections 4 & 11	Var	Var	GAC	CHECKED	4/10/74	L. G. Pond
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15	11/16/2015	Updates	Var	Var	DRS	Page 46 of 46		
NO	**DATE**	**ITEMS REVISED**	**BY**	**CH**	**APP**	SPECIFICATION No. 007-2231-14		

Exhibit "I"
Minimum Acceptable Requirements for 345 kV Substation Construction

The following CenterPoint Energy minimum acceptable electrical, mechanical, and structural design characteristics pertains to the 345 kV substation facilities owned by Generator for interconnection of the generation facility known as GIFSUB Substation to the CenterPoint Energy 345 kV TIFSUB Substation and the CenterPoint Energy transmission network:

1. Maximum operating voltage = 362.5 kV.

2. Impulse level (for equipment not listed below, excluding transformer winding BIL) = 1300 kV BIL.

3. Bus and switch insulator impulse level (leakage) = 1300 kV BIL (231 inches).

4. Apparatus bushing (porcelain insulators, circuit breaker bushings transformer bushings, etc.) impulse level (leakage) = 1300 kV BIL (225 Inches).

5. If the 345 kV substation facilities owned by Generator for interconnection of the generation facility known as GIFSUB Substation will be in a contaminated area, as determined by Generator, all porcelain (i.e. insulators, circuit breaker bushings transformer bushings, etc.) shall be coated with a room temperature vulcanizing (RTV) silicone rubber.

6. Phase-to-ground clearance (metal-to-metal) = 105 inches.

7. Phase-to-phase clearance (metal-to-metal) = 119 inches.

8. The CenterPoint Energy 345 kV TIFSUB substation to be constructed for interconnection of GIFSUB substation and CenterPoint Energy transmission network will utilize 5000 A equipment. The 345 kV lines and equipment in the substation facilities owned by Generator for interconnection of the generation facility known as GIFSUB substation are not required to be 5000 A minimum. However, operational scenarios after a scheduled outage of equipment in the CenterPoint Energy 345 kV TIFSUB substation exist that would result in CenterPoint Energy transmission line network load current flowing on the 345 kV transmission lines and substation facilities owned by Generator. Therefore, CenterPoint Energy suggests that 345 kV transmission 'loop lines' and substation 'loop bus' facilities owned by Generator be 5000 A minimum.

9. Any 345 kV conductor connections shall utilize a minimum bundled 795 kcmil conductors.

10. The CenterPoint Energy 345 kV TIFSUB substation to be constructed for interconnection of GIFSUB substation and CenterPoint Energy transmission network will be designed for a total maximum anticipated fault current, including contribution from the Generator generation facility, of 63 kA rms symmetrical three phase and single phase, X/R of 15 and a duration of 0.25 seconds. The 345 kV substation facilities owned by Generator shall be designed for a total available short circuit current from all sources commensurate with the Generator 345 kV transmission line design, generation facility design and the CenterPoint Energy 345 kV TIFSUB substation design.

11. Normal anticipated wind speed conditions combined with maximum fault current = 15 mph, 63 kA.

12. Maximum anticipated wind speed conditions combined with reduced fault current (80%) = 120 mph, 50 kA.

13. The CenterPoint Energy 345 kV TIFSUB substation bus will not be directly bus connected to the 345 kV substation facilities owned by Generator for interconnection of the generation facility known as GIFSUB substation and therefore the bus height does not need to conform to CenterPoint Energy substation bus elevations.

14. Direct lightning stroke shielding design shall comply with IEEE standard 998.

15. Substation ground mat and fence grounding system shall comply with IEEE standard 80.

16 The CenterPoint Energy 345 kV TIFSUB substation will not be adjacent to 345 kV substation facilities owned by Generator for interconnection of the generation facility known as GIFSUB substation, and therefore the two substation ground mats will not be directly connected together by ground mat connections.

17. The CenterPoint Energy 345 kV TIFSUB substation circuit breaker current transformers (CTs) that connect to the CenterPoint Energy protective relaying schemes will be 4000:5 multi-ratio, two CTs per bushing, with C800 accuracy at the 3000:5 tap and a rating factor (RF) equal to 2.0. The secondary resistance of the CTs shall not exceed 0.0025 ohms per turn. The circuit breaker shall not have a capacitor across the interrupters. The interrupting capability and CT ratings of the 345 kV substation circuit breakers owned by Generator shall be commensurate with the Generator 345 kV transmission line design, generation facility design and the CenterPoint Energy 345 kV TIFSUB substation design. CenterPoint Energy will provide information on the minimum interruptible current rating of the breaker (63 kAIC or potentially higher) and CT ratio required after project commencement and determination of system conditions.

18. Surge arresters shall be station class with a minimum rated MCOV of 220 kV.

19. A key interlock system is not permitted on 345 kV equipment.

20. The use of manually applied grounding devices constructed of conductors and clamps is the norm for protective grounding of all de-energized 345 kV electrical apparatus directly connected to the CenterPoint Energy transmission system. The use of a 'grounding switch' that is motor operator and is electrically interlocked with the 'open' status of appropriate motor operated disconnect switch(es) will be considered acceptable to CenterPoint Energy provided drawings (i.e. the motor operator 'grounding switch' cannot be closed unless the surrounding motor operated disconnect switches are in the open position). This would be verified by CenterPoint Energy's review of substation protection & control drawings of the control for the motor operated 'grounding switch' and motor operated disconnect switches. Generator would be responsible for the periodic preventive maintenance of the motor operated 'grounding switch'. A manually operated 'grounding switch' associated with 345 kV equipment is not acceptable to CenterPoint Energy.

Exhibit "J"
Subtractive Metering – Transmission Voltage Guideline

SUBTRACTIVE METERING – TRANSMISSION VOLTAGE GUIDELINE

1. SCOPE

1.1. This guideline defines the requirements for Retail Subtractive Metering through a customer owned substation facility from CenterPoint Energy's (CNP) overhead transmission lines.

2. GENERAL

2.1. The metered service will require a signed Tariff Form: 6.3.4.1 – Agreement for Subtractive Metering – Transmission Voltage. The meters will be owned and maintained by CNP.

2.2. The subtractive meter installation is non-standard and will be provided at an additional charge pursuant to CNP Tariff, Section 6.1.1.1.5

2.3. The metered service is allowed only one voltage transformation from Retail Customer A's substation service voltage (i.e. 345kV/138kV, 138kV/12kV).

2.4. The customer shall submit a system one-line diagram of the service configuration with a load analysis to CenterPoint Energy Transmission Accounts.

2.5. All equipment, engineering and installation shall be furnished by the Customer unless otherwise noted in this guideline.

2.6. Communication equipment must also be installed and wired by Customer in the Customer's control building.

2.7. All equipment and work covered by this guideline shall be designed, constructed, and tested in accordance with the latest revisions or editions of industry requirements in effect at the time of fabrication. Industry requirements include the applicable codes, standards, specifications, regulations, tests, and procedures of all federal, state and local laws, and include (but are not limited to) the following:

2.7.1. American National Standards Institute (ANSI)
2.7.2. IEEE formerly the Institute of Electrical and Electronics Engineers, Inc.
2.7.3. National Electrical Manufacturers Association (NEMA)
2.7.4. Occupational Safety and Health Administration (OSHA)
2.7.5. Federal Communications Commission (FCC)
2.7.6. NFPA 70 - National Electric Code.

2.8. In the event of conflicting requirements, the order of precedence shall be this guideline.

3. DESIGN, LAYOUT , AND PHYSICAL CRITERIA (See Figure 1)

3.1. Each metering cabinet is 30 inches wide, 42 inches high, 12 inches deep and is wall mounted. Wall space 3.0 ft. wide and 8.0 ft. high measured from the floor with 4.0 ft. (from wall) front clearance shall be provided for installation of each metering cabinet. Metering cabinets will be furnished by CenterPoint Energy and installed by the customer. See CNP Service Standards Book for Company Offices.

3.2. Metering cabinets shall be located inside an environmentally controlled cubicle.

3.3. Any part of the metering system that is installed by the customer or its agent shall conform to ANSI C12.1 at minimum, unless otherwise specified by CenterPoint Energy.

3.4. Customers requesting metering data shall provide all conduits and wiring necessary to connect to a junction box provided by CenterPoint Energy and mounted on the metering installation.

3.5. The customer shall provide a conduit from the telephone board to the metering cabinet.

3.6. The Customer shall provide a 120 VAC, fifteen (15) amp, dedicated AC power circuit, protected by a fifteen (15) amp circuit breaker, to the Metering cabinet.

3.7. The Customer shall provide a 130 VDC, fifteen (15) amp, dedicated DC power circuit, protected by a fifteen (15) amp circuit breaker, to the Metering Cabinet.

3.8. SWITCHGEAR MOUNTED METERING INSTRUMENT TRANSFORMERS

3.8.1. The customer shall provide space for CenterPoint Energy specified instrument transformers in the customer's switchgear. CenterPoint Energy shall specify all instrument transformers used for CenterPoint Energy metering.

3.8.2. Metering current transformers (CTs) shall be located in the incoming main breaker cubicle. The CTs shall be installed by the customer.

3.8.3. Metering potential transformers (PTs) shall be located in roll-out boxes. The PTs shall be installed by the customer.

3.8.4. The secondary windings shall be used only for CenterPoint Energy metering.

3.8.5. The customer shall install a 1.5 in. rigid galvanized steel conduit from each instrument transformer cubicle to the meter cabinet (See Figure 1)

3.8.6. CenterPoint Energy personnel shall supply control cable and make all secondary instrument transformers connections. The customer is responsible for pulling the CenterPoint Energy provided control cable.

3.8.7. The customer shall supply copper ground wire from the customer's switchgear to the CenterPoint Energy meter.

4. COMMUNICATION LINES

4.1. The Customer shall provide and maintain a full business (lFB) phone line to be used by CNP for remote interrogation of the meters. This phone shall be direct dial and not go through the Customer's main switchboard or exchange.

4.2. The telephone communication circuit(s) shall be specified to operate in the event of power failure. The communication line shall remain operational in the event a line conditioner or loopback device fails.

4.3. The customer is responsible for arrangements with the telephone service provider to establish the telephone service up to a demarcation point in the control cubicle. The customer is responsible for providing any equipment required by the telephone service provider for telephone service to the demarcation point.

4.4. The customer is responsible for providing any equipment (e.g. telephone cable, conduit, etc.) from the telephone service provider demarcation point to the control cubicle telephone board.

5. CURRENT TRANSFORMERS AND POTENTIAL TRANSFORMERS

5.1. Instrument Transformers shall be delivered to CenterPoint Energy for testing along with the original certified test reports prior to installation by customer. (Contact Customer Rep. for Details)

5.2. The current transformers (CTs) will require 0.3% accuracy rating with a preferred 1.8 ohm burden rating or minimum acceptable burden rating of 0.9 ohm (IEEE C57.13).

