Clark Public Utilities

APPROVED PRIMARY ELECTRICAL INSTALLATION CONTRACTOR TRAINING CLASS 2022

Introductions

- Brian Roden, Construction Superintendent
- Karen Perzanowski, Senior Standards Engineer
- Michael Brown, T&D Manager
- Michael Redinger, Construction Superintendent
- Jackie Carter, Construction Superintendent
- Jaylon Muonio, Construction Superintendent
- Justin Zucconi, Safety Manager

Introductions

- Justin Rindt, New Construction Designer
- Zach Muonio, Construction Inspector
- Sean Boyle, Construction Inspector
- Jim Angel, Construction Inspector
- Ally Whedon & Zac Herron – Construction Coordinators
- Jolynn Burk – Primary Contractor Coordinator
- Deborah Kainu – Senior Construction Coordinator

Show of Hands

- Who is attending for the first time?
- How many field workers?
- Who has specific questions or subjects you would like to cover today?
- Ask questions at any time

Class Timeline and Housekeeping

- Four hour class with a 10 minute break every 50 minutes
  - Coffee
  - Bathrooms
  - Exits
  - AEDs
  - Sign-in

Program Background

Began in 1994 to prevent a rate increase and has grown into what it is today

- PUD received approval from State L&I
  - Which requires this training
  - And they require the signed agreement
- Benefits
  - Competitive pricing/free market
  - Reduces pricing
  - Covers the cost of the installation
- Safe quality installations
- Benefits our customers

Reason for Training

- Not everyone here has been around the high-voltage side of electrical work
- When the work is done correctly it saves time for CPU, for you and our customers
- Dangerous trade and there is a need for consistency
- Required by Washington State L & I

Listing Procedures

- Must have and submit to Clark Public Utilities:
  - Current Electrical System Contractor Agreement (updated agreements will be sent out in the next week to your administrator for signature)
  - Proof of $5,000.00 bond naming Clark Public Utilities
  - Valid Washington State Electrical Contractor's License

Listing Procedures

- Completed qualified Contactor application
- Certificate of liability insurance
- Personnel that have attended this training at least once a year
- Who should attend? Lead field workers, project leads, etc. – those who will train field workers

Approved Contractor Delisting

- Program violations:
  - Non-compliance with the Electrical Systems Installation Agreement
  - Failure to provide any of the listing items (and keep current)
  - Use of false or misleading advertising

Approved Contractor Delisting

- Violation of safety practices and standards
  - L&I will be notified
- A specific job fails two inspections
- Contractor fails to correct unsatisfactory installations within 10 working days
  - NOTE: Your work is warranted for up to a year after it is T&E'd

Approved Contractor Delisting

- Contractor will be notified in writing of delisting and the grounds
- Contractor can appeal delisting and has 30 days to do so
  - Warning Letter
  - First Offense: 180 days
  - Second Offense: 1 Year
  - Third Offense: Permanent Delisting

Warning Letter

- Sent before de-listing procedure starts

The purpose of this letter is to notify you that Company Name is facing delisting from Clark Public Utilities Primary Electrical Installation Contractor List. A delisted company can no longer perform new construction primary electrical materials installations in Clark County, WA until meeting all criteria to be relisted after a minimum of 180 days. Please review the noted violations associated with one or more of your job sites (*see marked items*):

☐ Violation of appropriate safety practices and standards.

☐ Poor workmanship.

☐ Failure to provide license, bond or insurance documentation.

☐ Use of false or misleading advertising, research or testing results.

☐ Use of bid sheets that have intentional untruths or inaccuracies.

☐ Failure to complete installation within 90 days of purchase order date, unless an extension is granted. Material delays, scheduling delays, or Owner delays may be considered as reason for extension to this rule but all extensions must be approved in writing.

☐ A specific job fails two post-installation inspections.

☐ Continuing pattern of failed inspections.

☐ Contractor refuses or fails to correct unsatisfactory installations within five (5) days of inspection turndown.

☐ Failure to attend required annual contractor training session.

Please be aware that this is the only notification that you will receive regarding this conduct. **Any further violations will result in immediate delisting per your Electrical System Contractor Agreement.**

If you would like to discuss this matter further, please contact our Operations Office at 360-992-8839 to schedule a meeting at our Operations Center.

Immediate and/or Permanent Delisting of an Approved Primary Electrical Installation Contractor

If the Contractor commits a serious safety violation (as determined by the Utility) or misrepresents their association with Clark Public Utilities, the Utility reserves the right to immediately and permanently delist a Contractor from the contractor list.

Online Information

- All information covered today is available on the CPU website:

  www.clarkpublicutilities.com

- QR Codes on business cards – links to Commercial and Residential Electric Service Handbooks

- Please exhaust these resources before calling with questions

Online Information

- Use as a guide; local, state and federal codes and requirements supersede
- Consult the web material with any questions prior to calling the CPU
- Has CPU's standards, not construction procedures
- Procedures will be in the material directions

Process of the Job

- Homeowner or builder (Customer) contacts CPU (Construction Services 360-992-8558)
  - A work request will be created and assigned to a design engineer/planner
  - Single family residential subdivisions over three lots and multi-family projects with multiple buildings will go to an outside design firm and the New Construction Designer
  - A design is created and approved
    - P:\Operations\T&D\Brian Roden\New Construction Power Point

Process of the Job

- New construction primary installations require that the customer hires an approved Primary Electrical Installation Contractor to do this work

- Now trench and conduit may begin
  - Call for locates
  - Call CPU at least 2 weeks before starting to verify the plans have not change

- If there are road crossings, it may require a permit
  - State or County - CPU secures permit
  - Within city limits - customer secures

- After primary trench and conduit is installed call CPU for an inspection (Operations Office 360-992-8839)

Process of the Job

- When trench and conduit is finished and passed inspection, backfill trench, then work on pulling cable and make up may begin
- REMINDER: Do NOT pull primary cable until backfill is complete
- Once cable and make up is finished call for a cable and make up inspection
- After the final inspection passes and all required paper work is received, CPU will energize the equipment
  - Required Paper Work:
    - Conveyance Documents
    - Payments of CPU charges
    - Easements and permits secured
    - Transformer Loss Statements
    - Other
      - Meter equipment and labeling inspection (if necessary)
      - CTs installed (if necessary)

Process of the Job

Important Reminders:

- Approved Contractors do NOT work with, or in, energized equipment
- No standby is required for boring
- Any time you need to plumb conduit or cable into an energized device call CPU to schedule a standby
- Call two weeks prior to starting the project
- We will send a journeyman to stand by
  - https://www.clarkpublicutilities.com/wp-content/uploads/2022/09/Contractor-Standby-Handout-Final.pdf
- The journeyman will unlock equipment and provide a safety watch. No physical help should be assumed or expected.
  - We require CPU personnel to wear Arc Flash clothing and highly recommend you do too

Safety

- This is an example of FR clothing
- It prevented this worker from major burns

Safety

- Dangerous environment
- Consistency
- Safety violations reported to L&I
- Standards
- Trenching

Safety

- Common Violations seen by our Inspectors
  - Dig-in
  - Cutting conduits
  - Closer than 10’ to primary
  - Always assume cable is energized
  - If questions, call us before proceeding

Right of Way Work Permits

- Clark County and WSDOT require a pre-construction meeting in the field
- Notify both agencies 24 hours prior to start of work
- Adhere to erosion control requirements
- Have an approved traffic control plan
- Plan for timely and proper restoration
- If CPU pulled the permit (Clark County, WSDOT) these agencies will notify us with problems and we will let you know
- The customer secures ROW permits within any city limits
- Repeat ROW problems will lead to delisting

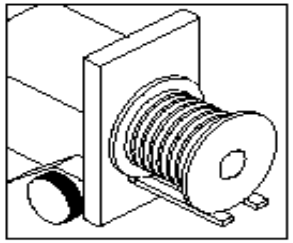
Land Use Documents

- Easements
- ROWs
- PUEs
- These are recorded agreements that give a utility the legal right to use and access a specific area of property
- Property is still owned by customer
- Must be installed to design

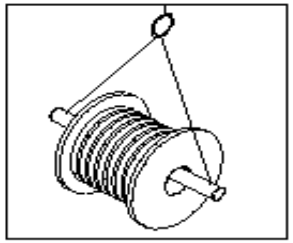
Material Handling

Material Handling

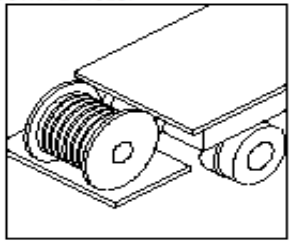
HOW TO HANDLE CABLE REELS



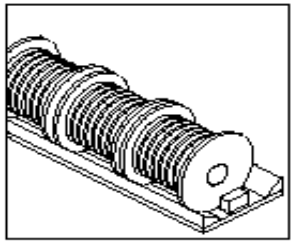
CRADLE BOTH REEL FLANGES BETWEEN FORKS.



REELS CAN BE HOISTED WITH A SHAFT EXTENDING THROUGH BOTH FLANGES.



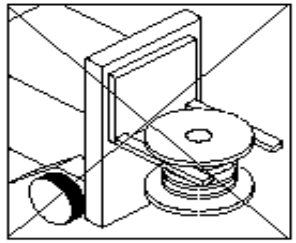
LOWER REELS FROM TRUCK USING HYDRAULIC GATE, HOIST OR FORK LIFT. (LOWER CAREFULLY)



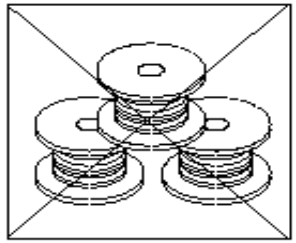
ALWAYS LOAD WITH FLANGES ON EDGE AND CHOCK AND BLOCK SECURELY.

← YES

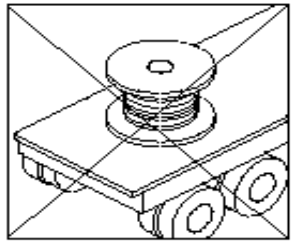
NO →



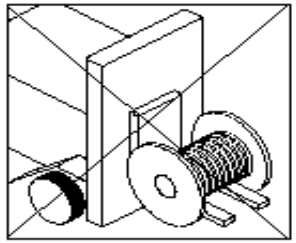
DO NOT LIFT BY TOP FLANGE. CABLE OR REEL WILL BE DAMAGED.



UPENDED HEAVY REELS WILL OFTEN ARRIVE DAMAGED. REFUSE OR RECEIVE SUBJECT TO INSPECTION FOR HIDDEN DAMAGE.



DO NOT UPEND REELS



NEVER ALLOW FORKS TO TOUCH CABLE SURFACE OR REEL WRAP.

Clark Public Utilities

CONSTRUCTION STANDARDS

UNDERGROUND CABLE REEL HANDLING

REVISIONS			
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PAGE: 1 of 2

UCH-0

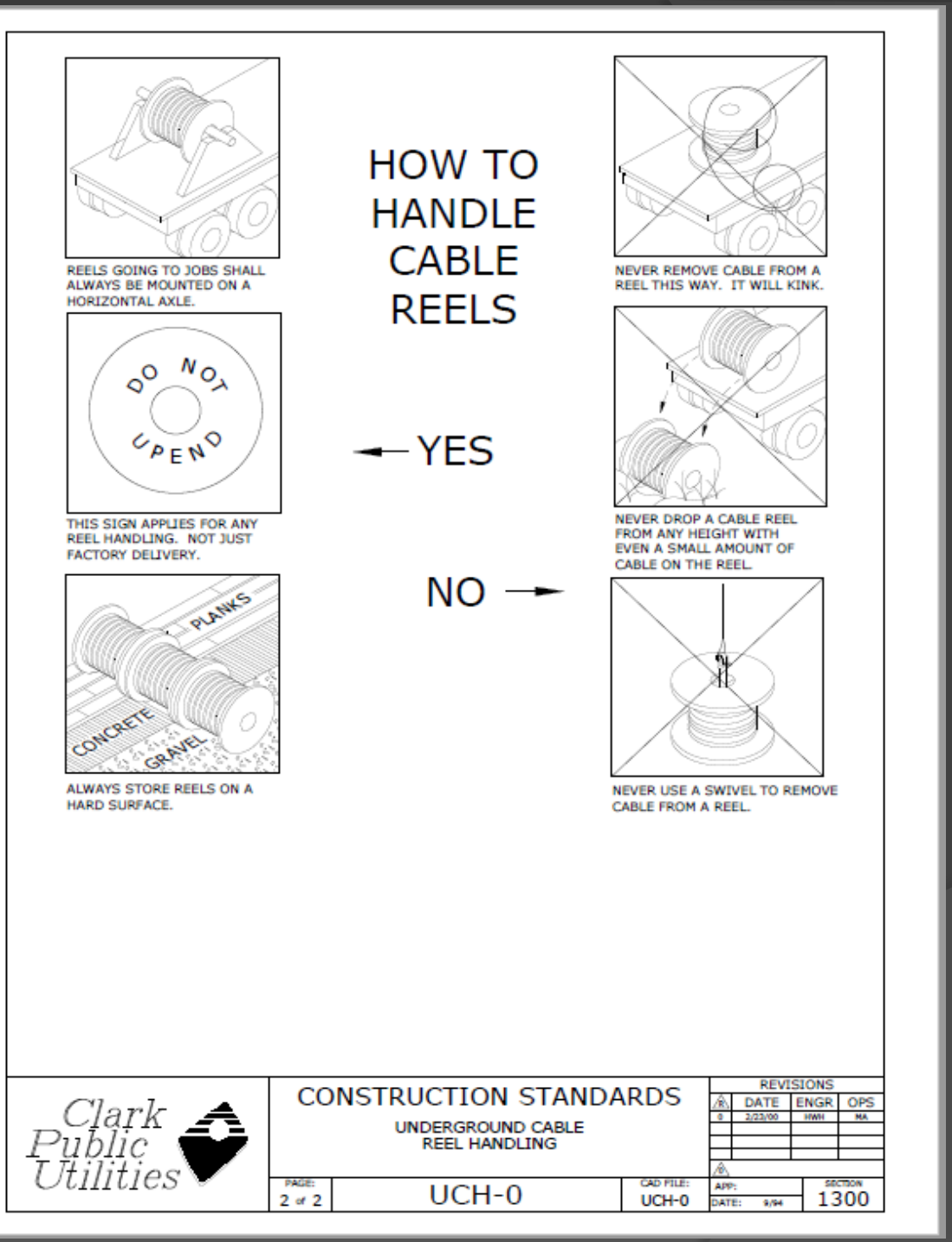
CAD FILE: UCH-0

APP:

DATE: 9/94

SECTION 1300

Material Handling



Material Handling

- Important notes on cable reel movement:
  - Do not drop reels (roll off the back of trucks)
  - Lift using either a shaft and crane or fork lift
  - Reels may be rolled but only for short distances
  - Only roll in the direction indicated on the reel

Material Handling

- Important notes on cable reel storage:
  - Seal end of cable to prevent entry of moisture
  - Leave factory protective cover on as long as possible, preferably cover if outside for long periods
  - Store on a hard surface with good drainage
  - Never store reels on end
  - Clark Public Utilities will perform intermittent inspections of your storage sites

Material Handling

- Important notes - handling during installation/pulling:
  - Bends shall be clean and smooth
  - The total angles shall not exceed 270º unless approved by a CPU engineer
  - Sufficient approved cable lubricant shall be used at the start and during the pull

Material Handling

- Never allow tension at the reels during the pull.
  - Cable should be slack going into the conduit
- Cable attachments shall either be basket/sock or pulling eye
- Keep transformers on level ground

Material Handling

Material Handling

- Remember to care for the cable!
- If the CPU test shows the cable is bad, the contractor will replace it at the ***contractor's expense.***

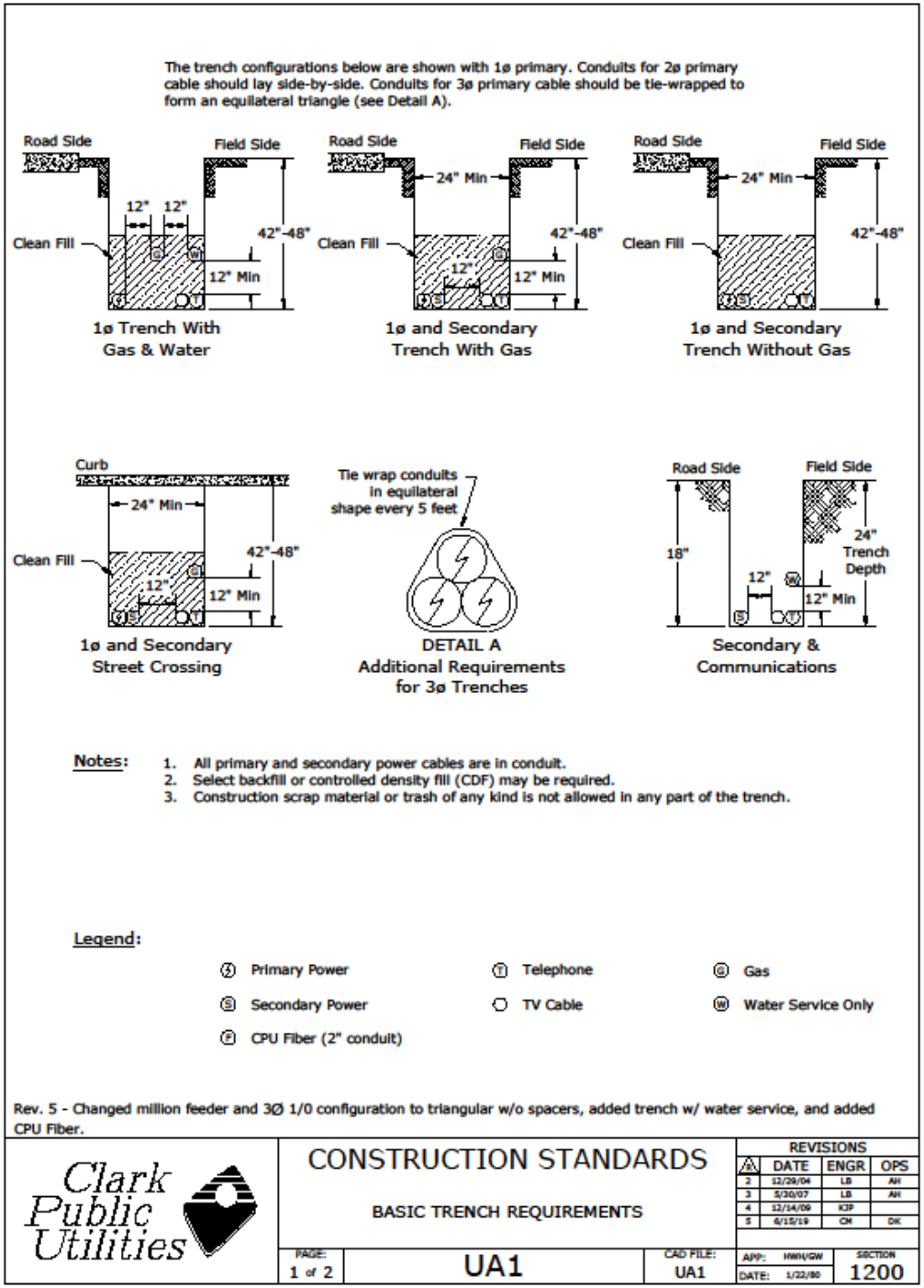
Trenching and Conduit

Trenching and Conduit

- Before you dig, call 811 and know the site location
- Trenching needs to be done by an approved contractor
  - Most cases require a 42” deep trench
  - We want them 1’-3’ off of the driveways
  - The driveways need to be in place
  - We require a smooth trench bottom, two feet wide
  - We do not allow the use of trenchers or plows

