**CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC**
**PROJECT NO. 56822**
**INVESTIGATION OF EMERGENCY PREPAREDNESS AND RESPONSE**

**PUBLIC UTILITY COMMISON OF TEXAS**
**REQUEST NO.: PUC-RFI01-116**

**QUESTION:**

**Staffing and Mutual Assistance**

How did the rollout and deployment of mutual assistance during the events of Hurricane Beryl compare to previous hurricane events during which you requested assistance from mutual assistance programs? In your response, please specifically compare the types and quantities of resources requested, the percentage of request aid provided, the efficacy of coordination between your company and the mutual assistance provider, and the efficiency of staging, deployment, and release of those assistance resources.

**ANSWER:**

There are two main similarities between Beryl and previous hurricanes. The first is the preparation, deployment, and release of mutual assistance crews, consisting of line skills, vegetation management and field support. The second is the use of staging sites to expedite the restoration by locating the crews closer to the damaged areas.

1. Preparation/Deployment/Release of Mutual Assistance Crews

Hurricane Beryl (2024)

CentterPoint Houston prepared for Hurricane Beryl in a similar fashion to previous hurricanes by gathering both line skill and vegetation resources from mutual assistance groups and contractor companies well before the storm impacted our customers. For more information about the mutual assistance process, refer to questions 1-108 and 1-111.

Between July 6 and July 14, CenterPoint Houston requested 9,388 line-skills resources, 2,837 vegetation management resources, and 1,000 damage assessment resources from external contractors. CenterPoint Houston requested over 94% of these resources by July 8. From those requests, CenterPoint Houston received 10,606 line-skills, 2,817 vegetation management, 189 field support skills, and 1,019 external damage assessment resources. This amount is in addition to the existing 209 CenterPoint Houston employess also working damage asssessment, for a total of 14,840 people for Beryl restoration. For more details, see the attachment to response PUC-RFI01-115. This does not account for CenterPoint Houston crews, local contractors, and internal employees used for the restoration. The percentage of requested assistance was 113% of line-skills, 99% of vegetation, and 102% of damage assessment requests.

Coordinating with outside mutual assistance crews did not present any significant challenges. The mutual assistance responders were managed daily by an operations manager, multiple operations supervisors, and in the field by internal foreign crew coordinators ("FCCs"). The logistics of the staging sites are also supported by turnkey providers and CenterPoint Houston employees, allowing crews to focus on restoration activities. This process has shown to be effective for across the lifecycle of the restoration, from staging site arrival to departure.

CenterPoint Houston was able to facilitate the mobilization of approximately 10,000 professionals within two days of Hurricane Beryl's landfall. This includes providing resources, logistics, and work orders for the restoration. The demobilization of the crews was even more efficient, with all mutual assistance resources released within two days.

Hurricane Nicholas (2021)

Before the storm made landfall, CenterPoint Houston confirmed 1,942 workers (1,564 line skill and 378 vegetation) from 21 different companies. There is not information available for the requested amount from CenterPoint Houston. For the actual storm, there were 1,951 skilled professionals to assist with the restoration, consisting of 1,576 line skill workers and 375 vegetation workers. Every staging site had crews arrive on September 15th, 2021, just one day after Nicholas made landfall.

Hurricane Laura (2020)

For Hurricane Laura, crews embarked towards Houston on August 24th, three days before the storm made landfall. CenterPoint Houston had confirmed the help of 3,700 line skill and 738 vegetation professionals to accelerate the restoration, for a total of 4,438 mutual assistance contractors. There is not information available for the requested amount from CenterPoint Houston. CenterPoint Houston had also prepared fifteen (15) staging sites systemwide to accommodate the foreign crews. Once Laura came ashore and CenterPoint Houston determined that the damage could be repaired using internal crews, all contractors were released on August 27th to support those areas more impacted to the east.

Hurricane Ike (2008)

Five days before landfall, CenterPoint Houston began communications with mutual assistance utilities and contractors. On the day after landfall, CenterPoint Houston began opening staging sites in preparation of the arrival of mutual assistance linemen (linemen from other utilities), foreign contractor linemen (contractors outside of Houston) and foreign tree trimmers. Also, the Company started receiving confirmations and roster lists of the foreign crews that would be arriving. For Hurricane Ike, CenterPoint Houston implement 10 staging sites, with two for additional parking. The Company utilized 175 local contractor linemen, 2,211 mutual assistance linemen and 4,357 foreign contractor linemen. This was in addition to 589 CEHE overhead linemen and 98 CenterPoint Houston underground cable splicers/network testers. The Company utilized 450 local contractor tree trimmers and 5,100 foreign contractor tree trimmers.

The Company initially predicted it would require 3,000 distribution linemen, 300 transmission linemen, and 2,500 tree trimmers if hit by a category three hurricane.

2. Staging Sites

Similar to previous hurricanes, CenterPoint Houston also utilized multiple staging sites system-wide to strategically locate crews closer to the damage in an effort to accelerate restoration. For Hurricane Beryl, CenterPoint Houston used twenty-two (22) staging sites. For detailed information on the staging sites, see the attachement in response 1-115.

While Hurricane Laura did not have a significant impact on CenterPoint Houston's footprint, there were staging sites prepared for an activation. These sites include: Sam Houston Race Park, Lone Star College, and Reed Road.

Hurricane Nicholas also used staging sites for restoration. The staging sites used for Nicholas were Sam Houston Race Park, Reed Road, Galveston County Fairgrounds and Brazoria County Fairgrounds.

**SPONSOR:**
Deryl Tumlinson

**RESPONSIVE DOCUMENTS:**
None

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**REQUEST NO.: PUC-RFI01-117**

**QUESTION:**

**Staffing and Mutual Assistance**

Please describe what specific actions you took to begin staging internal staff and any responsive mutual assistance crews or resources.

**ANSWER:**

CenterPoint Houston staged its internal crews and native contractors to begin work Monday July 8, at 6:00 a.m. and staged some non-native contractors in advance of the storm to begin work Tuesday, July 9, at 6:00 a.m. Please see the response to PUC-RFI01-115 for additional information on staging of resources along with the responses to requests 1-108 and 1-111.

Several days before Hurricane Beryl made landfall, CenterPoint Houston began calling contract aggregator firms to provide situational awareness, confirm resource availability, and determine estimated travel times for resources to CenterPoint Houston's service area. CenterPoint Houston also communicated with its native contractor line-skill and vegetation management resources to confirm availability and share resource plans. CenterPoint Houston issued a notification for bargaining unit (union) CenterPoint Houston skilled resources that they should arrive for duty Monday, July 8 at 6:00 a.m. The Company pre-staged mutual assistance crews to be ready to perform restoration work on Tuesday, July 9. Additionally, notifications were made to have damage assessor crews ready to perform their work at 6:00 a.m. on July 9.

**SPONSOR:**
Deryl Tumlinson

**RESPONSIVE DOCUMENTS:**
None

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**PUBLIC UTILITY COMMISON OF TEXAS**
**REQUEST NO.: PUC-RFI01-118**

**QUESTION:**

**Staffing and Mutual Assistance**

Did you have to train or on-board any personnel that was provided in response to your request(s) for mutual assistance during the events of Hurricane Beryl? If yes, please describe what kind of training or on-boarding you provided.

**ANSWER:**

CenterPoint Houston onboarded all non-native resources through a virtual on-boarding process. Please see the attachments for the information provided in the on-boarding process. Mutual assistance personnel and contractors were sent the information and instructed to review the "EOP Safety Orientation" and restoration handbook with their team and then complete the "Safety Onboarding Acknowledgement" form.

**SPONSOR:**
Deryl Tumlinson

**RESPONSIVE DOCUMENTS:**
PUC-RFI01-118 - EOP_Safety Orientation_Talking Points.pdf
PUC-RFI01-118 - Service_Restoration_Hndbk_08252020.pdf
PUC-RFI01-118 - Service Restoration_Hndbk_Spn06202017.pdf

Updated 5/17/2024

# EOP Safety Orientation – Linemen

*Relay talking points to the crews and answer any questions you are able. Refer them to their FCC for any technical questions.*

## Traffic & Roadway Hazards

- Hi-Viz vest are required within the staging site area and when working near roadways.
- Beware of unlit or uncontrolled intersections, distracted drivers, etc.
- Don't relax just because you get back to staging area. Accidents happen within the staging site as well.
- Speed limits in service centers and staging sites is 10 MPH unless otherwise designated
- Make sure you know the clearance of the boom when driving, operating and offloading equipment and material. Power lines may be lower than normal and may be energized. "Look up and live".
- Mark out work zones clearly with traffic cones, signs and flagmen if necessary
- Interaction with the public – Let your crew spokesperson deal with the public
- Toll roads *may* be open for free use but check with your FCC before traveling on them. Please be aware, however, that large trucks will not fit through the regular lanes at toll plazas. Use EZ Tag lanes

## Job Briefing/Tailboard Document

- Documented tailboard is required at the start of each job before work starts.
- Utilize 911 for emergency medical, police or fire.

## PPE

- Wear all appropriate PPE (gloves, clothing, head protection, hi-vis vests, protective footwear, fall protection, etc)
- Please remember that a minimum of 8.5 calorie FR shirts and pants are required when working anything *energized*
- Hard hats would only be required in the Logistics Areas (areas where equipment is being off loaded and loaded) of the staging site, in the area of overhead work or any time a hazard to the head area exist.

## Incident Reporting

- Report all injuries and/or vehicle collisions. Obtain all injury or collision information and report immediately to your FCC or the safety contact at your staging site.

Updated 5/17/2024

- First Aid sites should be available at all staging sites. Get it treated while it is a minor issue to prevent it from becoming a major issue. If EMS services are needed for crews in the field, they can be contacted through 911 or by working with your FCC.

## Climate & Environmental Considerations

- Be aware of the hazards of Houston weather, hot and humid. Stay hydrated. Drink plenty of fluids but don't overdo the Gatorade. Drink more water than Gatorade.
- Be aware of mosquitoes and other insects, snake hazards as well as poisonous plants. Poison ivy and poison oak are common throughout our service area.
- Birds (Avian Protection)
    - Federal law prohibits the killing, harassing, and transportation of birds and their nests, eggs and young
    - Fines for violations of these federal laws can be severe, both for companies, and for individuals
    - During EOP operations, priority is given to worker and public safety and restoring power. When possible, however, avoid bird nests with eggs or young in them. Also, whenever possible, avoid activities that may kill or injure birds
    - Call Jeff Dallarosa at 281.841.3162 for assistance with bird nests and other concerns.

- Leaking Fluids
    - When changing out transformers, if the unit is LEAKING be sure to contain the unit by BAGGING the unit and sealing the top of the bag, prior to leaving the area. The spill MUST be reported to your FCC.
    - Don't transport leaking transformer. Immediately report any oil leaks to your FCC with details regarding address and spill size. (i.e. Oil Filled Electrical Equipment such as Transformers, Regulators; also Hydraulic Fluid, Fuel, and Motor Oil spills). See Environmental spill form included in your work packet.
    - Information needed includes: *(Note – The crews should not be expected to remember all of this just from this quick review. It is all included in the Oil Spill Notification Form that will be available either in their work packet or from their FCC.)*
    - Address & City
    - Service Center location
    - Spill size
    - Approx. gallons spilled
    - Area affected
    - Electrical equipment size
        - Type of Equipment (OH, URD, Regulator, etc)
        - Serial Number
        - Manufacturer
        - Manufacturer Date
        - PCB content

Updated 5/17/2024

## Safe Work Practices for Distribution Crews

- Verify for absence of voltage, ground and tag all de energized conductors before working as dead. *Work between grounds.* Never assume anything is dead. There will be many generators or other distributed generation sources of voltage, and back feed is always a hazard.
- List name and contact number on tags. Can use their own tag or get with FCC for tags.
- Never remove someone else's tag or energize a section that is tagged out. Notify FCC to contact owner of tag.
- Minimum 2/0 copper grounds for all primary conductors.
- Install grounds at source in addition to bracket grounds.
- Use orange or red flagging at ground locations for visual aid.
- **Important note about switching & Tagging: Make sure switching and clearance tags are filled out with your name and phone number. In the event that management decides to energize a line that has a clearance, Federal Law requires communication steps be followed to notify you that your clearance has been removed. Try to keep your clearance area as small as possible (i.e. clearance on a section of circuit instead of the entire circuit).**
- Remove high side jumpers after opening disconnects, especially when working on the same structure as the disconnect switch.
- Grounding for tree crews is a "must" – Work with the tree crews to ground as requested
- Check job status each day. Don't assume the job is the same as it was left. Verify all open points before work begins each day. Rogue crews working for cash may be out there.
- Call before you dig – call 811 for emergency locates – don't make a bad situation worse
- (Give an overview of the EOP Handbook, including fusing charts and common pole framing specifications. Emphasize voltages and checking nameplates on equipment if unsure. Check with FCC for answers to questions regarding CenterPoint Energy's transmission and distribution system.
- Mobile Generation: Mobile Generators may be deployed on the system to energize circuits from the Substation or at locations where needed (sections of circuits and laterals). **NO ENERGIZED WORK IS PERMITTED IF THE CIRCUIT, PORTION OF CIRCUIT, LATERAL, EQUIPMENT, ETC IS ENERGIZED BY MOBILE GENERATION PROVIDED BY CENTERPOINT ENERGY. Any work in these situations must be performed deenergized and grounded.**

Updated 5/17/2024

## Two Distribution Primary Voltages on System

- 12KV and 35KV-Always check nameplate on transformer to confirm. There is some 12KV construction energized at 35KV and some 35KV construction energized at 12KV. There are also step transformer in the system stepping voltages from 19.9Kv to 7.2KV, step transformers are typically in rural areas and on URD loops.
- 12KV- MAD is 27". Primary neutral is mounted below primary conductors. Requires minimum of Class 2 rubber gloves to work energized conductors from an insulated aerial device. Class 2 and above insulated cover must be used when required. Typically armless or crossarm construction.
- 35KV- MAD is 36". Primary neutral is in the static position above primary conductors. Minimum of Class 3 gloves must be worn within extended reach of MAD. Energized 19.9/35KV must be worked with insulated hot sticks. Rubber glove method is not allowed from pole or insulated aerial device.
- FCC will contact dispatcher if a crew requires a work-tag/one shot to perform work on energized main circuits.
- Check pole integrity prior to climbing. A square tag on the pole indicates a rotten pole.
- URD loops are generally fed from two sources with an open point in the middle. Several loops have one feed and the open point may be an open cutout. **Never assume an open cutout on a URD loop is de-energized**.

## Distribution Transformer Banks and Secondary Voltages

- There are several different Wye and Delta transformer configurations with voltages of 120,208,240 and 480.
- If there is a damaged three phase service and crew is unsure of phase rotation leave service off and notify FCC.
- Customer is responsible for the entire meter loop. If safe, temporary the service and notify FCC of address.
- Notify FCC if a meter is damaged and needs replaced

## Digital Resources

Use the following QR codes to access a variety of digital resources. Simply open your smart phone camera app, view the QR code on the screen, and click the links.

Updated 5/17/2024

## Safety Orientation Materials

**Scan QR Code for the following resources:**

- EOP Safety Orientation
- Restoration Handbook (English & Spanish)
- After the Storm Video

## Safety Onboarding Acknowledgement Form

**This form is to be completed by a person who is acting as a representative of a responding company. Scan the QR Code to complete this form.**

# Service Restoration Handbook

CenterPoint. Energy

# Contents

# Introduction

Welcome to CenterPoint Energy Houston Electric, and thank you for your efforts in our storm restoration.

CenterPoint Energy Houston Electric provides electricity to more than 2.5 million customers in an area of 5,000 square miles. Houston, the nation's fourth largest city in population, depends on our network of transmission and distribution lines that serve the electrical needs of some of the world's largest industrial companies, including petroleum, chemical and metal manufacturers.

Now that the storm is over, the safe restoration of power to our customers will be our top priority. Throughout the restoration efforts, you will be assigned to a Foreign Crew Coordinator (FCC). This person will be your single point of contact to which any questions you may have should be addressed.

# Purpose

This handbook will give you general safety guidelines and an overview of CenterPoint Energy Electric system's characteristics and conditions, as required by OSHA regulation 1910.269. Additional information can be found in work packages, including the Contractor Information Transfer Worksheet. Safety is a core value at CenterPoint Energy and is part of our total culture. Unsafe acts taken to speed any restoration effort will not be tolerated. This handbook may not address all the safety requirements associated with electrical distribution work but will serve to supplement your prior training and expertise. Should a discrepancy exist between the work practices stated in this handbook and those established by your company, the more stringent of the two shall be followed. Each person is required to follow safety practices for personal protection, protection of fellow workers, and protection of the public.

## Conduct Policy

While the following list does not encompass all of CenterPoint Energy Electric's policies, we would like to stress the following points:

- Possession, use, sale, distribution or being under the influence of alcohol, illegal drugs, or controlled substances on CenterPoint Energy Electric property (staging sites, substations, service centers, and parking lots) or anytime while on duty in the field is strictly prohibited.
- Firearms, ammunition, or other weapons are prohibited on CenterPoint Energy Electric property and/or work sites.
- Improper conduct such as "horseplay, fighting, gambling, scuffling, practical jokes, etc." on CenterPoint Energy Electric property and/or work sites is forbidden.

CenterPoint Energy Electric has no intention of intruding into private lives; however, the Company does expect you to report to work in a condition conducive to performing your duties safely and effectively.

## Expenses

CenterPoint Energy Electric will not pay for the following personal expenses:

- Long distance phone calls
- In-room movies
- Hotel room service
- Snacks, beverages
- Tobacco products
- Hotel damages
- Additional clothing or tools purchases
- Hotel laundry service
- Entertainment

## Accident and Injury Reporting

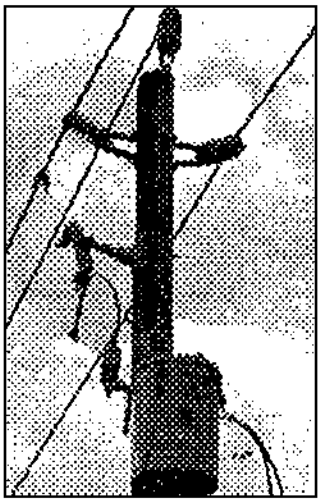
It is important that each worker understand the steps that should be taken to minimize and control the effects of an accident or emergency.

- All accidents and incidents, regardless of the severity, shall be reported to your Foreign Crew Coordinator immediately.
- Emergency medical care facilities have been identified throughout the service area. Each Foreign Crew Coordinator will have a copy of the medical emergency guidelines.
- All vehicle accidents shall be reported to your Foreign Crew Coordinator immediately. Department of Transportation regulations regarding post-accident testing shall be complied with.

## System Configuration

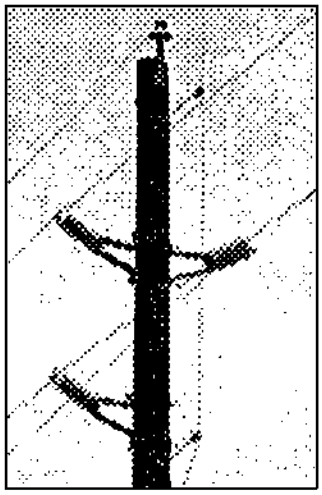
CenterPoint Energy Electric's distribution system is comprised of two primary voltages which are both connected grounded wye. Your Foreign Crew Coordinator will provide you with framing specifications for each configuration.

The 12 kV system (7200 volts phase to ground) has a common neutral and is framed armed or armless construction.



Typical pole heights are 40 and 45 foot poles. The figure at the right portrays the typical 12kV armless configuration. ***Caution:*** *Framing alone cannot be relied upon to determine voltage level. In some instances, 12kV framing is energized at a higher voltage. Always refer to the associated equipment's nameplate to positively identify voltage level.*

The 35kV system (19,920 volts phase to ground) has a primary neutral framed in the static position above the phases. Typical pole heights are 50 and 55 foot poles. The predominant framing is armless construction, however some crossarm construction does exist.



The figure at the right portrays the typical 35 kV armless configuration. ***Caution:*** *Framing alone cannot be relied upon to determine voltage level. In many instances 35kV framing is energized at a lower voltage. Always refer to the associated equipment's nameplate to positively identify voltage level.*

## Secondary Voltages and Connections

CenterPoint Energy Electric utilizes both delta and wye connected transformer banks to provide a range of secondary voltages.

Single phase secondaries are connected to individual transformer stations and are not paralleled. Note: Single phase secondaries are not tied to several transformer stations. Therefore, service from the secondaries is not maintained should an individual transformer station go out.

CenterPoint Energy Electric maintains a standard clockwise rotation at the meter on all three phase service locations.

Consult your Foreign Crew Coordinator for three phase service rotation guidelines. CenterPoint Energy Electric uses the following pole mounted transformer connections.

| 7,200/12,470 V | 19,920/ 34,500 V |
|---|---|
| 120- 240 single phase | 120- 240 single phase |
| 120- 240 open wye/open delta | 120- 240 open wye /open delta |
| 120- 240 wye /delta | 120- 208 wye /wye* |
| 120- 208 wye /wye * | 277- 480 wye /wye |
| 480 open wye/open delta | 480 wye/ ungrounded wye |
| 480 wye/delta | |
| 277- 480 delta/ wye | |
| 277- 480 wye/ wye | |
| 480 wye/ ungrounded wye | *Transformers must be cut two-wire |

***Note:*** *On 7200 volt closed wye/closed delta transformer banks the common primary bushings are to be tied but not grounded.*

Some large commercial and light industrial customers are served with single and multi-bank transformer installations at 480 through 4160 volts. Transformer wiring diagrams are included in the back of this handbook.