5.3. The potential transformers (PTs) will require 0.3% accuracy rating, "Z" rating preferred (IEEE C57.13).

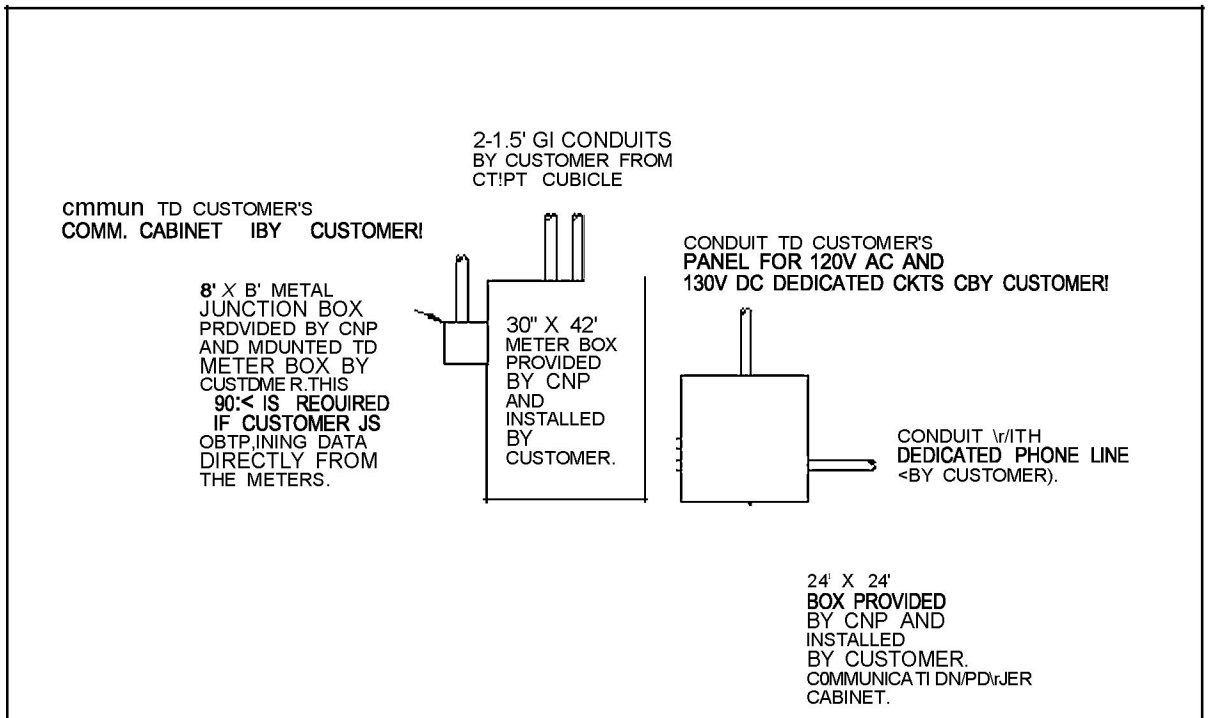
5.4. PT's shall be equipped with 1 A, current limiting primary fuses.

5.5. Replacement of any CTs or PTs, if necessary, shall be the Customer's responsibility.

6. CALIBRATION AND MAINTENANCE

6.1. After all equipment necessary for subtractive metering has been installed, CNP personnel will calibrate and verify operation of all equipment installed per this guideline.

6.2. The meters installed per this guideline will be maintained by CNP unless otherwise noted in an agreement with the Customer. Maintenance activities will include accuracy checks, recalibration and replacement/repair of equipment when required.



METER CABINET LAYOUT

FIGURE 1

Exhibit "K"
Specification for Installation of Access Roads, Paving, and Drainage

SPECIFICATION

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
P. O. BOX 1700, HOUSTON, TEXAS 77251-1500

A. CONSTRUCTION

Reference Drawings:

CenterPoint Energy Transmission Standards Manual
Drawing No.: 006-203-01
006-203-02
006-203-04
006-203-07
GC3GATE
Hike and Bike Trail Specification

Reference Specifications:

- **CenterPoint Energy #007-229-06**
- **Texas Health & Safety Code – Chapter 752**
- **Federal Regulations, Title 29, CFR 1926.651, CFR 1910.333 ASTM C76**
- **Texas Highway Department Standard Specifications for Construction of Highways, Streets and Bridges: Item 162,Item 164,Item 166**
- **American Association of State Highway and Transportation Officials (AASHTO) 17TH Edition-2002**

B. SPECIAL AND TECHNICAL CONDITIONS, FLEXIBLE BASE ROAD AND YARD PAVING

REFERENCE SPECIFICATIONS:

Texas Highway Department (THD) — **Item 260**
a/k/a Texas Department of Transportation (TxDOT)
1972 Standards for Construction — **Item 264**
Of Highways, Streets and Bridges — **Item 270**

Texas Highway Department Test Methods

Tex-101E-1966	**ASTM C14-75**
Tex-104E-1968	**ASTM C76-75**
Tex 106E-1962	**ASTM C506-75**
Tex 110 E 1968	**ASTM C150-76**
Tex 114E-1965	**ASTM D2487-69**
Tex 115E 1962	**AWPA C1-73**
Tex-116E 1962	**AWPA C2-73**
	AWPA A5-76
	AWPA P8-64
	AWPA P9-73

NO.	DATE	REVISION SECTION(S) AFFECTED	BY	CH	APP
1	07/03/86	Created	RDT	RNM	REB
2	05/05/03	Revised all sections	LRS	LRS	MJP
3	02/18/08	Revised all – Split Sec. 9	LRS	LRS	MJP
4	10/20/09	Revised Sect. 4	LRS	LRS	MJP
5	01/19/12	Revised Gate & Access Widths	LRS	LRS	MJP
6	02/10/14	Overall Revision	MDL	LRS	JHD

SPECIFICATION			
SHEET 1 of 35 SHEETS			
SPEC ID	007	231	79

CONTENTS

1.0 SCOPE

a. This specification covers the requirements that a Grantee/Contractor shall adhere to when performing work on the property of CenterPoint Energy.

b. At the time of this revision, the active Company Representatives for these specifications are:

Janice Coburn
Office 713-207-6138
Cell 281-460-0635

Travis Drabek
Office 713-207-6480
Cell 832-623-1326

D. Scott Humble
Office 713-207-6747
Cell 713-855-7836

Scott Owens
Office 713-207-4321
Cell 281-381-7387

2.0 DEFINITIONS

a. Company – CenterPoint Energy Houston Electric, LLC, which also may be referred to as Grantor in associated documents.

b. Company's Representative - The person or persons designated in the agreement to inspect the work performed on Company Property.

c. Company's Property - All property in which the company has an interest (easement or fee) including distribution easements, district office locations, and substations as they pertain to transmission use including towers, poles and wires, which also may be referred to as Grantor's Property in associated documents

d. Agreement – The written contract, letter agreement, or Document by which the company formally authorizes the use of its property by an outside party

e. Grantee - The actual owner, developer, lessee, private person, partnership, company, corporation or governmental entity that is responsible for the maintenance and control of the facility or work authorized by the Agreement, which also may be referred to as Grantee in associated documents.

f. Contractor – Any individual or business firm, separate from the grantee, but contracting to perform or supply part or all of the activity or facilities under the Grantee.

g. Subcontractor - Any individual or business firm, separate from the contractor, but contracting to perform or supply part or all of the activity or facilities under the Contractor. Any work performed by the Subcontractor and its agents or employees shall comply with the provisions of the Agreement as if they were employees of the Contractor.

3.0 GENERAL REQUIREMENTS FOR CONSTRUCTION

a. The following General Requirements in this section are applicable to a Grantee/Contractor requesting permission to perform construction work on Company's Property. The Special Requirements in other sections apply in addition to these General Requirements.

b. Any violation of the requirements contained herein shall be considered as grounds, by the Company's Representative, to stop the construction until corrective actions are taken.

c. No work shall be performed on Saturdays, Sundays or holidays on Company's Property unless approved by the Company's Representative forty-eight (48) hours in advance.

d. The Grantee/Contractor shall furnish to the Company's Representative access at all times to the work being done and to the premises used by the Grantee/Contractor, and shall provide every reasonable accommodation for the purpose of inspection, even to the extent of discontinuing portions of the work temporarily, or of uncovering or taking down portions of finished work.

e. Upon project completion, the Grantee/Contractor shall return Company's Property to its original condition or better, including roads, fences, and gates.

- The Grantee/Contractor shall grade Company's Property to a smooth finish, and all excess material shall be either removed from, or distributed on Company's Property as directed by the Company's Representative.

- All swales, ditches, and other surface graded areas disturbed during construction shall be seeded with Bermuda grass in accordance with Texas Highway Department Item 164. Fertilizer application shall conform to Texas Highway Department Item 166 and shall have an analysis of 16-8-8.

- All debris, vegetation or cleared materials shall be removed from Company's Property by the Grantee/Contractor, including:

  - ❖ Trash, rubble and any flammable materials.

  - ❖ Sand, concrete and construction materials.

- ❖ Containers of any type or character for the purpose of storing trash.

- ❖ Any material defined in environmental regulations as a solid waste, regulated toxic material or hazardous material.

f. DOCUMENTATION REQUIREMENTS

- The Grantee/Contractor shall have a copy of the signed Agreement at all times at the construction site where the operation of equipment is within Company's Property. It is the Grantee's responsibility to provide a copy of this specification to the Contractor and to ensure that all the provisions in the Agreement are followed.

- Any necessary field changes or modifications to the Agreement must be approved in writing by the Company's Representative prior to construction by the Grantee/Contractor.

- It is the Grantee/Contractor's responsibility to examine all the available records and to make a field inspection of the site and Company's Property for determination of the surface conditions and surface water conditions to be encountered, and the character of equipment and facilities needed for the desired work.

g. NOTIFICATION REQUIREMENTS

- The Grantee/Contractor shall be responsible for notifying all parties having an interest in or an easement on, under or above the subject Company's Property. The construction requirements of the parties with prior rights shall be observed; however, the Company's Specification for Construction shall be adhered to as a minimum.

- The Grantee/Contractor shall notify the Company's Representative seven (7) days prior to beginning any type of work so that an inspection of Company's facilities and/or properties can be arranged. The Grantee/Contractor shall provide the name and telephone number of their representative responsible for the construction activities to coordinate a preliminary inspection. The executing party of the Agreement shall pay the repair cost for damages to Company's facilities caused by the Grantee/Contractor.

- The Grantee/Contractor shall be responsible to call the One-Call Network at "8-1-1", forty- eight (48) hours prior to construction, to locate the Company's underground fiber optics line, and/or underground distribution facilities, and/or underground transmission facilities.

h. DAMAGE MITIGATION REQUIREMENTS

- Any use of land necessary by the Grantee/Contractor's operations which causes damage to property, crops, etc. shall be mitigated by the Grantee/Contractor at his expense.

- Any damage to Company's facilities or Company's Property caused by the Grantee/Contractor's operations shall be mitigated by the Grantee/Contractor at his expense.

i. SAFETY AND EQUIPMENT REQUIREMENTS

- It shall be the Grantee's responsibility to ensure that the Contractor be familiar with and comply with all local, state, and federal codes (i.e. Texas Health and Safety Code Chapter752 and Federal Regulations, Title 29, CFR 1910.333, CFR 1926.1407-1411) for construction operations in close proximity to electrical power lines. The Grantee/Contractor shall comply with all applicable federal, state, and local environmental regulations concerning the loading and transportation of hazardous materials.

- The Grantee/Contractor shall take all precautions necessary, shall be responsible for the safety of the work, and shall maintain all lights, guards, barriers, barricades, signs, temporary passageways, or other protection necessary for that purpose. The work shall be carried on to completion without damage to any work or property of the Company or of others and without interference with the operation of existing machinery or equipment.

- The Grantee/Contractor shall be responsible at all times for the safety of the general public and for the protection of persons who may for any reason enter within the limits of his work and shall comply with all the laws of the State of Texas and the United States and with all valid rules and regulations now in force or hereafter adopted pursuant there to. Effective barricades with acceptable warning and detour signs shall protect roads and highways closed to traffic. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset to sunrise. The Grantee/Contractor shall bear the entire expense and shall not be reimbursed directly or separately by the Company for providing and maintaining all necessary or required barricades, warning lights, danger signals, signs or other precautions for the protection of the work and safety of the public.