Trenching and Conduit

- Standard for joint trench from the E-Guide:
  - Power towards the road
  - Phone towards the field
  - Gas towards the field and one foot of separation
  - Wet utilities minimum 5-foot separation



Trenching and Conduit

- Conduit Installation-**All** power cables will be installed in conduit
- Installations prior to 2005 were commonly direct buried, not in conduit

Trenching and Conduit

- You are liable for your trenches: cone or ribbon off

Trenching and Conduit

- You are liable for your trenches: cone or ribbon off

Trenching and Conduit

- All primary and secondary cables shall be in conduit
- All risers above finished grade shall be in **Schedule 80** PVC
- Acceptable conduit sizes are as follows
  - 1Ø, 1/0 primary cable in 1-2” conduit
  - 3Ø, 1/0 primary cable in 1-4” or 3-2” conduits
  - Triplex secondary cable in 1-3” conduit
  - 3Ø, 1000MCM cable in 3-4” conduits
- All conduit terminations shall have end bells or collars
- All conduit installed for future use shall be marked and tagged

Trenching and Conduit

- Sufficient select backfill (gravel or slurry)
- Unused conduits shall have removable plugs designed for that purpose in both ends (need tags)
- All street and road crossings shall be at property lines
- Conduit sweeps shall be 24” secondary and 36” primary radius
- Conduits shall be installed so that cable is pulled toward the end bells to avoid scraping cable on sharp edges of conduit
- All cut ends of conduit shall be square
- Steel mandrels shall be pulled through the conduits to detect damage and debris

Trenching and Conduit

- Cut in for a transformer
  - 90 degrees to the trench

Trenching and Conduit

- Cross Country Secondary
  - 24” deep

Trenching and Conduit

- Joint Trench: Fail
  - Looks like spaghetti!

Trenching and Conduit

- Joint Trench: Pass
  - Straight and free of debris - Streetlight, Primary, Secondary

Trenching and Conduit

- Another passing trench

Trenching and Conduit

- Road Crossing
  - Leave ends of pipe exposed for inspection

Trenching and Conduit

- Directional drilling shall be performed only by CPU-approved primary electrical installation contractors
- Directional drilling equipment shall be pre-approved by CPU
- Conduit installation shall be 2”, 4” or 6” gray polyethylene pipe, SDR ≥ 13.5
- All connections to PVC sweeps or conduit will be made by mechanical coupling (Raceways Technologies #S80-2PE-PVC and Raceway Technologies #S80-4PE-PVC)

Trenching and Conduit

- A plot and track of the bore shall be provided to CPU before acceptance of the installation
- The depth of the conduit shall be identified by a stake with the depth every 10 feet along the route in unpaved areas and by the depth written in marker paint every 10 feet along the route in paved areas
- The conduit depth shall conform to the CPU standards of 42” nominal depth
- All installed conduits shall be “proofed” using the appropriate mandrel, and have a 2500 pound, ¾” sequentially-numbered, continuous “mule tape” installed
- CPU reserves the option to require “potholing” to determine depth and location for any installations that are questionable
- Required “potholing” will be at the contractor’s expense

Trenching and Conduit

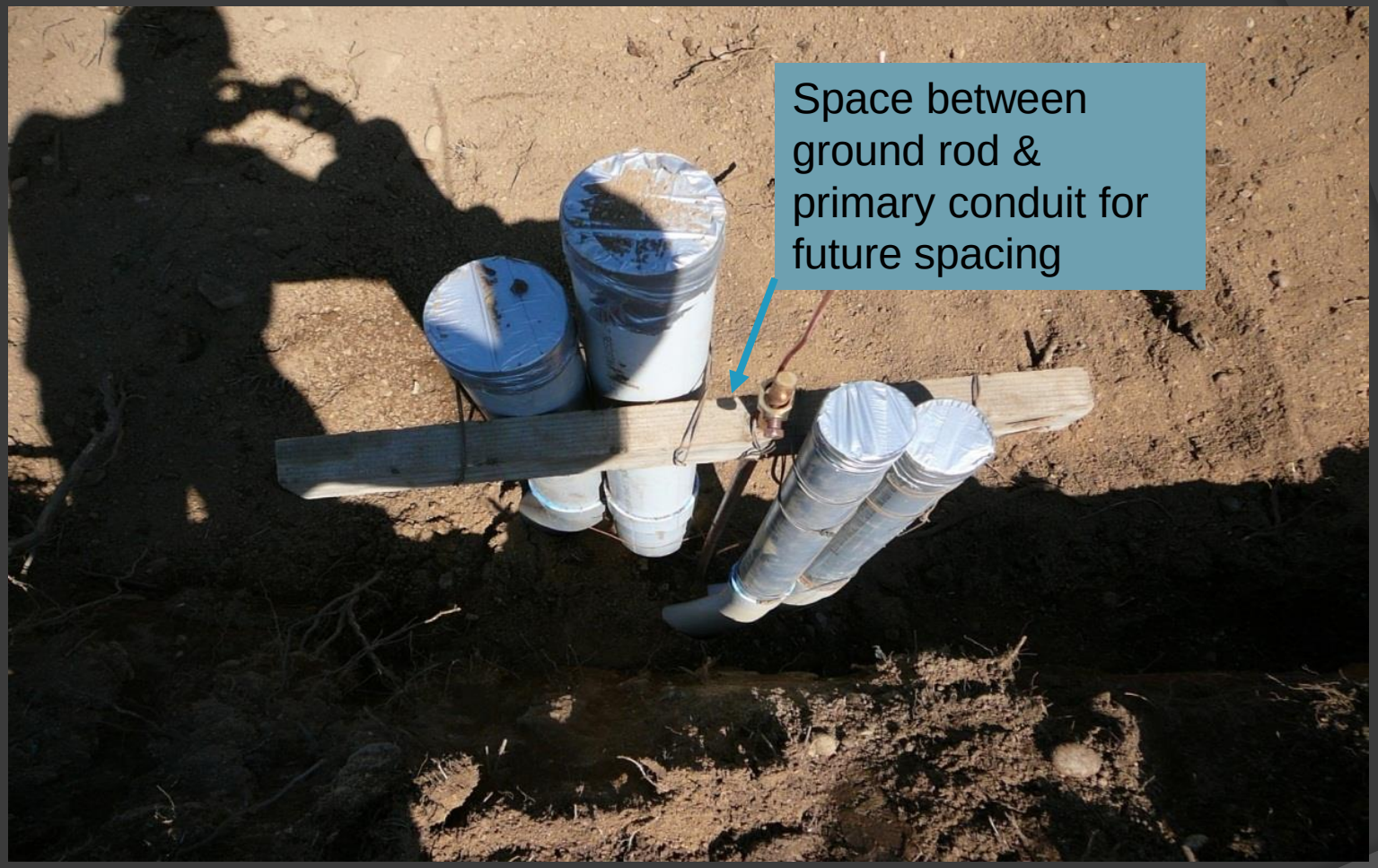
- After completion of Trench and Conduit:
  - Call 992-8839 for an inspection
  - Any conduit needing to be plumbed into an energized device will require a CPU stand-by
  - Call 992-8839 for a stand-by and inspection
  - After Trench and Conduit has passed, you may backfill and proceed

Setting Single-Phase Transformers (conduit trees)

Single-Phase Transformers

- Tree up conduit with Makeup Board
- Make sure they are exactly where the print stakes them
- If there is a concern over placement of any equipment, contact the designer to address BEFORE continuing with the install

Single-Phase Transformers



- Place board on ground rod
- Attach pipe to board in appropriate position
- Keep the board above final grade

Single-Phase Transformers

- Primary pipe to the Right Front
- Secondary to the Left Back
- Primary in on the Right
- Primary out on the Left

Single-Phase Transformers

- Evenly distribute backfill around tree to support installation and not push pipe over
- Cover ends of pipe to keep debris from entering conduit

Single-Phase Transformers

- Square the trees with the direction the transformer should face
- Compact fill evenly around the conduits

Single-Phase Transformers

- 5/8” Minus Rock fill - minimum 1-1/2 yards
- Soil conditions may require additional fill

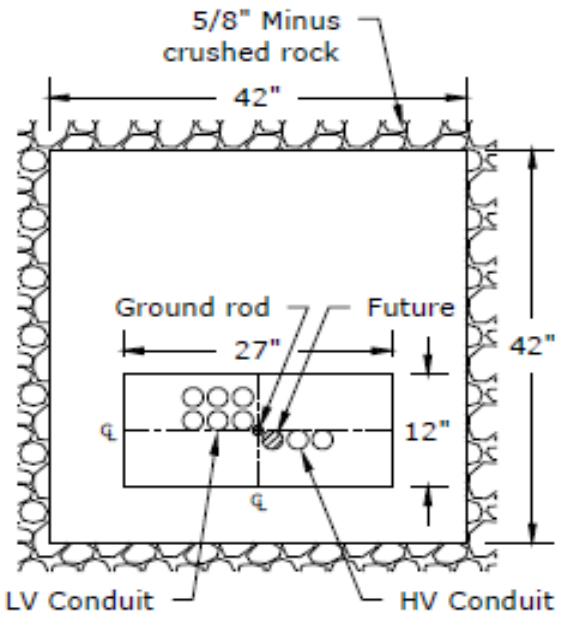
Single-Phase Transformers

- Remove Makeup Board and compact properly
- Cut conduit and drive ground rod flush

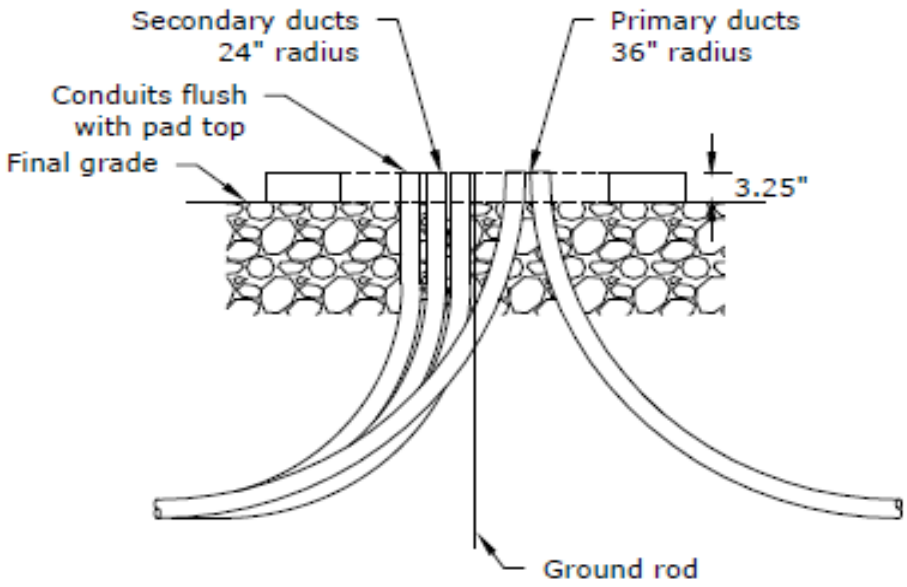
Single-Phase Transformers

- Set
- Orientate
- Level pad

Single-Phase Transformers



25-75 KVA PAD
PLAN VIEW



FRONT VIEW

1Ø PADMOUNT TRANSFORMER CONDUIT ORIENTATION (25-75 KVA)

- 25 to 75 kVA Pad Standard
- 100 kVA pad looks the same but is larger

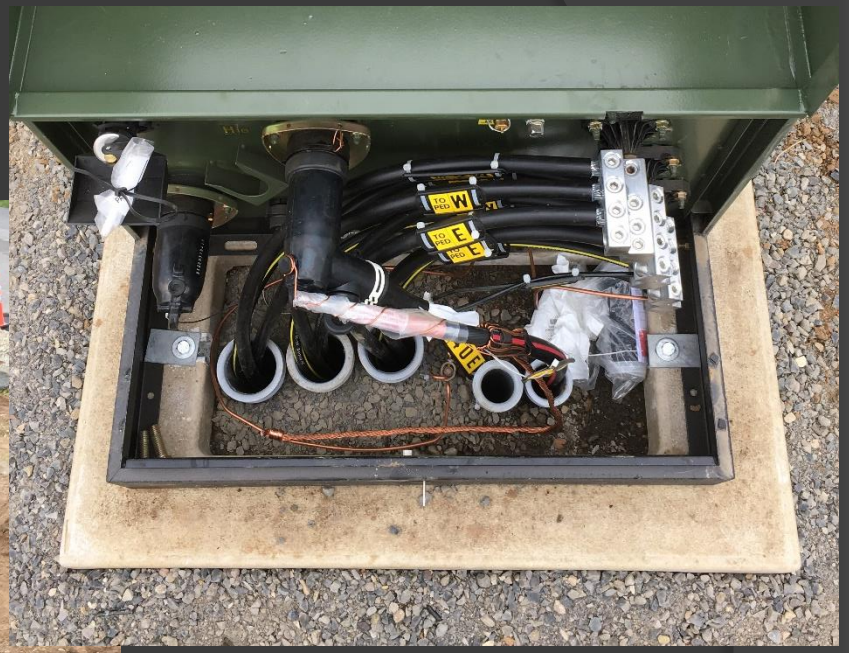
Single-Phase Transformers

- Set Transformer on the pad
- Spreader bar is required

Single-Phase Transformers

- Pack the sides of the pad with rock

Single-Phase Transformers



- Check for centering on the pad
- Check both the outside of the pad and the inside opening

Single-Phase Transformers

- Uneven grade calls for a hillside barrier

Single-Phase Transformers

- Make sure to remove picking bolts
- Hillside barrier with pedestal behind

Subdivision and Apartment Conduit & Transformer Set

Single-Phase Transformers- Subdivisions and Apartments

- Conduit trees will be on the lot line

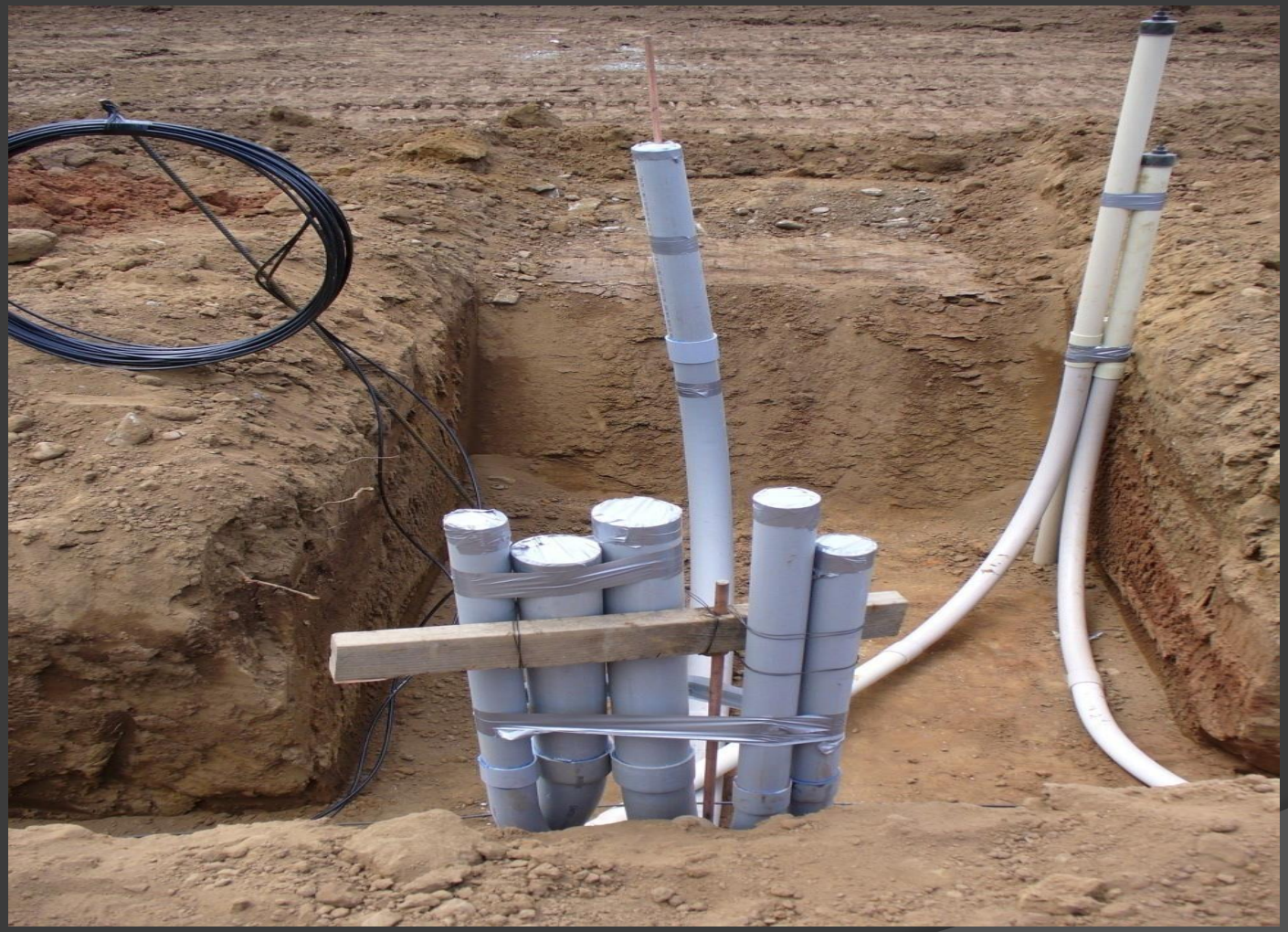
Single-Phase Transformers- Subdivisions and Apartments