## Determining Voltage on Lines and Equipment

Nominal voltages of lines and equipment can be found by using one or more of the following methods:

- Referencing the name plate rating
- Referencing the Circuit ID in work package
- Foreign Crew Coordinator can contact Distribution Control – you may need to provide a meter number or facility ID
- Using voltage measuring devices

## Determining Maximum Switching-Transient Voltages & Presence of Hazardous Induced Voltages

Transient voltages and Induced voltages normally are not predetermined and consequently not documented for reference by crews prior to arriving at the job site. However, crews should always determine if transient voltages are possible during the Tailboard and take appropriate measures to mitigate or eliminate the hazards. If CenterPoint Energy is aware or made known of any potential procedures that will or could create transient voltages by switching procedures, it will be communicated to crews.

- Transient Voltages could be produced by switching operations
- Induced voltages can originate from various sources
  - Customer generation/back feed
  - Lightning
  - Parallel conductors running adjacent to energized conductors by means of electromagnetic transference
  - Other natural occurring conditions

When practical, conductors should always be isolated, tested for de-energized and grounded to eliminate the possibility of this type of situation. Any known sources of back feed will be communicated by the Foreign Crew Coordinator or information will be provided in work package.

## Advanced Metering System (AMS)

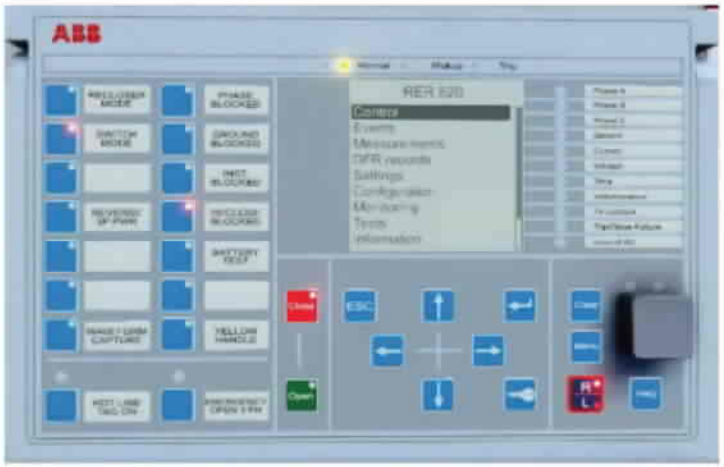

CenterPoint Energy utilizes an advanced metering system (AMS) to provide usage data to our customers and system status data to our automated distribution system. These components are a vital piece of our infrastructure. AMS meters can be identified by the words "Open Way" on the face of the meter, and all damaged meters must be replaced with another open way meter. In addition to meters, a network of communication antennas transmits data. Restoration of this equipment will receive the same priority as restoring power to our customers. Leaning Cell Relay poles should be straightened, replaced or stubbed as a last resort. Should AMS meters require replacement or AMS communications equipment be damaged, contact your Foreign Crew Coordinator for further instructions.

*Note the location of the antenna, below the secondary and the communications connection level.*

*Mounted equipment with pole mounted antennas and/or cell relay will not be worked on until confirmation from Foreign Crew Coordinator.*

## Automated Switching

An automated switching network can isolate distribution line segments due to loss of voltage or faults and automatically restore power to unaffected line segments. These networks usually involve two or three circuits, from possibly different substations. Labels are installed on the control nameplate of devices that are part of our automated switching network. This label indicates that the device is part of an automated switching network and is remotely operated as shown below. Prior to performing any manual operations on any devices that are part of automated switching network, communicate with your Foreign Crew Coordinator who will contact Distribution Control so they can assist in disabling automation on the network as needed.

# Safe Work Practices

All personnel have STOP WORK AUTHORITY if they witness any hazards condition or unsafe acts that can cause harm to personnel, the public or CNP assets. While observing safe work practices is fundamental, the following reminders are important when performing service restoration

## Driving Safely

Wear seat belts, follow posted speed limits and comply with all Federal and State DOT guidelines, as well as all other motor vehicle regulations. While driving, do not send or read texts or emails, minimize use of cellphones and use hands-free devices only, and avoid any other distractions that would remove your focus from the road. Before moving a parked vehicle, secure all loads and equipment and conduct a 360º walk around to ensure there are no obstacles around, above, or below the vehicle. Position vehicles to minimize the need for backing. Pull through or back into parking spaces when possible or use a backing guide when available.

Any intersection where the traffic control signals may not be working should be treated as a four way stop intersection.

## Pre-Job Briefing / Tailboard

Prior to performing any work activities, identify hazards associated with the task during a documented Tailboard. Identify ways to eliminate/mitigate hazards and clarify each crew member's role in the job. A tailboard is required at the following times: the start of a work activity, when personnel, conditions, or exposure changes. A tailboard must cover following subject areas:

- Identify the Person In Charge (PIC) / Job Leader
- Hazards associated with the job

- Hazard Mitigation
- Work procedures involved in the job
- Special Precautions
- Energy source controls
- Personal Protective Equipment / Protective Equipment
- Emergency Procedures

## Insulate and Isolate Cover Up

Follow Insulate and Isolate procedures in accordance with OSHA requirements or CenterPoint Energy Rules and Procedures, whichever is more protective. An employee working from an insulated aerial device that has the potential for exposure to energized equipment, conductor or apparatus, shall wear voltage appropriate rubber gloves. Rubber gloves may be removed when all conductors and apparatus are de-energized, tested for de-energized and grounded.

## Grounding

All work on de-energized conductors and equipment shall be worked between grounds. All work on equipment presumed de-energized shall be performed only after the lines or equipment have been isolated, tested for de-energized voltage, locked and/or tagged out, and grounded (as required). Vehicles and mobile equipment shall be grounded or barricaded when working in proximity to energized lines or equipment, or any that may become energized. A clearance order shall be obtained through your Foreign Crew Coordinator prior to grounding sections of feeder circuits. Available fault currents on CenterPoint Energy Electric's distribution system dictate the use of a minimum 2/0 AWG copper ground cable. A red-orange safety flag shall be visibly displayed at

each grounding location when installing sets of protective grounds on overhead lines normally energized greater than 600 volts (this will include terminal poles on URD). A completely filled out Hold Tag will be installed at all grounds with the following information: Job Leader, contact number, switching order and clearance number and date grounds installed.

## Equipment Guidelines

Plan all lifting activities. Inspect all rigging equipment prior to each use. Employees involved in rigging activities shall be properly trained. The manufacturer's equipment ratings/limits shall not be exceeded. The use of pads under all outriggers is strongly encouraged due to wet ground conditions from the significant amounts of rainfall which accompany storms. Transformer weights are usually noted on equipment nameplates and average pole weights are shown in the following table. These references will aid in determining the lift parameters.

# ANSI Standard Pole Strengths, Weights, Dimensions

| | | POLE CLASS | H6 | H5 | H4 | H3 | H2 | H1 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FORCE 2' FROM TOP (LBS) | 11,400 | 10,000 | 8,700 | 7,500 | 6,400 | 5,400 | 4,500 | 3,700 | 3,000 |
| | | MIN TOP CIR. (IN) | 39 | 37 | 35 | 33 | 31 | 29 | 27 | 25 | 23 |
| | | MIN TOP DIA. (IN) | 12.4 | 11.8 | 11.1 | 10.5 | 9.9 | 9.2 | 8.6 | 8.0 | 7.3 |
| LENGTH (FT) | 70 | DIA. @ BUTT (IN) | - | - | 30.1 | 28.8 | 27.2 | 25.9 | 24.6 | 23.3 | 22.0 |
| | | BALANCE POINT (FT) | - | - | 25.0 | 24.9 | 24.8 | 24.7 | 24.6 | 24.4 | 24.2 |
| | | WEIGHT - PINE (LBS) | - | - | 7,416 | 6,564 | 5,850 | 5,178 | 4,806 | 4,170 | 3,612 |
| | | WEIGHT - D.FIR (LBS) | - | - | 6,374 | 5,765 | 5,136 | 4,574 | 4,047 | 3,512 | 3,042 |
| | 75 | DIA. @ BUTT (IN) | - | - | 31.1 | 29.8 | 28.5 | 26.8 | 25.5 | 23.9 | 22.6 |
| | | BALANCE POINT (FT) | - | - | 26.5 | 26.4 | 26.3 | 26.2 | 26.0 | 26.0 | 25.8 |
| | | WEIGHT - PINE (LBS) | - | - | 8,154 | 7,278 | 6,498 | 5,766 | 5,370 | 4,662 | 4,038 |
| | | WEIGHT - D.FIR (LBS) | - | - | 7,046 | 6,322 | 5,650 | 5,006 | 4,522 | 3,926 | 3,400 |
| | 80 | DIA. @ BUTT (IN) | - | - | 32.0 | 30.7 | 29.1 | 27.8 | 26.5 | 24.8 | 23.2 |
| | | BALANCE POINT (FT) | - | - | 28.0 | 27.9 | 27.8 | 27.7 | 27.5 | 27.4 | 27.3 |
| | | WEIGHT - PINE (LBS) | - | - | 8,928 | 8,028 | 7,134 | 6,390 | 5,370 | 4,662 | 4,038 |
| | | WEIGHT - D.FIR (LBS) | - | - | 7,786 | 6,955 | 6,230 | 5,530 | 5,017 | 4,350 | 3,769 |
| | 85 | DIA. @ BUTT (IN) | - | - | 32.9 | 31.6 | 30.0 | 28.7 | 27.1 | 25.5 | 23.8 |
| | | BALANCE POINT (FT) | - | - | 29.5 | 29.4 | 29.3 | 29.1 | 29.0 | 28.9 | 28.8 |
| | | WEIGHT - PINE (LBS) | - | - | 9,906 | 8,820 | 7,794 | 6,942 | 6,576 | 5,694 | 4,938 |
| | | WEIGHT - D.FIR (LBS) | - | - | 8,520 | 7,622 | 6,840 | 6,082 | 5,538 | 4,795 | 4,158 |
| | 90 | DIA. @ BUTT (IN) | 36.8 | 35.5 | 33.9 | 32.6 | 31.0 | 29.3 | 27.7 | 26.4 | 24.5 |
| | | BALANCE POINT (FT) | 31.3 | 31.1 | 31.0 | 30.9 | 30.8 | 30.7 | 30.5 | 30.3 | 30.2 |
| | | WEIGHT - D.FIR (LBS) | 11,395 | 10,498 | 9,394 | 8,486 | 7,478 | 6,658 | 6,068 | 5,255 | 4,557 |
| | 95 | DIA. @ BUTT (IN) | 37.8 | 36.5 | 34.8 | 33.2 | 31.9 | 30.3 | 28.3 | - | - |
| | | BALANCE POINT (FT) | 32.8 | 32.6 | 32.5 | 32.4 | 32.2 | 32.1 | 32.0 | - | - |
| | | WEIGHT - D.FIR (LBS) | 12,346 | 11,362 | 10,214 | 9,115 | 8,136 | 7,272 | 6,619 | - | - |
| | 100 | DIA. @ BUTT (IN) | 38.7 | 37.4 | 35.8 | 34.2 | 32.5 | 30.9 | 29.3 | - | - |
| | | BALANCE POINT (FT) | 34.2 | 34.1 | 34.0 | 33.9 | 33.7 | 33.6 | 33.4 | - | - |
| | | WEIGHT - D.FIR (LBS) | 13,325 | 12,254 | 11,069 | 9,821 | 8,789 | 7,853 | 7,190 | - | - |
| | 110 | DIA. @ BUTT (IN) | 40.6 | 39.0 | 37.3 | 35.7 | 34.1 | 32.5 | 30.5 | - | - |
| | | BALANCE POINT (FT) | 37.2 | 37.1 | 36.9 | 36.8 | 36.6 | 36.5 | 36.4 | - | - |
| | | WEIGHT - D.FIR (LBS) | 15,418 | 14,434 | 12,974 | 11,669 | 10,320 | 9,173 | 8,392 | - | - |

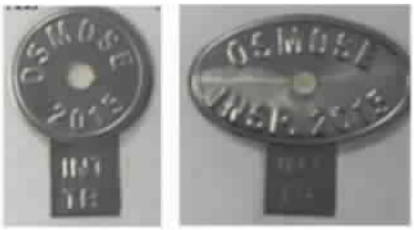
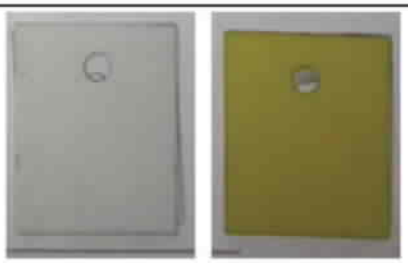
Note – Balance Point is measured from butt of pole. Balance Point and Weights are approximations and will vary.

## Lines under Tension

During storm restoration, many of our distribution and transmission lines are under tension due to damage, stress, branches, etc. This creates significant line of fire risks.

## Pole / Structure Inspection

All poles shall be visually inspected and tested, using the sound and probe/prod test prior to climbing, placing a ladder against the pole, or changing loading. Visual inspections shall be performed on all non-wood structures prior to climbing, alterations of loading, and installing or removing equipment. If a pole is deemed unsafe to climb or work on, it must be marked appropriately to identify the condition and help crews locate it for replacement. For specific methods of inspecting wood poles, refer to 1910.269, Appendix D. Do not rely on pole markings/tags as an indication of the pole integrity. It is the responsibility of the individual to ensure the pole is safe to climb by first testing the pole using the appropriate method. The following tags are used to indicate the pole condition:

| TAG | STATUS |
|---|---|
|  Inspected | Pole has been sounded and bored without excavation and has not been ground line treated. |
|  Treated | Pole has been excavated and externally treated with Cu-Bor, an EPA registered preservative, to extend its serviceable life. |
|  Internal Treat | Pole has internal decay pocket, hollow heart, or insect galleries, yet still has enough strength to remain in service. Hollow Heart has been applied. This tag is suspended below one of the above inspection tags |
|  Fumigant Treat | Pole has been inspected and treated. It has been treated with SMDC, an EPA-approved fumigant, according to label directions. This tag is suspended below one of the above inspection tags. |
|  Rejected | Do Not Climb!<br>Pole needs to be replaced (white square tag) or reinforced (yellow square tag). |

## Determining Pole Setting Depth

When setting a pole, obtain the length of the pole from the birthmark. To determine the depth at which to set the pole take 10% of the pole length and add 2 feet to that figure. Call 811 or Foreign Crew Coordinator if underground utilities are not marked.

Note - H2 and class 1 poles are set at a different depth. Check with your Foreign Crew Coordinator for more detail on proper installation. CCA and Penta treated poles are typically lighter than Creosote treated poles.

CCA – 58.0 lbs. per cube

Penta – 53.0 lbs. per cube

Creosote – 62.0 lbs. per cube

**Weight of Creosoted Southern Yellow Pine Poles**

| Length | Class | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25′ | 972 | 775 | 644 | 545 | 453 | 389 | 319 |
| 30′ | 1256 | 1060 | 880 | 749 | 630 | 510 | 421 |
| 35′ | 1598 | 1317 | 1134 | 959 | 820 | 709 | 600 |
| 40 | 1919 | 1652 | 1377 | 1195 | 1011 | 880 | 768 |
| 45 | 2262 | 1947 | 1834 | 1418 | 1214 | 1074 | 932 |
| 50′ | 2623 | 2255 | 1960 | 1655 | 1465 | 1267 | 1116 |
| 55′ | 3374 | 2894 | 2480 | 2181 | 1938 | 1762 | |
| 60′ | 3891 | 3317 | 2832 | 2466 | 2201 | 2031 | |
| 85′ | 4526 | 3767 | 3173 | 2770 | 2522 | | |
| 70′ | 5208 | 4263 | 3545 | 3080 | 2806 | | |
| 75′ | 5859 | 4774 | 3953 | 3405 | | | |

## Walking and Working Surfaces

CenterPoint Energy prohibits working/walking on roofs or other elevated structures where leading edges and/or floor openings are not sufficiently guarded.

## Fall Protection

Utilize fall protection equipment when required to work at heights greater than 4 feet, in compliance with OSHA 1926 Subpart M and 1910.269. Inspect fall protection equipment before each use and use it according to manufacturer recommendations. Maintain three points of contact when changing elevation.

## Falling Objects / Line of Fire

When overhead work is being performed, do not enter the drop zone without stopping overhead work activities, establishing three-way communications and receiving permission to enter. Consider "line of fire" when setting up work sites to ensure that objects that could fall or move suddenly due to stored energy do not cause injury to employees or the public.

## Underground Residential Distribution (URD)

CenterPoint Energy Electric's service area utilizes URD construction extensively. While you may or may not be actively involved with the URD aspect of the restoration, you could be restoring an overhead line feeding URD. Each URD loop has two associated terminal poles. The loop is split at either a midpoint transformer (normally 12 kV) or at a terminal pole (normally 35 kV). Assume all URD risers are energized until tested for de-energized and grounded. Class 3 rubber

gloves or greater are required to perform work in any URD or 3 Phase Pad Mount Transformer.

## Working on Energized Equipment

Rubber gloves of the appropriate insulating value shall be worn when:

- Performing hand work on any live electric apparatus carrying voltages up to and including 5000 volts.
- When working from insulated aerial devices on voltages up to but not exceeding 15 KV.
- At minimum Class O gloves must be worn for voltages of 0 to 600 volts.
- Rubber sleeve must be used if effective cover is not employed.

Live-line tools shall be used to work on voltages exceeding 15 kV from the pole or an insulated aerial device.

## Energizing Equipment

Energizing feeder circuits shall be done only through your Foreign Crew Coordinator. A switching order shall be obtained prior to operating any device associated with feeder circuits. Prior to energizing fused laterals, the following steps must be taken:

- Ensure all conductors and equipment are capable of being energized and will not create a hazardous condition.
- Ensure all grounds are cleared from the equipment and all personnel understand the equipment is to be energized.
- Notify your Foreign Crew Coordinator that the two steps listed above have been accomplished.

***Note:*** *Foreign Crew Coordinators will notify Distribution Control of all energized laterals on a daily basis.*

## Work Area Protection

Traffic control and warning devices shall be used when working on or near the shoulder of a roadway. Motorists should be guided in a clear and positive manner when approaching and crossing the work area. Traffic cones, instructional signs, and flaggers, when necessary, shall be used to control the flow of traffic in the work area. Hi-visibility vest shall be worn when working on the ground in a designated road right of way. Traffic control permits may be required when working on any state regulated roadway. Contact your Foreign Crew Coordinator for information and permits.

## Confined Spaces

Many areas within the CenterPoint Energy system contain spaces that are considered to be "confined". A confined space can be defined as an area

- Large enough for an employee to enter fully and perform assigned work; and
- Not designed for continuous occupancy by the employee; and
- Has limited or restricted means of entry or exit

Employees who work in confined spaces face increases risk of exposure to serious physical injury from hazards such as entrapment, engulfment, electrical and hazardous atmospheric conditions. If a job requires working in a confined space, prior to starting work, contact your Foreign Crew Coordinator to consult with CEHE Safety Department.

# Personal Protective Equipment

## Clothing

Those engaged in field restoration activities shall wear clothing that is safe and appropriate for the job. Appropriate clothing is required at all times.
FR clothing (Min. 8/Cal) shall be worn when performing grounding operations and when working energized conductors, equipment or apparatuses energized at 50 volts or more. Full flash protection shall be worn to install or remove 480-volt meters when the meter base is energized. Check with your FCC for PPE requirements.

## Head Protection

ANSI approved safety caps and hats shall be worn at all times while on the jobsite.

## Eye Protection

Appropriate eye wear (face shield, glasses, or goggles) shall be worn whenever the possibility of injury to the eye may occur. All protective eye wear shall meet ANSI-Z87 standards.

## Hand Protection

Work gloves shall be worn when handling rope, slings, and irregularly shaped, rough, jagged or harmful materials.

## Foot Protection

Approved leather shoes or boots in good repair are required on the job site. All protective footwear shall meet ANSI-Z41/ASTM F-2413.

# Other Hazards Common to Storm Restoration

The following conditions may be encountered during the restoration. While this is not an all-inclusive list, particular attention should be paid to the following:

## Fatigue

Fatigue can contribute to accidents. Be constantly aware of what your body is telling you. When you are exhausted, there is a point where productivity significantly decreases. Do not drive if you are tired. Be a vigilant passenger and be aware of the driver's alertness.

## Heat Stress

Drink plenty of water and moderate amounts of electrolyte drink. The Gulf Coast humidity requires acclimation. Pace your work and be aware of the early signs of heat-related illness. Until the public water supply has been declared safe to drink, drink only canned or bottled water.

## Chemical Releases

When working in the proximity of petrochemical sites be alert for possible chemical releases. If you suspect the presence of a chemical release, immediately leave the area and contact your Foreign Crew Coordinator so verification of a safe work environment is vital and can be obtained.

## Rising Water

Working in flood conditions present additional and unexpected hazards. Be prepared for rising water and flash floods. Always plan an escape route.

## Confrontations with Animals

During CenterPoint Energy does not condone or tolerate abuse of animals by our employees, contractors or our foreign crews. If you need to enter an area with an animal, reach out to the property owner to remove the animal. If that's not possible, proceed with caution. The safety of employees, contractors and foreign crews is CenterPoint Energy's top priority. Each situation must be addressed on a case-by-case basis. Use your best judgment. If you encounter an aggressive animal, shield or protect yourself from an attack and leave the area for safety immediately. You should never initiate a confrontation. If you are threatened by any animal, report it immediately to your Foreign Crew Coordinator.

## Snakes and Insects

During periods of rising water, snakes can be found in places where they would not normally be expected. Be on guard for snakes on poles, tops of transformer, or in any area free of water. The Texas Gulf Coast, under normal conditions, has a large mosquito population. Insect repellent is available for your use. Stinging insects such as bees, wasps, spiders and fire ants are common. Remain alert for these when working around fallen trees and storm debris. Do not use an insect repellent containing DEET on FR clothing. Poisonous Snakes: Coral Snake, Rattlesnakes, Western Cottonmouth and Copperheads.