- If at any time the Grantee/Contractor's methods, materials or equipment appear to the Company's Representative to be unsafe, inefficient or inadequate for securing the safety of the workers, the public, or any Company's facilities, he may order the Grantee/Contractor to increase his safety, efficiency and adequacy, and the Grantee/Contractor shall comply with such orders. The failure of the Company's Representative to make such demands shall not relieve the Grantee/Contractor of his obligation to secure the quality and safe conduct of the work, and the grantee/Contractor alone shall be and remain liable and responsible for the safety, efficiency and adequacy of his methods, materials, working force and equipment, irrespective of whether or not any changes are made as a result of any orders received from the Company's Representative.

- The Grantee/Contractor shall immediately remove from the job, whenever requested to do so by the Company's Representative, any person considered to be disposed or disorderly, or for any other reason unsatisfactorily complying with the requirements of this specification, and such person shall not again be employed on the work without the consent of the Company.

- The Grantee/Contractor shall not permit or suffer the introduction or the use of intoxicating liquor or narcotic drugs upon any of the grounds occupied or controlled by the Company.

- No structure of any type shall be constructed on Company's Property unless a final set of detailed drawings have been reviewed and approved by the Transmission Operations Department. Structures include but are not limited to signs, fences, paving, lighting, drainage facilities, etc. All structures of any type must be properly grounded.

- No temporary fuel tanks shall be stored on Company's Property unless prior written approval has been granted. Prior to approval, a specific location will be determined by the Company's Representative and the Grantee/Contractor. Fuel tanks within Company's Property must be adequately grounded and bermed for spill protection.

- No equipment or material shall be permitted on Company's Property at a height greater than 15 feet above natural ground elevation, unless approved by the Company's Representative. Cranes, lifts, etc. shall be blocked so that operators may not bring the boom to a greater height.

- Trenching and excavation will not be permitted within twenty (20) feet of any structure foundation or other facilities measured at ground level unless approved by the Company's Representative.

- Excavation shall comply with CFR 1926.651. The installation of sheet piling, cribbing or other protective measures beyond the scope of CFR 1926 .651 will be required if stipulated by the Company's Representative.

- No self-propelled equipment shall be allowed directly beneath a lattice tower.

j. RIGHT OF WAY ACCESS REQUIREMENTS

- The Grantee/Contractor shall not sell, assign, or remove equipment or materials which have been installed by or which are owned by the Company and may be necessary for right-of-way access or any other activities without the written consent of the Company's Representative.

- No equipment, material, or railroad cars shall be stored on Company's Property without prior written consent.

- A minimum 20-foot wide access path along Company's Property shall be kept free of obstacles at all times to provide a passable area for the Company's equipment to travel.

- The Grantee/Contractor upon the request of the Company's Representative shall use matting on the right-of-way for temporary access on or across Company's Property.

k. DRAINAGE REQUIREMENTS

- Under no circumstances shall the natural drainage pattern of Company's Property be blocked or altered by construction. All previously existing ditches shall be re-established.

- All reinforced concrete pipes installed on Company's Property should be Class IV as specified by ASTM Specification C76 and should have a minimum of 12 inches of cover.

- All corrugated steel pipe and high density polyethylene pipe used for culverts and installed on Company's Property should be 16 gauges with 2 & 2/3" x ½" or 3" x 1" corrugations and have a minimum of 12 inches of cover or manufacturer's specified cover.

- The top of all manholes shall be built at final grade and must be capable of HS-20-44 loading, (A ASHTO 17th Edition-2002). All manholes must be protected with a minimum of four 6" diameter bollards made of wood or steel that are 6' long and set at least 24" in the ground with 48" above the ground.

l. SPOILING REQUIREMENTS

- No spoiling is allowed unless written approval has been obtained.
- Spoiling, if allowed, shall be done as directed by the Company's Representative. The spoil material shall be free of concrete, asphalt, steel, wood, or any other objectionable material. Spoil material shall not be stockpiled or placed over any distribution manholes, pull holes, etc. The spoil material shall be spread in lifts not to exceed 12" and compacted as required by the Company's Representative. The end results of spoiling and grading shall yield positive drainage and flow with no ponding.
- The elevation beneath any of the Company's structures within the limits of the proposed work shall be maintained equal to or greater than the surrounding finished grade elevation. Spoil material, if approved in writing, shall not exceed a point six (6) inches below the top elevation of the concrete cap of a tower foundation. Any spoil material added beneath the tower shall be compacted to 95% density with a tamper or hand vibratory equipment and shaped to a smooth finish to provide proper drainage.

4.0 SPECIAL REQUIREMENTS FOR PIPELINES AND VALVE SITES, COMMUNICATION CABLES AND CABLE TELEVISION INSTALLATIONS

a. Pipelines shall have a minimum cover of four (4) feet, measured from the top of the pipe to the natural ground level, unless otherwise specified in the Agreement.

b. Pipelines to be installed within twenty (20) feet of any structure foundation shall be installed by either boring, tunneling, or other protective methods approved by the Company Representative. Where boring is performed, the hole shall not be more than one (1) inch greater than the outside diameter of the pipe and the protective coating or casing. Where tunneling is performed and column bents of concrete are used, the top of the concrete shall be a minimum of three (3) feet below ground level and the remainder of the column shall be filled and compacted at lifts not to exceed twelve (12) inches to 95% Standard Proctor density. De-watering will not be permitted unless approved by the Company's Representative.

c. Trenches shall be backfilled, sufficiently compacted to prevent future settlement, and crowned as required by the Company's Representative. For any settlement that occurs as a result of access for the associated pipeline installation, the owner of the pipeline, upon request, shall fill or smooth the Company's right-of-way as directed.

d. No structure of any type shall be constructed on Company's Property unless described in detail in the formal agreement document, except for test point terminals and pipeline markers, which shall be installed in locations such that they do not create an obstruction to Company's equipment traveling within Company's Property.

e. If at any time the pipe is abandoned, the pipe shall be removed by the pipeline owner. If the pipe cannot be removed because of possible damage to Company's facilities (tower foundation, poles, etc.), the pipeline shall be cut 20' away from each side of the Company facility and the abandoned pipe section filled with grout to prevent future caving or settling.

f. Pipelines with a proposed location between a Company's structure and a down guy anchor or other appurtenance will be bored or tunneled unless specific approval has been granted by the Company's Representative.

g. New or relocated pipeline occupations that are located between a lattice tower's foundations will require the Company to install "Mower Guards" (Company Drawing #006-203-07) at each tower at the expense of the requesting pipeline company.

h. The following are additional requirements applicable to installations of valve and metering sites within Company's Property.

- No valve site or station is to be located closer than fifty (50) feet to a transmission structure or appurtenance without exclusive written consent.
- Valve sites or stations are to be located on Company's Property such that they do not limit access along Company's Property.
- Valve sites or stations are to have perimeter barricades or fences installed in order to prevent damage from equipment traveling along Company's Property.
- Valve sites or stations, plus an additional three (3) feet outside the site area, shall be kept free of high grass and weeds at all times by the valve owners.
- Valve sites or stations are to be well marked with the owner's name and telephone number to be called in cases of emergency.
- No blow-off vents or flares are to be located on Company's Property.
- Grounding/Anode Beds will be treated as a Valve Site, separately from the pipelines.

i. The following are additional requirements for pipeline crossings of the Company's underground electric distribution facilities.

- The Company will furnish upon Grantee/Contractor's request any drawings of the existing underground distribution facilities.

- If a crossing is required, the pipeline shall be installed beneath the Company's underground distribution facilities. A minimum vertical clearance of eighteen (18) inches must be maintained between the Company's underground distribution facilities and any other facilities (i.e. outside pipe wall to outside concrete encasement or pipe wall).

- If a pipeline is installed parallel to the Company's underground electric distribution facilities, a minimum horizontal clearance of five (5) feet must be maintained between the Company's underground distribution facilities and any other facilities (i.e. outside pipe wall to outside concrete encasement or pipe wall).

- If the Company's concrete encased duct bank is to be exposed during the installation or maintenance of a pipeline, the Company's duct bank must be fully supported every four (4) feet.

- Upon completion of the work, Grantee shall furnish the Company with a complete set of as-built drawings. Any substitutions or changes made by the Contractor/Grantee for the purpose of fabrication or installation shall be marked by Contractor/Grantee on those drawings and accompanied by a complete revised metes and bounds or centerline description if applicable.

j. COMMUNICATION CABLES AND CABLE TELEVISION INSTALLATIONS

- Overhead cables must be approved by a Representative from the Asset Planning and Optimization Transmission Encroachment & 3rd Party Use Department, for location and maximum and minimum height requirements.

- All underground occupations must be buried with a minimum 4.0' of cover and all above ground appurtenances must be approved for location.

5.0 SPECIAL REQUIREMENTS FOR DRAINAGE DITCHES

a. Ditch side slopes along Company's Property shall be "Asphalt Mulch Seeded" with Bermuda grass in accordance with Texas Highway Department, Item 164. Application of seed shall be at the rate of forty (40) pounds per acre. Asphalt Film Spray Emulsion SS-1, CSS-1, CMS-25, or MS-2 shall be used. This spray is to be applied at the rate of 0.2 to 0.4 gallons per square yard. Fertilizer application shall conform to Texas Highway Department, Item 166 and shall have an analysis of 16-8-8 urea form.

ALTERNATE: The Grantee/Contractor may use solid "Block Sodding" on ditch side slopes in accordance with Texas Highway Department, Item 162.

b. Cement stabilized limestone and cement stabilized sand shall conform to Company's Specification #007-229-06, attached hereto and made a part hereof.

c. Unless specified otherwise, the Grantee/Contractor shall install, for the exclusive use of the Company, a culvert crossing for access to Company's Property with a roadway width of twenty four (24) feet. The Grantee/Contractor shall install the roadway at the location stipulated in the Agreement or as determined by the Company's Representative.

d. Ditch design shall be such that erosion and slope stability is controlled by flat side slopes, natural vegetation, riprap or other approved methods. The side slopes of ditches shall not be steeper than 4:1.

e. The high bank of any ditch shall not be closer than twenty four (24) feet to any structure foundation measured at ground level unless approved by the Company's Representative. The high bank of any ditch shall not be closer than three (3) feet to any wood poles or appurtenances measured at ground level unless approved by the Company's Representative. If this is not possible, the wood poles will be braced or relocated by the Company at the Grantee/Contractor's expense.

6.0 SPECIAL REQUIREMENTS FOR STREETS, ROADS, HIKE AND BIKE TRAILS, AND PLAY GROUND EQUIPMENT

a. Barricades to protect the Company's structures shall be installed as required before construction of the street or road begins.

b. Unless specified otherwise, the Grantee/Contractor shall install, for the exclusive use by the Company, a twenty four (24) foot wide drive on both sides of the street or road. The Grantee/Contractor shall install the drive at the location stipulated in the Agreement or as determined by the Company's Representative. Curb cut-outs shall be installed with a five (5) foot radius.

c. Adequate drainage for Company's Property shall be provided and indicated on plan and profile drawings at each street or road crossing. Installation of drainage structures and/or shaping of the adjacent property to ensure proper drainage of Company's Property shall be done at Grantee/Contractor's expense.

d. Hike and Bike Trail minimum standards are referenced on CenterPoint Energy Transmission Standard, Hike and Bike Trails, Minimum Standards Drawings. Subject to full review and subject to change based on the field notes.

e. PLAY GROUP EQUIPMENT or ANY RECREATION FACILITIES is prohibited within Company's Property without any exception.