- Lot numbers shall be clearly marked

Single-Phase Transformers- Subdivisions and Apartments

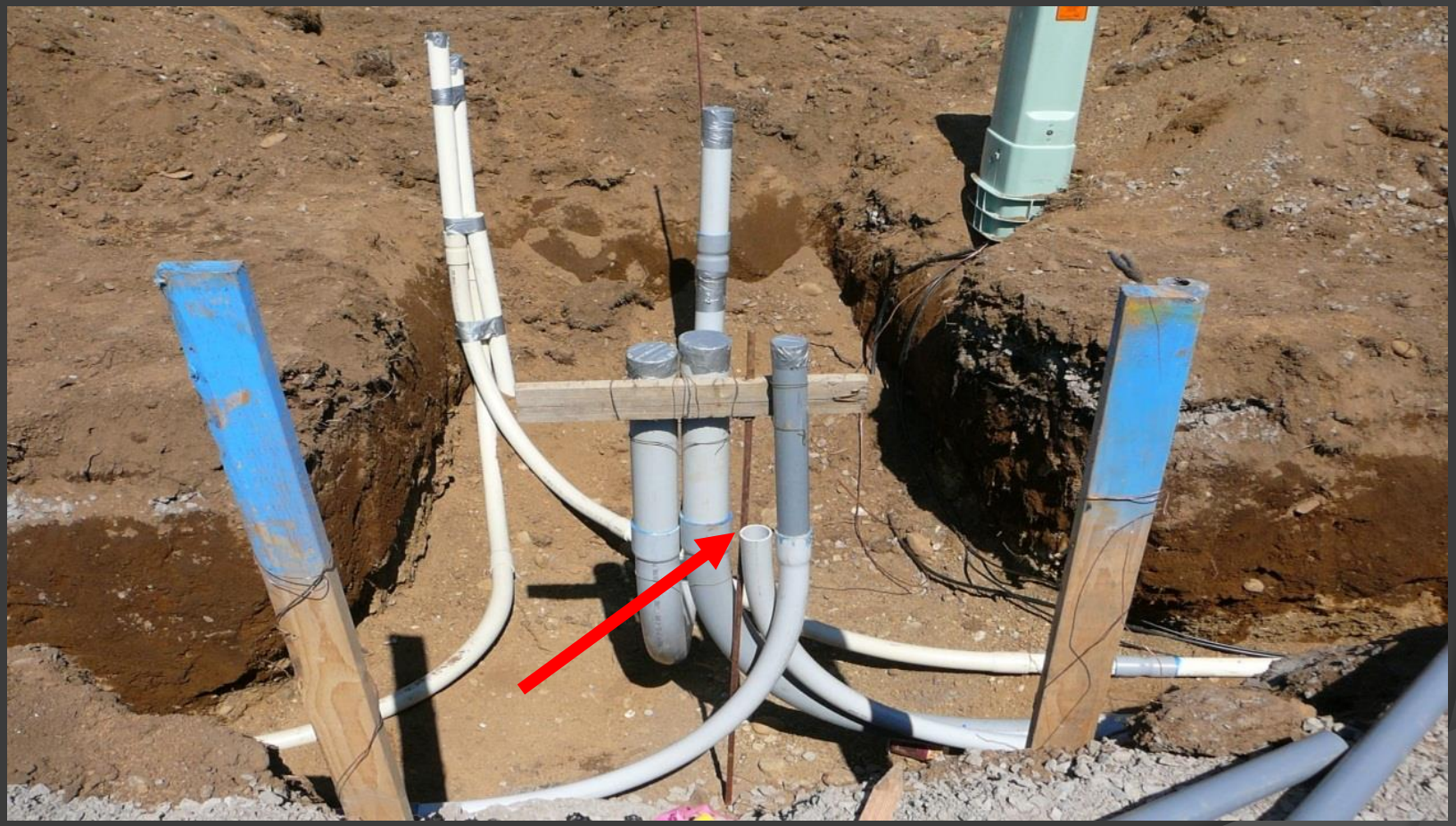
- Rear lot lines shall be clearly marked.

Single-Phase Transformers- Subdivisions and Apartments



- Conduit Inspection Pass

Single-Phase Transformers- Subdivisions and Apartments



- Conduit Inspection
- Maintain separation from other utilities

Single-Phase Transformers- Subdivisions and Apartments

- Primary in on the right
- Primary out on the left

Single-Phase Transformers- Subdivisions and Apartments

- Minimum 1-1/2 yards gravel under the transformer pad

Single-Phase Transformers- Subdivisions and Apartments

- Compact the gravel so the transformer does not settle crooked

Single-Phase Transformers- Subdivisions and Apartments

- Remove makeup board
- Cut conduit flush with the pad
- Add end bells/collars
- Level and orientate pad square with the road

Single-Phase Transformers- Subdivisions and Apartments

- Pack sides of pad with rock

Single-Phase Transformers- Subdivisions and Apartments

- Do not leave cable exposed. Theft is common.
- Pulling cable before transformer is set is not allowed

Single-Phase Transformers- Subdivisions and Apartments

- Transformer set complete
- Streetlight next to it

Single-Phase Transformers- Subdivisions and Apartments

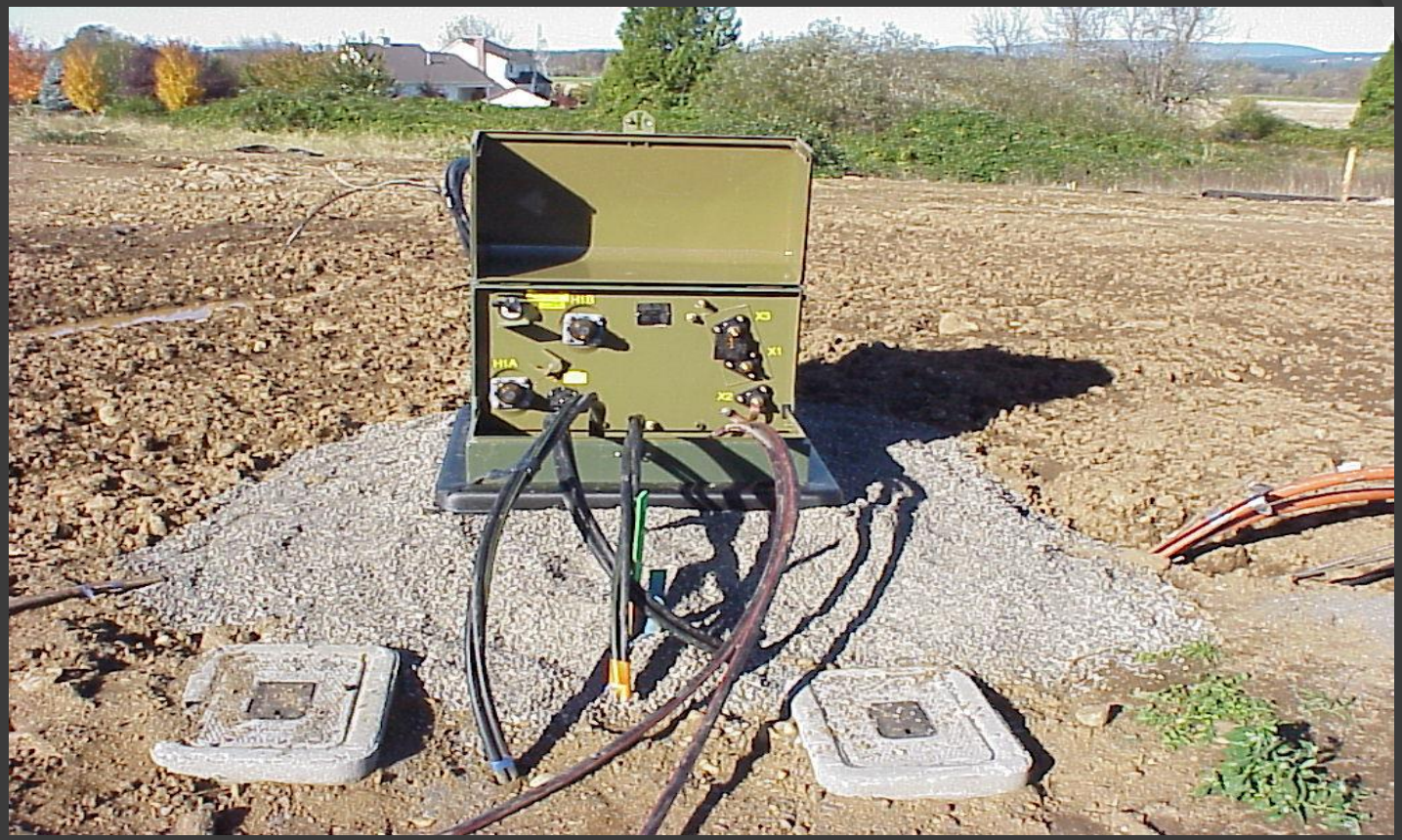
- Transformer with a pedestal behind
- Unlocked transformers are De-energized

Single-Phase Transformers – Subdivisions and Apartments

- After completion of trench and conduit:
  - Call 992-8839 for an inspection
  - Any conduit plumbed into an energized device will require a CPU stand-by and WILL NOT BE TERMINATED
  - Call 992-8839 for a stand-by and inspection
  - A stand-by should not last longer than two hours

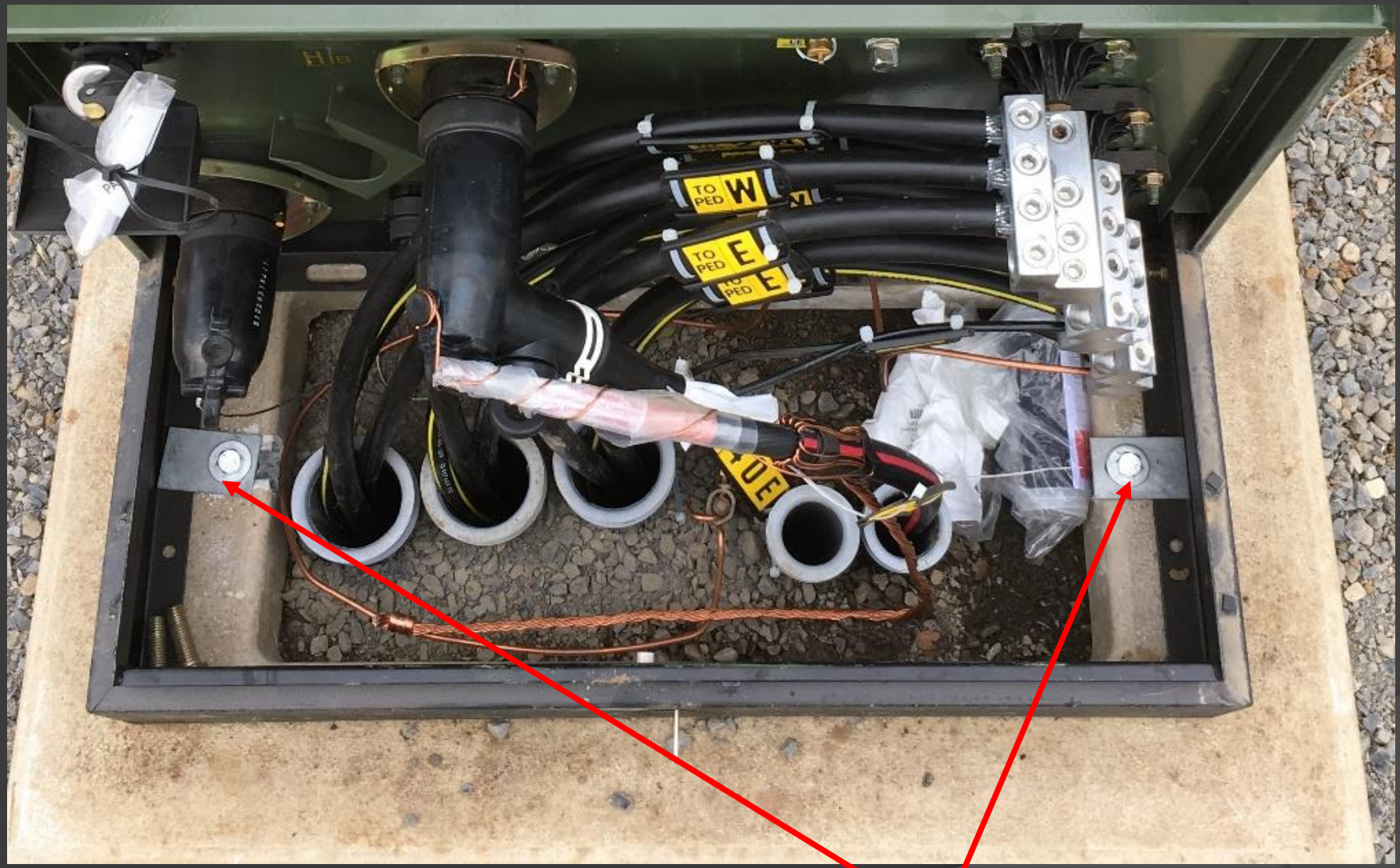
Secondary Makeup

Secondary Makeup



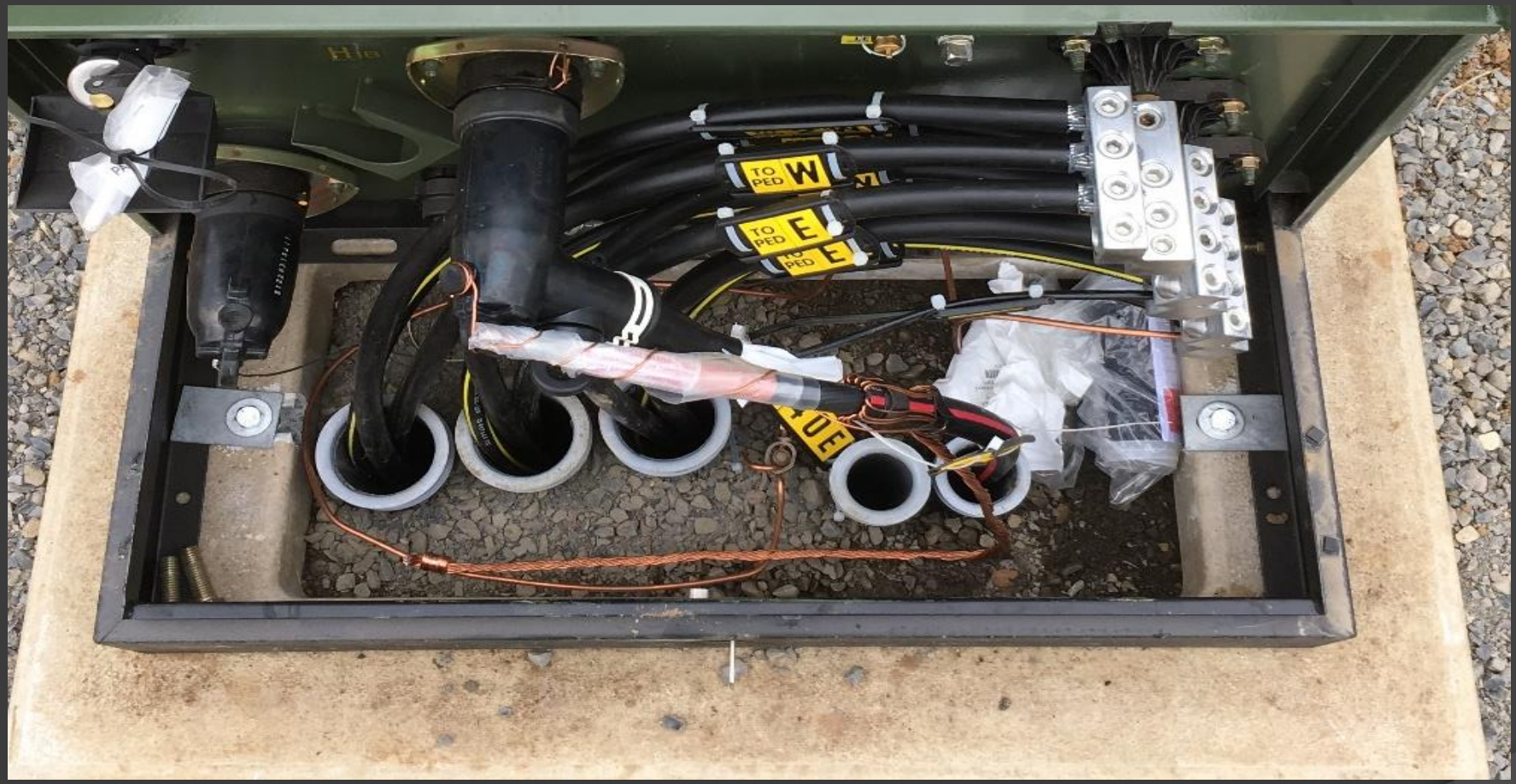
- Transformer set
- Install conduit end bells/collars
- Pull cable