Poisonous Spiders: Black Widow and Brown Recluse.

## Oil Spills

CEHE has to ensure federal, state, and local environmental regulatory compliance by responding to oil spills in a timely and efficient manner. This commitment includes, reporting, responding to, and cleaning up ALL spills, regardless of quantity or location. If

you discover a spill, you should protect yourself and wear appropriate PPE. Take the following precautions:

1. Try to avoid any actions that would spread the contamination beyond the area that is already contaminated (i.e. walking in contamination and spreading to other areas from boots, etc.).
2. Immediately report all fuel, hydraulic oil, motor oil, and transformer oil spills to your Foreign Crew Coordinator so they can fill out the EOP Oil Spill Notification form.
3. If no Electrical Equipment Disconnect Sticker – CNP 442 (2012) is available, use a permanent marker or a metal marker to write the date of removal, Service Center, Address of where the transformer was removed.
4. If possible, limit the environment impact of the oil. For example, prevent the oil from reaching a storm drain.
5. All leaking oil filled equipment is required to be bagged to limit oil clean up.
6. Verify address is on the transformer(s) before bagging.
7. Keep out of transformer oil as some could possibly be PCB-contaminated.

## EOP Waste Management

For large quantities of weathered pole debris and construction debris, contact Foreign Crew Coordinator so they can initiate the proper disposal process. Small quantities of scrap wire or old material can be disposed in the proper bins at the staging site. No liquids are to be placed in disposal bins.

Leaking transformers are not to be hauled into the staging site, inform Foreign Crew Coordinator for proper pick up and disposal.

- Ceramic/Porcelain Insulators
- Empty Containers (<5 gal)
- Hose/tubing (uncontaminated)
- Paper or wood packaging
- Paper, cardboard, twine
- Styrofoam, wrappings, rope
- PVC Pipe (uncontaminated
- Plastics Pole Set (reacted)

## Birds

Federal law prohibits killing, harassing, and transportation of birds and their nests, eggs and young. Care should be taken to avoid disturbing nests with eggs and young, and to avoid activities that could harm them. Refer to the following table to help determine the appropriate action required for handling active nests (live birds, young, or eggs present in nest), or inactive nests (no birds, young or eggs present)

| Bird | Nest Condition | Action |
|---|---|---|
| Bald Eagles | Active or Inactive | 1. Stop Work!<br>2.Ask FCC to contact Environmental Department<br>3. Avoid any work within 660 feet of nest. |
| Other birds | Active | 1. Stop Work!<br>2. Ask FCC to contact Environment Department |

| | | |
|---|---|---|
| | Inactive | 1. Continue work<br>2. Remove the nest from CNP equipment if needed. Wear appropriate PPE<br>3. Leave nest at job site. |

## Communication Tips

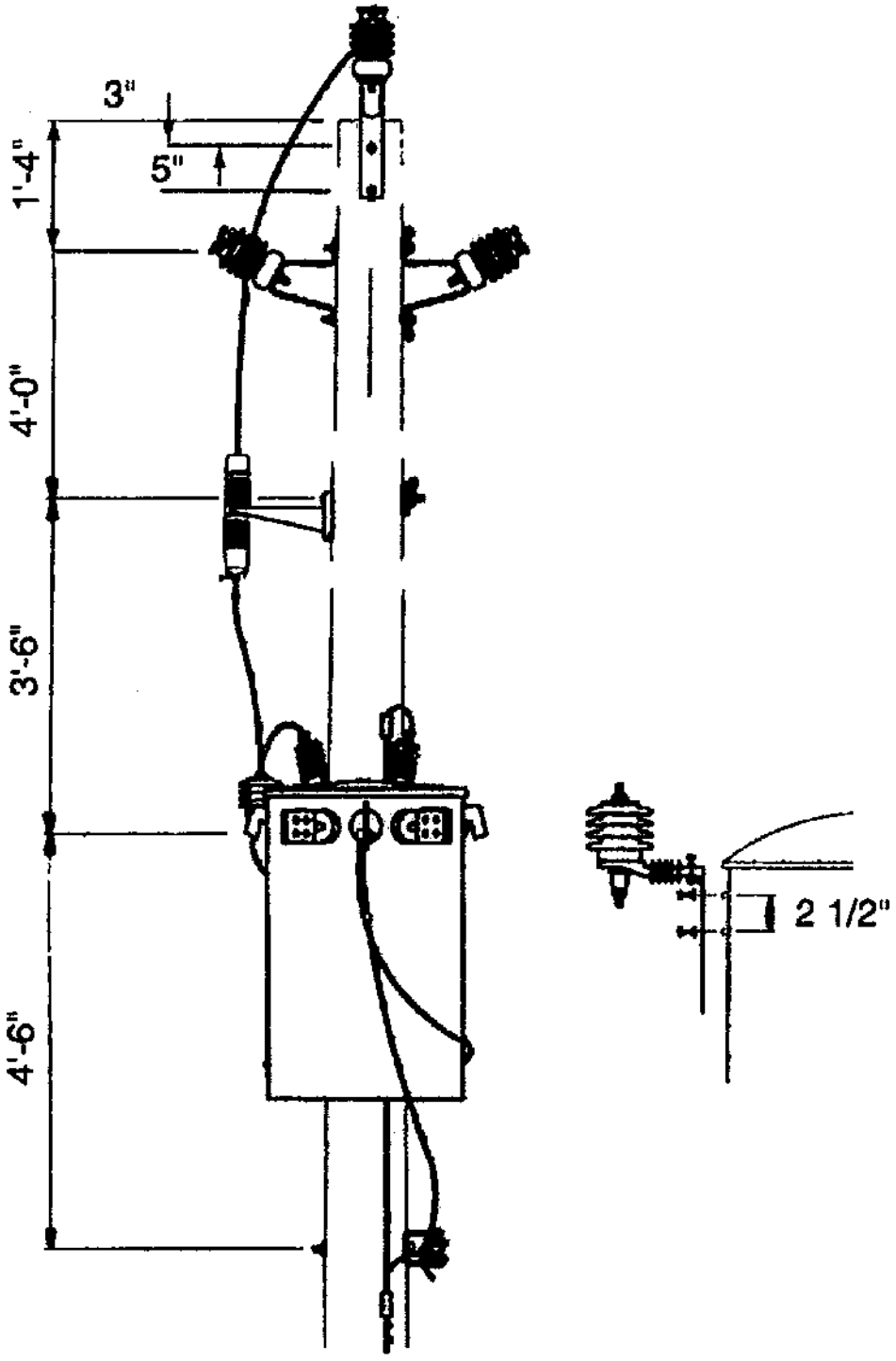
While working to restore power, customers may approach you to ask questions. If approached by customers:

- Keep safety a priority. Be polite, but do not attempt to talk to customers while working. The Crew Spokesperson (if one is assigned to you) or your FCC can talk to customers to allow you and your crew to work to restore service.
- Explain that you need to stay focused on your work and assure customers you are working to restore power as quickly and safely as possible.
- Don't engage in unproductive conversations with customers, particularly if they are upset and ask you to comment on various aspects of the recovery effort.
- Relay any issues or concerns about the restoration process to your Foreign Crew Coordinator. Please do not voice criticism to the public.
- You should never initiate a confrontation. If you are threatened or find yourself in a hostile situation, retreat immediately, and report it immediately to your Foreign Crew Coordinator.
- Refer customers to our website, www.centerpointenergy.com for restoration updates.
- Customers may also call Customer Service at 713-207-2222 or 1-800-332-7143

The news media may film your work, but you should ensure they remain a safe distance away. Alert your Foreign Crew Coordinator to any media presence, so we can send a company spokesperson to your location or contact the media by phone. Politely decline any interview requests made by the news media and ask them to contact CenterPoint Energy's media relations team.