7.0 SPECIAL REQUIREMENTS FOR SPUR TRACKS

a. Company's structures located within twelve (12) feet of the nearest rail of the proposed rail spur shall be relocated at the spur track owner's expense. The Company's construction forces will relocate the structures.

b. For the exclusive use of the Company, the Grantee/Contractor shall install a twenty four (24) foot wide grade crossing over the spur track in accordance with local railroad specifications. Before construction can begin, the Grantee/Contractor shall assume responsibility for the exact location of the grade crossing with respect to the Company's right-of-way line as determined by the Company's Representative. If the spur right-of-way is to be cross-fenced, a twenty four (24) foot wide gate shall be installed in each cross fence at/and parallel to the grade crossing.

c. The top rail elevation shall not exceed four (4) feet above the natural ground elevation of the Company's right-of-way.

8.0 SPECIAL REQUIREMENTS FOR PARKING FACILITIES

a. Parking lot plans showing the area to be surfaced, curbs, fences, drainage and traffic access routes as applicable must be submitted to and approved by the Company's Representative prior to the granting of the Agreement.

b. No through roads will be allowed along Company's Property; therefore, if the parking lot has multiple entrances, the lot must be so constructed that through traffic is not possible.

c. Company's Property requested for parking must be immediately adjacent or substantially close to the Grantee's property.

d. The Grantee/Contractor shall be responsible for any damage to Company's facilities. This includes all existing structures as well as future structures. Barriers will be required if the proposed parking facility or any drives associated with the parking area are closer than ten (10) feet to any transmission facility. Barriers in accordance with Company's Drawing #006-203-01, 006-203-02, or 006-203-04, attached hereto and made a part hereof, shall be installed.

e. If fences or traffic restrictors are placed across Company's Property, the Grantee/Contractor must install a twenty four (24) foot gate in accordance with Company's Drawing #GC3GATE, attached hereto and made a part hereof, on which the Company will install a chain and lock.

f. The Company reserves the right to enter and traverse any parking facility as required for inspection, maintenance or construction purposes and reserves the right to cancel all or part of the agreement as may be required for the installation of future facilities or maintenance of existing facilities.

9.0 SPECIAL REQUIREMENTS FOR NURSERY OPERATIONS

a. Liquid fertilizer is not allowed on Company's Property.

b. No permanent sprinkler systems are allowed on Company's Property.

c. Only containerized trees and plants will be allowed on nursery operations and only to a maximum height of ten (10) feet.

d. No berms or earthen mounds will be allowed.

e. The Company is not to be held responsible for any plants that may be damaged due to emergency repair of the Company's facilities.

10.0 SPECIAL REQUIREMENTS FOR DECORATIVE PLANTING

a. No plants which at maturity are taller than ten (10) feet will be approved and subject to approval on a case by case basis. No planting shall be made closer than twenty (20) feet to any Company's structure.

b. No trees of any type will be allowed.

c. No berms or earthen mounds will be allowed.

d. No permanent sprinkler systems are allowed on Company's Property.

e. Liquid fertilizer is not allowed on Company's Property.

f. The Company reserves the right to have plantings removed by the Grantee/Contractor without notice. Should plantings not be removed, the Company will remove the plantings and not be liable for their replacement.

g. Any vegetation placed within Company's Property without prior written approval may be removed by the Company. The Grantee/Contractor shall be responsible for reimbursing the Company for removal of unauthorized plantings.

h. The Company is not to be held responsible for any decorative grass or plants that may be damaged.

i. Grantee shall keep Company Property free of high grass, weeds, and trash within the area covered by the Agreement.

11.0 SPECIAL REQUIREMENTS FOR PROTECTING CULTURAL RESOURCES, ARCHAEOLOGICAL SITES, AND THREATENED AND ENDANGERED PLANTS AND ANIMALS

a. Archaeological and historical sites

- Known or potential archaeological or historical site(s)

  - ❖ The Grantee/Contractor shall conspicuously mark the site areas in the field to ensure the areas are avoided by construction activities.

  - ❖ If a site is determined to be located in a wooded area, any necessary vegetation clearing shall be done in such a manner that the root zone is not disturbed until an archaeologist has completed and investigation of the site, including removal of all artifacts. This may be accomplished by using manually operated chain saws or mechanical cutters to cut down trees at ground level and lifting them onto trucks for transport out of the right of way rather than dragging them. When archaeological work is completed, stump grinders may be used to remove the remaining portions of large trees below ground level, after which the surrounding surface can be prepared for construction. More specific procedures for avoidance or lessening of damage to sites will be decided on a site-by-site basis, or as directed by the State Historic Preservation Office.

  - ❖ In certain circumstances, it may be necessary for vehicles to cross the identified archaeological/ historical areas. In such cases, loose earth fill, or other temporary ground cover, in a thickness necessary to prevent damage by the passage of vehicles over the site surface will be placed on such sites. The fill shall be a contrasting color or texture so as to allow re-establishment of the original site surface at a later date. The Grantee/Contractor shall document the placement and removal of such temporary fill.

- Unknown archaeological or historical site(s)

  - ❖ Upon discovery of any evidence of an archaeological or historical site (e.g. accumulations of oyster shells or other seashells, pottery or pottery pieces, animal or human bones, rusted metal such as nails or cannon balls), all construction operations in the immediate vicinity shall cease. The Grantee/ Contractor shall promptly contact the Company's Representative.

  - ❖ The Company will contact qualified environmental contractors to investigate the discovered site in accordance with applicable procedures and guidelines. The area of significance will be conspicuously marked in the field so that construction activities may proceed while avoiding the site.

- Mitigation process

  - ❖ If a structure or site cannot be protected through any relocation, stabilization or restoration technique, then mitigation of the construction effects on archaeological and/or historical sites will be performed in accordance with applicable procedures and guidelines as directed by the State Historic Preservation Office.

b. Endangered or threatened plants and animals

- Known locations of species and/or their habitats

  - ❖ The company may provide the Grantee/Contractor any previously documented sites of any known endangered and threatened species that it has discovered along the construction route. Where such documentation is provided, the Grantee/Contractor shall implement any mitigating actions required by the Company.

- Unknown locations of species and/or their habitats

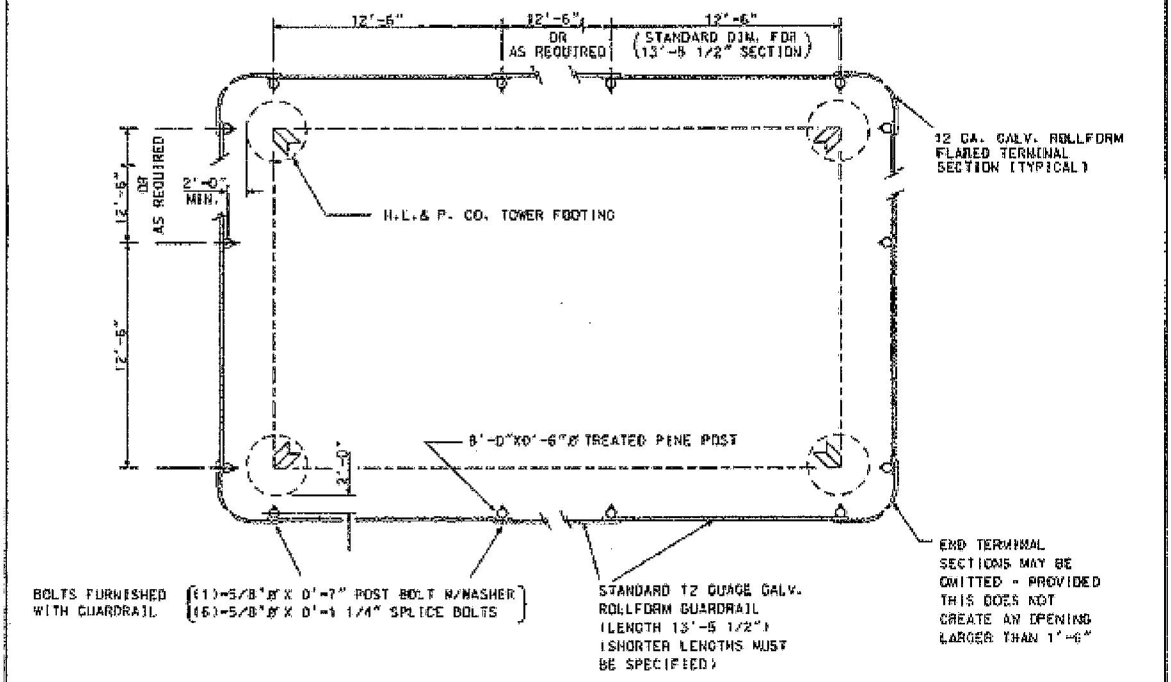
  - ❖ If during construction, the Grantee/Contractor discovers an endangered or threatened plant or animal species, the Grantee/Contractor shall cease all work in that immediate area. The Grantee/Contractor shall promptly notify the Company's Representative who will notify the appropriate State/Federal agencies for any required mitigating actions.

- ❖ If during construction, the Grantee/Contractor discovers an endangered or threatened plant or animal species, the Grantee/Contractor shall cease all work in that immediate area. The Grantee/Contractor shall promptly notify the Company's Representative who will notify the appropriate State/Federal agencies for any required mitigating actions.

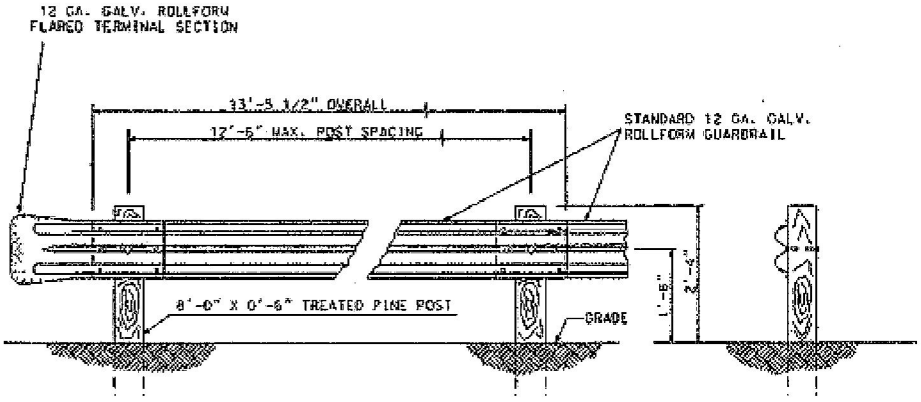
- Mitigation process

  - ❖ Any mitigation concerning endangered and/or threatened species, applicable to the project construction, will be reviewed by the Company and communicated to the Grantee/Contractor. Only when necessary mitigation measures have been completed by the Grantee/Contractor will construction work be reinitiated

CENTERPOINT ENERGY
TRANSMISSION STANDARD



PLAN



ELEVATION

SIDE VIEW

FOR USE ON HOUSTON LIGHTING AND POWER CO. RIGHTS-OF-WAY.