Secondary Makeup



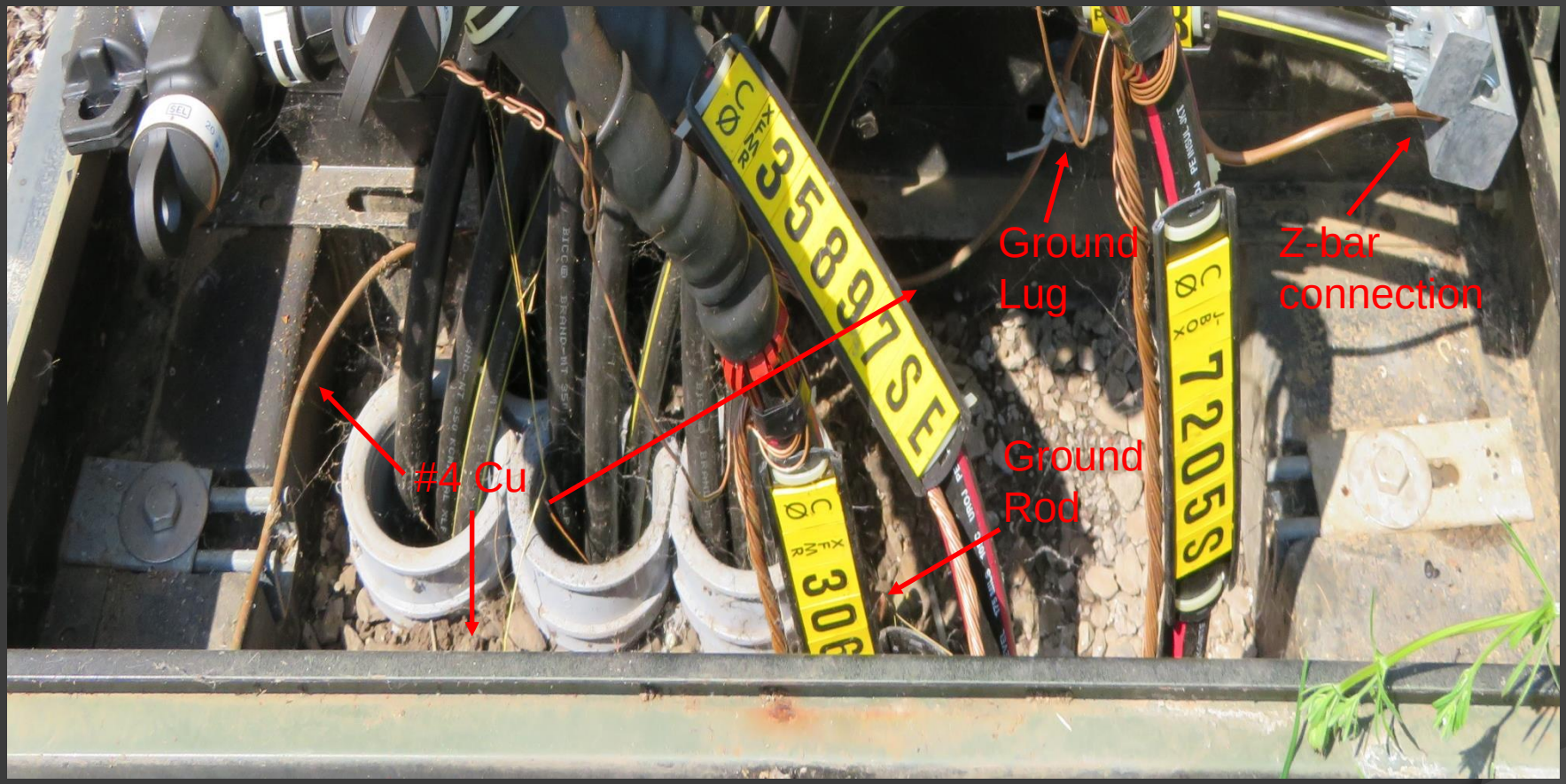
- Conduit Orientation
- Install transformer tie down on both sides

Secondary Makeup



- Install z-bars (pal nuts)
- Angle each slightly for easy tool access
- Tighten down both the nut on the backside and the lug
- Place on 100% tap

Secondary Makeup



- Install transformer ground lug
- Install #4 Cu solid soft drawn
- Ground rod, around the outside of pad, to the transformer ground lug, to the z-bar

Secondary Makeup

- Train cables to their appropriate positions
- Working one service at a time will help prevent cross phase

Secondary Makeup

- Cut to length and skin insulation
- Cut 90 degrees
- Only skin minimal amount
- Leave slack in the cable

Secondary Makeup

- Use Penatrox if not already in z-bar
- Connect to z-bar, wiggle the wire as you tighten, hold the z-bar to support
- Tag to location (cow tags for temporary service only)

Secondary Makeup

- Start with one service
- Finish service then move on

Secondary Makeup

- Work from the inside out
- Use the top of the z-bar

Secondary Makeup

- Keep the cable uniform

Secondary Makeup

- The tags should be visible

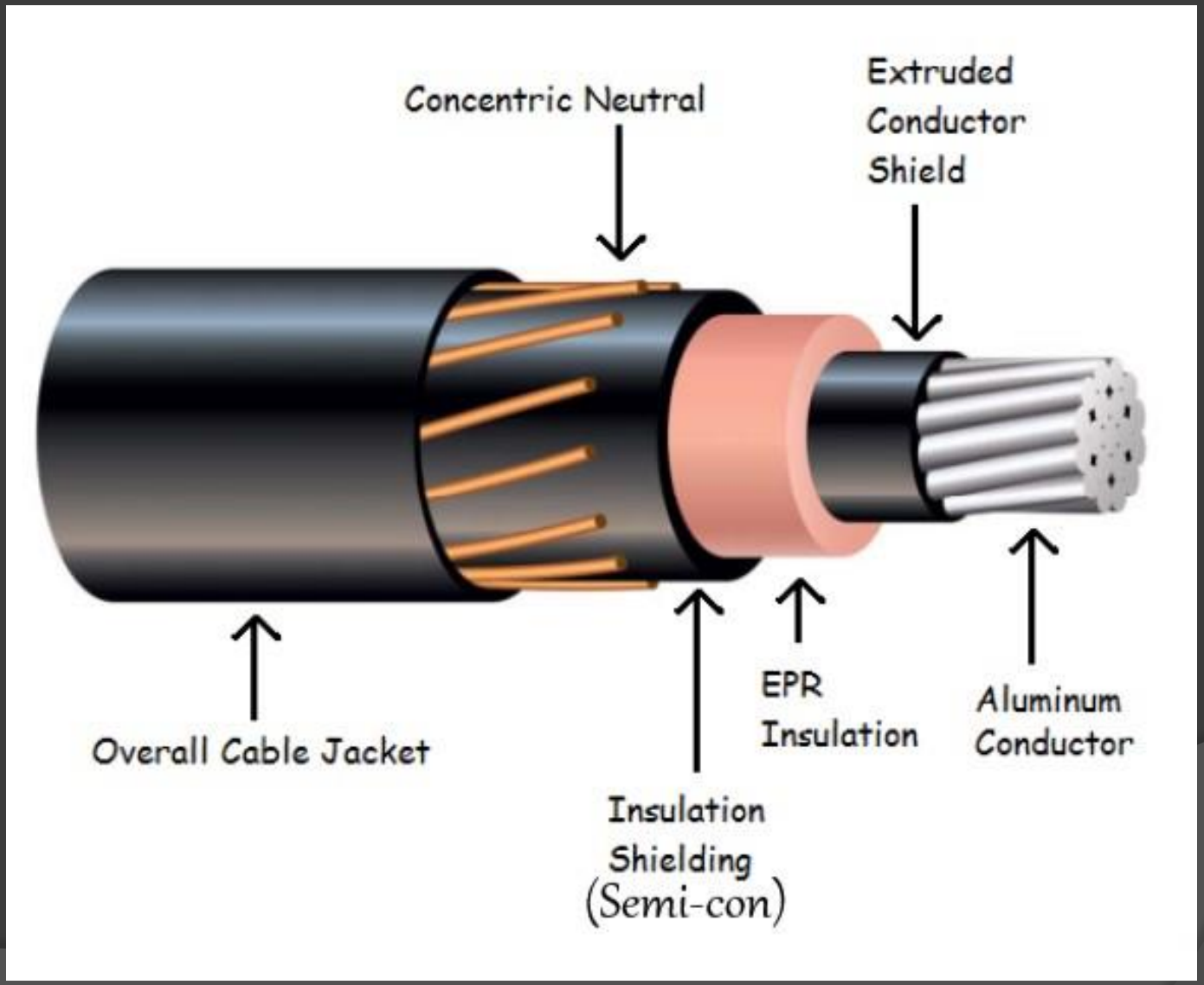
Secondary Makeup

- Attach tagging to every cable
- Install z-bar insulated covers

Primary Termination-Transformer

Primary Termination-Transformer

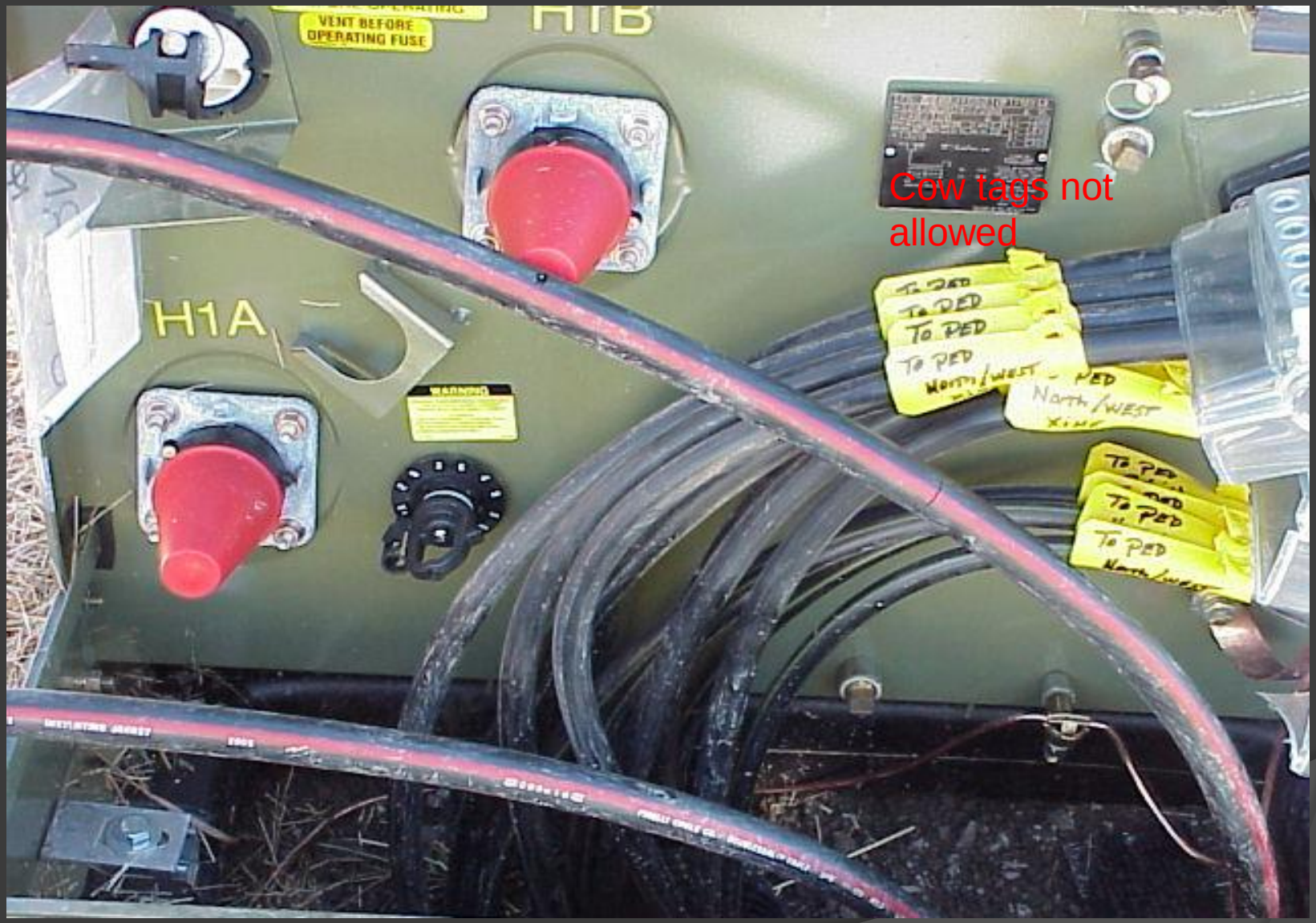
- Layers of a primary cable



Primary Termination-Transformer

- First thing: READ THE DIRECTIONS!
  - The directions have step-by-step instructions
  - The same manufacturer can have different measurements from year-to-year

Primary Termination-Transformer



- Train the Conductor with slack

Primary Termination-Transformer

- Get your measurement from manufacturer's instructions
- Score the jacket down from the center of the transformer bushing

Primary Termination-Transformer

- Pull bleeder wire down to the score mark
- Keep it separate from other concentric

Primary Termination-Transformer

- Remove cable jacket

Primary Termination-Transformer

- Follow manufacturer's measurement from the concentric

Primary Termination-Transformer

- Cut the conductor

Primary Termination-Transformer

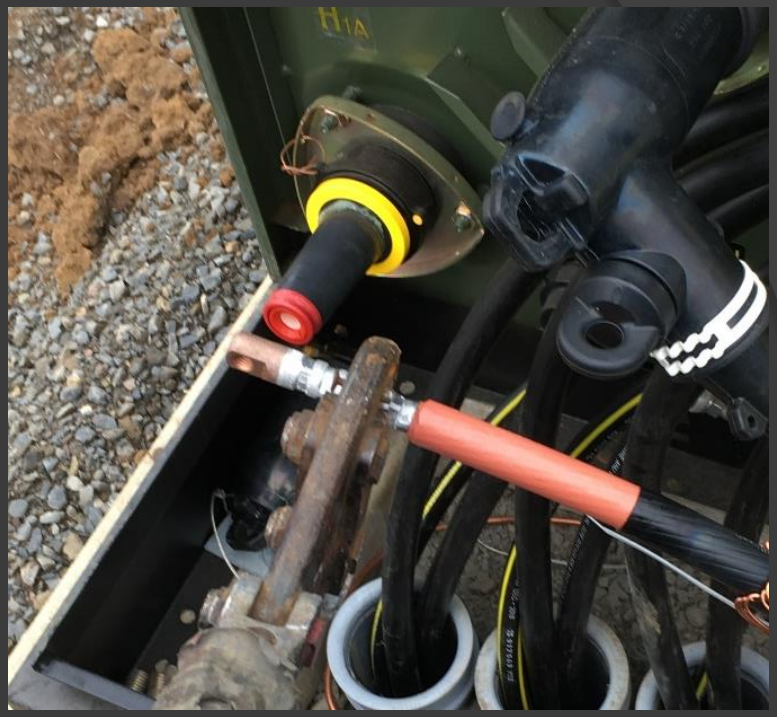
- Use manufacturer's measurement from the end of the cable
- Remove insulation

Primary Termination-Transformer

- Wire brush conductor
- Apply linket
- Align to the bushing

Primary Termination- Transformer

- Press linket
- Rotate every press 90 degrees
- Use a MD-6 press with BG dies



Primary Termination-Transformer

- Use appropriate tools to score semi-con
  - Banana peeler / Clamshell

Primary Termination- Transformer

- Measure from the end of the lug per manufacturer's instructions
- Mark the semi-con

Primary Termination-Transformer

- Peel the semi-con

Primary Termination-Transformer

- Check for nicks or cuts in the insulation

Primary Termination-Transformer

Nicks and scores ruin the insulation

- Use calibrated tools to avoid scoring insulation
- If nicked or cut it needs to be replaced at contractor expense

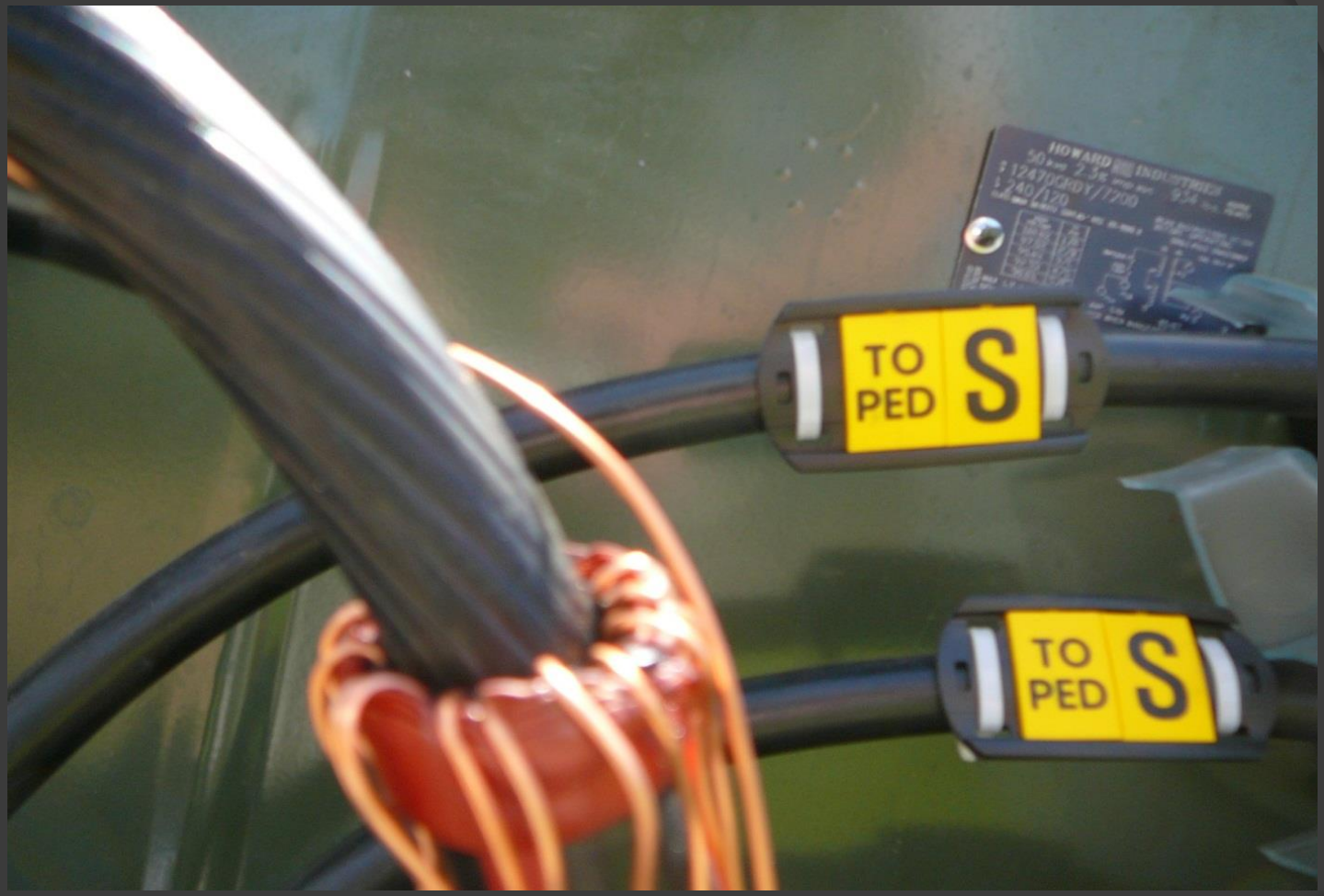
Primary Termination-Transformer

- Pencil (Bevel) the insulation

Primary Termination-Transformer

- Clean and Lubricate the bushing

Primary Termination-Transformer



- Apply the mastic
- Fold the concentric back evenly
- Apply tape 2” down from the mastic

Primary Termination-Transformer

- Clean and Lubricate the Insulation

Primary Termination-Transformer

- Put a bag on the termination
- Wrap with the bleeder wire around the bag and through the lug
- Do not wrap bleeder too tight or excessively