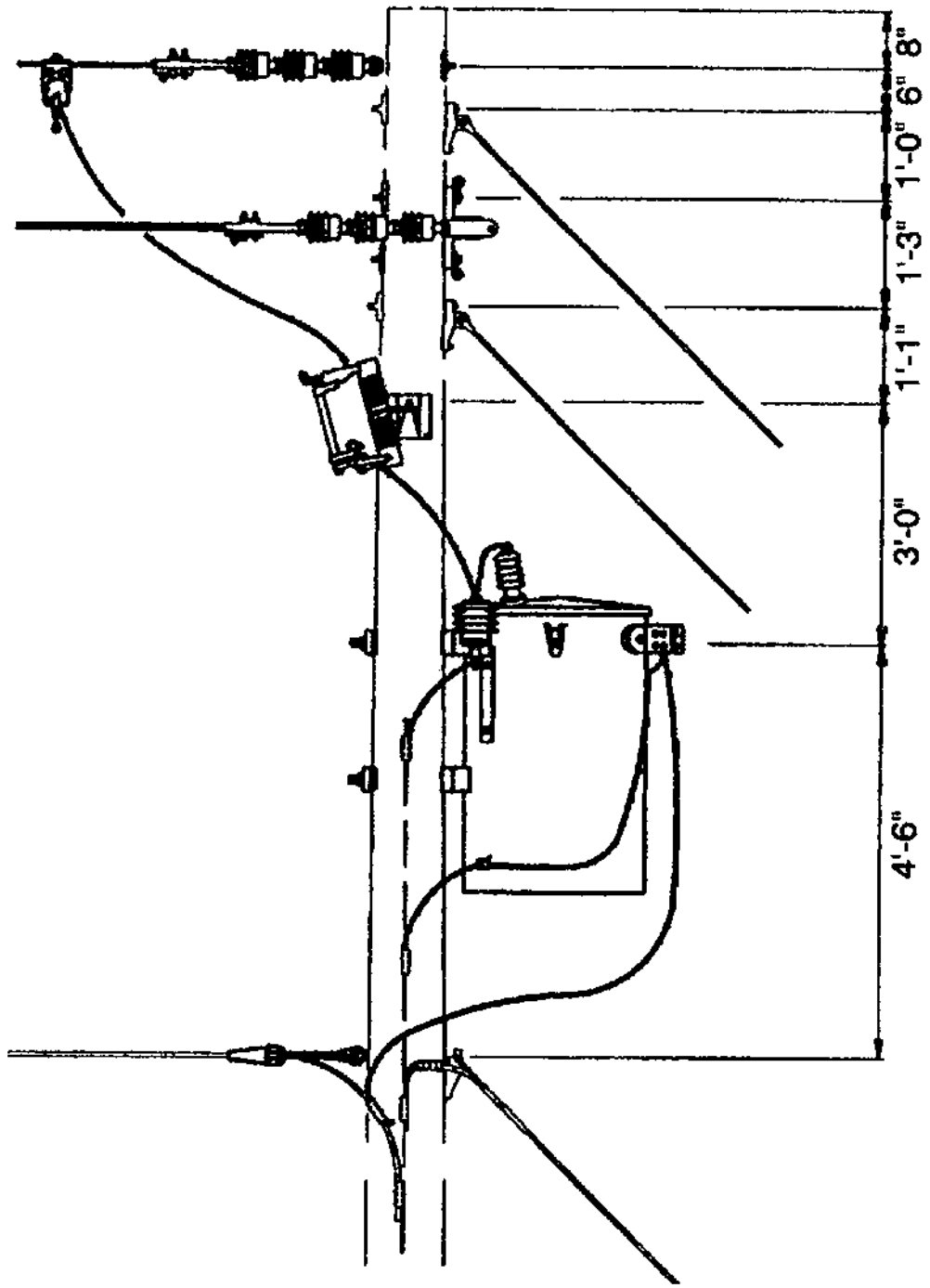
# 12 KV Armless Tangent Pole

## With Single Phase Transformer



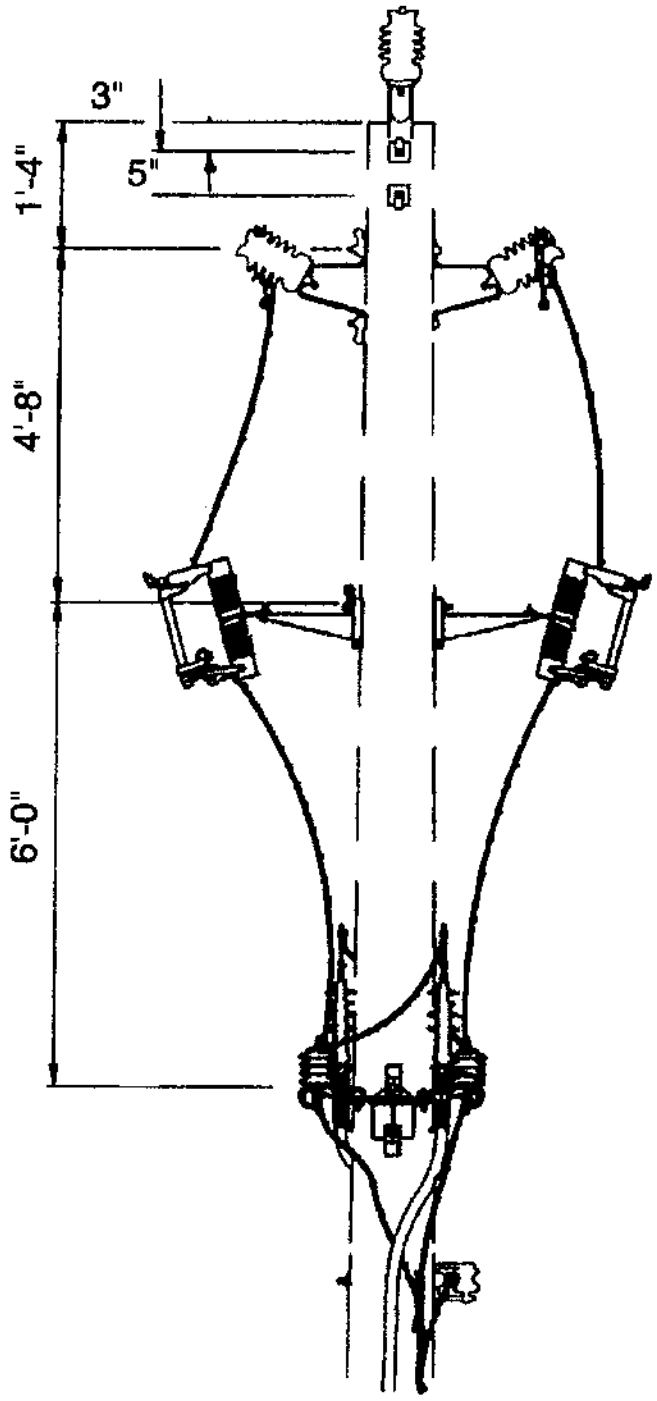
# 12 KV Armless Deadend Pole

With Single Phase Transformer



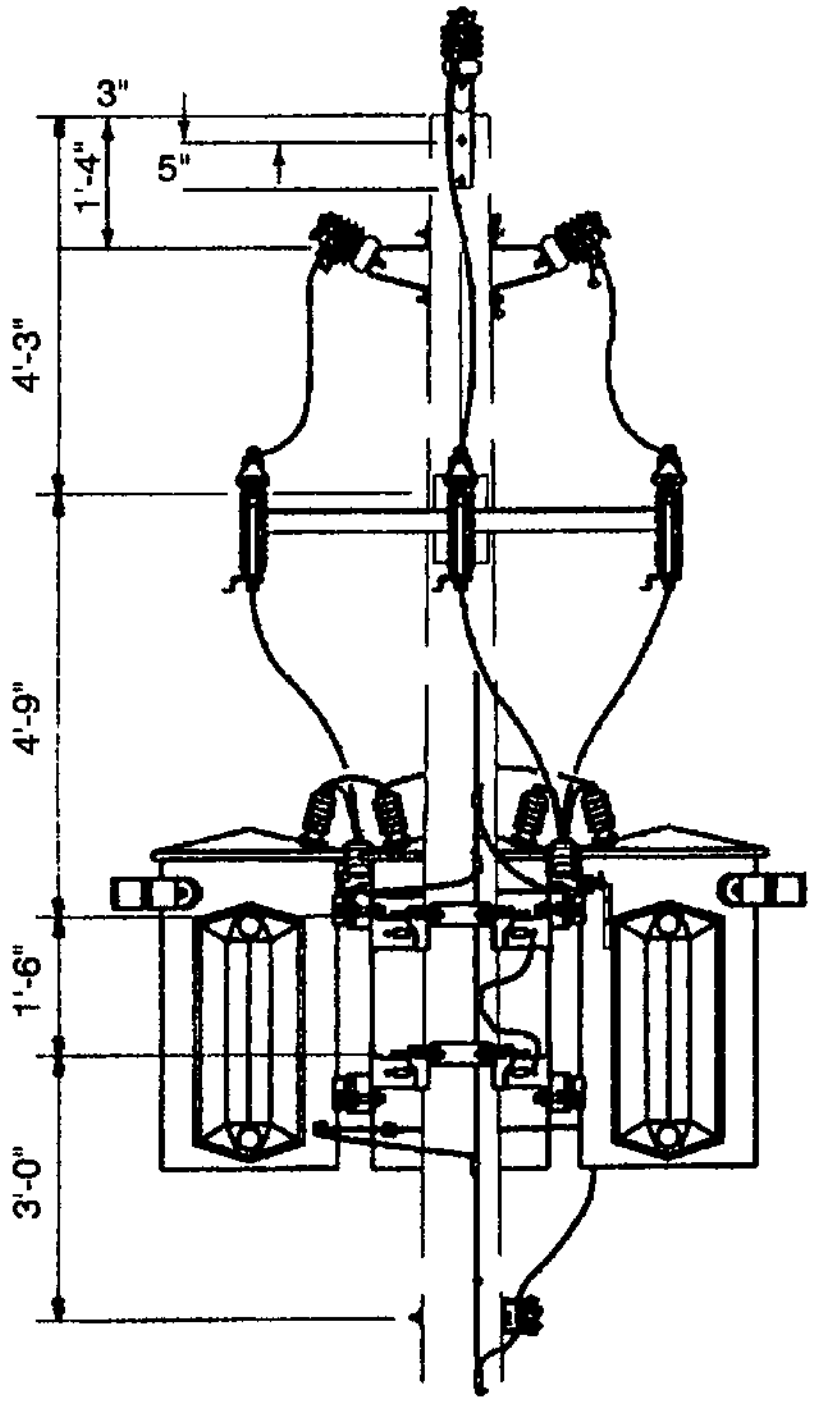
# 12 KV URD Terminal Pole

## Assembly



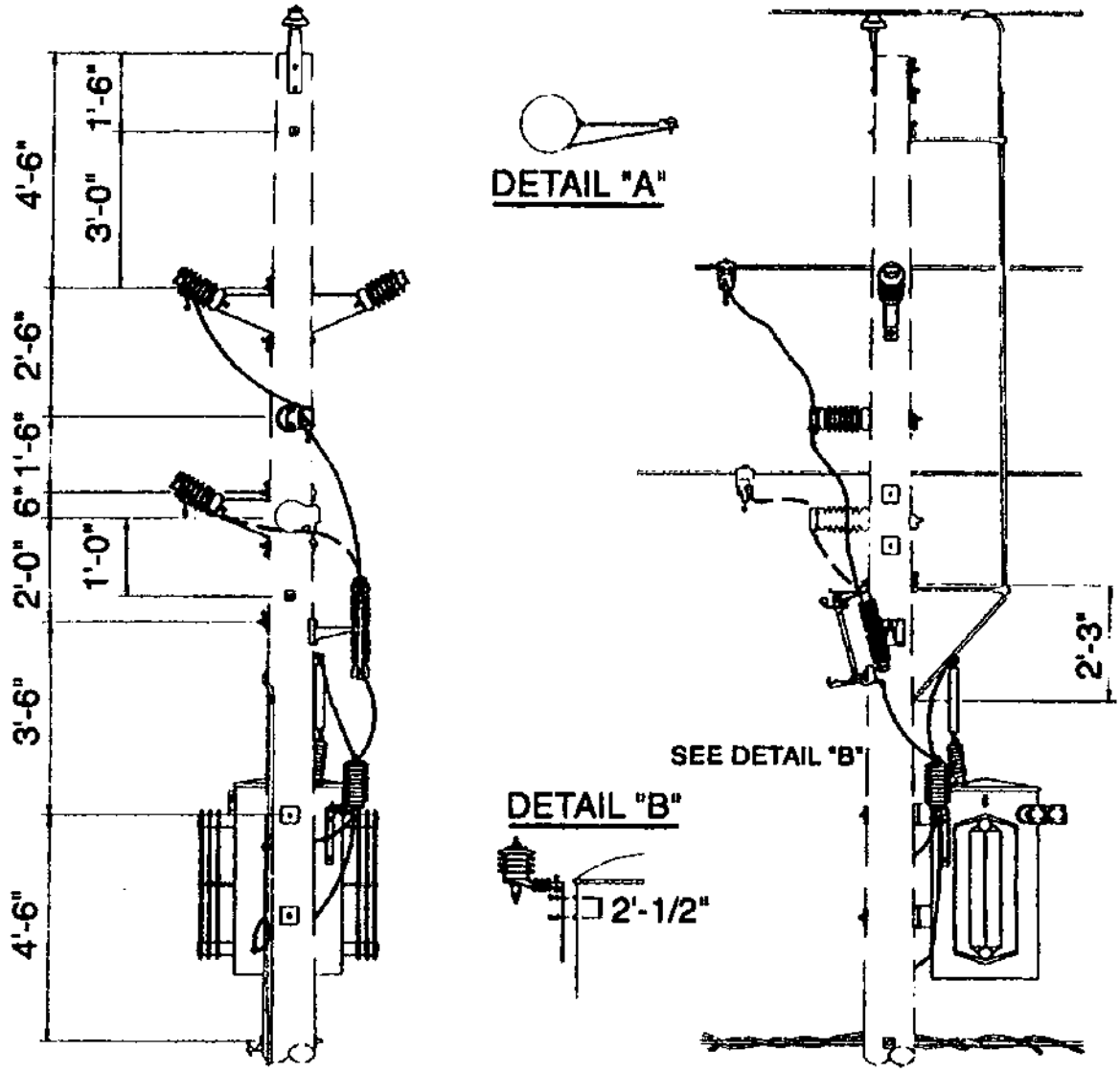
# 12 KV Armless Tangent

## With Three Phase Transformer Bank



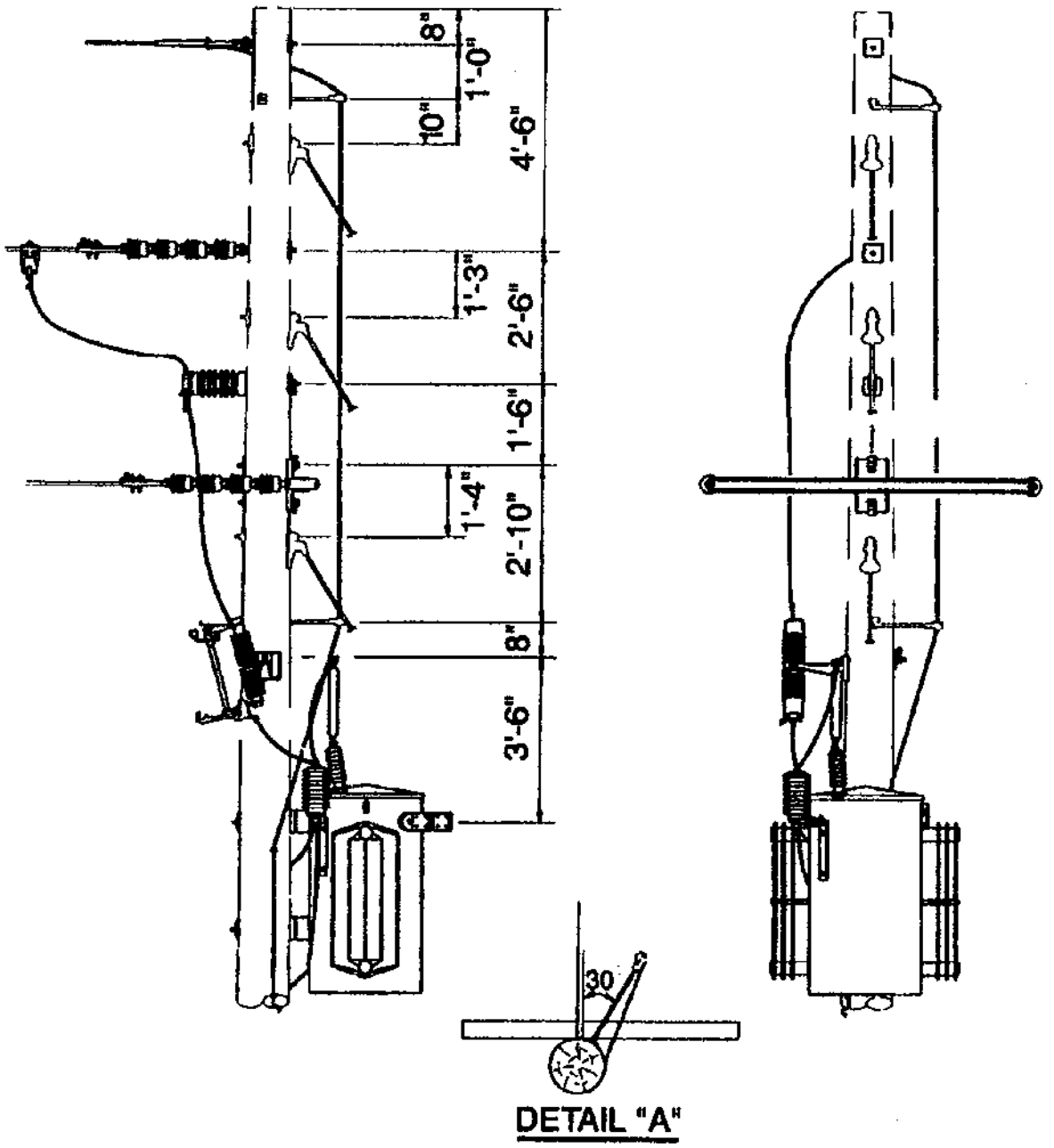
# 35 KV Armless Delta Tangent Pole

## With Single Phase Transformer



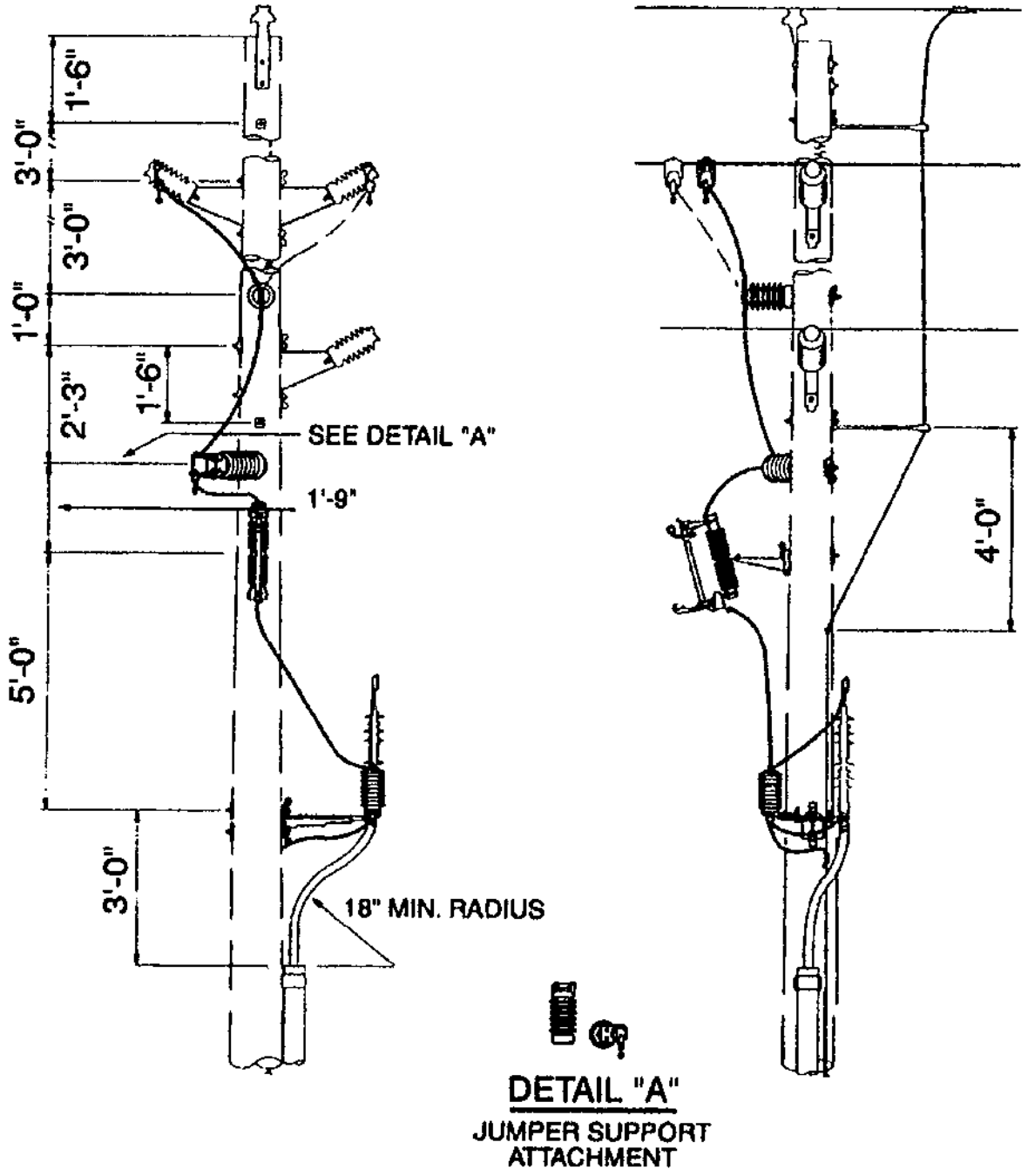
# 35 KV Delta Armless Deadend Pole

with Single Phase Transformer



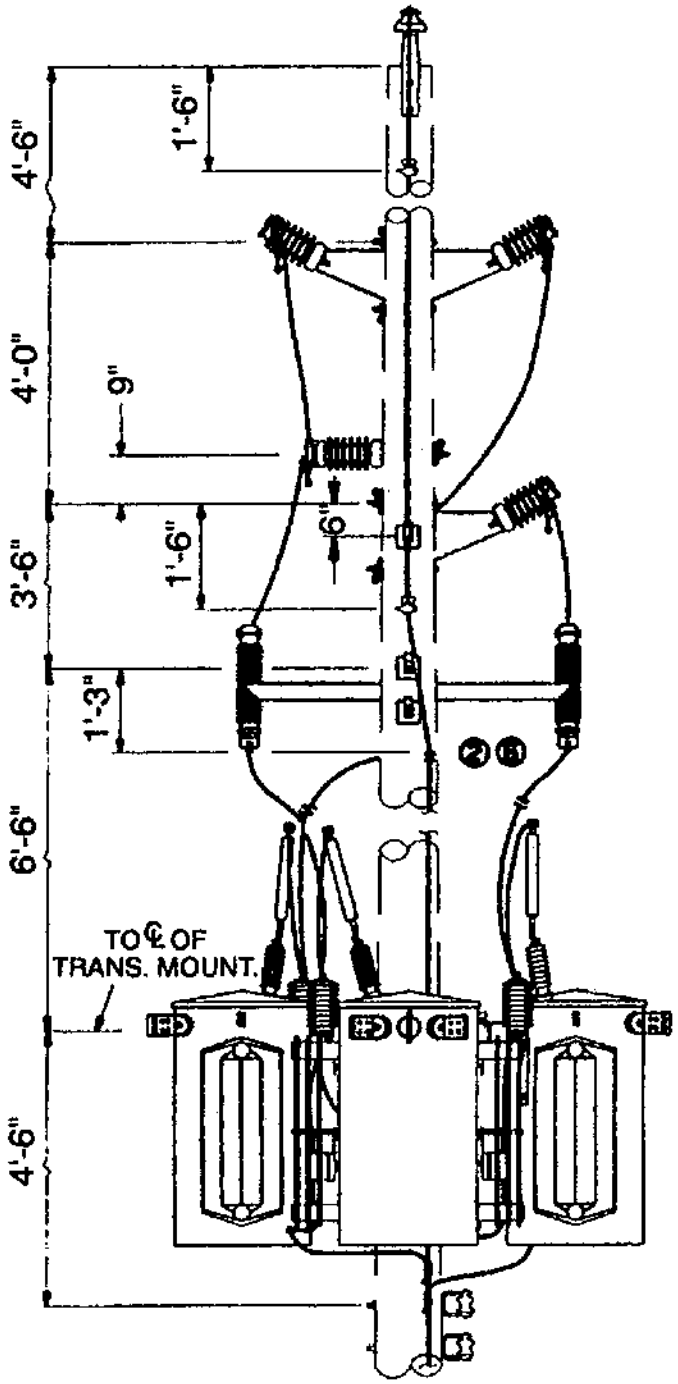
# 35 KV URD Terminal Pole

## Mounting Assembly



# 35 KV Armless Delta Tangent

## With Three Phase Transformer Bank



# 12 KV Transformer Fusing Chart

Distribution System

| Single Phase Transformer KVA | Fuse Size |
|---|---|
| 3 | 3T |
| 5 | 3T |
| 20 | 3T |
| 15 | 3T |
| 25 | 6T |
| 37.5 | 8T |
| 50 | 10T |
| 75 | 15T |
| 100 | 20T |
| 167 | 30T |
| 250 | 50T |
| 333 | 65T |
| 500 | 100T |

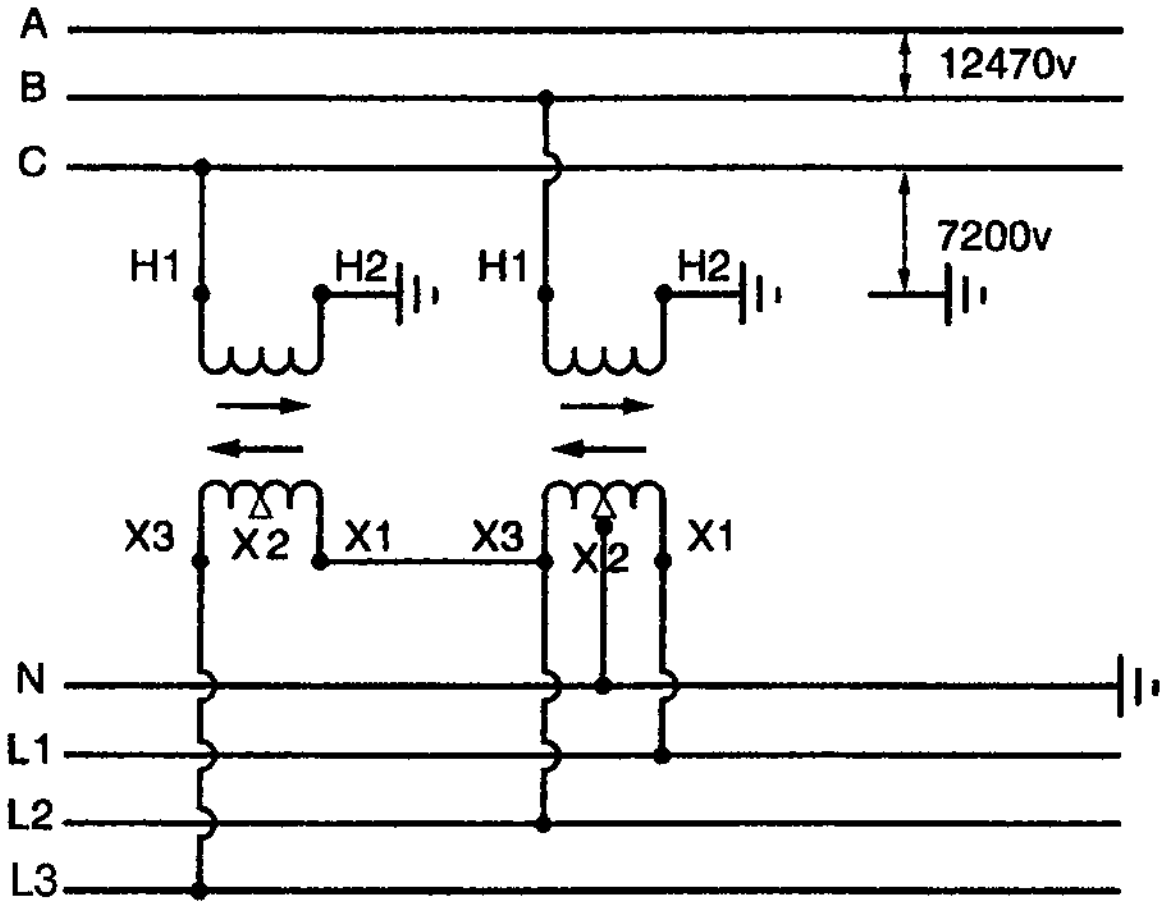
# 35 KV Transformer Fusing Chart

Distribution System

| Single Phase Transformer KVA | Expulsion Fuse | CLF Size |
|---|---|---|
| 25 KVA | 3K | 12 |
| 37.5 KVA | 3K | 12 |
| 50 KVA | 6K | 12 |
| 75 KVA | 6K | 12 |
| 100 KVA | 10K | 12 |
| 167 KVA | 15K | 25 |
| 200 KVA (Parallel 2-100 KVA) | 20K | 25 |
| 250 KVA | 20K | 25 |
| 333 KVA | 25K | 25 |
| 500 KVA | 30K | — |
| 500 KVA (Parallel 2-250 KVA) | 30K | — |

# Open Y Delta Bank – 7200/12470Y – 120/240

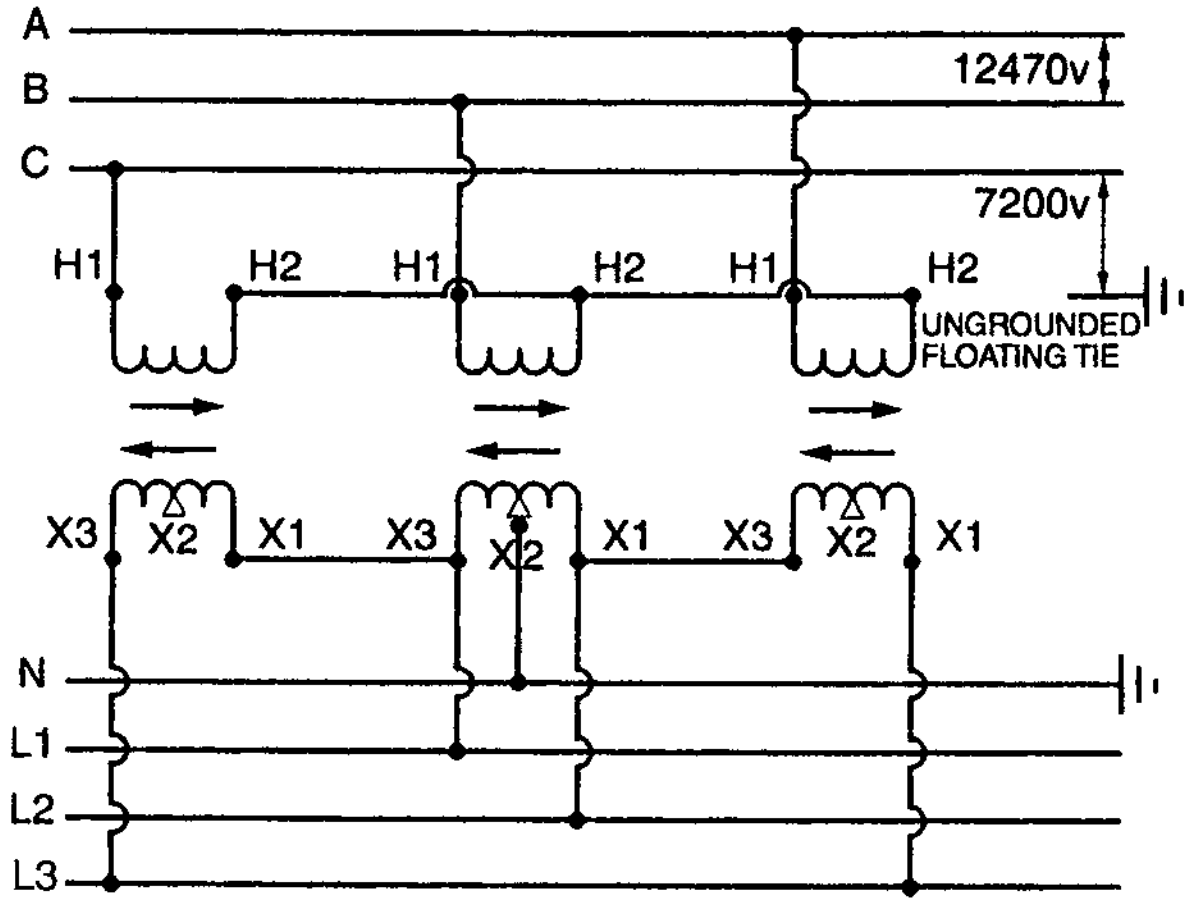
Case ground all transformers and cluster racks to system neutral and bond. Additive polarity. Center tap lighter transformer.




| | | | |
|---|---|---|---|
| Secondary Voltages | (1) N-L1=120 | (2) N-L2=120 | (3) N-L3=208 |
| | (4) L1-L2=240 | (5) L1-L3=240 | (6) L2-L3=240 |

# Closed Y Delta Bank – 7200/12470Y – 120/240

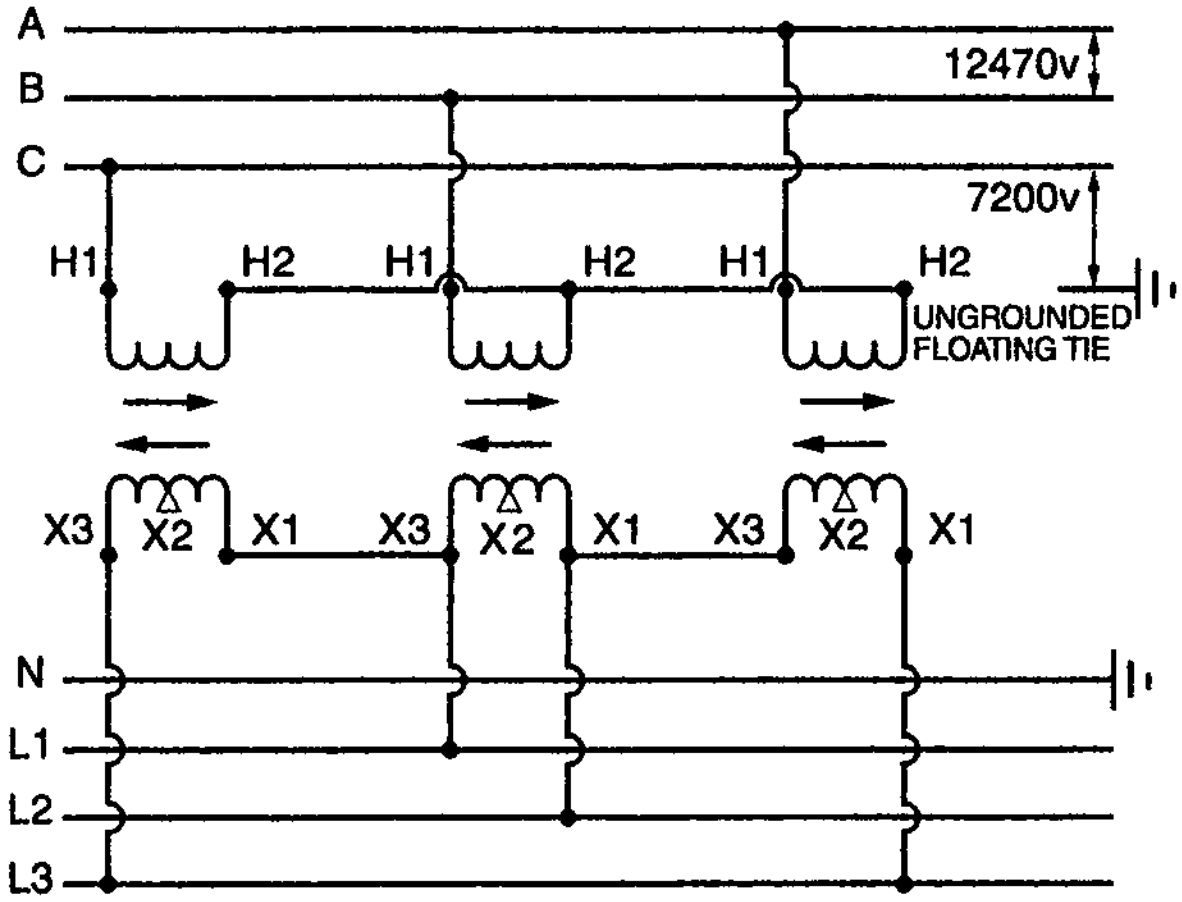
Case ground all transformers and cluster racks to system neutral and bond. Additive polarity. Center tap lighter transformer.