NO.	DATE	REVISION	BY	CHK	APP
1	11-18-93	CONVERT TO CAD	JME		

DRAWN	01-23-69	R.A.VAUGHT
CHECK	01-24-69	L.B.WADEMAN
CORR	01-27-69	E.A.TURNER

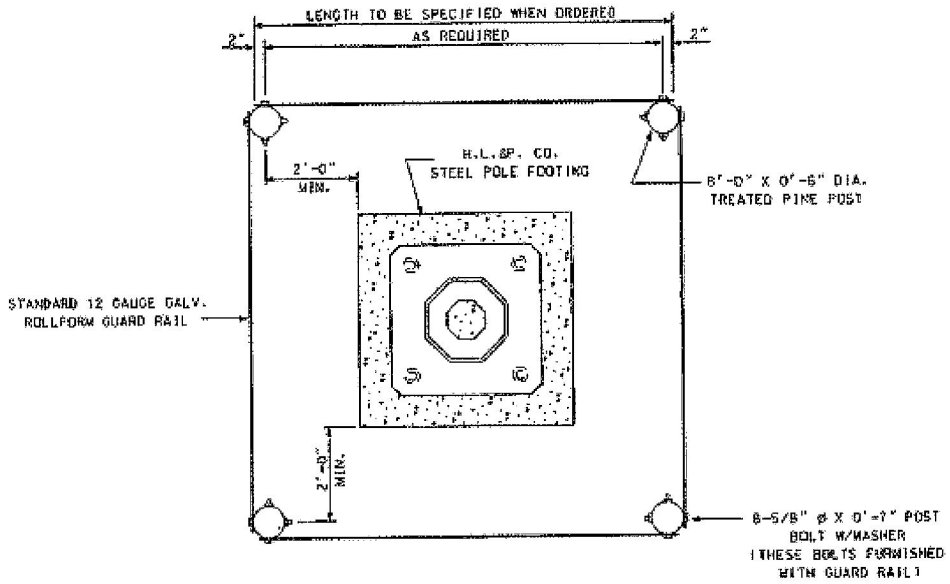
BARRIERS

TYPICAL DETAILS
GALVANIZED ROLLFORM
TOWER GUARD RAIL

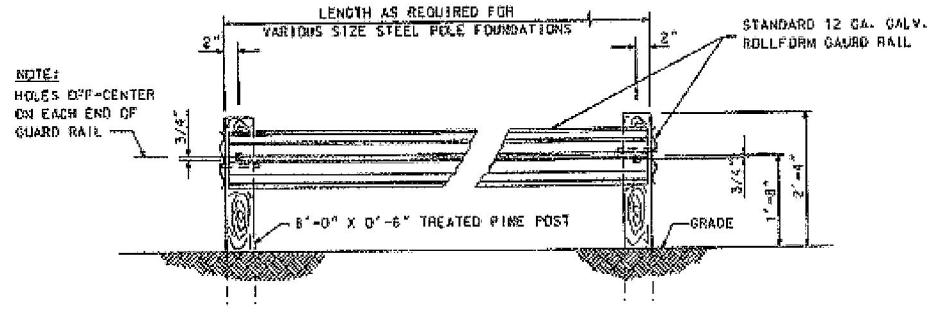
SCALE: NTS | SHEET 1 OF 1 | 006-203-01

SPECIFICATION			
SHEET	18 of	35	SHEETS
SPEC ID	007	231	79

CENTERPOINT ENERGY
TRANSMISSION STANDARD



PLAN



ELEVATION

FOR USE ON HOUSTON LIGHTING AND POWER CO. RIGHTS-OF-WAY.

NO.	DATE	REVISION	BY	CHK	APP'R
1	11-19-93	CONVERT TO CAD	LAW		

DRAWN	6/06/70	A.A.WRIGHT
CHECK		L.D.WIDEMAN
CORR	6/09/70	E.A.TURNER
APP'R		O.E.SIMMONS

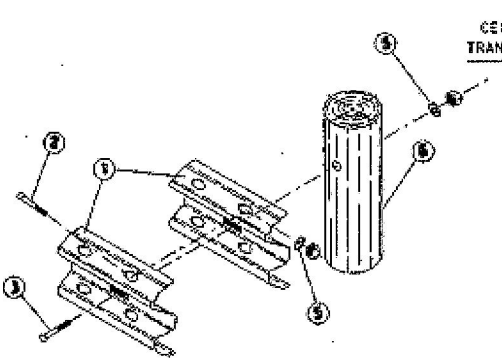
BARRIERS

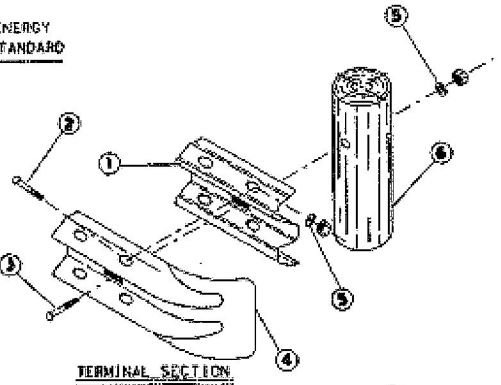
TYPICAL DETAILS GALVANIZED ROLLFORM STEEL POLE GUARD RAIL

SCALE: NTS | SHEET 1 OF 1 | 006-203-02

SPECIFICATION			
SHEET	19 of	35	SHEETS
SPEC ID	007	231	79

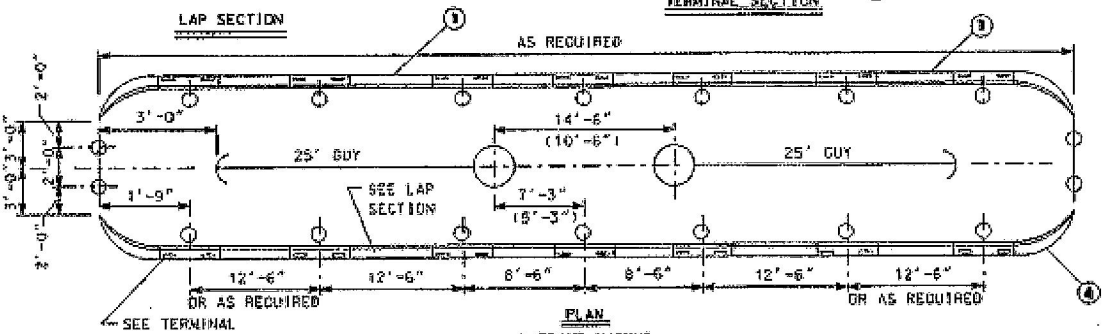
CENTERPOINT ENERGY
TRANSMISSION STANDARD



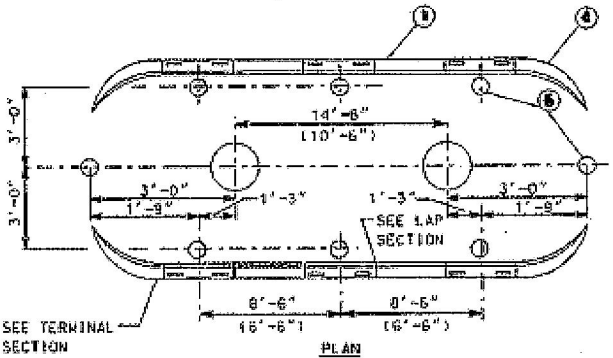


TERMINAL SECTION

LAP SECTION

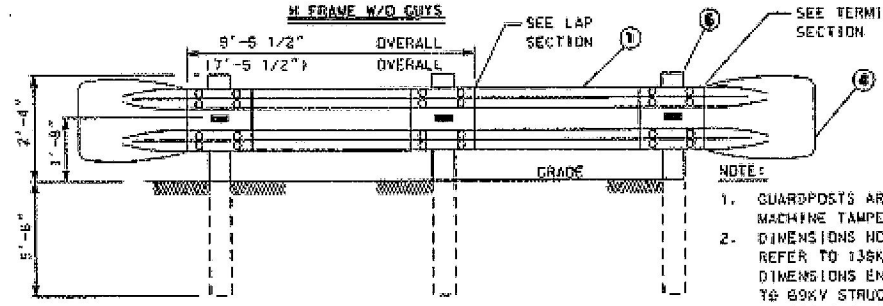


PLAN
H FRAME W/GUYS



PLAN
H FRAME W/O GUYS

MATERIAL LIST		
ITEM NO.	DESCRIPTION	QTY (AS REQ BY JOB)
1	GUARDRAIL (12 GA.) SEE NOTE 3	
2	BUTTON HEAD BOLT W/NUT 5/8" Ø x 9 1/4" WITH OVAL SHOULDER	
3	BUTTON HEAD BOLT W/NUT 5/8" Ø x 9 1/2" WITH OVAL SHOULDER	
4	TERMINAL SECTION	
5	WASHER FOR 5/8" Ø BOLT	
6	GUARD POST 8'-0" WITH 6" TOP DIA.	



ELEVATION

NOTE:
1. GUARDPOSTS ARE TO BE SET 5'-8" AND MACHINE TAMPED.
2. DIMENSIONS NOT ENCLOSED IN PARENTHESIS REFER TO 138KV H-FRAME STRUCTURES. DIMENSIONS ENCLOSED IN PARENTHESES REFER TO 69KV STRUCTURES.
3. GUARDRAILS MAY BE ORDERED AND FURNISHED TO LENGTH DESIRED.

NO.	DATE	REVISION	BY	CHK	APP'D
1	11-17-93	CONVERT TO CAD	TMY		

DRAWN	11-28-72	R.L. BLANKENSHIP
CHECK	12-21-72	J.W. HANSON
COOR	12-21-72	A. SUTOWSKI
APPR	12-22-72	J.A. CAMPBELL

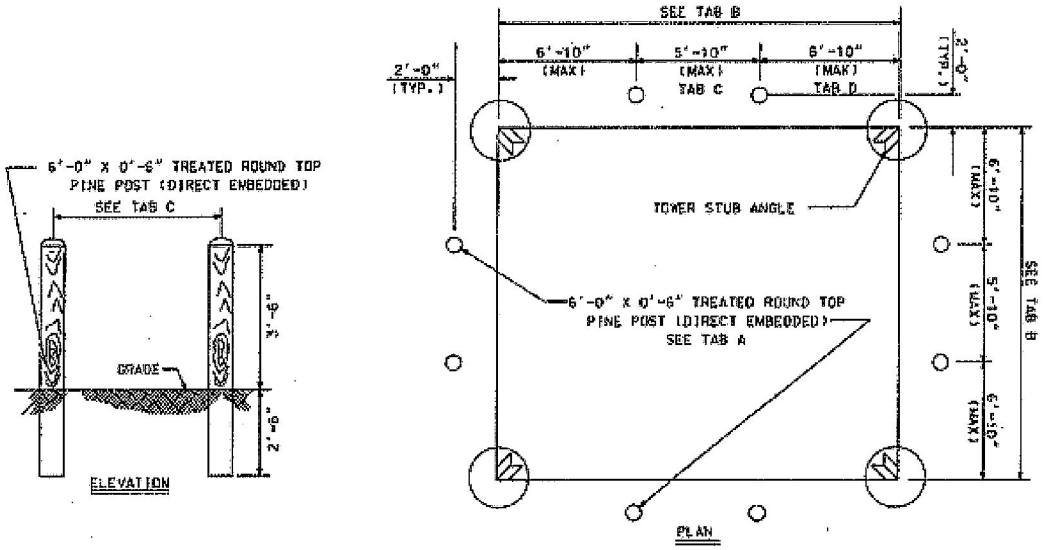
BARRIERS

TYPICAL DETAILS
GALVANIZED ROLLFORM H-FRAME GUARDRAIL

SCALE: NTS | SHEET 1 OF 1 | 006-203-04

SPECIFICATION			
SHEET	20 of	35	SHEETS
SPEC ID	007	231	79

CENTERPOINT ENERGY
TRANSMISSION STANDARD



DIMENSIONAL SPACING OF WOOD BARRIERS FOR SQUARE BASE TOWERS			
A	B	C	D
NO. OF BARRIERS PER SIDE	DIMENSION BETWEEN TOWER LEGS	DIMENSION BETWEEN BARRIERS	DIMENSION BETWEEN BARRIERS AND TOWER LEG
2 BARRIERS	14'-9" TO 17'-5"	4'-11" TO 5'-10"	EVENLY SPACED
	17'-6" TO 19'-6"	5'-10" (MAX)	5'-10½" TO 6'-10" (MAX)
3 BARRIERS	19'-7" TO 23'-4"	4'-11" TO 5'-10"	EVENLY SPACED
	23'-5" TO 25'-4"	5'-10" (MAX)	5'-10½" TO 6'-10" (MAX)
4 BARRIERS	25'-5" TO 29'-2"	5'-1" TO 5'-10"	EVENLY SPACED
	29'-3" TO 31'-2"	5'-10" (MAX)	5'-10½" TO 6'-10" (MAX)
5 BARRIERS	31'-3" TO 35'-0"	5'-2" TO 5'-10"	EVENLY SPACED
	35'-1" TO 37'-0"	5'-10" (MAX)	5'-10½" TO 6'-10" (MAX)
6 BARRIERS	37'-1" TO 40'-10"	5'-3½" TO 5'-10"	EVENLY SPACED
	40'-11" TO 42'-10"	5'-10" (MAX)	5'-10½" TO 6'-10" (MAX)
7 BARRIERS	42'-11" TO 46'-8"	5'-4½" TO 5'-10"	EVENLY SPACED
	46'-9" TO 48'-8"	5'-10" (MAX)	5'-10½" TO 6'-10" (MAX)