Primary Termination-Transformer

Change to Integral Jacket Seal Elbow

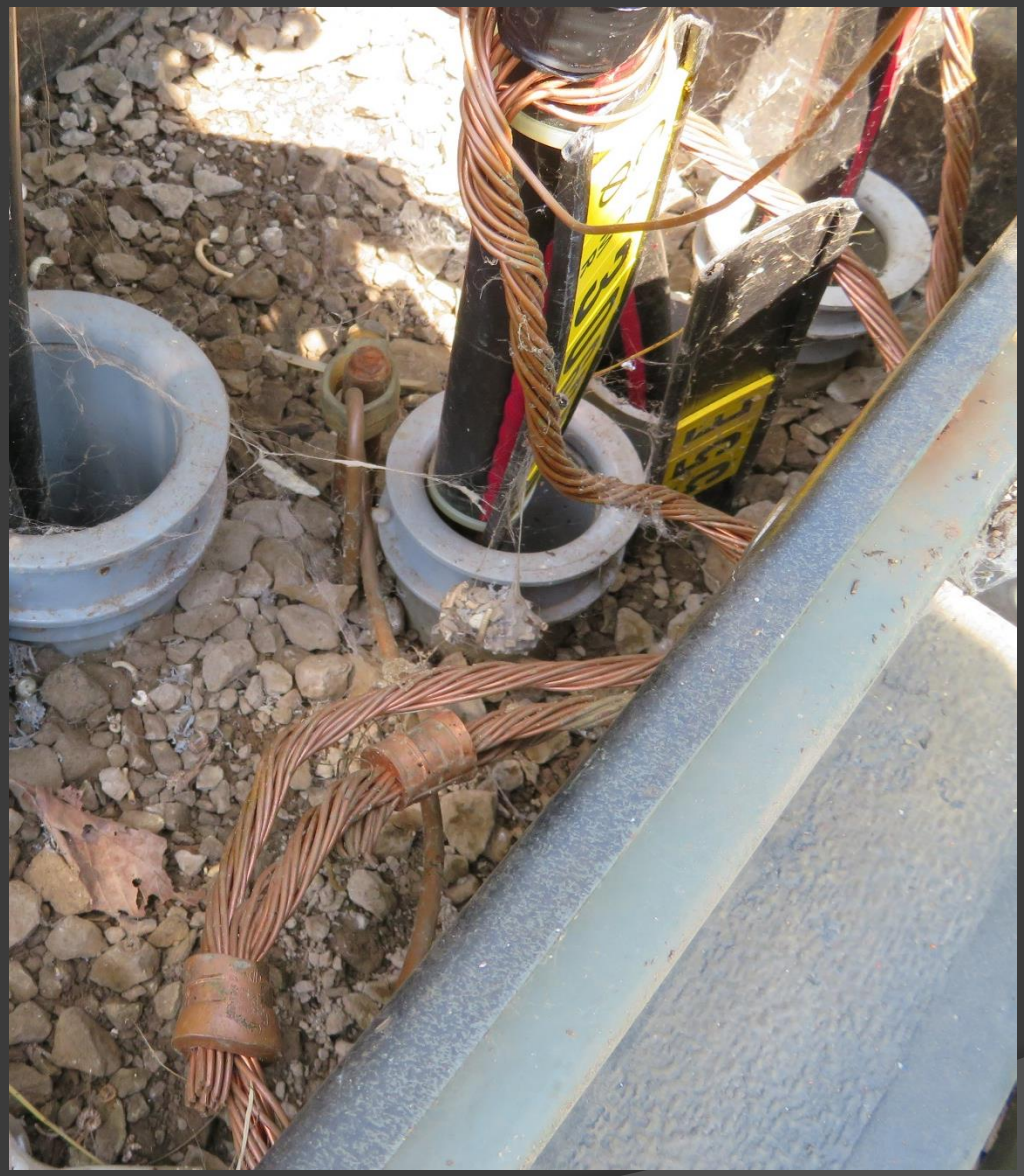
- Two pieces to buy

- One piece to buy

Primary Termination-Transformer

- Separate the bleeder wire
- Twist up the neutral
- Do Not install the elbow on the wire

Primary Termination-Transformer



- Press the neutrals together

Primary Termination-Transformer

- Press neutral to the ground wire

Primary Termination-Transformer

- Piggyback the termination on the elbow

Primary Termination-Transformer

- Proper Makeup

Primary Termination-Transformer

- Proper makeup

Primary Termination-Transformer

- Proper makeup

Primary Termination-Transformer

- After completion of Cable and Makeup:
  - Call 992-8839 for an inspection
  - Any cable plumbed into an energized device will require a CPU stand-by and WILL NOT BE TERMINATED
  - Call 992-8839 for a stand-by and inspection
  - A stand-by should not last longer than two hours

Transformer Numbers, Warning/Danger Labels & Cable Tagging

Transformer Numbering

- Contact Construction Services (construction@clarkpud.com) for Transformer numbers
- Apply the correct number to the top left corner

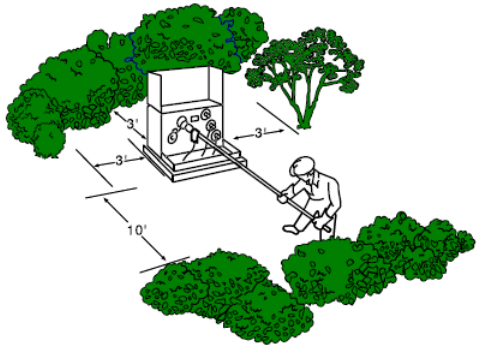
Transformer WARNING Labels

⚠WARNING

**Hazardous voltage inside.
Will shock, burn,
or cause death.**

**If unlocked or open
Immediately call
Clark Public Utilities
360-992-3000.**

NOTICE



We need room to work safely on this electrical supply device.

Please keep shrubs and structures 10 ft. away from this side and 3 ft. from all other sides.

Obstructions cause delays when restoring electric service and will be removed at the owner's expense.

⚠CAUTION

811 Know what's below. Call before you dig.

UNDERGROUND POWER CABLES ARE LOCATED IN THE AREA

CALL BEFORE YOU DIG

811 Know what's below. Call before you dig.

- Contact Construction Services (construction@clarkpud.com) for WARNING labels
- Apply to the front of transformers

Transformer DANGER Labels

- Contact Construction Services (construction@clarkpud.com) for DANGER labels
- Apply to the inside lid of transformers

Cable Tagging

- We require hard tagging of cables
- Tagging materials are on the Approved Material List

Primary

ØA | POLE XFMR SWITCH J-BOX EE | 1 | 2 | 3 | 4 | 5 | N S E W

Secondary

PED | N S E W

In transformer to secondary pedestal.

1 | 2 | 3 | 4 | 5

House #

In secondary pedestal to house.

XFMR POLE | 1 | 2 | 3 | 4 | 5 | N S E W

Transformer or Pole # | Direction to Transformer or Pole

In secondary pedestal from transformer or pole.

STLT | N S E W

In transformer or pedestal to streetlight.

Parallel Secondary

PARALLEL PRIMARY | XFMR POLE | 1 | 2 | 3 | 4 | 5 | N S E W

In secondary pedestal from transformer or pole.

PARALLEL PRIMARY | 1 | 2 | 3 | 4 | 5

In secondary pedestal to house.

Note: Zip tie ONE tag around each set of parallel cables.

Future Conduits (Normally Will Require Two Tag Holders)

POLE XFMR SWITCH J-BOX EE | 1 | 2 | 3 | 4 | 5

Device #

N S E W | 1 | 5 | 0

Length of Conduit

Notes:
1. These tags are for URD primary and secondary cables. Tag all cables.
2. Parallel cables shall have one tag zip tied around both cables.

Rev 4: Added tagging for parallel conductors.

Clark Public Utilities

CONSTRUCTION STANDARDS
UNDERGROUND CONDUCTOR IDENTIFICATION TAGS

REVISIONS	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	9/23/04	LB	AH
3	1/16/19	KJP	
4	10/3/22	DRAFT	

PAGE: 1 of 1 | UID2 | CAD FILE: xUID2 | APP: | DATE: 1/31/00 | SECTION 1300

Clark Public Utilities

Approved Primary Electrical Contractor 2022 Training Class

Part 2

Secondary Pedestal

Secondary Pedestal

- Tree up pipe
- Make sure it is in the exact location the print calls for

Secondary Pedestal

- Grade Pedestal to the grade line
- NOTE: 8’ ground rod driven 8” off the front of the pedestal - required for BDR install– prevents delay for temporary service

Secondary Pedestal

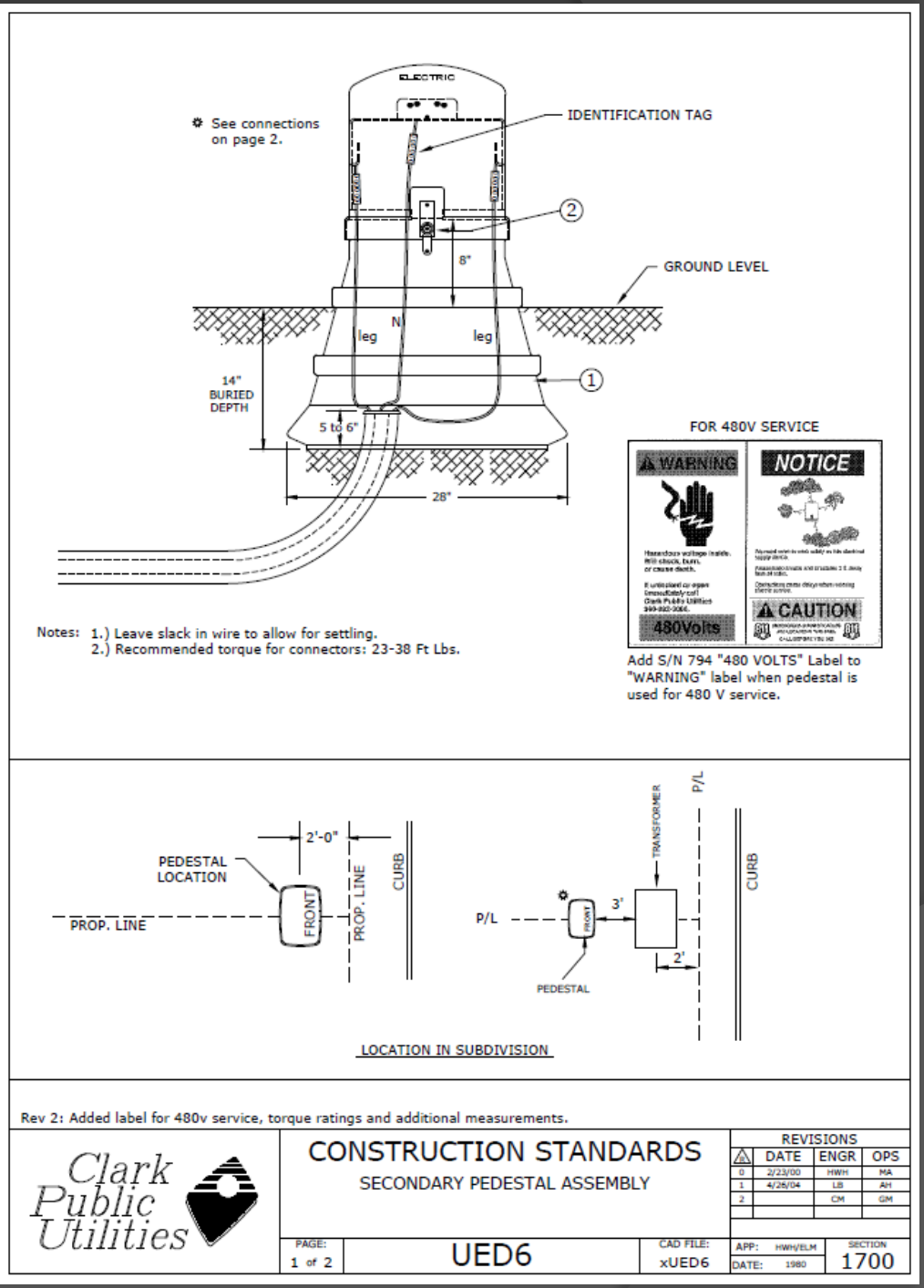
- Grade only to the grade line on the outside
- Do NOT fill the inside
- Start with source cable in the second hole from back and go forward with load(s)

Secondary Pedestal

- Be careful when backfilling

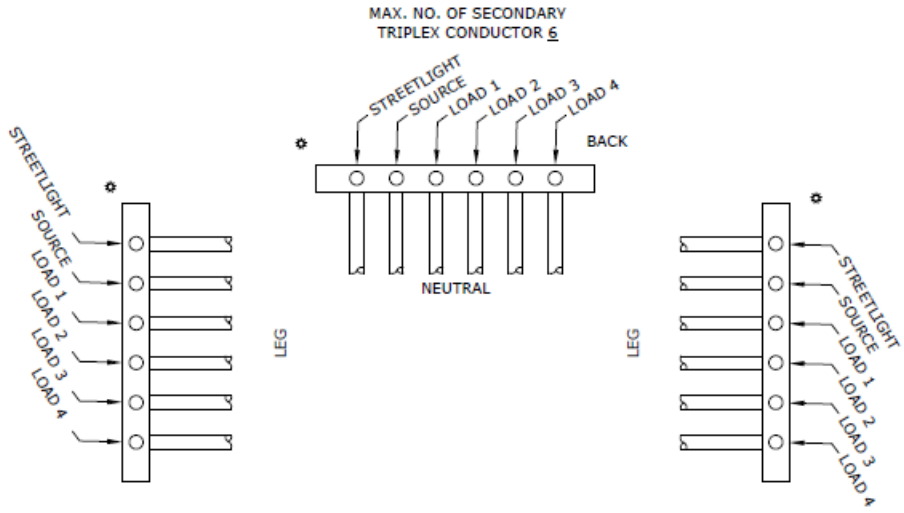
Secondary Pedestal

- Bury 14”, grade should be 8” down from the lock
- Set pedestal directly behind transformer
- Set on the property line
- Installed 3 feet behind transformer
- Be aware of grade to panel



Secondary Pedestal

- Follow cable placement
- Do NOT use an impact driver/wrench to tighten connectors
- Connectors sized #10 to 350MCM



Recommended torque: 23-38 ft-lb
Do NOT Use Impact Driver/Wrench

ITEM NO.	DESCRIPTION	UED4 QTY.	UED4 S/N
1	Pedestal, Secondary, aboveground W/ PED6 Connectors and Covers	1	2562
2	Lock, Equipment U.G.	1	837

NOTES: 1.) S/N 794-"480 volts" label-when pedestal is used for 480v service.
2.) Connectors are rated #10 to 350 MCM.

Rev 2: Added label for 480v service, torque ratings and additional measurements.

Clark Public Utilities

CONSTRUCTION STANDARDS
SECONDARY PEDESTAL ASSEMBLY

REVISIONS	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	4/26/04	LB	AH
2		CM	AH

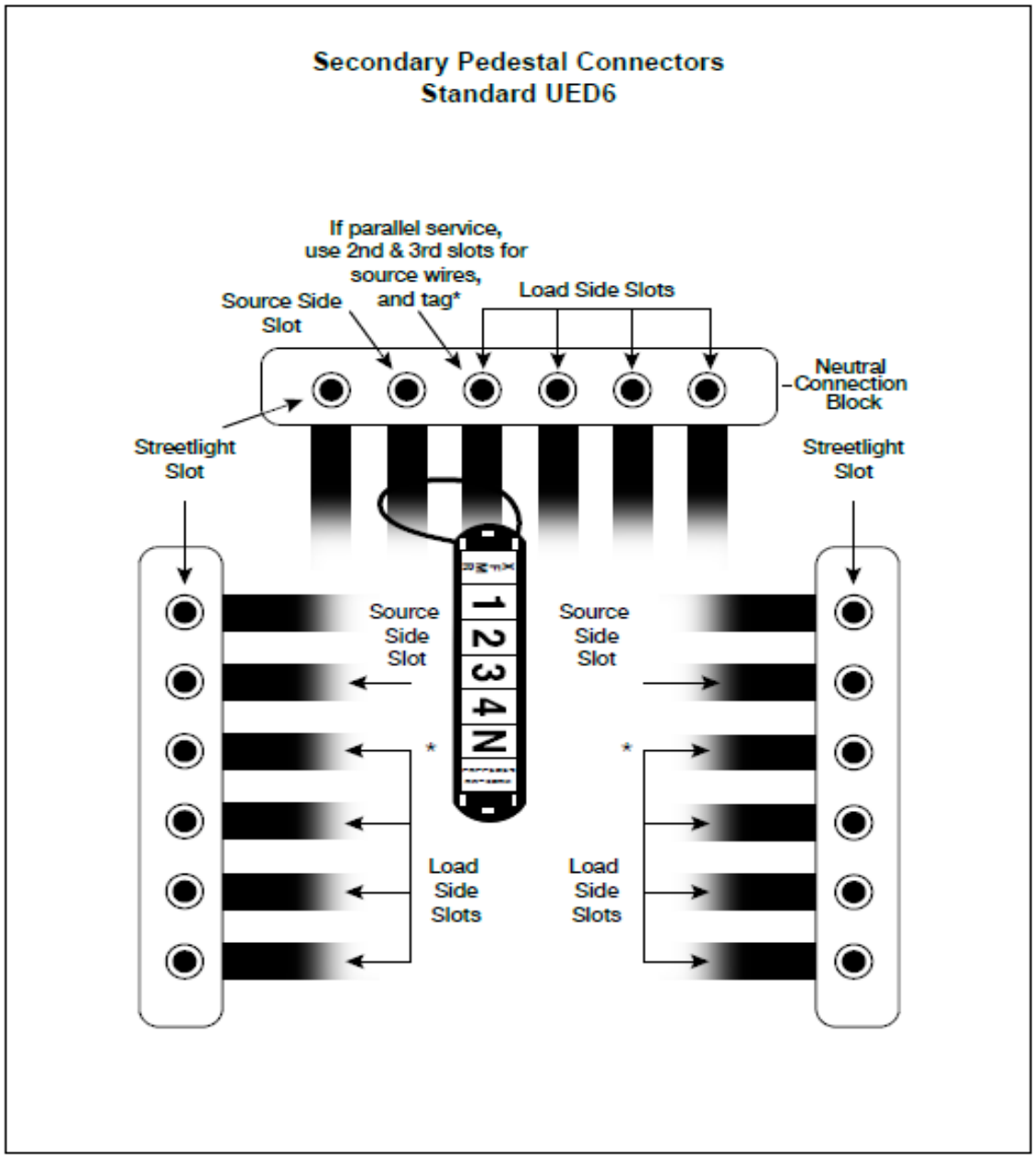
PAGE: 2 of 2 | UED6 | CAD FILE: xUED6 | APP: HWH/ELM | DATE: 1980 | SECTION 1700