Secondary Voltages (1) N-L1=120 (2) N-L2=120 (3) N-L3=208 (4) L1-L2=240 (5) L1-L3=240 (6) L2-L3=240

# Closed Y Delta Bank – 7200/12470Y – 480 POWER

Case ground all transformers and cluster racks to system neutral and bond. Additive polarity.

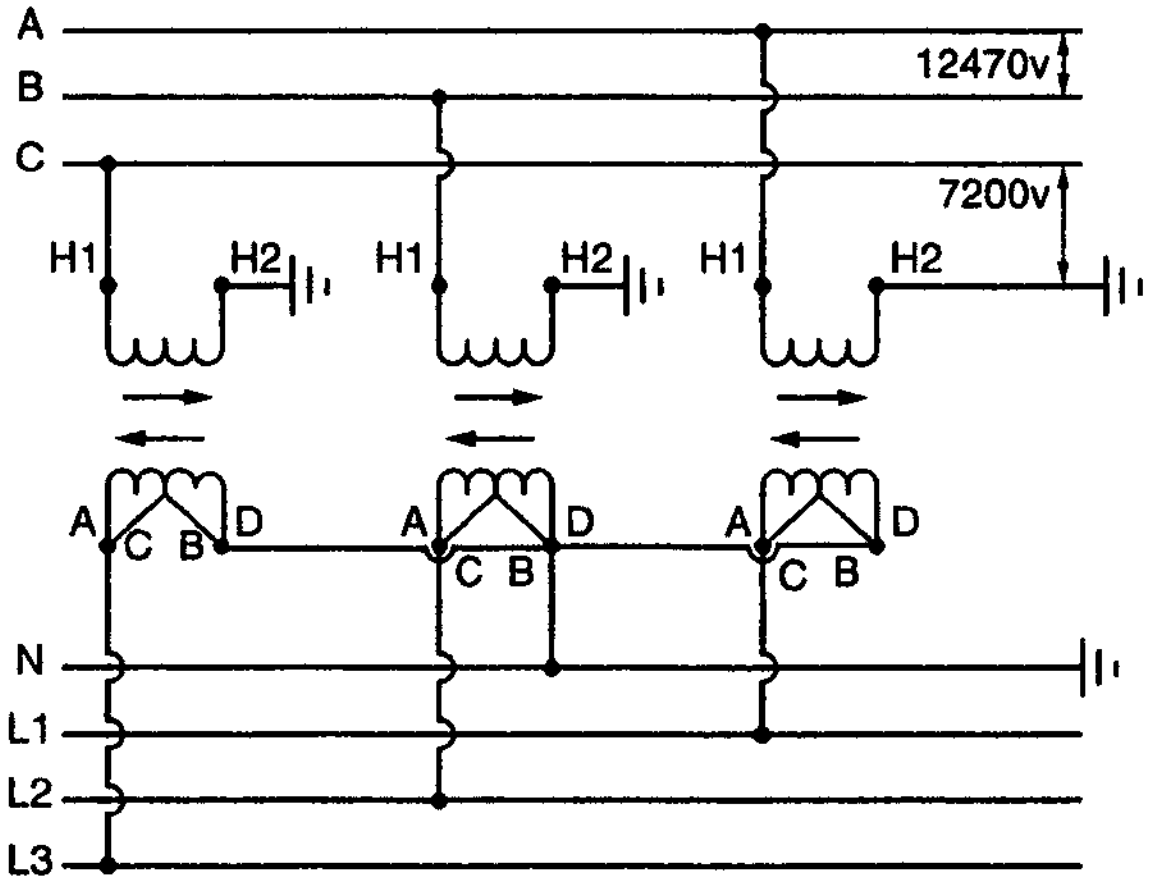



| | | | |
|---|---|---|---|
| Secondary | (1) N-L1=0+ | (2) N-L2=0+ | (3) N-L3=0+ |
| Voltages | (4) L1-L2=480 | (5) L1-L3=480 | (6) L2-L3=480 |

# Closed YY Bank – 7200/12470Y – 120/208

Case ground all transformers and cluster racks to system neutral and bond. Additive Polarity.

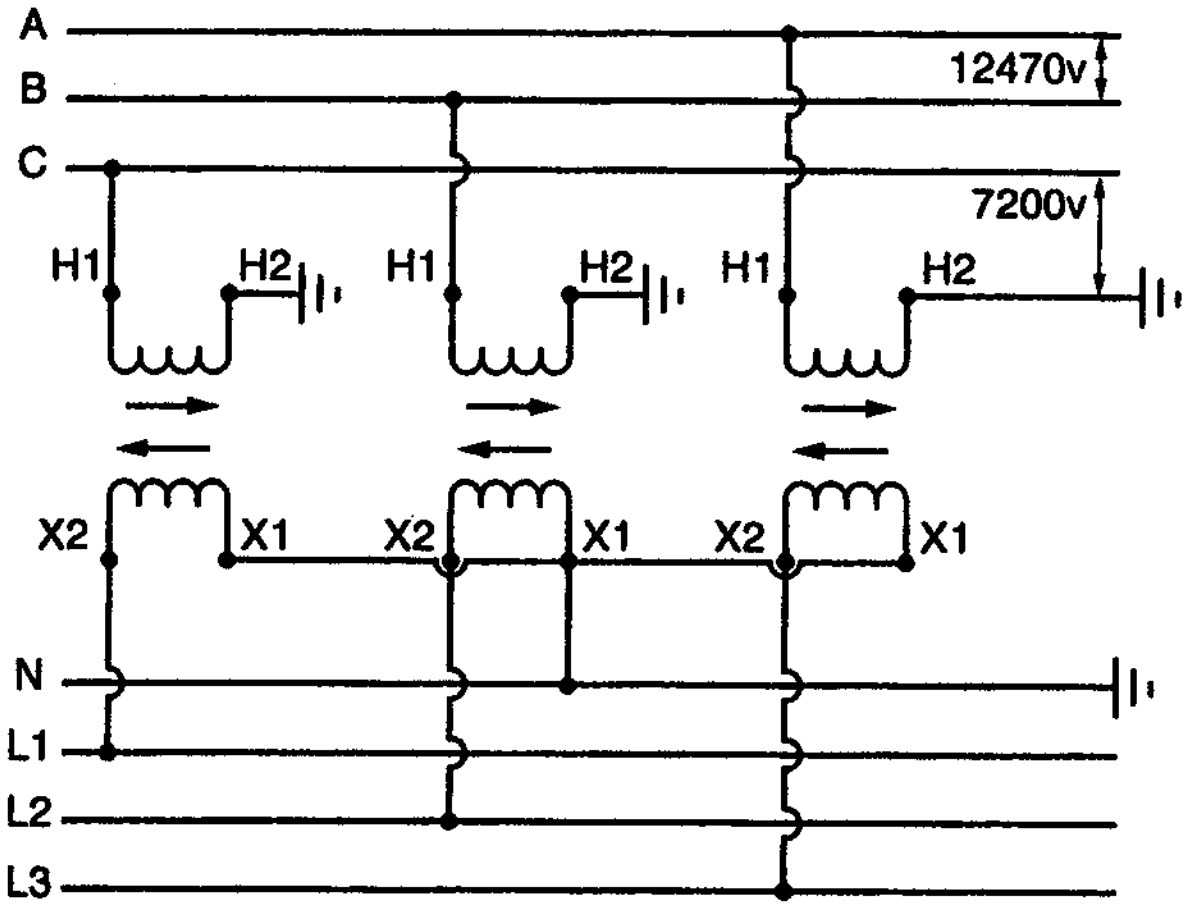
Transformers cut two wire. Case ground neutral bushings.




Secondary Voltages (1) N-L1=120 (2) N-L2=120 (3) N-L3=120 (4) L1-L2=208 (5) L1-L3=208 (6) L2-L3=208

# Closed YY Bank – 7200/12470Y – 277/480

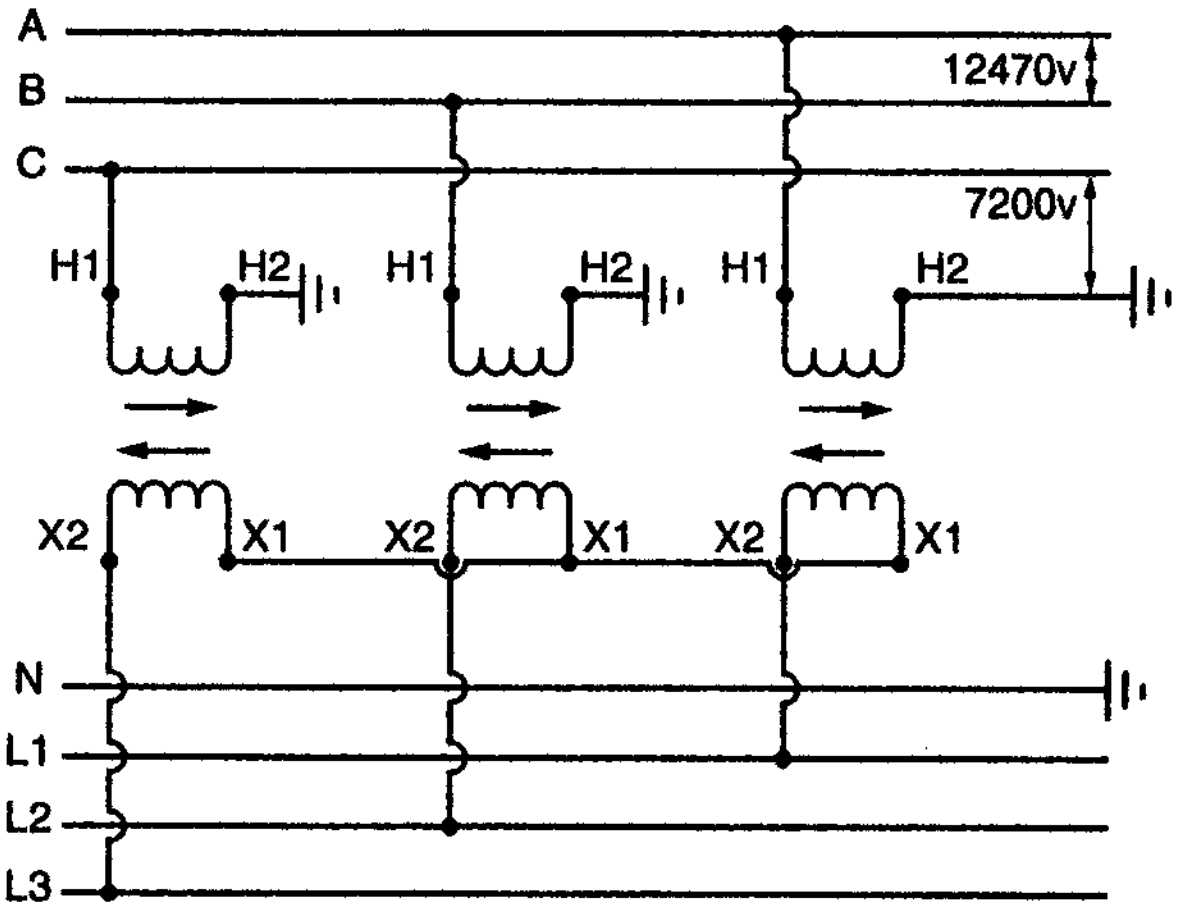
Case ground all transformers and cluster racks
to system neutral and bond. Case ground neutral bushings.
Additive Polarity.




| | | | |
|---|---|---|---|
| **Secondary Voltages** | (1) N-L1=277 | (2) N-L2=277 | (3) N-L3=277 |
| | (4) L1-L2=480 | (5) L1-L3=480 | (6) L2-L3=480 |

# Closed YY Bank – 7200/12470Y – 480 Power

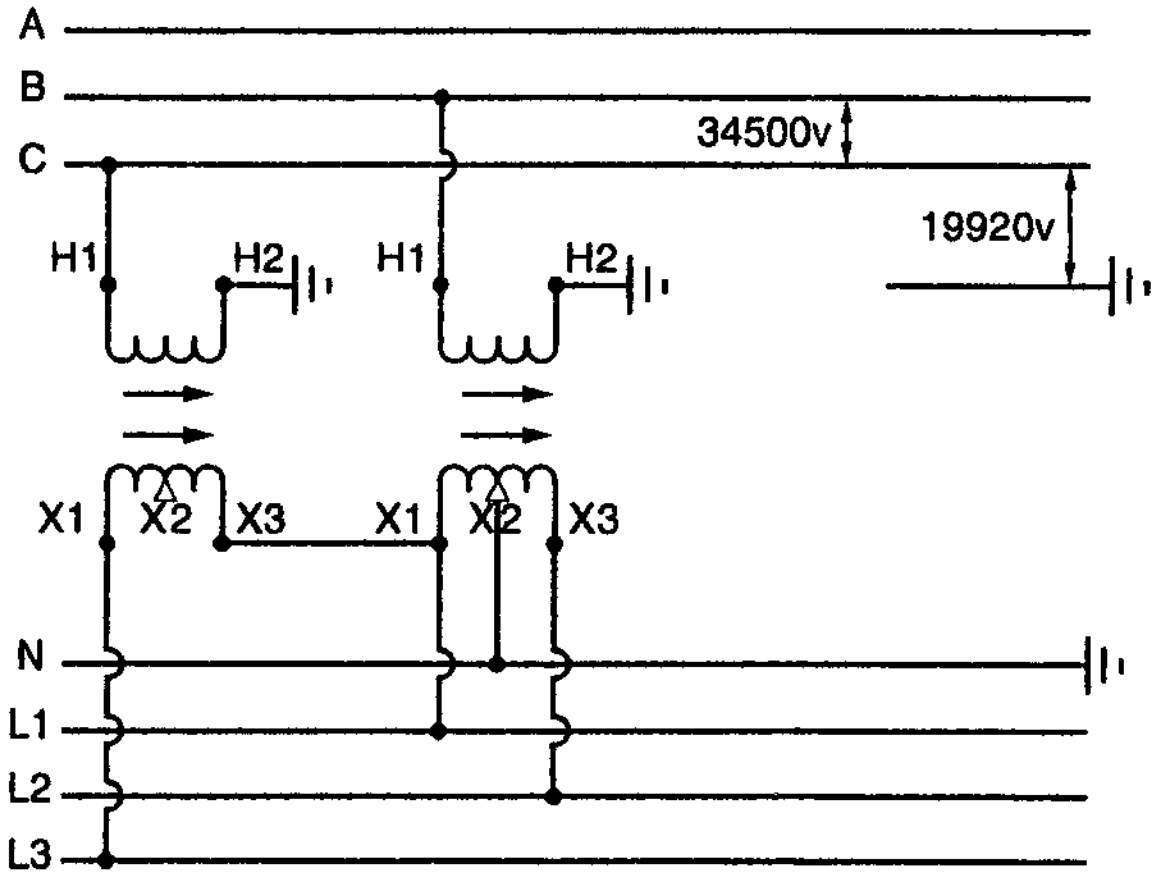
Case ground all transformers and cluster racks to system neutral and bond. Additive Polarity.




Secondary Voltages (1) N-L1=0+ (2) N-L2=0+ (3) N-L3=0+ (4) L1-L2=480 (5) L1-L3=480 (6) L2-L3=480

# Open Y Delta Bank – 19920/34500Y – 120/240

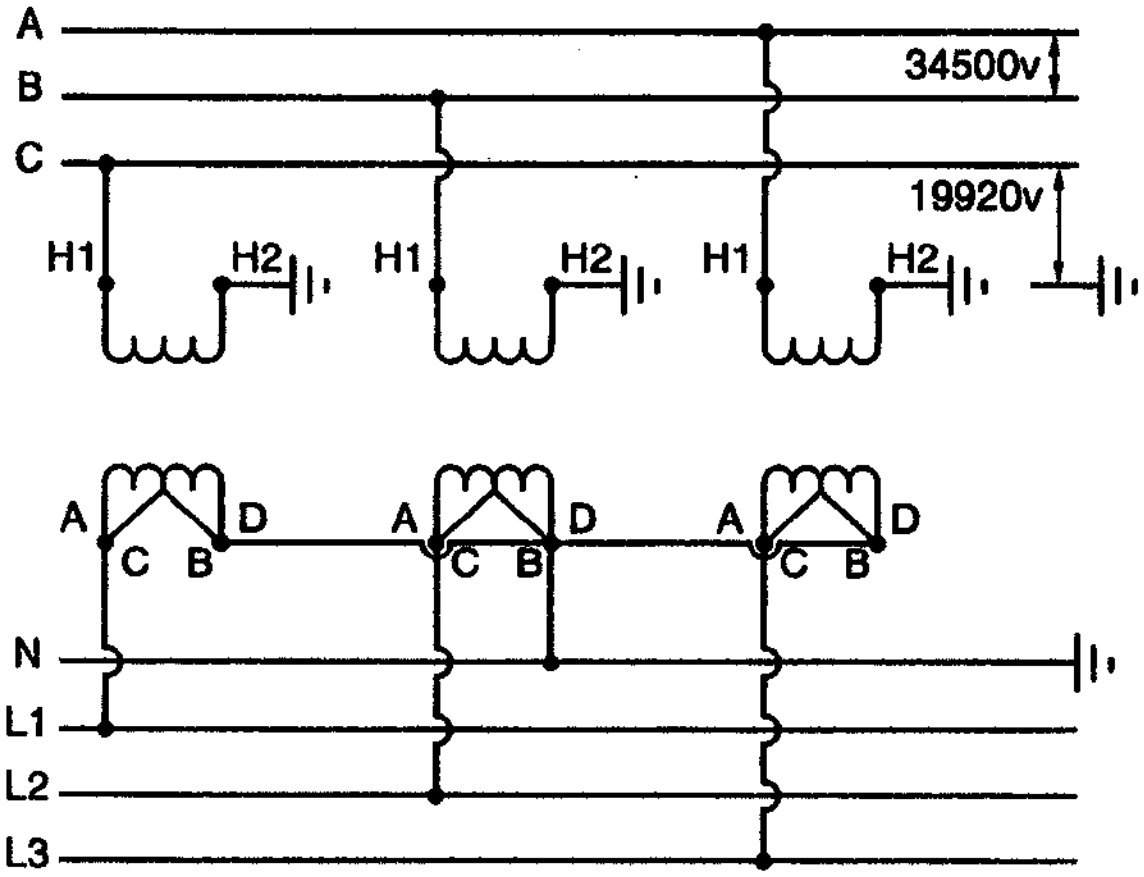
Case ground all transformers and cluster racks to system bond.
Subtractive Polarity.
Center tap lighter transformer.




Secondary Voltages (1) N-L1=120 (2) N-L2=120 (3) N-L3=208 (4) L1-L2=240 (5) L1-L3=240 (6) L2-L3=240

# Closed YY Bank – 19920/34500 – 120/208

Case ground all transformers and cluster racks to system bond.
Subtractive Polarity. Transformers cut two wire.
Case ground neutral bushings.