INSTRUCTIONS:

1. MEASURE DISTANCE BETWEEN TOWER LEGS AT STUB ANGLES.

2. LOCATE DIMENSION IN TAB "B".

3. DETERMINE BARRIER SPACING FROM TAB "C" AND "D". BARRIERS MAY BE SPACED EVENLY OR UP TO A MAXIMUM OF 5'-10" BETWEEN BARRIERS AND A MAXIMUM OF 6'-10" BETWEEN THE END BARRIER AND TOWER LEG.

4. BARRIERS TO BE LOCATED 2'-0" OUSIDE THE PERIMETER OF THE BASE, MEASURED FROM THE STUB ANGLE (SEE PLAN VIEW).

5. POST TO BE SET 2'-6" DEEP

6. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITES BEFORE DIGGING.

LOCAL POST SUPPLIERS: SAM BASSETT LUMBER
ADDRESS: 3839 POLK STREET
PHONE: 713-223-9154

NO.	DATE	REVISION	BY	CHK.	APP'R
1	04-23-07	REVISED POST SUPPLIER	RJB	KLW	KLW

DRAWN	10-20-06	KL WHITE
CHECK	10-20-06	RJ BUTTRICK
CORR	10-20-06	MD NOWOSZ
APP'R	10-20-06	MJ PARELTIS

BARRIERS

WOOD POST MOWER
BARRIER INSTALLATION
FOR TOWERS

SCALE: NTS	SHEET 2 OF 2	006-203-07

SPECIFICATION			
SHEET	21 of	35	SHEETS
SPEC ID	007	231	79

GC3GATE_

CENTERPOINT ENERGY
TRANSMISSION STANDARD

ITEM	DESCRIPTION FCA 352	M/M	UNIT	QUANTITY GAP GATE NEW		TUBE GATE NEW	TUBE GATE MAINT
				GC3GATEG	GC3GATEG	GC3GATEB	GC3GATEB
1	POST, 10' TREATED PINE W/7"-10" TOPS	100299	EA	"	–	4	"
2	POST, 8' TREATED PINE W/5"-6" TOPS	100180	EA	4	4	"	"
3	POST, 7' TREATED PINE W/3" TOPS	100080	EA	4	4	2	–
4	WIRE, BARBED 12 1/2 GUAGE (1320')	111278	SP	–	.15	–	"
5	WIRE, BARBLESS STEEL 2 PLY GALV. (1320')	111267	SP	.25	.10	.15	–
6	STAPLES, 1 1/2" GALVANIZED	137263	LB	1	1	1	–
7	NAILS, WIRE 8D GALVANIZED	137350	LB	1	1	1	"
8	RD E. GATE HANGER, 5/8" DIA. 14"	110176	EA	–	–	4	2
9	WASHER, CURVED, 4"x4"x1/4", 11/16" HOLE	225701	EA	"	"	8	4
10	GATE, 6-RAIL TUBE, GALVANIZED 12'X50"	245425	EA	"	–	2	1
11	STAY, TWISTED 42", GALVANIZED	111263	EA	3	3	"	–
12	PADLOCK, 3S DOUBLE RAIL STAINLESS STEEL, 2" OPENING	225147	EA	1	1	1	1
13	CHAIN, COIL 3/4"	136103	FT	5	5	2	2

STRUCTURE CLASSIFICATION
STRUCTURE TYPE
GC3_____

A/U KEY

STRUCTURE CLASSIFICATION

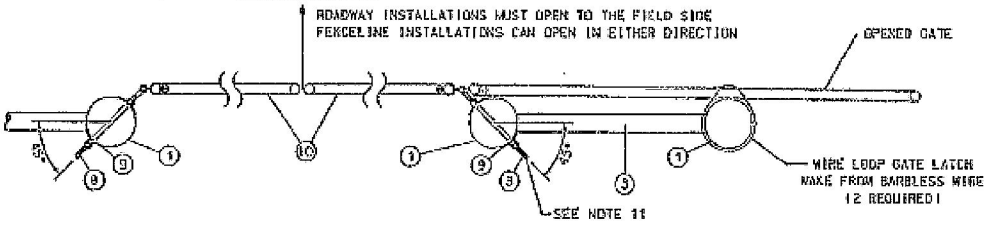
GATE – GATE

STRUCTURE TYPE

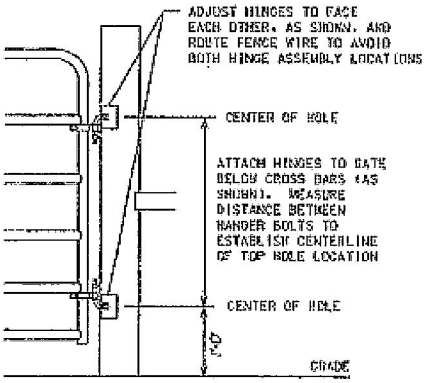
P – GAP GATE (BARBLESS WIRE)
G – GAP GATE (BARBED WIRE)
S – TUBE GATE, 6-RAIL
B – TUBE GATE & HARDWARE REPLACEMENT ONLY

OPENING DIRECTION

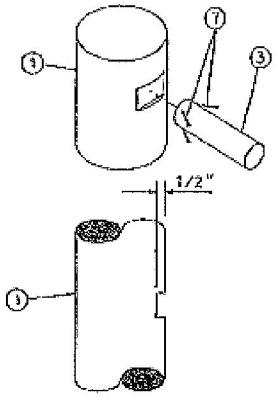
ROADWAY INSTALLATIONS MUST OPEN TO THE FIELD SIDE
FENCELINE INSTALLATIONS CAN OPEN IN EITHER DIRECTION



DETAIL "A"
POST AND GATE ATTACHMENT DETAIL



DETAIL "B"
GATE POST HINGE ATTACHMENT DETAIL



DETAIL "C"
HORIZONTAL WOOD BRACE DETAIL

NO.	DATE	REVISION	BY	CHK	APP	APPR	
3	02-27-03	REDRAWN FOR NEW SP DESIGN	RJB	RJB	MJP	DRAWN	02-03-98 R.J.BUTTRICK
2	04-14-00	REPLACED FARM GATE W/ PIPE GATE	FRS	RJB	MJP	CHECK	02-03-98 R.J.BUTTRICK
1	04-09-99	ADDED DIM TO DRAWING T.BLOCK	RJB	RJB	MJP	CORR	02-03-98 R.J.BUTTRICK
						APPR	02-04-98 M.J.PAGELTIS

GATES & CULVERTS

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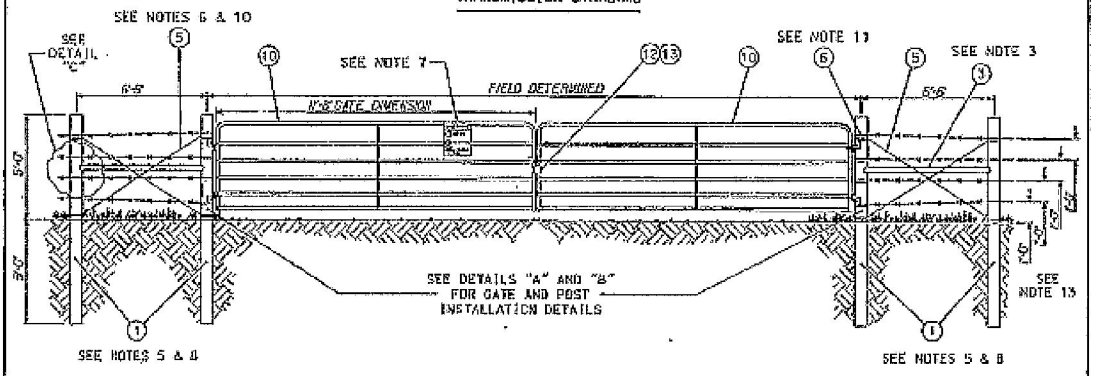
SCALE: NTS | SHEET 1 OF 2 | GC3GATE

SPECIFICATION			
SHEET	22 of	35	SHEETS
SPEC ID	007	231	79

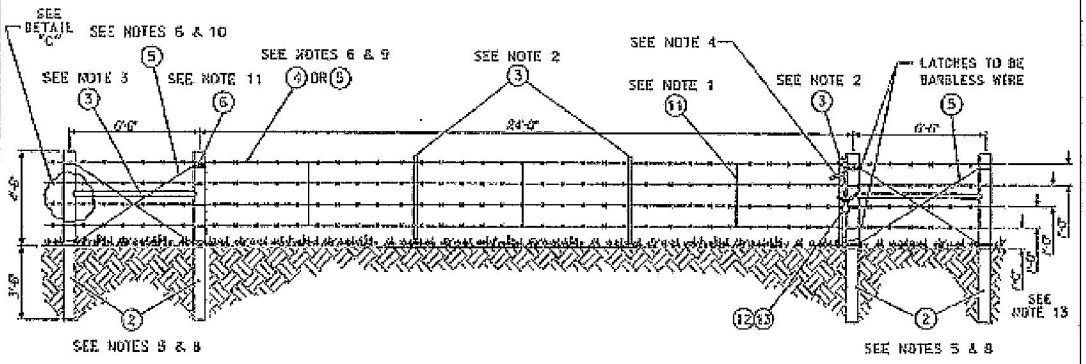
GC3GATE..