Secondary Pedestal

- Tag parallel cables with one tag
- Tag each leg individually

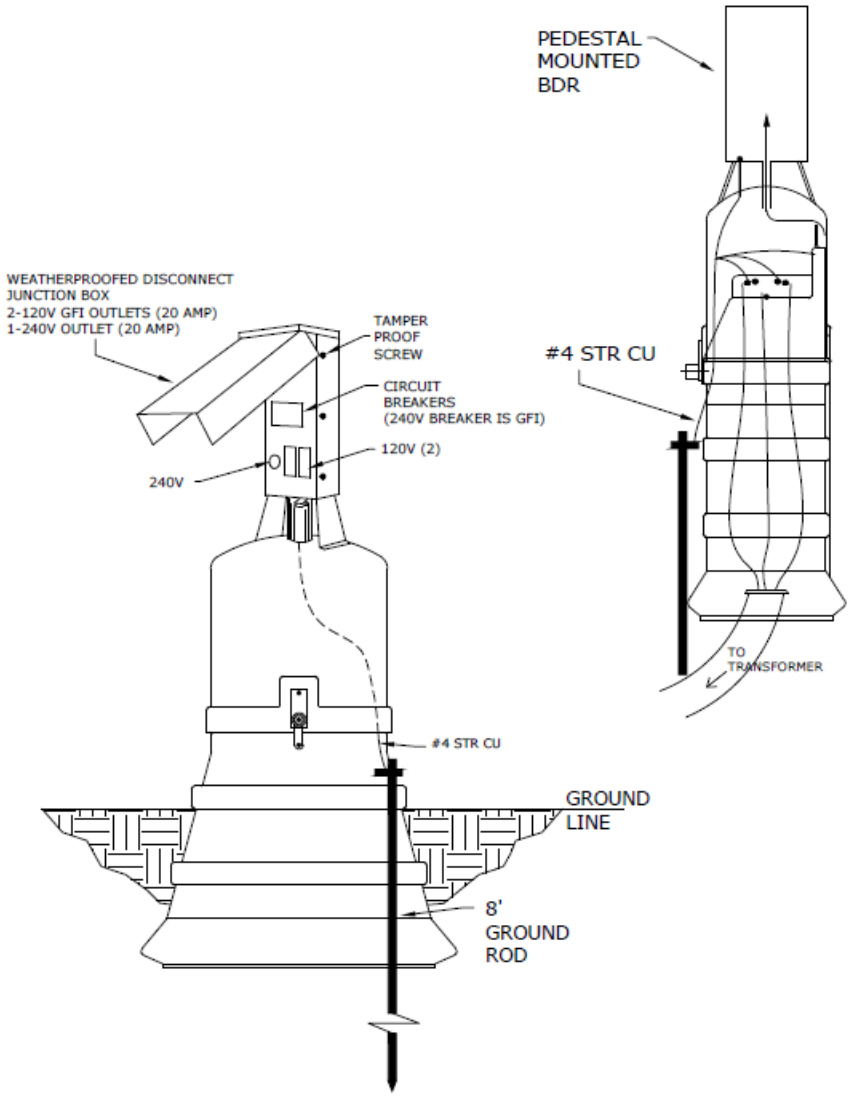
Clark Public Utilities

Secondary Pedestal and Tagging Installation Detail



Secondary Pedestal

- The ground rod is installed to ground the builders' service (BDR)
- Install ground rod 8" off the front corner of the pedestal



CONNECTION DIAGRAM

REV 2: Removed note

Clark Public Utilities

CONSTRUCTION STANDARDS

120/240 TEMPORARY PEDESTAL MOUNTED BDR

REVISIONS			
	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	4/26/04	LB	AH
2	5/30/07	LB	AH

PAGE: 1 of 1

UBDR

CAD FILE: UBDR

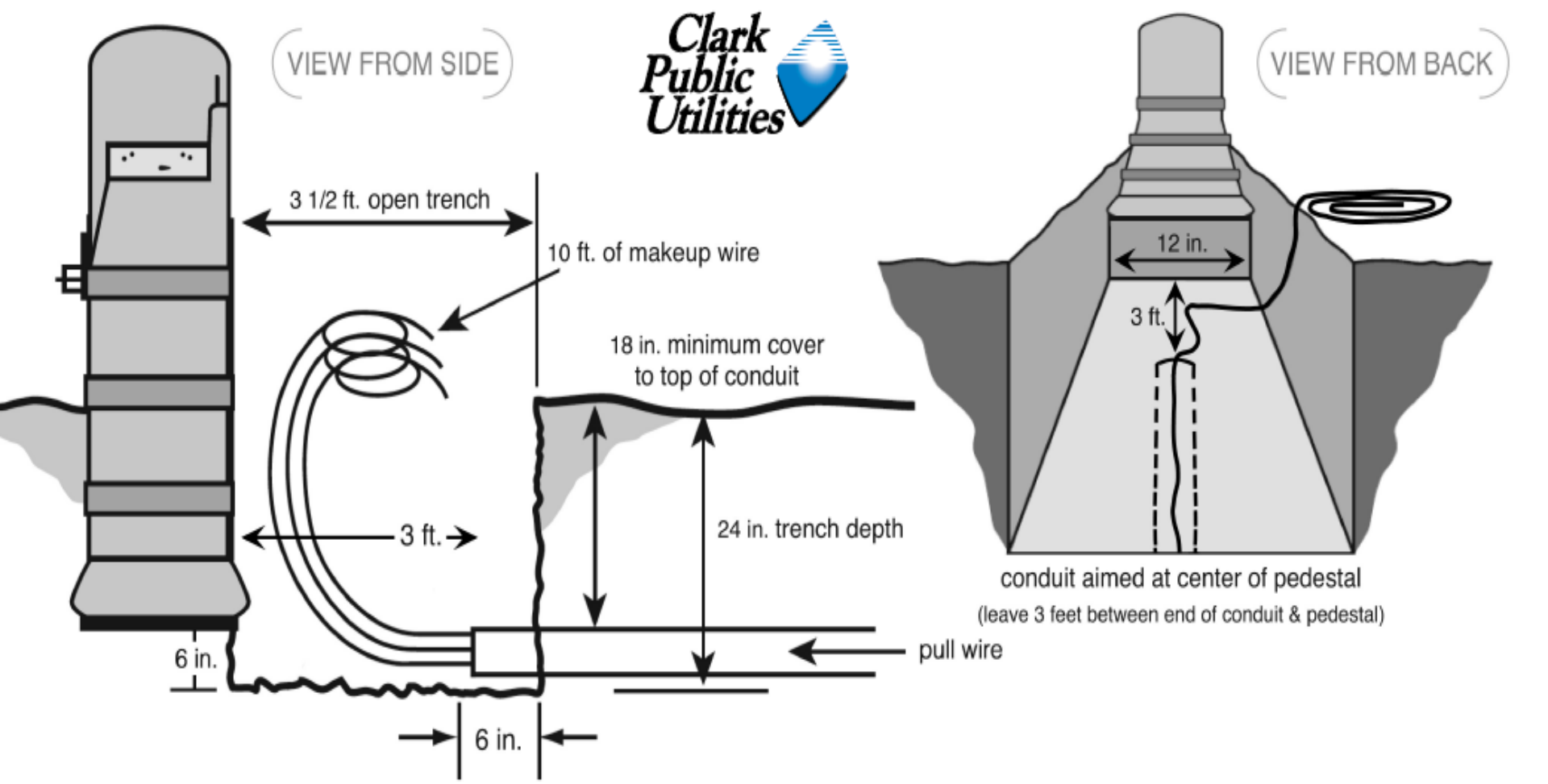
APP: JEH DATE: 2/22/00

SECTION 1700

Secondary Pedestal

- Throw-away wire to a BDR
  - Do not connect in the transformer
  - Utility crews will connect this wire when the transformer is ready to be energized
  - Label both ends: ‘Temp BDR wire’

Trench To Secondary Pedestal



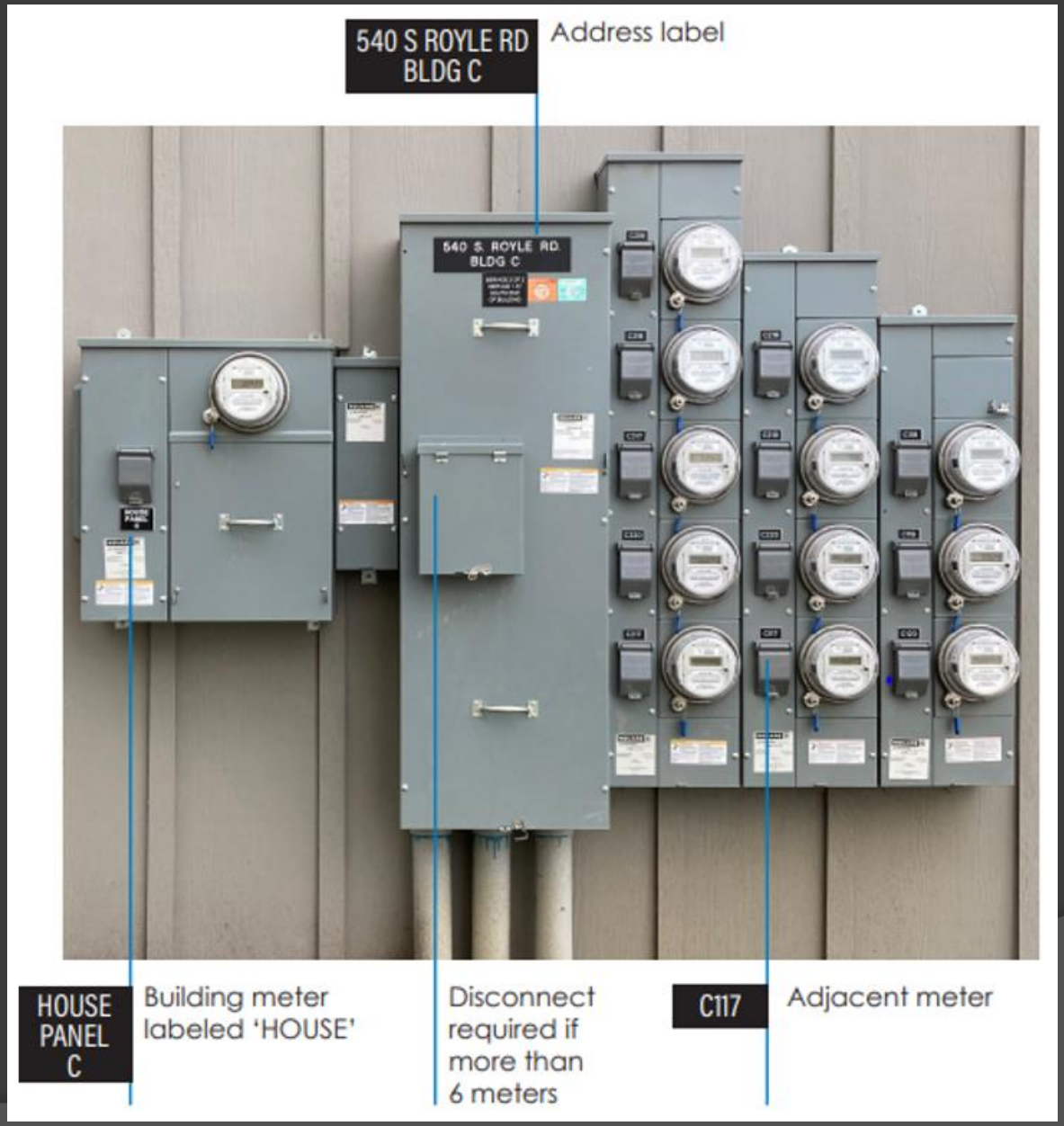
Example of a typical underground service ready for connection

Meter Pack

Meter Pack

- Meter Packs must be labeled with hard plastic, metal or phenolic block labels with raised or engraved letters
- An address/building number label is required for the building's main disconnect label
- A permanent label is required at the meter base, corresponding breaker , electrical panel and building (HOUSE) meter
- Minimum of ½-inch height letters are required for all metering equipment labels
  - https://www.clarkpublicutilities.com/wp-content/uploads/2021/10/Multi-Meter-Labeling-Detail.pdf

Meter Pack


540 S ROYLE RD
BLDG C
Address label
540 S. ROYLE RD.
BLDG C
HOUSE
PANEL
C
Building meter
labeled 'HOUSE'
Disconnect
required if
more than
6 meters
C117
Adjacent meter

Meter Pack

- You must have permanent meter equipment labeling and an electrical inspection before CPU will energize the meter base and set meters

Current Transformers (CTs)

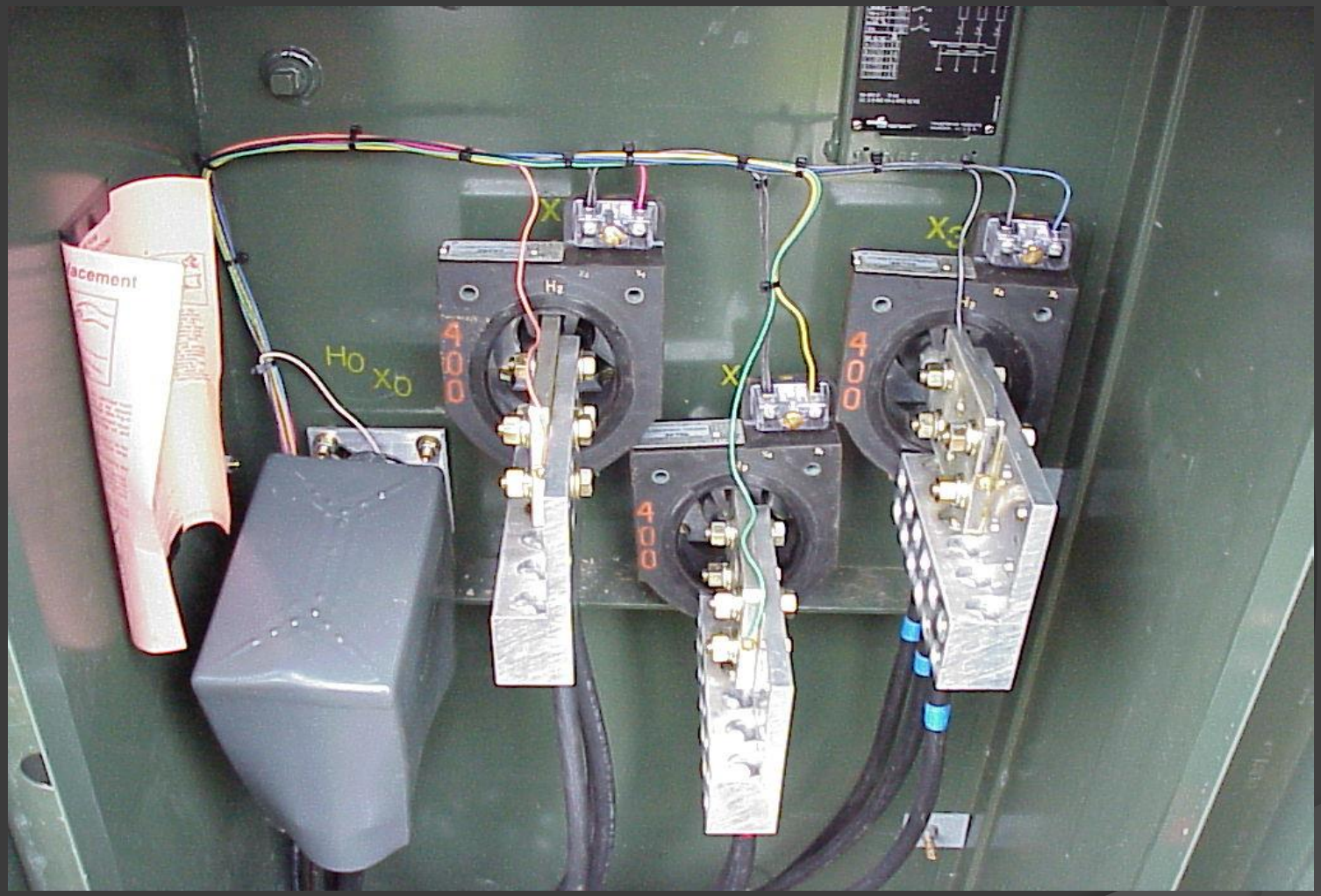
CTs

- This is a bad CT can make up.
- Fail!

CTs

- This is a good CT can make up.
- Pass!