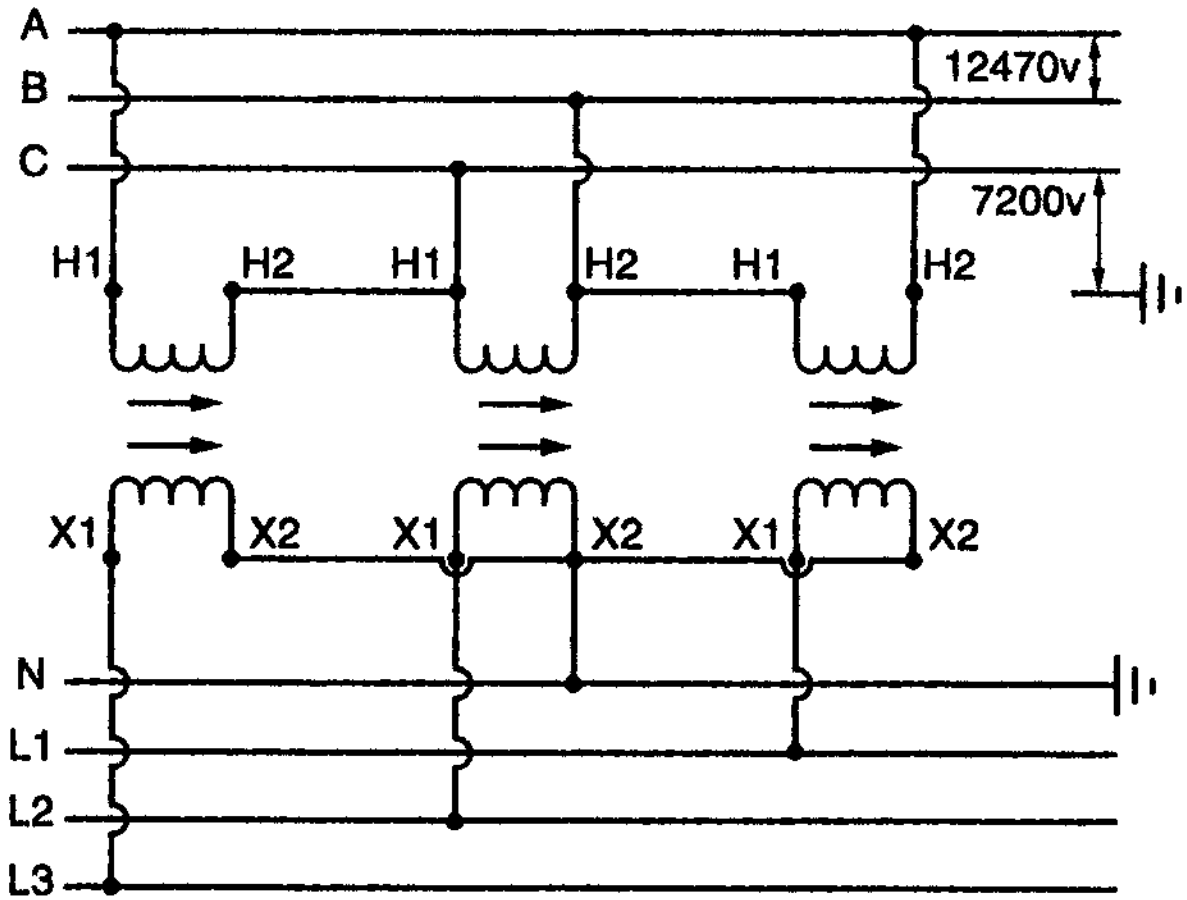



| | | | |
|---|---|---|---|
| **Secondary Voltages** | (1) N-L1=120 | (2) N-L2=120 | (3) N-L3=120 |
| | (4) L1-L2=208 | (5) L1-L3=208 | (6) L2-L3=208 |

# Closed Delta Y Bank – 13.2 KV – 277/480

Case ground all transformers and cluster racks to system neutral and bond. Subtractive Polarity.

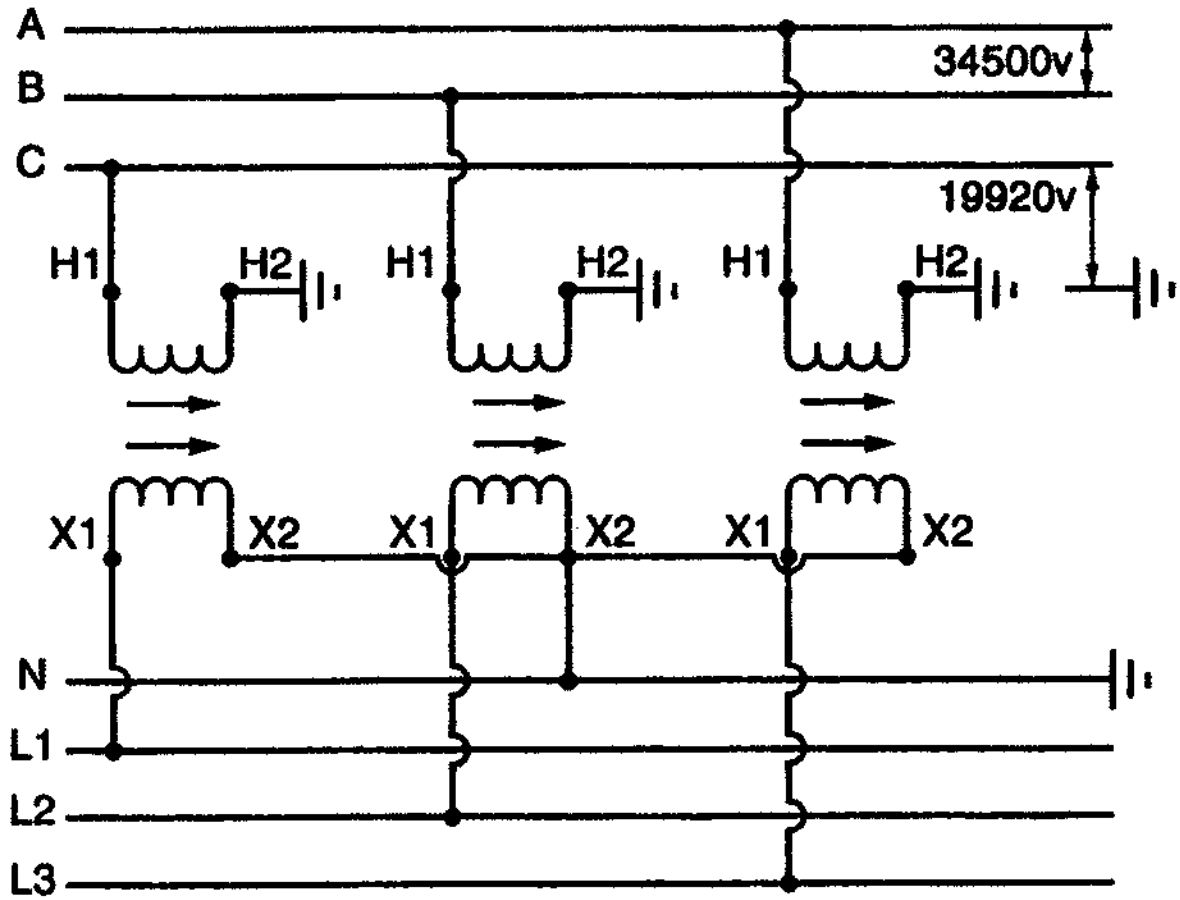
Case ground neutral bushings.




Secondary Voltages (1) N-L1=277 (2) N-L2=277 (3) N-L3=277 (4) L1-L2=480 (5) L1-L3=480 (6) L2-L3=480

# Closed YY Bank – 19920/34500Y – 277/480

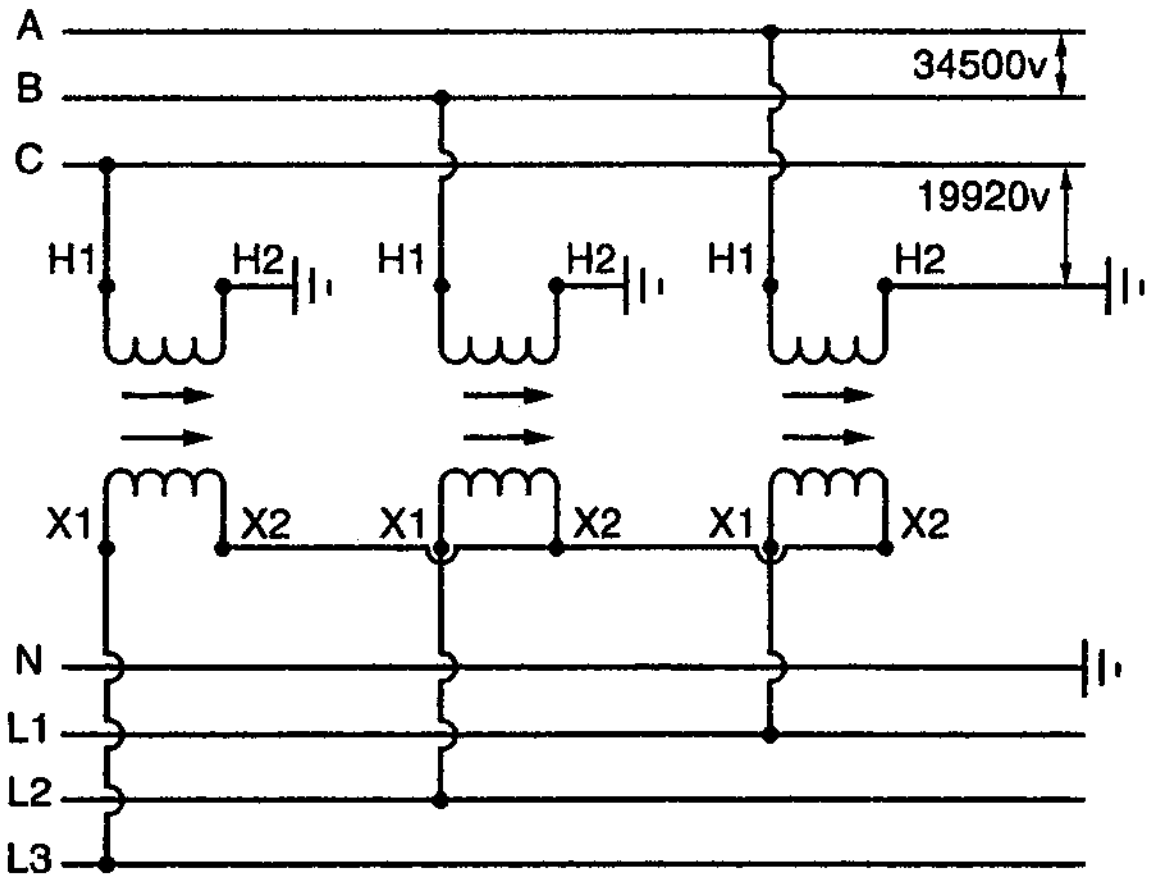
Case ground all transformers and cluster racks to system bond.
Subtractive Polarity.
Case ground neutral bushings.




| | | | |
|---|---|---|---|
| **Secondary Voltages** | (1) N-L1=277 | (2) N-L2=277 | (3) N-L3=277 |
| | (4) L1-L2=480 | (5) L1-L3=480 | (6) L2-L3=480 |

# Closed YY Bank – 19920/34500Y – 480 Power

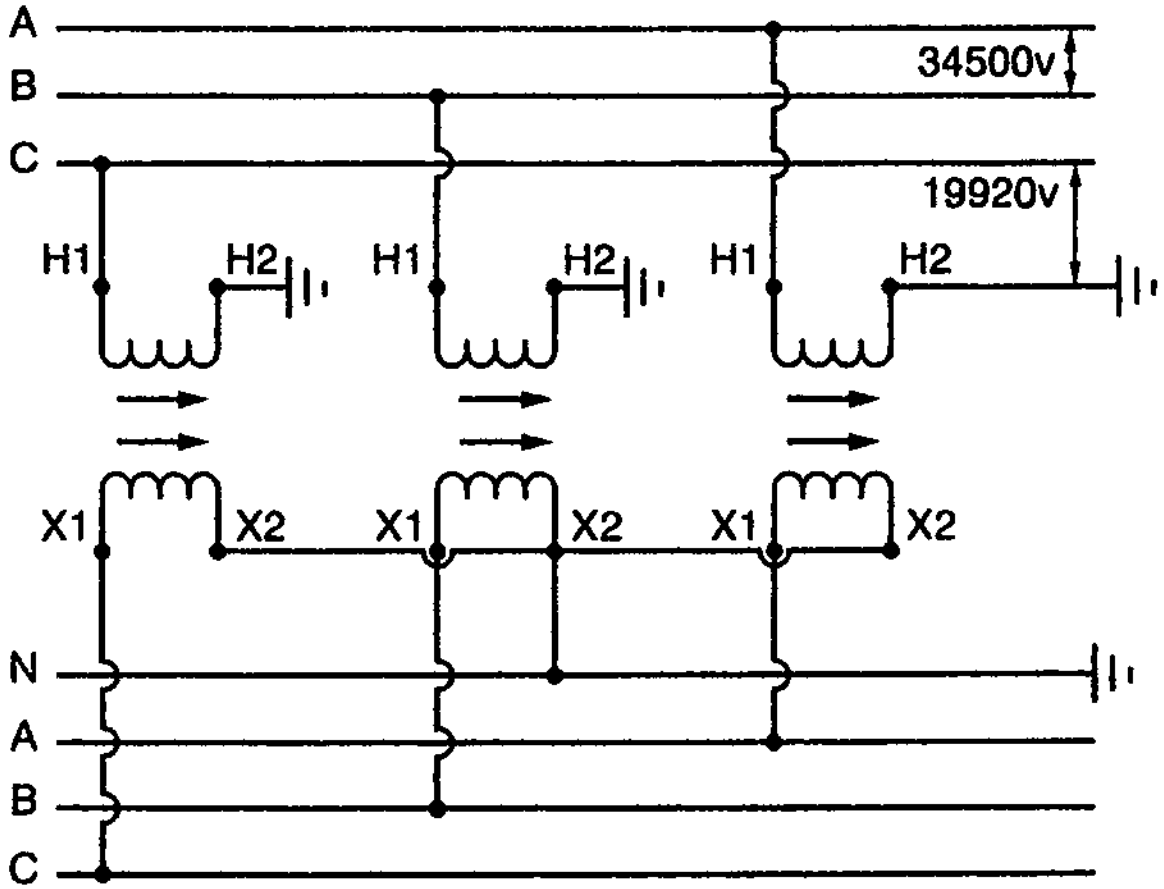
Case ground all transformers and cluster racks to system bond.
Subtractive Polarity.




| | | | |
|---|---|---|---|
| Secondary Voltages | (1) N-L1=0+ | (2) N-L2=0+ | (3) N-L3=0+ |
| | (4) L1-L2=480 | (5) L1-L3=480 | (6) L2-L3=480 |

## Closed YY Bank – 19920/34500Y – 7200/12470Y

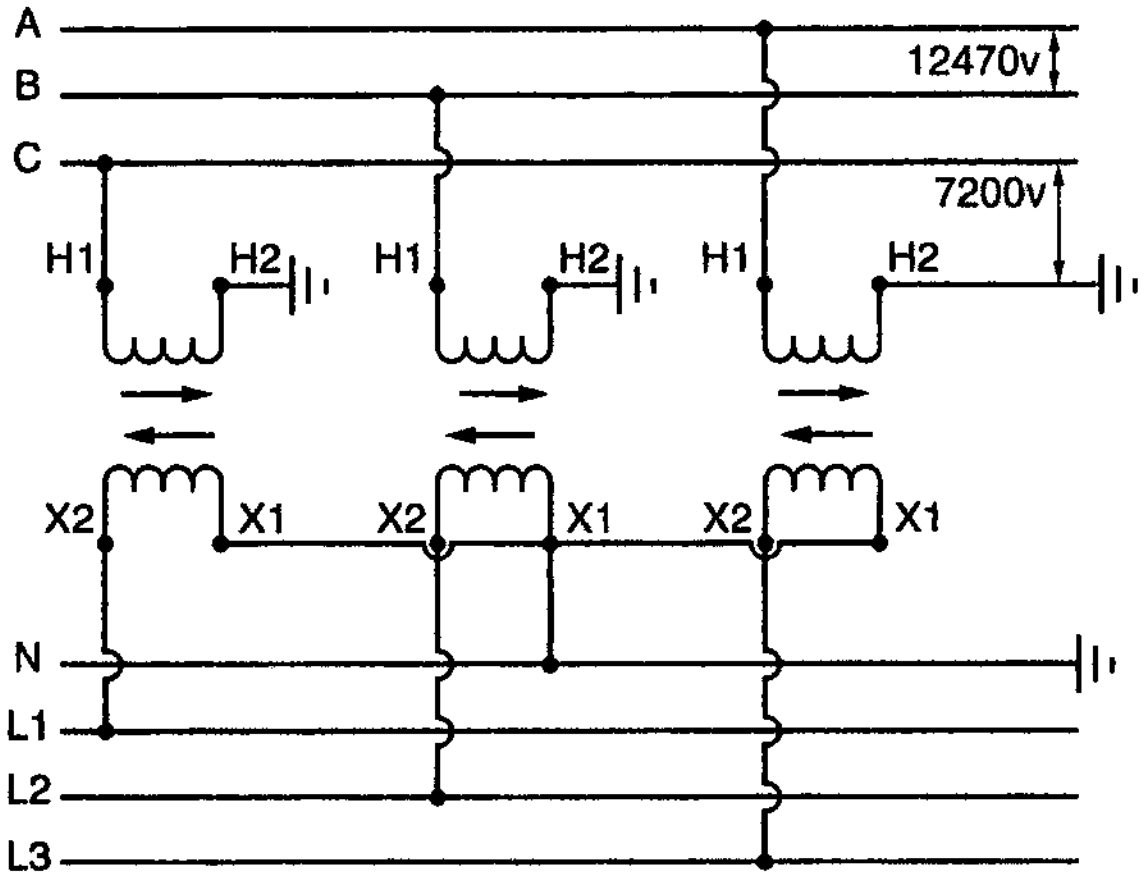
Case ground all transformers and cluster racks to system bond.
Case ground bushings. Subtractive Polarity.




| | | | |
|---|---|---|---|
| Secondary Voltages | (1) N-A=7200 | (2) N-B=7200 | (3) N-C=7200 |
| | (4) A-B=12470 | (5) A-C=12470 | (6) B-C=12470 |

# Closed YY Bank – 7200/12470Y – 2400/4160

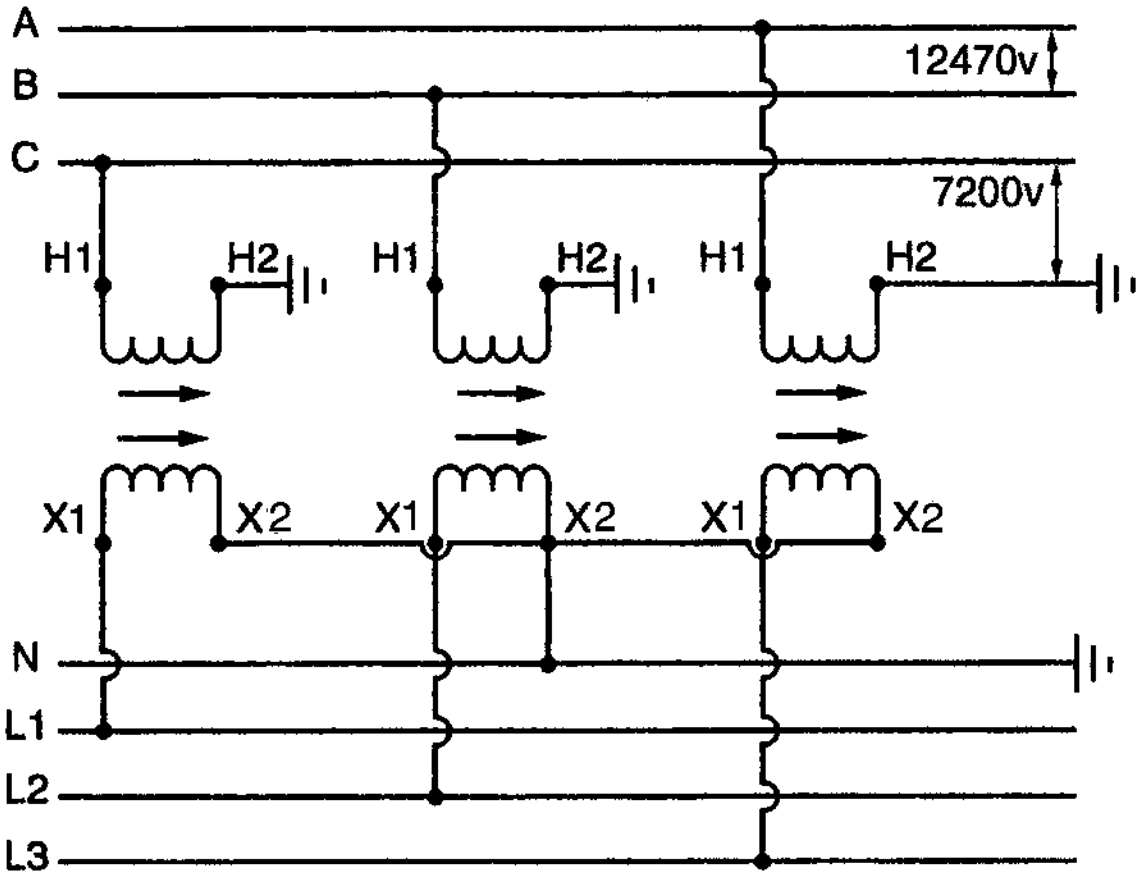
Case ground all transformers and cluster racks
to system neutral and bond. Case ground neutral bushings.
Additive Polarity.