CENTERPOINT ENERGY
TRANSMISSION STANDARD



TYPICAL 24' DOUBLE STEEL TUBE GATE

GC3GATES	24' TUBE GATE
GC3GATER	12' TUBE GATE REPLACEMENT



TYPICAL 24' GAP GATE

GC3GATEF	24' GAP GATE WITH BARBLESS WIRE
GC3GATEG	24' GAP GATE WITH BARBED WIRE

~~NOTES:~~

1. 2" DIAMETER WOOD POST MAY BE SUBSTITUTED FOR STAYS. (NON-STOCK ITEM).
2. VERTICAL BRACE POSTS AND LATCH POST (3) TO BE FABRICATED OUT OF POST FROM M/N 100889, CUT TO 4'-6".
3. HORIZONTAL BRACE POST (3) TO BE FABRICATED OUT OF POST FROM M/N 100889. CUT TO 6'-6".
4. WOOD CHEATER TO BE FABRICATED FROM WOOD POST SCRAP.
5. ALL TIMBER AND POSTS SHALL BE TREATED IN ACCORDANCE WITH AWPA SPEC. C-1, C-9, P-1 LATEST REVISION. FINAL NET RETENTION OF CREOSOTE TREATED BY ASSAY = 8 PCF.
6. ALL WIRE SHALL BE 12 1/2 GUAGE AND MUST MEET ASTM SPEC. A-121.
7. NOTICE SIGNS TO BE INSTALLED AT ALL ROADWAY INSTALLATIONS ON PROPERTY OWNED BY CENTERPOINT ENERGY. TO INSTALL NOTICE SIGN USE ASSEMBLY UNIT SGNTAGMG .
8. POSTS ARE TO BE TAMPED WITH NATIVE BACKFILL.
9. BARBLESS WIRE TO BE USED WITHIN INCORPORATED CITY LIMITS.
10. BRACE WIRES ARE TO BE WRAPPED TWICE AROUND POSTS, PULLED, AND STAPLED.
11. WHEN DEADENDING WIRE, PULL UNDER FULL TENSION, WRAP TWICE AROUND POST, THEN TWICE AROUND WIRE, AND STAPLE SEVERAL PLACES ON POST.
12. ALL NUTS ON GATE BOLTS SHALL BE WELDED OR GATE BOLTS STRIPPED TO PREVENT REMOVAL.
13. WIRE SPACING MAY VARY IN ORDER TO BE COMPATIBLE WITH EXISTING FENCE.

NO.	DATE	REVISION	BY	CHK	APP
3	02-27-06	REDRAWN FOR NEW 24' DESIGN	RJB	RJB	MJP
2	04-11-00	REPLACED FARB GATE W/ TYPE GATE	FBS	RJB	MJP
1	04-08-99	ADDED BOM TO DWG/REV T.BLOCK	RJB	RJB	MJP

DRAWN	02-03-99	R.J.BUTTRICK
CHECK	02-03-99	R.J.BUTTRICK
CORR	02-03-99	R.J.BUTTRICK
APPR	02-04-99	M.J.PARELLIS

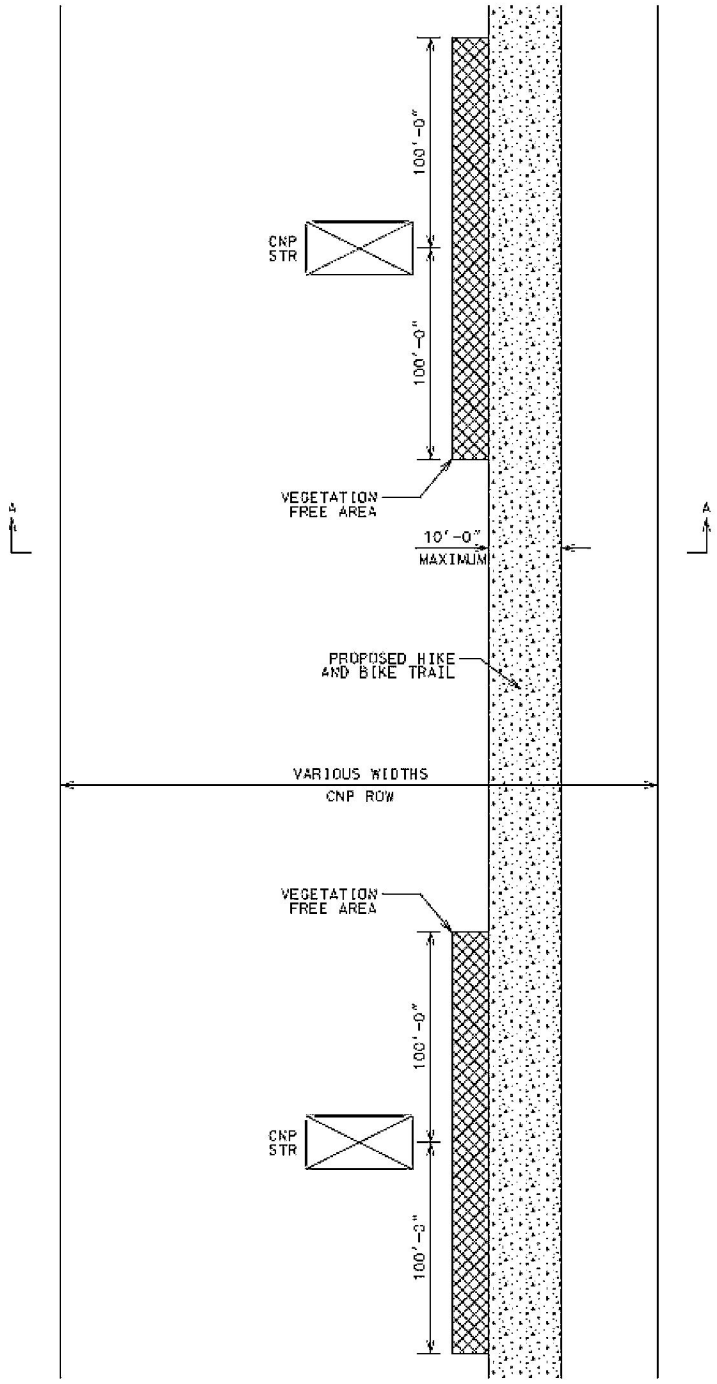
GATES & CULVERTS

Sheet 24 of 36

SCALE: NTS | SHEET 2 OF 2 | GC3GATE

SPECIFICATION			
SHEET	23 of	35	SHEETS
SPEC ID	007	231	79

CENTERPOINT ENERGY
TRANSMISSION STANDARD



NO.	DATE	REVISION	BY	CHK	APP

DRAWN	01-20-14	C. GREEN
CHECK	01-21-14	D. KLARE
CORR	02-04-14	C. GREEN
APPR	02-04-14	J. DODGE

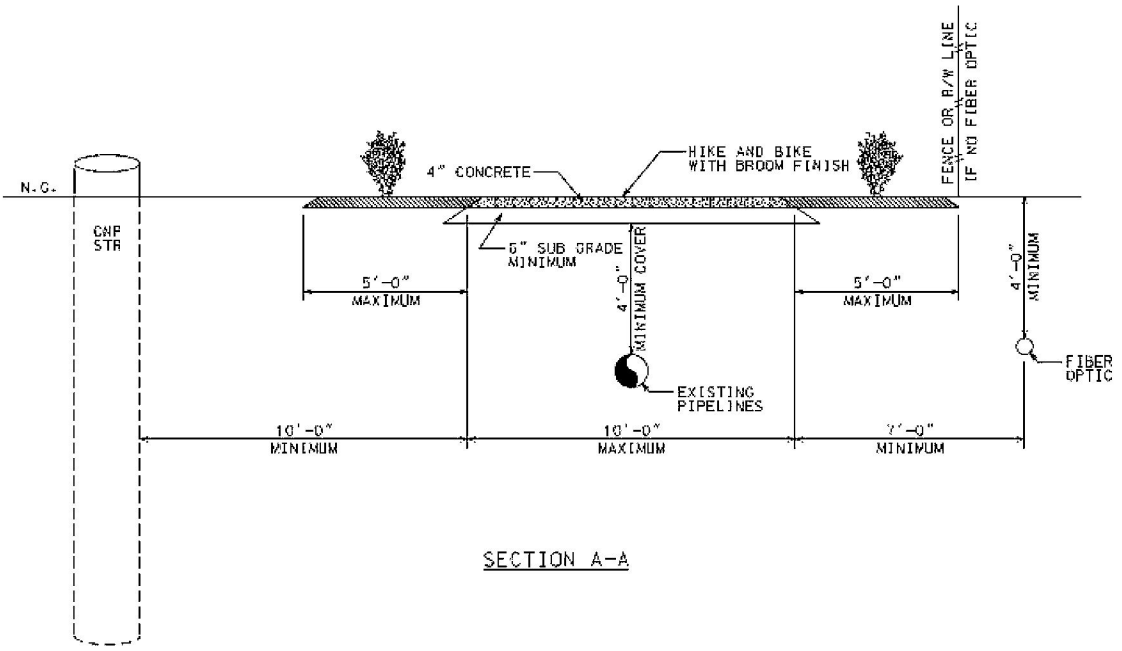
HIKE AND BIKE TRAILS

MINIMUM STANDARDS

SCALE: NTS | SHEET 1 OF 2

SPECIFICATION			
SHEET	24 of	35	SHEETS
SPEC ID	007	231	79

CENTERPOINT ENERGY
TRANSMISSION STANDARD



SECTION A-A

NO.	DATE	REVISION	BY	CHK	APP

DRAWN	01-20-14	C. GREEN
CHECK	01-21-14	D. KLARE
CURR	02-04-14	C. GREEN
APPR	02-04-14	J. BRIDGE

HIKE AND BIKE TRAILS

MINIMUM STANDARDS

SCALE: NTS | SHEET 2 OF 2

SPECIFICATION			
SHEET	25 of	35	SHEETS
SPEC ID	007	231	79

12.1 SCOPE

a. This specification covers the furnishing of labor, material, equipment, permits and supervision necessary for the installation of flexible base road and yard paving on CenterPoint Energy's property.

12.2 GENERAL

a. The paving work shall be done in accordance with the CenterPoint Energy's Purchase Order, CenterPoint Energy's drawings, CenterPoint Energy's Job Specifications, General Conditions for Construction (CenterPoint Energy's Specification 007-231-79), this specification, the Texas Highway Department Standards (THD), American Society for Testing Materials Standards (ASTM), and the American Wood Preservers Association Standards (AWPA).

b. In case of conflict, the order of precedence shall be the CenterPoint Energy's Purchase Order, CenterPoint Energy's Job Specification, CenterPoint Energy's drawings, this Specification, the General Conditions for Construction, and the THD, ASTM and AWPA Specifications.

c. The equipment for proper prosecution of the work shall be at the work site and approved by the CenterPoint Energy's Representative prior to the beginning of construction operations.

d. The Contractor shall maintain on the job site, at all times, a complete and readable copy of all specifications and any drawings provided by CenterPoint Energy governing the subject paving installation.

e. No deviation from this specification will be permitted without authorization from CenterPoint Energy.

12.3 MATERIAL ESTIMATES

a. The quantities indicated on the CenterPoint Energy's drawings are estimated by CenterPoint Energy utilizing plan dimensions, and shall be verified by the Contractor. If the Contractor detects any discrepancies in the quantities estimated by CenterPoint Energy, he should amend the figures on the inquiry sheet to reflect the quantities he has estimated. The quantities shown on the inquiry sheet by CenterPoint Energy, or as amended by the Contractor, shall be the quantities which appear on the purchase order when issued and will be the quantities for which the Contractor will be paid.

12.4 SCHEDULING

a. The Contractor shall state in his proposal the number of working days required to complete the job.

b. The Contractor shall give CenterPoint Energy notice 72 hours prior to the start of construction.

c. All work shall be performed between the hours of 7:00 a.m. to 7:00 p.m. Work shall not be performed on Saturdays or holidays without a 48 hour advance approval by CenterPoint Energy. Work shall not be performed on Sundays.

12.5 GRUBBING AND EXCAVATION

a. The area to be paved shall be excavated and shaped to conform with the typical sections shown on the paving drawing.

b. The area to be paved shall be "cleared and grubbed" removing and disposing of all trees, stumps, brush, roots and stripped of all vegetation, logs, rubbish and other undesirable matter to a depth of four (4) inches.

c. Very soft or unstable soils that are deemed unfit due to high humus content, high water content, low density, etc., shall be removed to a depth determined by CenterPoint Energy.

d. All holes, ruts and depressions shall be filled with material approved by the CenterPoint Energy's Representative.

e. The Contractor shall not use excavated material as fill material without specific authorization from the CenterPoint Energy's Representative.

f. The Contractor shall exercise care when grading, to stay clear of power lines, structures, pipes, septic tanks, fences or any underground facilities installed prior to the road and/or paving construction.

g. The Contractor shall reimburse CenterPoint Energy for the repair or replacement of any of the previously mentioned equipment he damages.