CTs



- Jabbo style CTs will be needed for larger loads

Streetlights

City Streetlight Ownership & Maintenance

- **<u>Not Maintained by CPU</u> - Vancouver/Camas**
  - All street lights are owned and maintained by the Cities of Camas and Vancouver
  - Most lights are direct feed off CPU's system
  - UG streetlight wire is maintained by CPU, the fixtures and poles are city maintained
  - New installations require a disconnect, installed to the NEC, and the City owns and maintains all equipment
- **<u>Maintained by CPU</u> - All Other Cities (Battle Ground/ Ridgefield/ La Center/Yacolt/ Washougal)**
  - All street lights owned by the Cities
  - Street lights directly fed off CPU's system are maintained by CPU
  - All direct feeds owned and maintained by CPU
  - Newly installed street lights are directly sourced by CPU

Streetlights

- Example of a streetlight trench
- It has a cut out of the side, for the base

Streetlights

- Streetlight standards must be positioned according to the design print
- The base normally requires 4 foot depth

Streetlights

- Example of a streetlight conduit that is treed up
- Notice this ditch has been partially back filled and the gas line is installed

Streetlights

- Insert wire into the base of the streetlight and stand up right
- Should have conduit into the base

Streetlights

- Position the light to the correct spot
- Plumb the light so it is vertical
- Backfill around the base

Streetlights

- Compact around the base as you backfill

Streetlights

- Backfill to the final grade

Streetlights

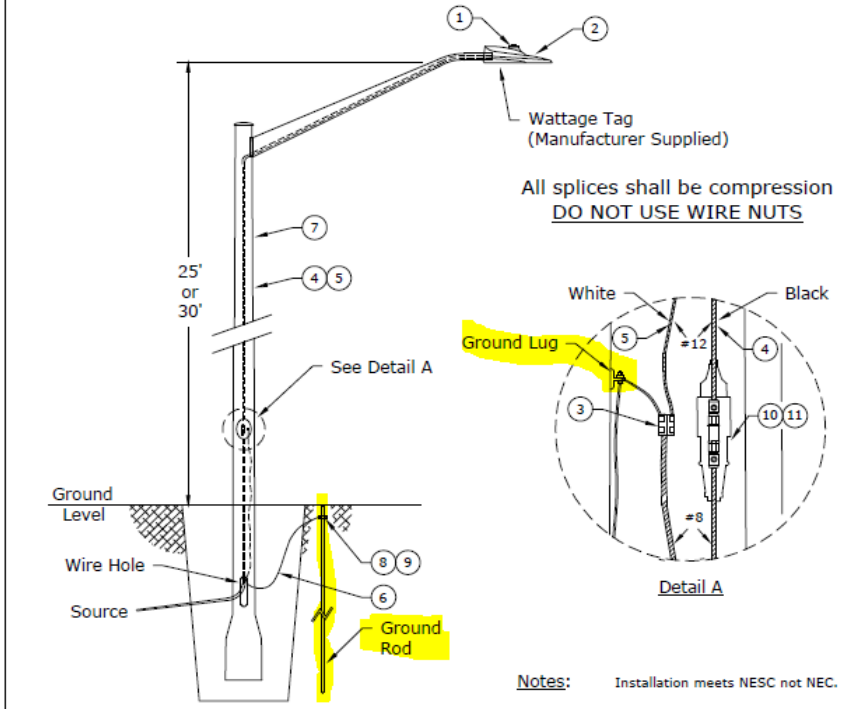
- Install the Light and Arm
- Run the wire from the light down to the base of the standard

Streetlights

- Make the neutral connection
- Make the phase connection using a fuse
- Attach the hand hole cover plate

Streetlights - Aluminum Poles

- Aluminum poles require ground rod
- Run #6 Cu from ground lug in pole to ground rod
- Decorative aluminum poles will be added as a standard in the near future



ITEM NO	DESCRIPTION	SL100ALED		SL200ALED	
		QTY	S/N	QTY	S/N
1	Photoeye, LED and HPS, 120V, 3-pin	1	2872	1	2872
2	Luminaire, Cobrahead, LED, Type 3, 3000K, HPS Equivalent	1	2889	1	2895
3	Connector, H-Tap, Al/Cu, Run #6-#2 Str, Tap #14-#8 Str	1	416	1	416
4	Cable, 600V, Cu, #12, 19-Str, Black, 1C	42 ft	386	42 ft	386
5	Cable, 600V, Cu, #12, 19-Str, White, 1C	42 ft	387	42 ft	387
6	Conductor, Cu, #6, Solid, Bare, Soft Drawn, 1C	2 ft	374	2 ft	374
7	Pole, Streetlight, Al, Direct Burial, 25' Mounting Height w/ 6' Arm ✪	1	2946	–	N/A
7	Pole, Streetlight, Al, Direct Burial, 30' Mounting Height w/ 6' Arm ✪	–	N/A	1	2945
8	Clamp, Ground Rod, 5/8", Bronze, Small	1	281	1	281
9	Rod, Ground, 5/8" x 8'	1	1124	1	1124
10	Fuse, 10A, 250V, Time Delay, Streetlight	1	2389	1	2389
11	Holder, Fuse, Streetlight	1	2388	1	2388

Clark Public Utilities

CONSTRUCTION STANDARDS

STREETLIGHT, 100/200W EQUIV. LED COBRAHEAD
SINGLE ARM
ALUMINUM POLE, DIRECT BURIAL

REVISIONS

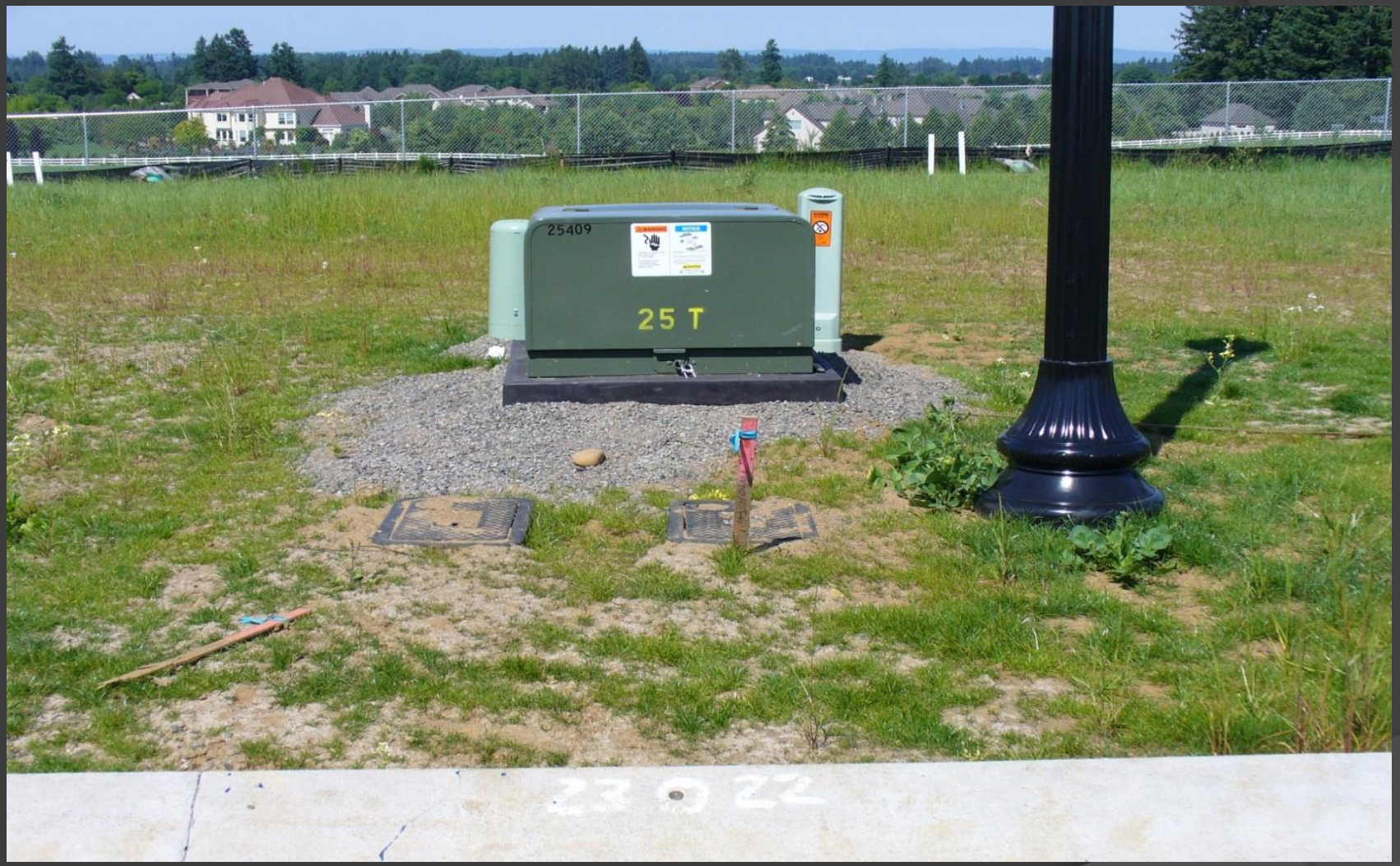
⚠	DATE	ENGR	OPS

PAGE: 1 of 1 | SL100ALED,SL200ALED | CAD FILE: SL100ALED | APP: DRK/KJP | DATE: 6/1/22 | SECTION 1000

Streetlights

- Example of a decorative streetlight standard
- Notice the base is flush to the ground

Streetlights



- An example of a finished streetlight installation

Three Phase Transformers

Three Phase Transformers

- Primary conduit treed up
- Attach it to a make up board

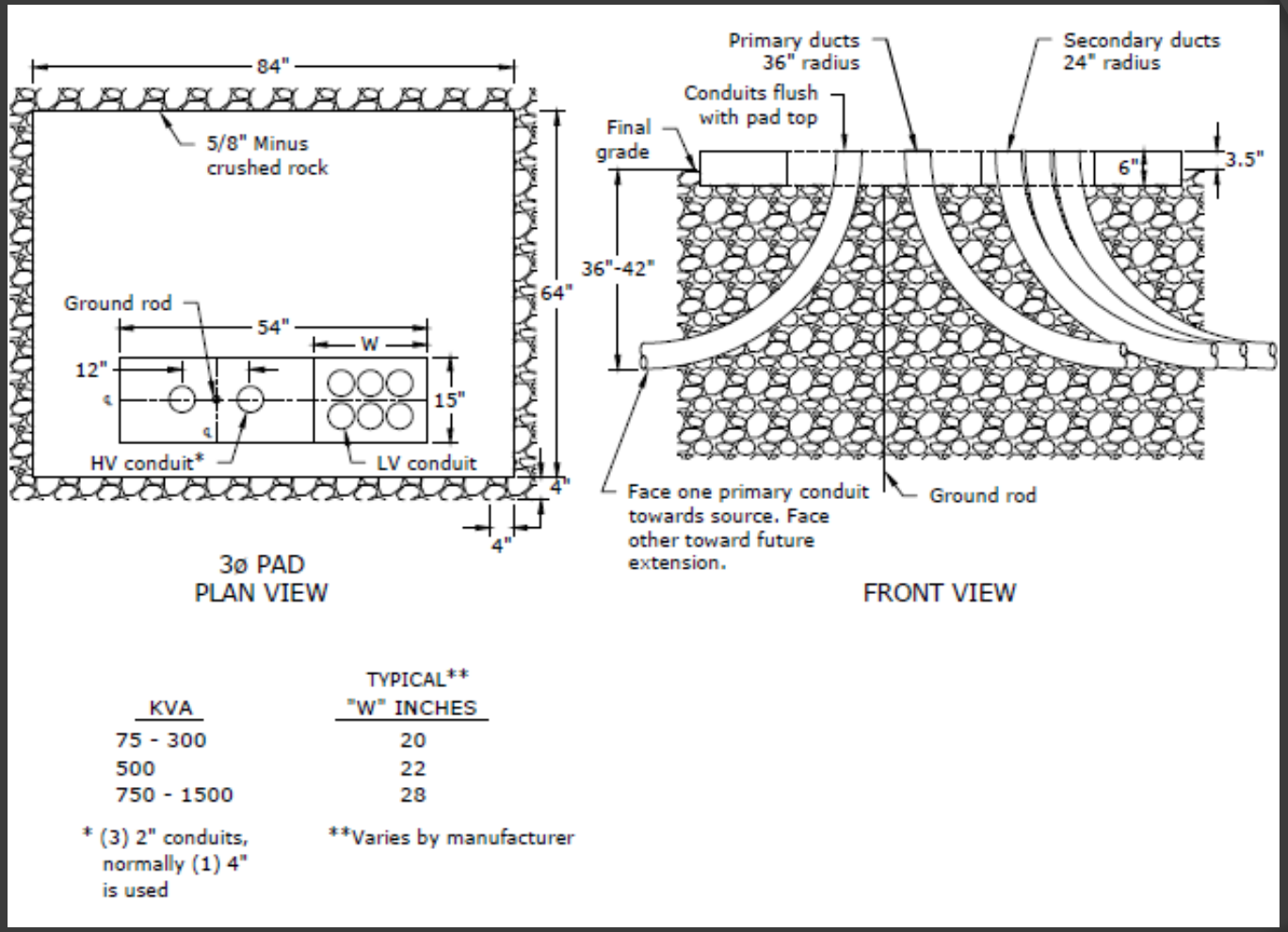
Three Phase Transformers

- Bring in the secondary pipe and attach it to the board
- Primary will be on the left and secondary will be on the right

Three Phase Transformers

- Remove tree bracket and begin to backfill
- Backfill under concrete pads must be 5/8” rock
- Plug the end of the pipe

Three Phase Transformer



KVA	TYPICAL** "W" INCHES
75 - 300	20
500	22
750 - 1500	28

* (3) 2" conduits, normally (1) 4" is used

**Varies by manufacturer

- Diagram of a 3 phase transformer layout
- Primary source on the left and the load is on the right

Three Phase Transformers

- After grade is established install the concrete pad
- Cut the conduit flush with the pad
- Install conduit end bells/collars

Three Phase Transformers

- Install the transformer
- Make sure it is square on the pad

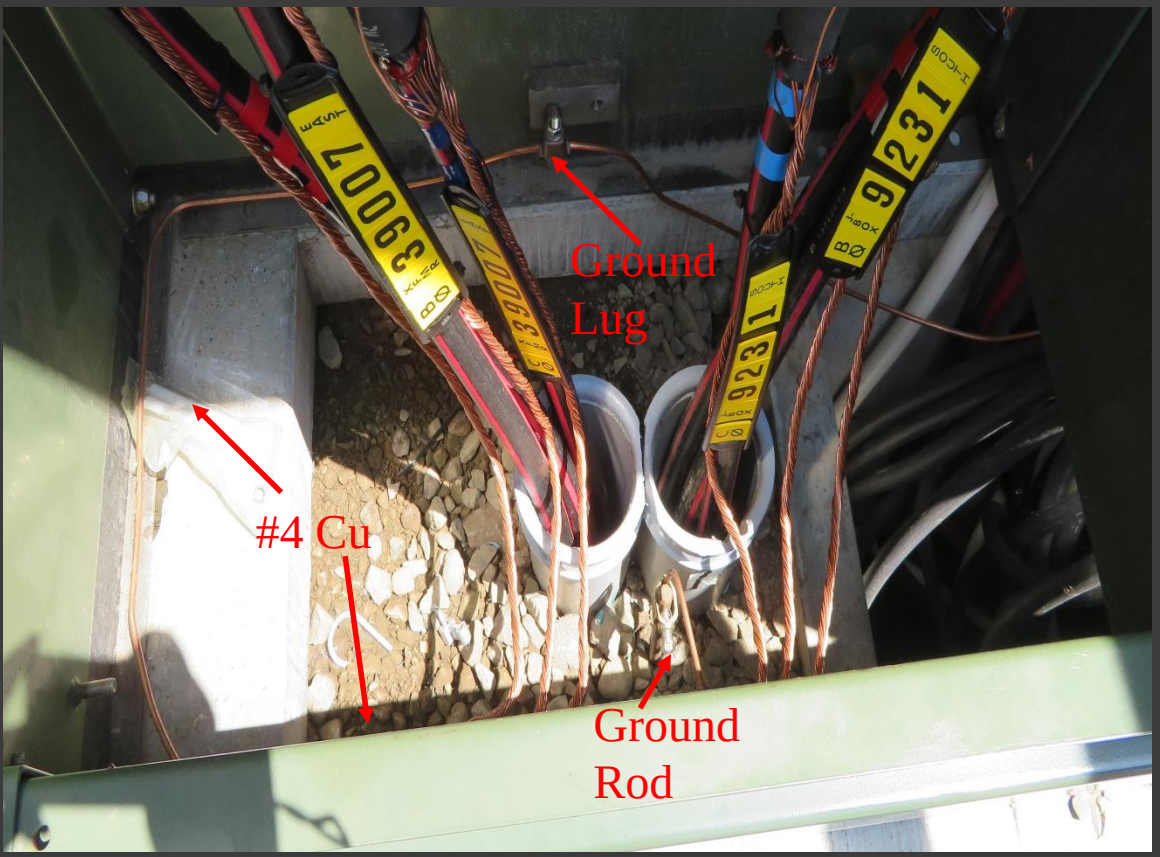
Three Phase Transformers

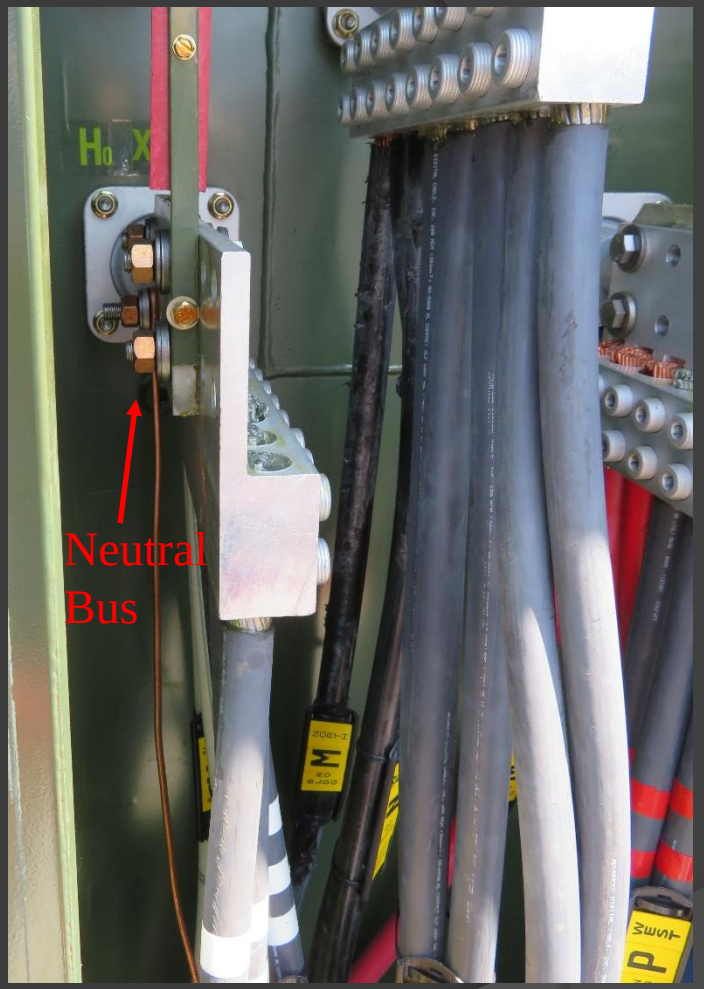
- Example of a secondary compartment
- CPU prefers conduit plugs instead of duct tape

Three Phase Transformers

- Proper make up of radial three phase transformer
- The phasing will be left to right A,B,C,C,B,A