Secondary Voltages (1) N-L1=2400 (2) N-L2=2400 (3) N-L3=2400
(4) L1-L2=4160 (5) L1-L3=4160 (6) L2-L3=4160

# Closed YY Bank – 19920/34500Y – 2400/4160

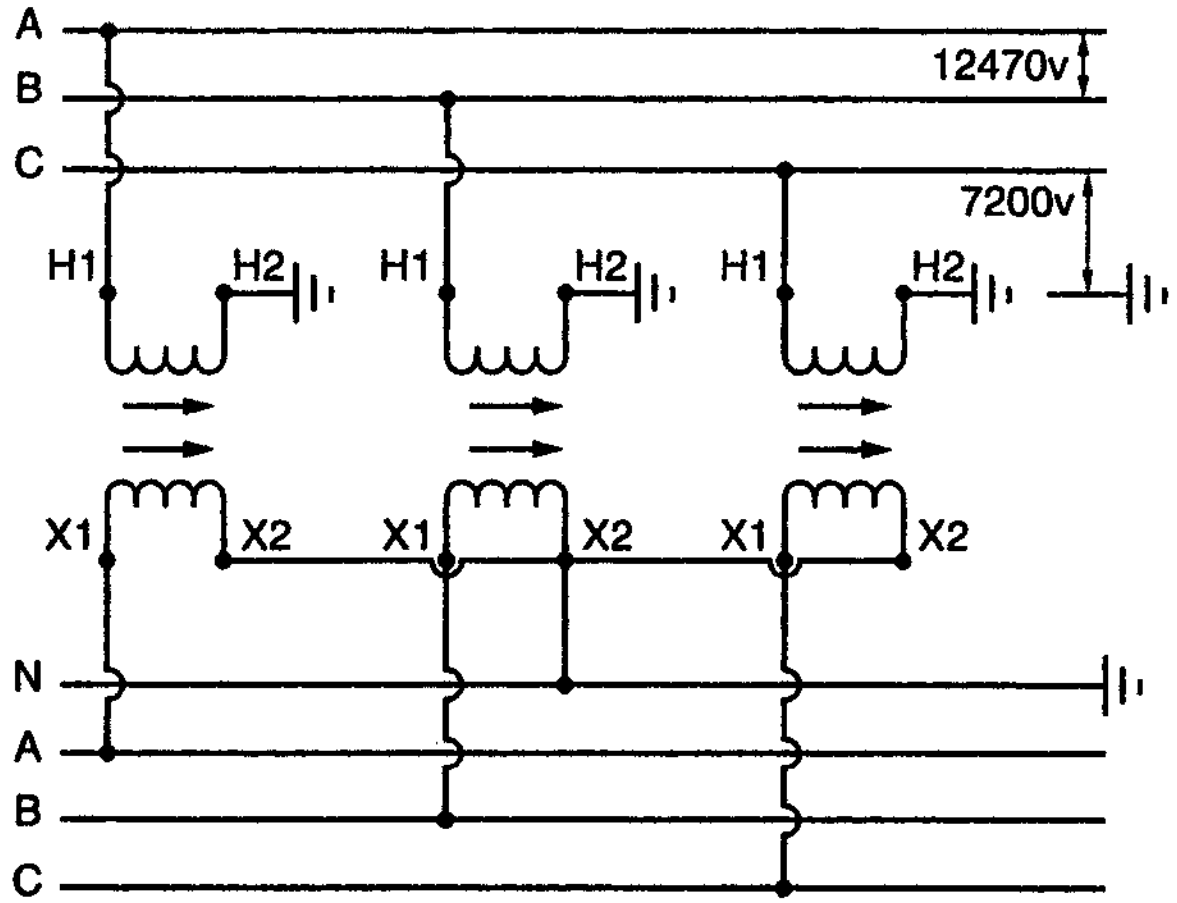
Case ground all transformers and cluster racks to system bond.
Subtractive Polarity.




Secondary Voltages (1) N-L1=2400 (2) N-L2=2400 (3) N-L3=2400 (4) L1-L2=4160 (5) L1-L3=4160 (6) L2-L3=4160

# Closed YY Bank – 7200/12470Y – 19920/34500Y

Case ground all transformers and cluster racks to system bond.
Case ground neutral bushings. Subtractive Polarity.




Secondary Voltages (1) N-A=19920 (2) N-B=19920 (3) N-C=19920 (4) A-B=34500 (5) A-C=34500 (6) B-C=34500

# Notes

# CenterPoint Energy Contact Information and Emergency Numbers

Your assigned FCC will provide a listing of primary and emergency contact numbers. You must have this information prior to starting work.

## Primary Contact Information

Assigned FCC - _____

Local Service Center - _____

Safety Department - _____

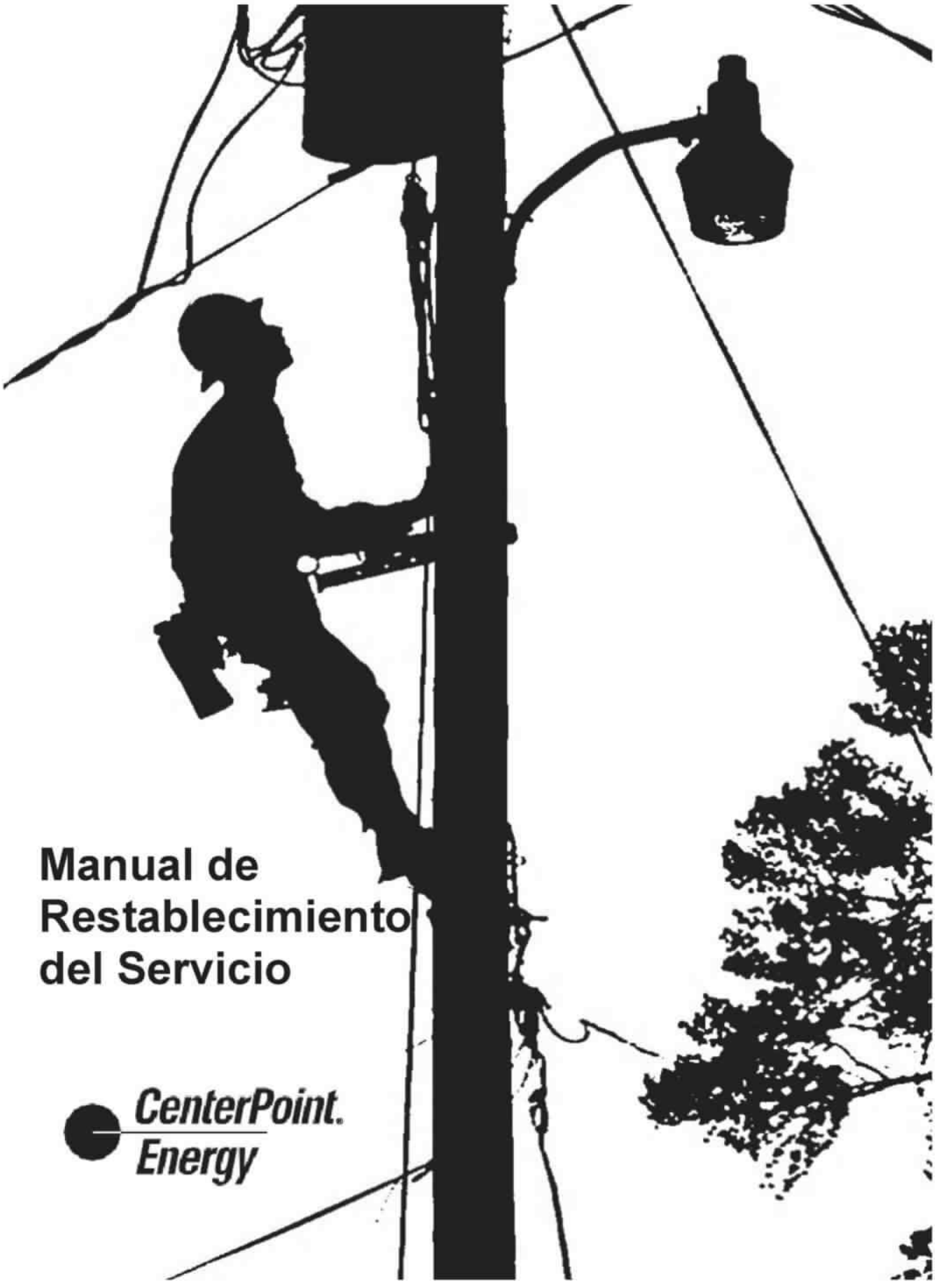
## Emergency Contact Information

Police - _____

Fire/EMS - _____

Hospital -_____

Keep record (in writing) of the locations where you have left material at the jobsite and/or any instances in which you have made temporary repairs to the system. All documentation should be provided to your assigned FFC contact.



# Manual de Restablecimiento del Servicio

CenterPoint Energy

# Contenido

# Introducción

Bienvenido a CenterPoint Energy Houston Electric, y gracias por sus trabajos en nuestras actividades de restablecimiento del servicio tras tormentas.

CenterPoint Energy Houston Electric proporciona electricidad a más de 2.3 millones de clientes en un área de 5,000 millas cuadradas. Houston, la cuarta ciudad más grande del país en cuanto a población, depende de nuestra red de líneas de transmisión y distribución que atienden las necesidades eléctricas de algunos de las empresas industriales más grandes del mundo, entre ellas empresas petroleras, químicas y metalúrgicas.

Ahora que la tormenta ha terminado, el restablecimiento seguro del suministro eléctrico a nuestros clientes será nuestra máxima prioridad. A lo largo de los trabajos de restablecimiento del servicio, usted será asignado a un Coordinador de Cuadrillas Foráneas (FCC, en inglés). Esta persona será su único punto de contacto y a la cual deberá hacer cualquier pregunta que pueda tener.

# Propósito

Este manual le proporcionará las pautas generales de seguridad y una visión general de las características y condiciones del sistema de CenterPoint Energy Electric, según lo exige la reglamentación 1910.269 de la OSHA. Puede encontrarse información adicional en los paquetes de trabajo, que incluye la Hoja de Trabajo de Transferencia de Información del Contratista. La seguridad es un valor central en CenterPoint Energy y forma parte de nuestra cultura total. No se tolerarán

actos inseguros cometidos con tal de acelerar cualquier trabajo de restablecimiento. Este manual pudiera no abordar todos los requisitos de seguridad asociados con el trabajo de distribución eléctrica, pero servirá para complementar su formación y experiencia previas. En caso de existir alguna discrepancia entre las prácticas de trabajo establecidas en este manual y las establecidas por su empresa, se seguirá la más estricta de los dos. A cada persona se le exige seguir las prácticas de seguridad para su protección personal, la protección de los compañeros de trabajo y la protección del público.

## Política de Conducta

Si bien la siguiente lista no abarca todas las políticas de CenterPoint Energy Electric, sí queremos destacar los siguientes puntos:

- Dentro de las instalaciones de CenterPoint Energy Electric (estas incluyen sitios de almacenamiento temporal, subestaciones, centros de servicio y estacionamientos) está estrictamente prohibida la posesión, uso, venta, y distribución de alcohol, drogas ilegales o sustancias controladas -o estar bajo su influencia- o en cualquier momento mientras se esté de servicio en el campo.
- En las instalaciones y/o sitios de trabajo de CenterPoint Energy Electric están prohibidas las armas de fuego, municiones u otras armas.
- En las instalaciones y/o sitios de trabajo de CenterPoint Energy Electric se prohíben las

conductas inapropiadas como "juegos de manos, peleas, juegos de azar, forcejeos, bromas pesadas, etc.".

CenterPoint Energy Electric no tiene ninguna intención de invadir las vidas privadas; sin embargo, la empresa sí le exige que se presente al trabajo en condiciones aptas para realizar sus deberes de manera segura y eficaz.

## Gastos

CenterPoint Energy Electric no pagará los siguientes gastos personales:

- Llamadas de larga distancia
- Películas en la habitación
- Servicio a la habitación
- Snacks, bebidas
- Productos de tabaco
- Daños en el hotel
- Compras de ropa o herramientas adicionales
- Servicio de lavandería del hotel
- Actividades recreativas

## Informes sobre accidentes y lesiones

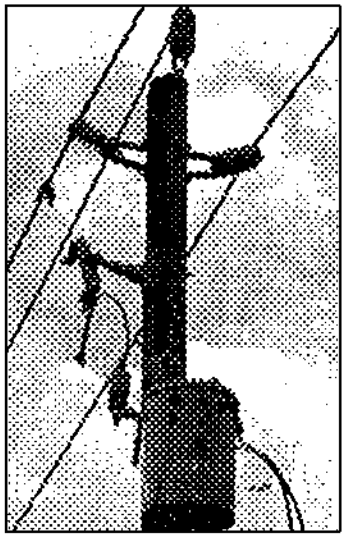
Es importante que cada trabajador entienda los pasos que deben tomarse para minimizar y controlar los efectos de un accidente o emergencia.

- Todos los accidentes e incidentes, independientemente de la gravedad de los mismos, deberán ser notificados inmediatamente a su Coordinador de Cuadrillas Foráneas.
- Se han identificado instalaciones de atención médica de emergencia en toda el área de servicio. Cada Coordinador de Cuadrillas Foráneas tendrá consigo una copia de las pautas para emergencias médicas.
- Todos los accidentes de vehículos deben ser reportados inmediatamente a su Coordinador de Cuadrillas Foráneas. Deberán cumplirse las normas del Departamento de Transporte relativas a las pruebas posteriores a los accidentes.

## Configuración del sistema

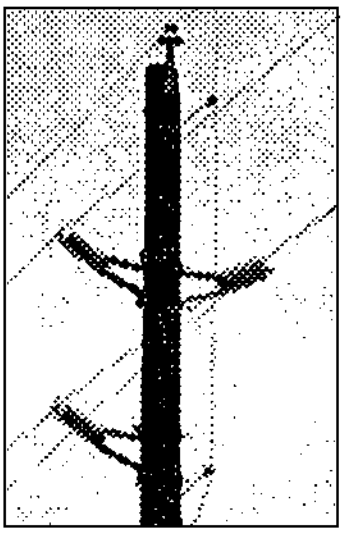
El sistema de distribución de CenterPoint Energy Electric se compone de dos tensiones primarias, ambas conectadas en estrella a tierra. Su Coordinador de Cuadrillas Foráneas le proporcionará las especificaciones del armazón para cada configuración.

El sistema de 12 kV (fase de 7200 voltios a tierra) tiene un neutro común y una construcción de armazón con o sin crucetas.



Las alturas típicas de los postes son de 40 y 45 pies. La figura a la derecha representa la configuración típica de 12kV sin crucetas. ***Precaución:*** *No se puede confiar en el armazón solamente para determinar el nivel de voltaje. En algunos casos, el armazón de 12kV está energizado a un voltaje más alto. Siempre consulte la placa de datos de los equipos asociados para identificar positivamente el nivel de voltaje.*

El sistema de 35kV (fase de 19,920 voltios a tierra) tiene un neutro primario enmarcado en la posición estática por encima de las fases. Las alturas típicas de los postes son de 50 y 55 pies. El tipo de armazón predominante es de construcción sin crucetas; sin embargo, existen algunos de construcción con crucetas.



La figura a la derecha representa la configuración típica de 35kV sin crucetas. ***Precaución:*** *No se puede confiar en el armazón solamente para determinar el nivel de*

*voltaje. En muchos casos, armazones de 35kV están energizados a un voltaje más bajo. Siempre consulte la placa de datos de los equipos asociados para identificar positivamente el nivel de voltaje.*

## Voltajes secundarios y sus conexiones

CenterPoint Energy Electric utiliza bancos de transformadores conectados en delta y en estrella para proporcionar una gama de voltajes secundarios.

Los secundarios monofásicos se conectan a estaciones de transformadores individuales y no están en paralelo. Nota: Los secundarios monofásicos no están atados a varias estaciones de transformadores. Por lo tanto, el servicio de los secundarios no se mantiene si una estación de transformador individual queda fuera de servicio.

CenterPoint Energy Electric mantiene una rotación estándar en el sentido de las agujas del reloj en el contador en todas las localidades de servicio trifásico.

Consulte a su Coordinador de Cuadrillas Foráneas respecto a las pautas de rotación de los servicios trifásicos. CenterPoint Energy Electric utiliza las siguientes conexiones para los transformadores montados en postes.

| **7,200/12,470 V** | **19,920/ 34,500 V** |
|---|---|
| 120 - 240 monofásica | 120 - 240 monofásica |
| 120- 240 estrella abierta/ delta abierta | 120- 240 estrella abierta/delta abierta |
| 120 - 240 estrella/delta | 120 - 208 estrella/estrella* |
| 120 - 208 estrella/estrella* | 277 - 480 estrella/estrella |
| 480 estrella abierta/ delta abierta | 480 estrella/estrella sin conexión a tierra |
| 480 estrella/delta | |
| 277- 480 delta/estrella | |
| 277 - 480 estrella/estrella | |
| 480 estrella/ estrella sin conexión a tierra | *Los transformadores deben ser cortados a dos hilos |

***Nota:*** *En los bancos de transformadores de 7200 voltios de estrella cerrada / delta cerrada, los bujes primarios comunes deben estar encadenados, pero no conectados a tierra.*

A algunos grandes clientes comerciales y de la industria ligera se les presta servicio con instalaciones de transformadores de un solo banco y de múltiples bancos desde 480 a 4160 voltios. En la parte posterior de este manual están los diagramas de cableado de los transformadores.

## Determinación del voltaje en líneas y equipos

Los voltajes nominales de las líneas y equipos se pueden encontrar usando uno o más de los siguientes métodos:

- Consultando la capacidad nominal indicada en la placa de datos
- Consultando la identificación del circuito en el paquete de trabajo
- El Coordinador de Cuadrillas Foráneas puede ponerse en contacto con Control de Distribución; en tal caso, es posible que necesite proporcionar un número de contador o de identificación "ID" de la instalación
- El uso de dispositivos de medición de voltaje

## Determinación de los voltajes máximos de los transitorios de conmutación y presencia de voltajes inducidos peligrosos

Los voltajes transitorios y las tensiones inducidas normalmente no están predeterminadas y, por consiguiente, no están documentados para su consulta por parte de las cuadrillas antes de llegar al lugar de trabajo. Sin embargo, durante las reuniones de seguridad antes de iniciar el trabajo, las cuadrillas siempre deben determinar si los voltajes transitorios son posibles y tomar las medidas adecuadas para mitigar o eliminar los peligros. Si CenterPoint Energy está al tanto o se le hace saber acerca de cualquier posible procedimiento que creará o podrá crear voltajes transitorios mediante los

procedimientos de conmutación, esto le será comunicado a las cuadrillas.

- Los voltajes transitorios podrían ser producidos por operaciones de conmutación
- Los voltajes inducidos pueden provenir de varias fuentes
    - Generación/retorno de alimentación eléctrica del cliente
    - Relámpagos
    - Conductores paralelos que corren adyacentes a conductores energizados por medio de transferencia electromagnética
    - Otras condiciones naturales

Cuando sea práctico, los conductores deben estar siempre aislados, comprobados que están desenergizados y conectados a tierra para eliminar la posibilidad de este tipo de situación. Cualquier fuente conocida de retorno de alimentación eléctrica será comunicada por el Coordinador de Cuadrillas Foráneas o la información será proporcionada en el paquete de trabajo.

# Sistema avanzado de medición (AMS)


CenterPoint Energy utiliza un sistema avanzado de medición (AMS) para proporcionar datos de consumo a nuestros clientes y datos del estado del sistema a nuestro sistema de distribución automatizado. Estos componentes son una parte vital de nuestra infraestructura. Los contadores AMS pueden ser identificados por las palabras "Open Way" en la carátula del medidor, y todo contador dañado debe ser reemplazado por otro contador "open way". Además de los contadores, hay una red de antenas de comunicación que transmite los datos. El restablecimiento de este equipo recibirá la misma prioridad que el restablecimiento de la energía eléctrica a nuestros clientes. Los postes inclinados de relés de celda deben ser enderezados, reemplazados o, como último recurso, apuntalados. Si los contadores AMS requiriesen reemplazarse o el equipo de comunicaciones AMS se dañase, comuníquese con su Coordinador de Cuadrillas Foráneas para recibir instrucciones más detalladas.

*Tome nota de la ubicación de la antena, por debajo del nivel de conexión del secundario y de las comunicaciones.*

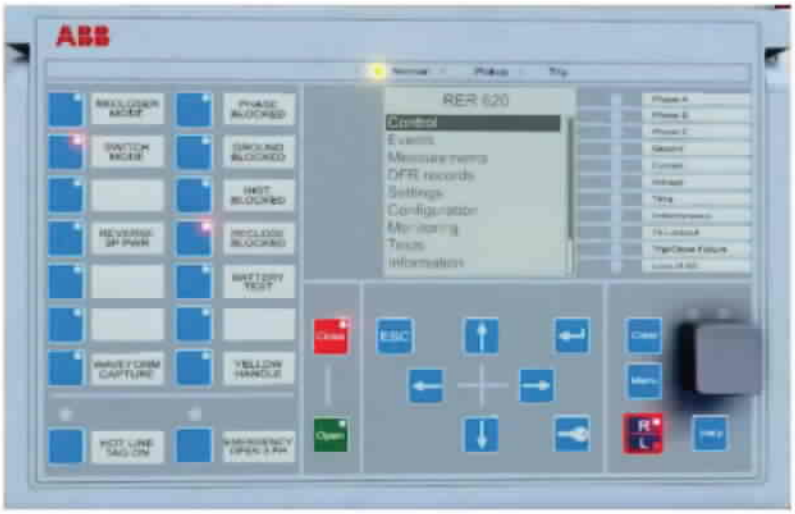
*No se trabajará en los equipos instalados con antenas y/o relés de celda montados en el poste hasta tanto no se reciba confirmación del Coordinador de Cuadrillas Foráneas.*


## Conmutación automatizada

Una red de conmutación automatizada puede aislar los segmentos de líneas de distribución debido a la pérdida de voltaje o fallas y restaurar automáticamente el suministro eléctrico a los segmentos de líneas no afectadas. Estas redes suelen implicar dos o tres circuitos, posiblemente provenientes de diferentes subestaciones. Las etiquetas están instaladas en la placa de datos de control de los dispositivos que forman parte de nuestra red de conmutación automatizada. Esta etiqueta indica que el dispositivo forma parte de una red de conmutación automática y se opera de forma remota como se muestra a continuación. Antes de realizar cualquier operación manual en cualquier dispositivo que sea parte de la red de conmutación automatizada, comuníquese con su Coordinador de Cuadrillas Foráneas, quien se pondrá en contacto con Control de

Distribución para que pueda ayudar a desactivar la automatización en la red en caso que fuese necesario.


Dispositivo de conmutación Schweitzer




Dispositivo de conmutación ABB

# Prácticas de trabajo seguras

Si bien la observación de prácticas de trabajo seguras es fundamental, los siguientes recordatorios son importantes cuando se realizan las actividades de restablecimiento del servicio.