12.6 SELECT FILL MATERIAL

a. Select fill material shall conform to a CL (clay) or SM (sand) soil classification designated in ASTM D-2487 unless otherwise approved by the CenterPoint Energy's Representative.

b. Select fill material shall meet the following Atterberg limits:

Class A Fill Material

Liquid Limit 30-45
Plasticity Index 7.5 – 15

Class B Fill Material
Maximum Liquid Limit 35
Maximum Plasticity Index 20

12.7 SOIL STERILANTS

a. When required, Krovar-1 and Dowpon soil sterilants shall be applied to the area to be paved at the rate of 30 lbs. of Krovar-1 and 30 lbs of Dowpon in 200 gallons of water per acre.

b. The soil sterilants shall be applied by a state licensed applicator.

c. The Contractor shall notify the CenterPoint Energy's Representative 48 hours prior to applying soil sterilants so that spraying operation may be inspected.

d. Failure to abide by this shall be cause for the Contractor to re-spray the designated area at his expense.

12.8 CEMENT STABILIZED SOIL

a. Soil that CENTERPOINT ENERGY requires to be stabilized with cement shall be done in accordance with THD Standards, Item 270.

b. The entire area shall be stabilized to the depth shown on the CenterPoint Energy's paving drawings prior to the placement of the fill material.

c. The amount of Portland cement will be specified by CenterPoint Energy as required by the soil conditions.

d. The Contractor shall assume full responsibility for damage resulting from cement that has washed or blown off the subgrade.

12.9 LIME STABILIZED SOIL

a. Soil that CenterPoint Energy requires to be stabilized with lime shall be done in accordance with THD Standards, Items 260 and 264.

b. The lime shall be furnished and spread as dry lime.

c. The road and yard areas shall be stabilized to the depth shown on the paving drawings upon completion of grubbing operations and prior to the placement of any select fill.

d. The amount of lime stabilization will be specified by CenterPoint Energy as required by the soil conditions.

e. Sprinkling may be employed to reduce dusting problems during spreading, but excessive wetting of the lime shall be avoided until mixing operations commence.

f. The Contractor shall assume full responsibility for damages resulting from lime that has washed or blown off the subgrade.

12.10 COMPACTION REQUIREMENTS

a. All select fill material, stabilized soil, existing yard paving and excavated areas shall be compacted to 95% density as established by the Standard Proctor Density Test with moisture content within 2% optimum.

b. The select fill material shall be compacted in lifts not to exceed eight (8) inches.

c. The CenterPoint Energy's Representative shall approve the equipment the Contractor proposes to use for compaction of the fill material.

d. CenterPoint Energy will check the in-place density using Nuclear Test Methods.

12.11 FORMING

a. The forms for the paving shall be constructed of Southern yellow pine treated with pentachlorophenol.

b. The pentachlorophenol solution shall be in accordance with AWPA P8 and AWPA P9, and shall contain a minimum of 5% pentachlorophenol by weight as determined by AWPA A5.

c. The preservative treatment shall be by the Empty-Cell Process in accordance with AWPA C1 and C2.

d. The lumber shall be treated to 0.40 pounds per cubic foot final net retention of pentachlorophenol by assay.

e. The forms shall be installed in accordance with the plans and shall be true in both horizontal and vertical planes.

f. The forms shall be of the size, shape and type indicated on the plans.

g. Forms and stakes shall be of sound heartwood and shall be free of knots, clustered birdseye, checks, splits, and sapwood. Occasional sound or hollow birdseye when not in clusters will be permitted, provided the board is free from any other defects that will impair its usefulness as a form.

h. Any forms damaged beyond repair due to the Contractor's negligence shall be replaced at his expense.

12.12 CONCRETE PIPE

a. All concrete pipe shall be constructed in accordance with ASTM C-14, Tongue and Groove.

b. All reinforced concrete pipe shall be constructed to comply with ASTM C-76, Class IV, Wall B, Reinforced Concrete Pipe.

12.13 GRASS SEEDING

a. The substation site shall be seeded with hulled Bermuda at the rate of 110 pounds per acre. Gulf Coast Rye shall also be planted with the Bermuda when the ground is 70^{o}F or below. When Bermuda and Gulf Coast Rye are planted together they shall be proportioned as follows:

Bermuda:	50 pounds per acre
Gulf Coast Rye:	100 pounds per acre

b. Seeding shall not be performed when the wind velocity would be detrimental to the uniform distribution of the seed.

c. The area to be seeded shall be lightly raked to provide a seed bed.

d. The required seed mixture shall be sown uniformly in accordance with the Manufacturer's recommendations.

e. After sowing, the area shall be evenly raked to provide cover for the seeds.

f. The lawn area shall be watered in a manner so as not to cause surface erosion.

12.14 AGGREGATES

a. The aggregates for the base and sub-base shall consist of one or more of the following: shell, sand, gravel, limestone, or granite gravel.

b. The aggregates when properly slaked and tested shall conform to the following size requirements:

AGGREGATE TYPE	U.S. STANDARD SIEVE SIZE	PERCENT RETAINED BY WEIGHT	MAX. LIQUID LIMIT	MAX. PLASTIC INDEX
Oyster Shell	2”	0-12%		
	7/8”	12-37%		
	No. 40	50-85%		
	No. 200	88-100%	35	12
Sand	No. 10	0-5%		
	No. 20	5-20%		
	No. 50	75-90%		
	No. 100	95-100%	--	--
Gravel	1 3/4” Screen	0-10%		
	No. 4	30-75%		
	No. 40 Mesh Sieve	70-85%	35	12
Shell and Sand	1 3/4 “ Sieve	0-10%		
	No. 4 Sieve	40-65%		
	No. 40 Sieve	50-75%	35	12
Limestone	1 3/4” Sieve	0		
	3/4” Sieve	15-45%		
	No. 4 Sieve	45-75%		
	No. 40 Sieve	60-85%	40	12
Granite Gravel	3/8” to 3/4” Sieve	10-15%		
	No. 4	15-25%		
	No. 8	40-55%		
	No. 16	55-70%		
	No. 40	65-90%	32	14

c. Local material suppliers shall be approved by CenterPoint Energy.

d. The aggregate shall be free from excess salt, alkali, vegetable matter, clay or otherwise objectionable matter.

e. At the discretion of CenterPoint Energy, the following THD test methods will utilized to verify compliance with these specifications:

1. Tex-101-E, Preparation of Soil & Flexible Base material for Testing
2. Tex-104-E, Liquid Limit
3. Tex-106-E, Plastic Index
4. Tex-110-E, Sieve Analysis

12.15 CEMENT

a. Cement shall be Type 1 of a standard brand of Portland cement and shall conform to the requirements of ASTM C-150.

12.16 GROUND BOXES

a. Ground boxes will be set by CenterPoint Energy before final grading. The Contractor shall set the ground boxes to finish grade.

b. The Contractor shall set ground boxes to grade over base line monuments.

12.17 STABILIZED BASE COURSES

a. The approximate combination of aggregates stabilized with Portland cement or flue dust may be provided for the base or subbase in accordance with the following percent mixtures:

Cement-Dual Base		Cement-Tri-Base		Flue Dust-Dual Base	
Oyster Shell	60%	Oyster Shell	30-55%	Oyster Shell	60%
Sand	33%	Gravel	18-35%	Sand	33%
Cement	7%	Sand	35-45%	Flue Dust	7%
		Cement	1.17-7%		

b. The percent of Portland cement in the Cement-Dual Base and the percent of flue dust in the Flue Dust-Dual Base shall be to the exact proportion give n above.

c. The percent of Portland cement in the Cement-Tri-Base will range from 1.17-7%, with the actual proportion given in the CenterPoint Energy purchase order.

d. The Portland cement or flue dust stabilized base courses shall not be mixed or placed when the air temperature is 40°F (or below) and falling.

12.18 MIXING

a. The cement, aggregate and water shall be thoroughly mixed in a pugmill type mixer approved by CenterPoint Energy.

b. The plant shall be equipped with feeding and metering devices which will add the aggregate, cement or flue dust and water into the mixer in the specified quantities.

c. The moisture content of the mixture shall be maintained between optimum moisture and two percentage points above optimum moisture to protect against dehydration during shipment.

d. The optimum moisture content and desirable density shall be determined by the Texas Highway Department test Method Tex-114-E, latest revision, and checked in the field by the Nuclear Method.

12.19 CONSTRUCTION METHODS

a. The Contractor shall apply the base in lifts of not more than 6" or less than 3".

b. After each lift is spread, it shall be sprinkled and rolled to secure maximum compaction with succeeding layers placed similarly until the course is completed. The material shall be tamped with floats and/or rolled with a roller weighing not less than three (3) tons.

c. All areas and "nests" of segregated coarse or fine material shall be corrected or removed and replaced with well-graded material, then be sprinkled as required and rolled until a uniform compaction is secured.

d. All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting.

e. When the uncompacted stabilized base mixture is wetted by rain so that at the time of final compaction the average moisture content exceeds the range specified in the test, the entire section shall be removed or additional stabilizer shall be added at the Contractor's expense.

f. The stabilized base shall be compacted to a density of not less than 95 percent of compaction ratio density as established by the Standard Proctor Density Test. After completion of compaction, the surface that forms the ramp shall be thoroughly wetted and slush rolled to work sufficient mortar to the surface to provide a broom finish for the ramp.

g. Prior to each day's construction, a straight joint shall be formed by cutting back into the entire depth of completed work to form a true vertical face free of loose and shattered material.

h. The stabilized base shall be protected against rapid drying for a period not less than three days.

j. After the final course of the stabilized base is compacted, the surface shall be finished to grade and section by blading and shall be sealed with approved pneumatic tire or flat wheel rollers.

k. The finished shape of the course shall be smooth and conform to the typical sections shown on plans, and to the established lines and grades. The surface shall be finished to a tolerance of 1/2 inch in ten (10) feet under a straight edge.

l. Not more than two (20 hours shall elapse between the start of mixing and the time of starting the compaction of the stabilized base on the prepared subgrade.

m. The compaction shall be completed within six (6) hours of the time water is added to the mixture.

n. The CenterPoint Energy's Representative may at his/her option reject any stabilized material that is not in accordance with this specification.

o. The Contractor shall erect and maintain sufficient barricades to prevent traffic on the newly paved area(s) for a period of 72 hours.

12.20 GRADING

a. The Contractor shall surface grade the entire substation property including drainage facilities to provide a smooth finish and good drainage.

b. In the event the paving installation is performed in two phases, the Contractor shall surface grade the substation area after each phase.

c. When grading, it shall be the Contractor's responsibility to stay clear of power lines and structures. When pipes, septic tanks, or any other underground facilities have been installed prior to road and paving construction, care shall be taken to avoid damage during construction. If these structures are damaged due to the Contractor's negligence, they shall be replaced at his expense.

12.30 JOB COMPLETION

a. The Contractor shall remove all debris, scrap material, broken asphalt or concrete and any other objectionable material.

b. Private property that was damaged during construction shall be repaired, replaced or otherwise corrected at the Contractor's expense.

c. The unpaved areas shall be sufficiently smooth to allow machine mowing and drainage of all areas.

d. All clean-up work and surface grading shall be complete before the final inspection by the CenterPoint Energy's Representative.

Exhibit "L"
Attached Drawings