## Conducir con seguridad

Utilice los cinturones de seguridad, acate los límites de velocidad establecidos y cumpla con todas las pautas federales y estatales del Departamento de Transporte, así como con todas las demás regulaciones para vehículos de motor. Mientras conduzca, no envíe ni lea textos o correos electrónicos, minimice el uso de los teléfonos celulares y utilice solamente dispositivos manos libres, y evite cualquier otra distracción que le impida concentrarse en la carretera. Antes de mover un vehículo estacionado, asegure todas las cargas y equipos y camine 360° alrededor del vehículo para asegurarse de que no haya obstáculos alrededor, por encima o por debajo del mismo. Coloque los vehículos de manera que se minimice la necesidad de retroceder. En lo posible, aparque de frente en el espacio del estacionamiento de adelante o retroceda dentro del mismo o utilice un guía de retroceso cuando esté disponible.

Cualquier intersección donde las señales de control de tráfico no estén funcionando se debe tratar como una intersección de parada de cuatro vías.

## Reuniones de seguridad previas al trabajo

Antes de realizar cualquier actividad de trabajo, identifique los riesgos asociados con la tarea en una reunión de seguridad documentada. Identifique las maneras de eliminar/mitigar los peligros y aclare el rol de cada miembro de la cuadrilla en el trabajo. Se requiere realizar una reunión de seguridad en los siguientes momentos: al inicio de una actividad de trabajo y cuando el personal, las condiciones o la exposición llegasen a cambiar. Una reunión de seguridad debe cubrir las siguientes áreas temáticas:

- Identificar a la persona a cargo (PIC, en inglés)/ líder del trabajo
- Riesgos asociados con el trabajo
- Mitigación de riesgos
- Procedimientos de trabajo que se usarán en la ejecución de la tarea
- Precauciones especiales
- Controles de la fuente de energía
- Equipos de protección personal/equipos protectores
- Procedimientos de emergencia

## Aislar, separar y cubrir

Siga los procedimientos de aislamiento y separación de acuerdo con los requisitos de OSHA o las normas y procedimientos de CenterPoint Energy, cualesquiera que brinden mayor protección. Un empleado que trabaje

desde un dispositivo aéreo aislado que tenga la posibilidad de quedar expuesto a equipos, conductores o aparatos energizados, deberá usar guantes de goma apropiados para el voltaje desde el momento en que el cesto abandona la cuna hasta el momento en que regresa al mismo (cuna a cuna). Los guantes de goma pueden ser retirados una vez que todos los conductores y aparatos estén desenergizados, que se les haya realizado las pruebas para comprobar que están desenergizados y conectados a tierra.

**Puesta a tierra**

Todo el trabajo en conductores y equipos desenergizados debe ser llevado a cabo entre conexiones de puesta a tierra. Todo trabajo en equipos que se suponen desenergizados debe ser realizado solamente después de que las líneas o equipos hayan sido aislados, que se haya comprobado que estén desenergizados, que se hayan bloqueado y/o etiquetado, y que se hayan conectado a tierra (según sea necesario). Los vehículos y equipos móviles deben estar conectados a tierra cuando se trabaje cerca de líneas o equipos energizados, o que pudieran ser energizados. Una orden de autorización debe ser obtenida a través de su Coordinador de Cuadrillas Foráneas antes de conectar a tierra secciones de los circuitos de alimentación. Las corrientes de falla disponibles en el sistema de distribución de CenterPoint Energy Electric dictan el uso de un cable de puesta a tierra de cobre de por lo menos 2/0 AWG. Al instalar conjuntos de puesta a tierra de protección en líneas aéreas normalmente energizadas a

más de 600 voltios, en cada ubicación de puesta a tierra se colocará de manera visible un indicador de seguridad rojo-naranja (esto incluirá los postes terminales en las distribuciones residenciales subterráneas (URD)).

**Pautas respecto a los equipos**

Planifique todas las actividades de izamiento. Inspeccione todos los aparejos antes de cada uso. Los empleados involucrados en las actividades de colocación de aparejos deberán estar debidamente capacitados. No se deben exceder las capacidades nominales/límites indicados por los fabricantes de los equipos. Debido a las condiciones mojadas del suelo a raíz de las cantidades significativas de precipitación que acompañan las tormentas, se recomienda con énfasis el uso de almohadillas debajo de todos los estabilizadores. Los pesos de los transformadores se indican generalmente en las placas de identificación del equipo y los pesos promedio de los postes se muestran en la siguiente tabla. Estas referencias ayudarán a determinar los parámetros para los izamientos.

# Resistencias, pesos, dimensiones de postes según la norma ANSI

| | | CLASE DE POSTE | H6 | H5 | H4 | H3 | H2 | H1 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FUERZA 2' DESDE EL TOPE (LBS) | 11,400 | 10,000 | 8,700 | 7,500 | 6,400 | 5,400 | 4,500 | 3,700 | 3,000 |
| | | CIR. MIN. EN TOPE (PULG.) | 39 | 37 | 35 | 33 | 31 | 29 | 27 | 25 | 23 |
| | | DIÁM. MIN. EN TOPE (PULG.) | 12.4 | 11.8 | 11.1 | 10.5 | 9.9 | 9.2 | 8.6 | 8.0 | 7.3 |
| LONGITUD (PIES) | 70 | DIÁM. EN PARTE GRUESA (PULG.) | - | - | 30.1 | 28.8 | 27.2 | 25.9 | 24.6 | 23.3 | 22.0 |
| | | PUNTO DE EQUILIBRIO (PIES) | - | - | 25.0 | 24.9 | 24.8 | 24.7 | 24.6 | 24.4 | 24.2 |
| | | PESO - PINO (LBS) | - | - | 7,416 | 6,564 | 5,850 | 5,178 | 4,806 | 4,170 | 3,612 |
| | | PESO - ABETO D. (LBS) | - | - | 6,374 | 5,765 | 5,136 | 4,574 | 4,047 | 3,512 | 3,042 |
| | 75 | DIÁM. EN PARTE GRUESA (PULG.) | - | - | 31.1 | 29.8 | 28.5 | 26.8 | 25.5 | 23.9 | 22.6 |
| | | PUNTO DE EQUILIBRIO (PIES) | - | - | 26.5 | 26.4 | 26.3 | 26.2 | 26.0 | 26.0 | 25.8 |
| | | PESO - PINO (LBS) | - | - | 8,154 | 7,278 | 6,498 | 5,766 | 5,370 | 4,662 | 4,038 |
| | | PESO - ABETO D. (LBS) | - | - | 7,046 | 6,322 | 5,650 | 5,006 | 4,522 | 3,926 | 3,400 |
| | 80 | DIÁM. EN PARTE GRUESA (PULG.) | - | - | 32.0 | 30.7 | 29.1 | 27.8 | 26.5 | 24.8 | 23.2 |
| | | PUNTO DE EQUILIBRIO (PIES) | - | - | 28.0 | 27.9 | 27.8 | 27.7 | 27.5 | 27.4 | 27.3 |
| | | PESO - PINO (LBS) | - | - | 8,928 | 8,028 | 7,134 | 6,390 | 5,370 | 4,662 | 4,038 |
| | | PESO - ABETO D. (LBS) | - | - | 7,786 | 6,955 | 6,230 | 5,530 | 5,017 | 4,350 | 3,769 |
| | 85 | DIÁM. EN PARTE GRUESA (PULG.) | - | - | 32.9 | 31.6 | 30.0 | 28.7 | 27.1 | 25.5 | 23.8 |
| | | PUNTO DE EQUILIBRIO (PIES) | - | - | 29.5 | 29.4 | 29.3 | 29.1 | 29.0 | 28.9 | 28.8 |
| | | PESO - PINO (LBS) | - | - | 9,906 | 8,820 | 7,794 | 6,942 | 6,576 | 5,694 | 4,938 |
| | | PESO - ABETO D. (LBS) | - | - | 8,520 | 7,622 | 6,840 | 6,082 | 5,538 | 4,795 | 4,158 |
| | 90 | DIÁM. EN PARTE GRUESA (PULG.) | 36.8 | 35.5 | 33.9 | 32.6 | 31.0 | 29.3 | 27.7 | 26.4 | 24.5 |
| | | PUNTO DE EQUILIBRIO (PIES) | 31.3 | 31.1 | 31.0 | 30.9 | 30.8 | 30.7 | 30.5 | 30.3 | 30.2 |
| | | PESO - ABETO D. (LBS) | 11,395 | 10,498 | 9,394 | 8,486 | 7,478 | 6,658 | 6,068 | 5,255 | 4,557 |
| | 95 | DIÁM. EN PARTE GRUESA (PULG.) | 37.8 | 36.5 | 34.8 | 33.2 | 31.9 | 30.3 | 28.3 | - | - |
| | | PUNTO DE EQUILIBRIO (PIES) | 32.8 | 32.6 | 32.5 | 32.4 | 32.2 | 32.1 | 32.0 | - | - |
| | | PESO - ABETO D. (LBS) | 12,346 | 11,362 | 10,214 | 9,115 | 8,136 | 7,272 | 6,619 | - | - |
| | 100 | DIÁM. EN PARTE GRUESA (PULG.) | 38.7 | 37.4 | 35.8 | 34.2 | 32.5 | 30.9 | 29.3 | - | - |
| | | PUNTO DE EQUILIBRIO (PIES) | 34.2 | 34.1 | 34.0 | 33.9 | 33.7 | 33.6 | 33.4 | - | - |
| | | PESO - ABETO D. (LBS) | 13,325 | 12,254 | 11,069 | 9,821 | 8,789 | 7,853 | 7,190 | - | - |
| | 110 | DIÁM. EN PARTE GRUESA (PULG.) | 40.6 | 39.0 | 37.3 | 35.7 | 34.1 | 32.5 | 30.5 | - | - |
| | | PUNTO DE EQUILIBRIO (PIES) | 37.2 | 37.1 | 36.9 | 36.8 | 36.6 | 36.5 | 36.4 | - | - |
| | | PESO - ABETO D. (LBS) | 15,418 | 14,434 | 12,974 | 11,669 | 10,320 | 9,173 | 8,392 | - | - |

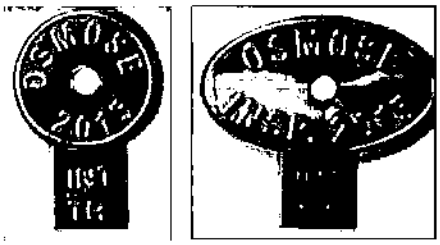
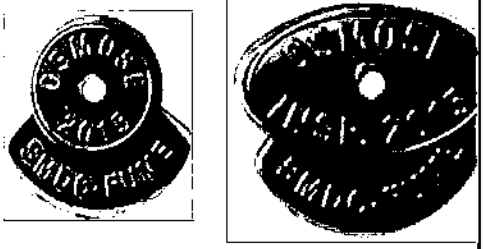
Nota: El punto de equilibrio se mide desde el extremo más grueso del poste. Los puntos de equilibrio y pesos son aproximaciones y variarán.

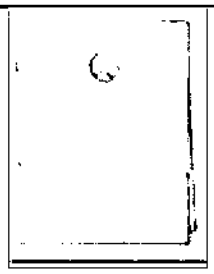
## Líneas bajo tensión

Durante el restablecimiento del servicio tras una tormenta, muchas de nuestras líneas de distribución y transmisión quedan bajo tensión mecánica debido a daños, esfuerzos, ramas, etc. Esto crea riesgos significativos de incendios en las líneas.

## Inspección de los postes/estructuras

A todos los postes se les debe realizar inspecciones visuales y pruebas, utilizando la prueba de sonido y de sondeo/pinchado antes de trepar en ellos, colocar una escalera contra el poste o cambiar la carga. Se realizarán inspecciones visuales en todas las estructuras que no sean de madera antes de proceder a treparlas, alterar la cargas e instalar o retirar equipos. Si se considera que un poste no es seguro para trepar o trabajar en él, debe marcarse apropiadamente para identificar la condición y ayudar a las cuadrillas a ubicarlo para su reemplazo. Para métodos específicos de inspección de postes de madera, véase 1910.269, Apéndice D. No confíe en las marcas/etiquetas en los postes como una indicación de la integridad de los mismos. Es responsabilidad de la persona el asegurarse de que el poste sea seguro para trepar en él probando primero el poste mediante el método apropiado. Las siguientes etiquetas se usan para indicar la condición del poste:

| ETIQUETA | ESTADO |
|---|---|
|  Inspeccionado | Al poste se le ha hecho la prueba de sonido con martillo y se ha perforado sin excavarlo; no ha sido tratado a ras de tierra. |
|  Tratado | El poste ha sido excavado y externamente tratado con Cu-Bor, un conservante registrado en la EPA, para prolongar su vida útil. |
|  Tratamiento interno | El poste tiene bolsones internos putrefactos, corazón hueco, o galerías de insectos, pero aún posee suficiente resistencia para permanecer en servicio. Corazón hueco, se ha aplicado. Esta etiqueta se cuelga debajo de una de las etiquetas de inspección anteriores |
|  Tratamiento con pesticida | El poste ha sido inspeccionado y tratado. Se ha tratado con SMDC, un pesticida aprobado por la EPA, de acuerdo con las instrucciones de la etiqueta. Esta etiqueta se cuelga debajo de una de las etiquetas de inspección anteriores. |

| | |
|---|---|
|   Rechazado | ¡No trepar!<br>El poste necesita reemplazarse (etiqueta cuadrada blanca) o reforzarse (etiqueta cuadrada amarilla). |

## Determinación de la profundidad de fijación del poste

Al fijar un poste, obtenga la longitud del poste desde la marca de nacimiento. Para determinar la profundidad a la que fijar el poste, tome el 10% de la longitud del poste y añada 2 pies a esa cifra. Llame al 811 o al Coordinador de Cuadrillas Foráneas si los servicios públicos subterráneos no están marcados.

Nota: Los postes H2 y clase 1 se fijan a una profundidad diferente. Consulte con su Coordinador de Cuadrillas Foráneas para obtener más detalles sobre su instalación correcta. Los postes tratados con CCA y Penta son típicamente más ligeros que los postes tratados con creosota.

CCA - 58.0 lb. por cubo

Penta - 53.0 lb. por cubo

Creosota - 62.0 lb. por cubo

# Peso de postes de pinos amarillos sureños tratados con creosota

| Longitud | Clase | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25’ | 972 | 775 | 644 | 545 | 453 | 389 | 319 |
| 30’ | 1256. | 1060. | 880 | 749 | 630 | 510 | 421 |
| 35’ | 1598. | 1317. | 1134. | 959 | 820 | 709 | 600 |
| 40 | 1919 | 1652 | 1377 | 1195 | 1011 | 880 | 768 |
| 45 | 2262 | 1947 | 1834 | 1418 | 1214 | 1074 | 932 |
| 50’ | 2623 | 2255 | 1960 | 1655 | 1465 | 1267 | 1116 |
| 55’ | 3374 | 2894 | 2480 | 2181 | 1938 | 1762 | |
| 60’ | 3891 | 3317 | 2832 | 2466 | 2201 | 2031 | |
| 85’ | 4526 | 3767 | 3173 | 2770 | 2522 | | |
| 70’ | 5208 | 4263 | 3545 | 3080 | 2806 | | |
| 75’ | 5859 | 4774 | 3953 | 3405 | | | |

## Superficies sobre las que caminar y trabajar

CenterPoint Energy prohíbe trabajar/caminar sobre tejados u otras estructuras elevadas donde los bordes y/o las aberturas del piso no estén lo suficientemente protegidos.

## Protección contra caídas

Utilice equipos de protección contra caídas cuando se requiera trabajar a alturas mayores de 4 pies, de acuerdo con la Subparte M de OSHA 1926 y 1910.269. Inspeccione el equipo de protección contra caídas antes de cada uso y úselo de acuerdo con las recomendaciones del fabricante. Mantenga tres puntos de contacto al cambiar de elevación.

## Objetos que caen / línea de fuego

Cuando se esté realizando un trabajo en alturas, no entre en la zona de caídas sin detener las actividades de trabajo en la altura, estableciendo comunicaciones de tres vías y recibiendo permiso para entrar. Considere la "línea de fuego" al establecer los sitios de trabajo a manera de asegurar que los objetos que podrían caer o moverse de repente debido a energía almacenada no causen lesiones a los empleados o al público.

## Distribución residencial subterránea (URD, en inglés)

El área de servicio de CenterPoint Energy Electric utiliza extensivamente la construcción tipo URD. Aunque usted podría o no estar activamente involucrado con los aspectos de restablecimiento relacionados con la URD, usted pudiera tener que restaurar una línea aérea que

alimenta a una URD. Cada bucle de URD tiene dos postes terminales asociados a la misma. El bucle se divide en bien sea un transformador de punto medio (normalmente de 12 kV) o en un poste terminal (normalmente de 35 kV). Hasta tanto no se haga la prueba para determinar que estén desenergizados y estén conectados a tierra, dé por sentado que todos los conductores de subida de la URD están energizados.

**Trabajo en equipos energizados**

Se utilizarán guantes de goma con el valor de aislamiento apropiado cuando:

- Se realicen trabajos manuales en cualquier aparato eléctrico en funcionamiento con voltajes de hasta 5000 voltios.
- Se trabaje desde dispositivos aéreos aislados con voltajes no mayores de 15 kV.
- Se deben usar guantes de por lo menos clase O para voltajes de 0 a 600 voltios.
- Deberá utilizarse una manga de goma si no se emplea una cubierta eficaz.

Se utilizarán herramientas para conductores con corriente para trabajar con voltajes superiores a 15 kV desde el poste o desde un dispositivo aéreo aislado.

**Energización de equipos**

La energización de circuitos alimentadores se debe realizar solamente a través de su Coordinador de Cuadrillas Foráneas. Se debe obtener una orden de

conmutación antes de operar cualquier dispositivo asociado a circuitos de alimentación. Antes de energizar laterales con fusibles, deben tomarse los siguientes pasos:

- Asegúrese de que todos los conductores y equipos estén en condiciones de ser energizados y que no crearán una condición peligrosa.
- Asegúrese de que todas las fallas a tierra sean despejadas de los equipos y de que todo el personal entienda que el equipo va a ser energizado.
- Notifique a su Coordinador de Cuadrillas Foráneas que los dos pasos enumerados arriba han sido ejecutados.

***Nota:*** *Los Coordinadores de Cuadrillas Foráneas notificarán diariamente a Control de Distribución todos los laterales energizados.*

## Protección del área de trabajo

Se utilizarán dispositivos de control y advertencia de tráfico cuando se trabaje en o cerca de la orilla de una carretera. Los conductores deben ser guiados de una manera clara y positiva al acercarse y cruzar por el área de trabajo. Cuando sea necesario, se usarán conos de tráfico, letreros de instrucción y abanderados señaleros para controlar el flujo de tráfico en el área de trabajo. Se usarán chalecos de alta visibilidad al trabajar a nivel de piso en el derecho de vía de una carretera. Podrían requerirse permisos de control de tráfico al trabajar en cualquier carretera regulada por el estado. Para mayor

información y los permisos respectivos, comuníquese con su Coordinador de Cuadrillas Foráneas.

## Espacios confinados

Muchas zonas dentro del sistema de CenterPoint Energy contienen espacios que se consideran "confinados". Un espacio confinado puede definirse como un área

- Lo suficientemente grande como para que un empleado entre completamente y realice el trabajo asignado; y
- Que no está diseñada para su ocupación continua por parte del empleado; y
- Que tiene medios limitados o restringidos de entrada o salida

Los empleados que trabajan en espacios confinados enfrentan un mayor riesgo de exposición a lesiones físicas graves debido a peligros tales como quedar atrapados, sepultados, o a condiciones eléctricas y atmosféricas peligrosas. Si un trabajo requiere trabajar en un espacio confinado, antes de comenzar el trabajo, comuníquese con su Coordinador de Cuadrillas Foráneas para que lo consulte con el Departamento de Seguridad de CEHE.

# Equipos de protección personal

## Vestimenta

Aquellos que se dedican a actividades de restablecimiento en el campo deben usar ropa que sea segura y apropiada para el trabajo. Se requiere ropa apropiada en todo momento.

Se deberá utilizar ropa ignífuga (Min. 8/Cal) cuando se realicen operaciones de puesta a tierra y al trabajar con conductores, equipos o aparatos energizados a 50 voltios o más.

### Protección para la cabeza

Mientras se esté en el lugar de trabajo, se usarán en todo momento gorras y cascos de seguridad aprobados por ANSI.

### Protección para los ojos

Se debe usar una protección ocular adecuada (careta, anteojos, gafas) siempre que pueda ocurrir una lesión en los ojos. Toda protección ocular debe cumplir con las normas ANSI-Z87.

### Protección para las manos

Al manipular cuerdas, estrobos y materiales de forma irregular, ásperos, dentados o dañinos, se deben utilizar guantes de trabajo.

### Protección para los pies

En el lugar de trabajo se requieren zapatos o botas de cuero aprobados y en buen estado. Todo el calzado de protección debe cumplir con ANSI-Z41/ASTM F-2413.

# Otros peligros comunes durante las restauraciones tras tormentas

Las siguientes condiciones se pueden encontrar durante el restablecimiento del servicio. Aunque no se trata de una lista exhaustiva, se debe prestar especial atención a lo siguiente:

## Fatiga

La fatiga puede contribuir a los accidentes. Esté constantemente consciente de lo que su cuerpo le está diciendo. Cuando usted está agotado, hay un punto en el cual la productividad disminuye significativamente. No conduzca si está cansado. Sea un pasajero vigilante y esté pendiente del estado de alerta del conductor.

## Estrés por calor

Beba abundante agua y cantidades moderadas de bebida electrolítica. La humedad de la Costa del Golfo requiere aclimatación. Ajuste su ritmo su trabajo a la capacidad de su cuerpo y esté pendiente de los primeros signos de enfermedades relacionadas con el calor. Hasta tanto el suministro público de agua no sea declarado seguro para beber, beba sólo agua enlatada o embotellada.

## Liberaciones de sustancias químicas

Cuando trabaje en la proximidad de sitios petroquímicos esté alerta de posibles liberaciones de sustancias químicas. Si sospecha la presencia de una liberación de sustancias químicas, salga inmediatamente del área y póngase en contacto con su Coordinador de Cuadrillas