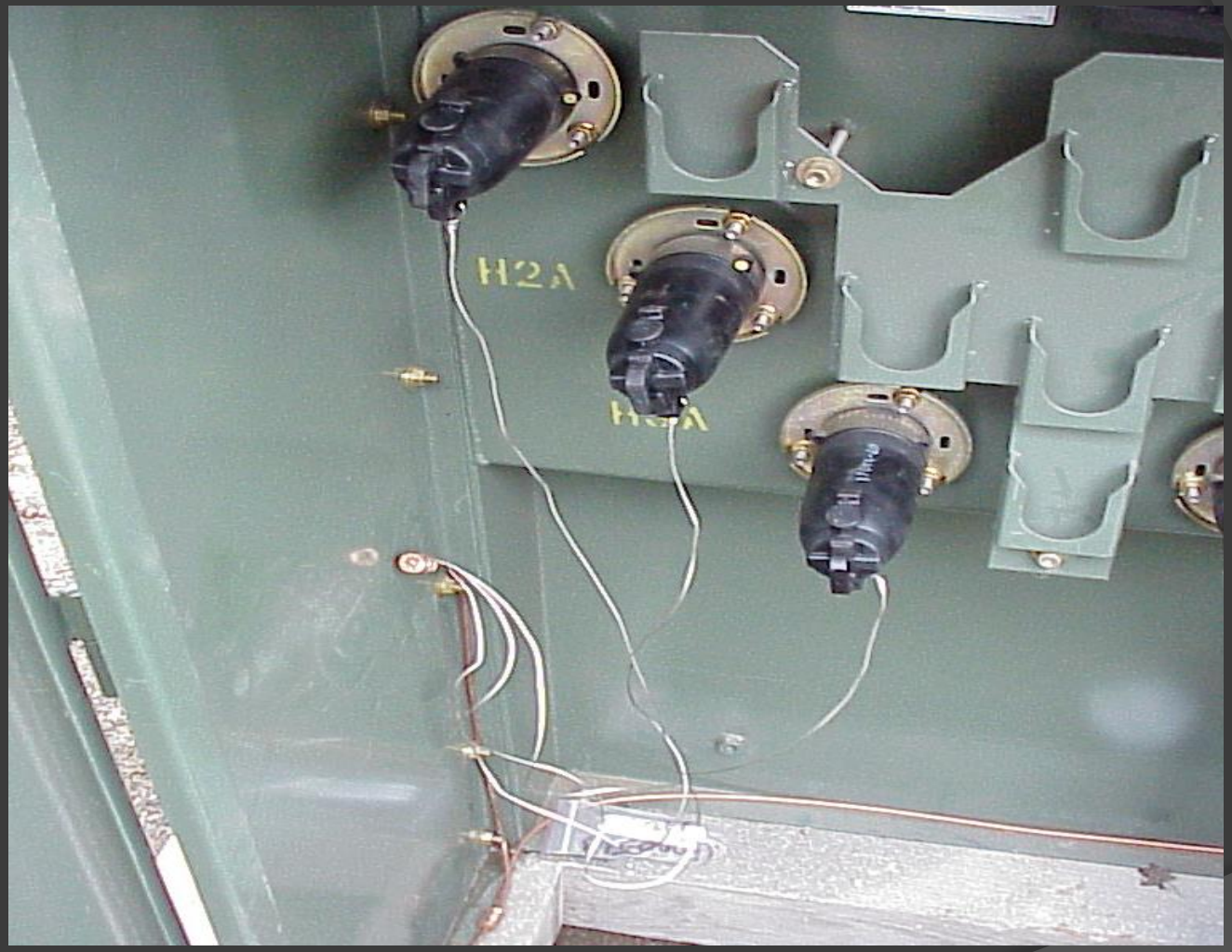
Three Phase Transformers





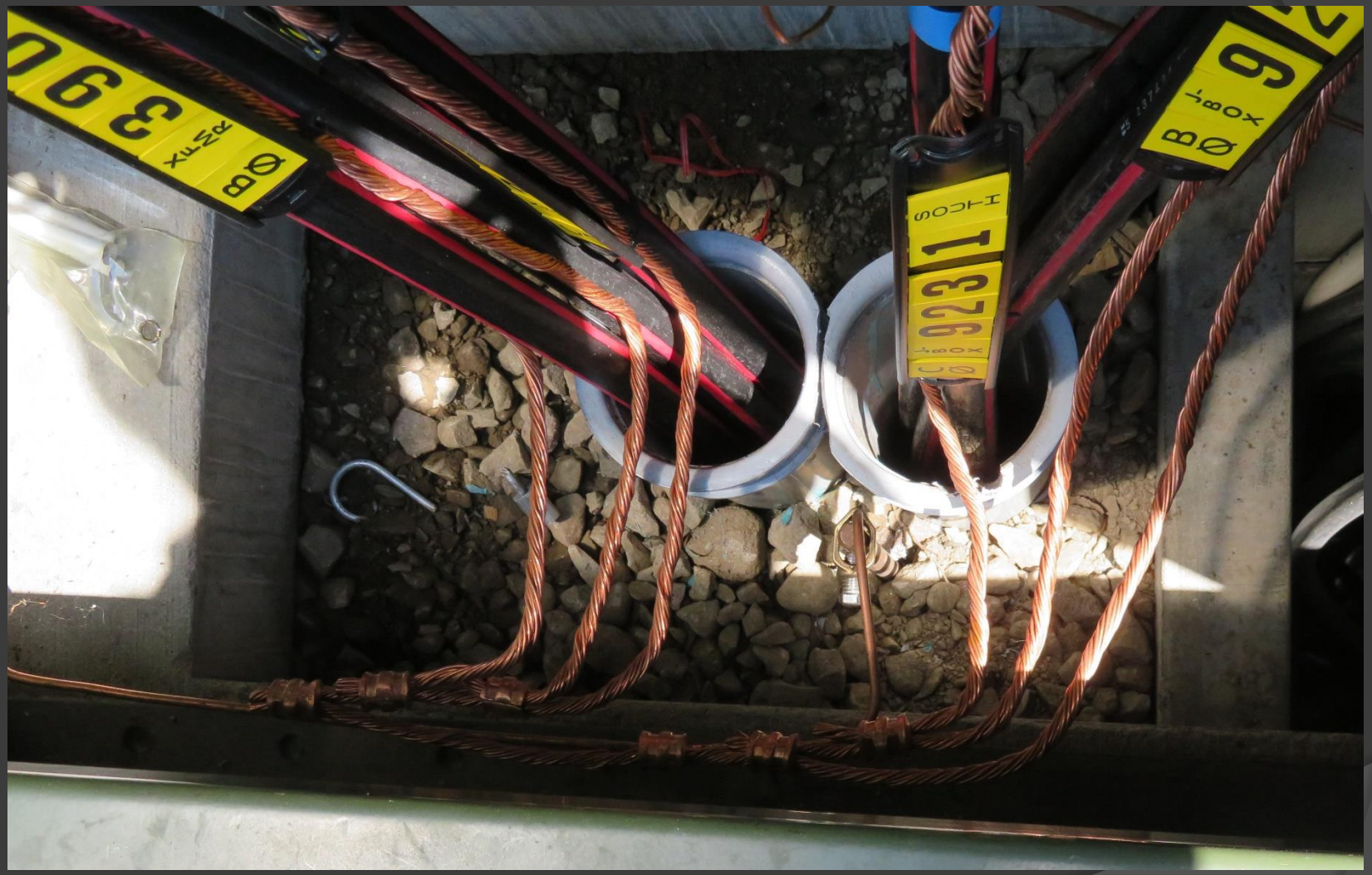
- Install #4 CU from the ground rod around the cabinet to the ground lug then to the secondary neutral bus

Three Phase Transformers



- Stub up a tail to connect the dust cover bleeder wires

Three Phase Transformers

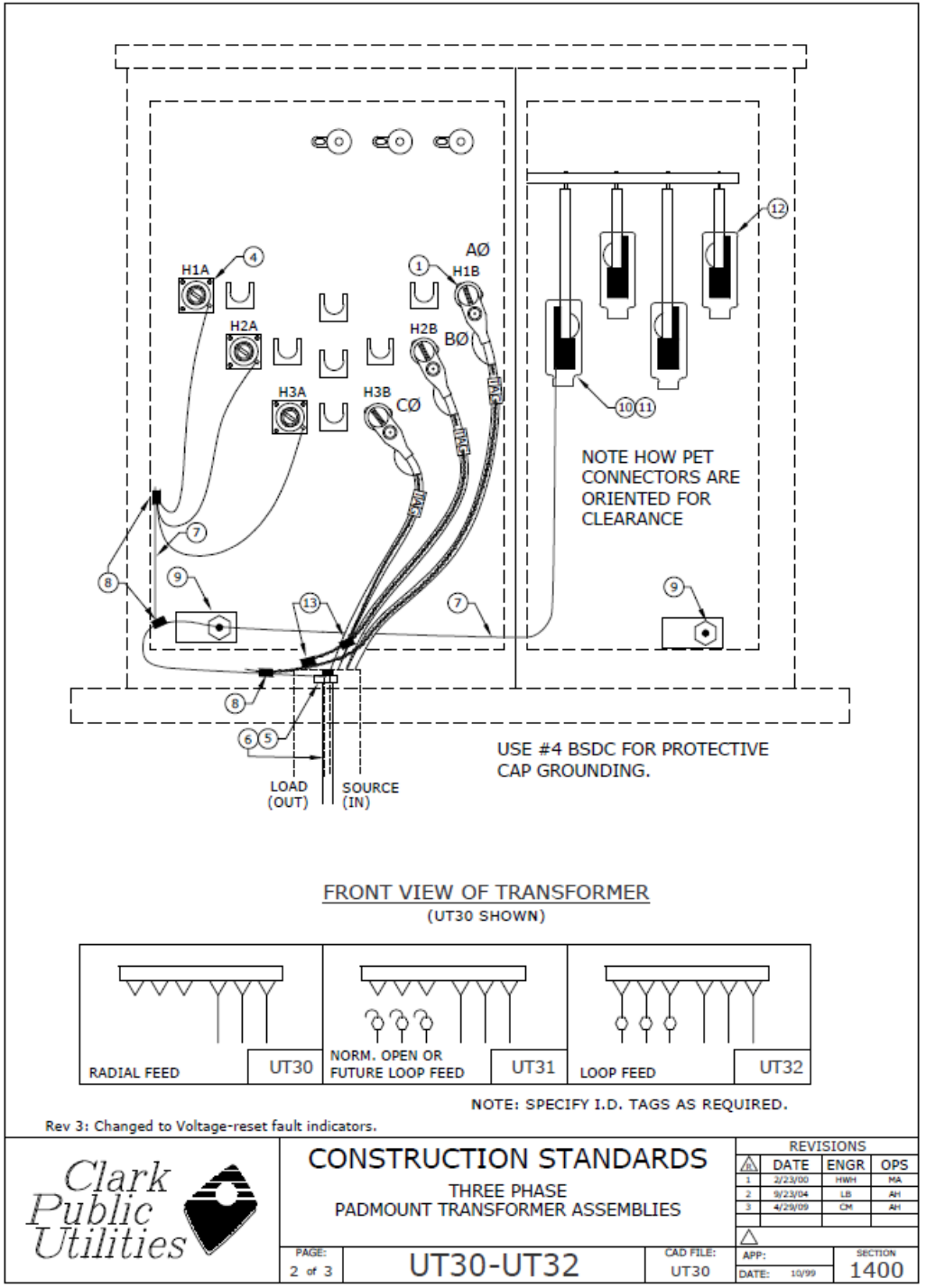


- To make up multiple primary neutrals, piggy back the concentric then connect to the ground wire

Three Phase Transformers

- This is Std UT30 - radial
- The phase labeling must align
- Make sure to tape Red, White, Blue- A,B,C

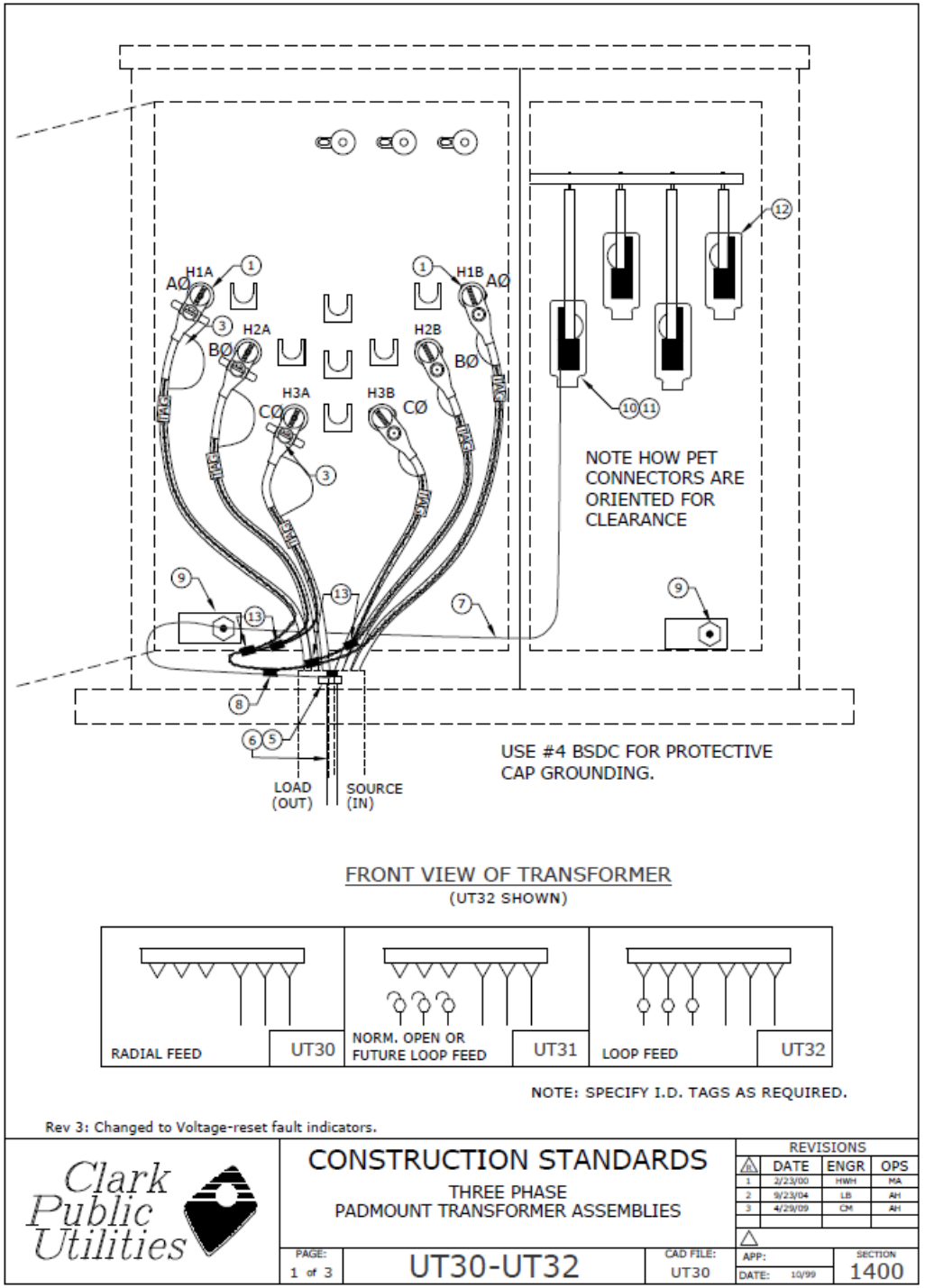
(Extremely Important)



Three Phase Transformers

- This is Std UT33 – feed-thru
- The phase labeling must align
- Make sure to tape Red, White, Blue- A,B,C

(Extremely Important)



Three Phase Transformers

- This is a picture of a feed-thru primary
- The load side has fault indicators

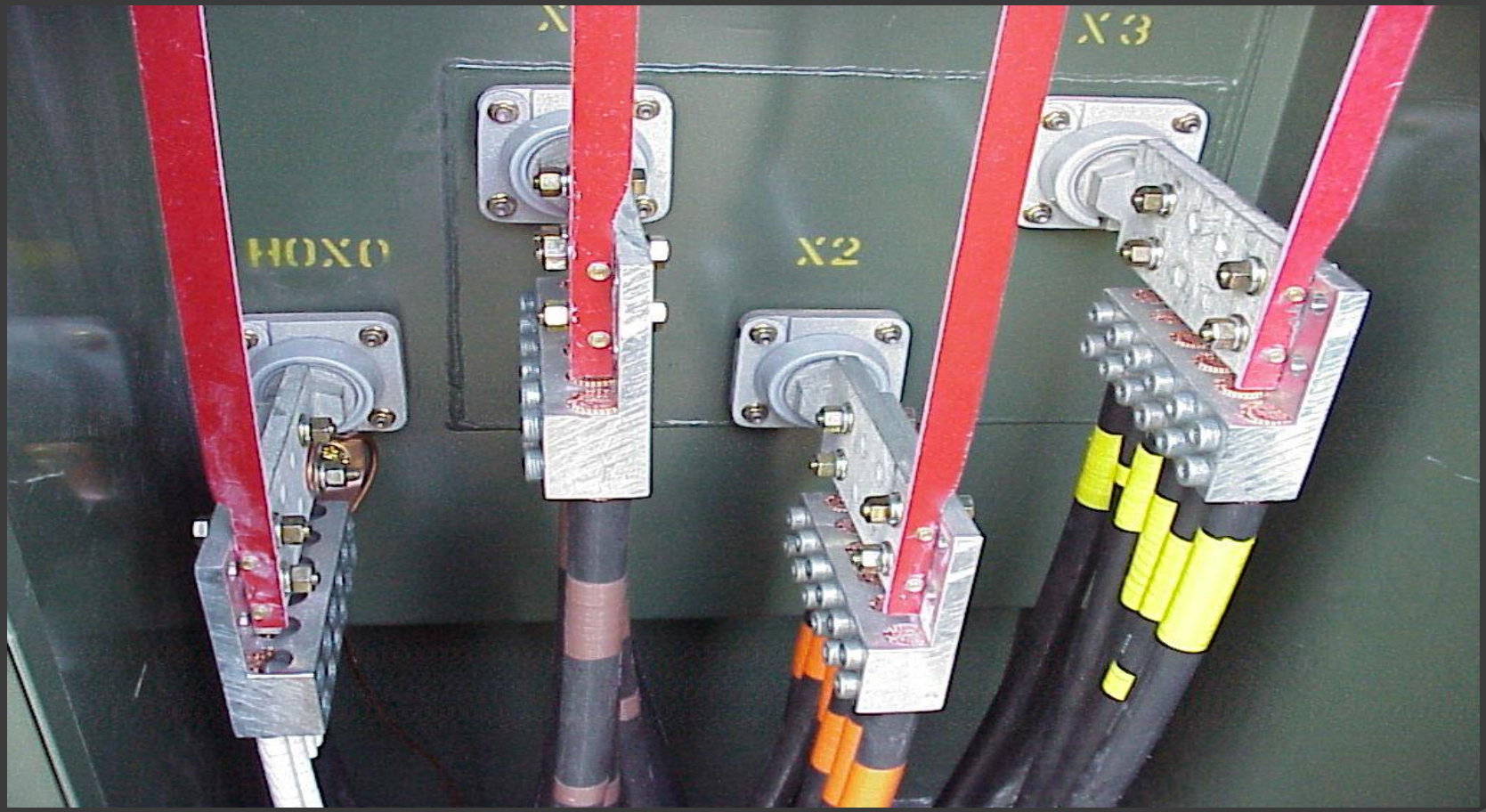
Three Phase Transformers

- This is a picture of 208v secondary make up
- It is taped white-neutral, black-x1, red-x2, blue-x3

Three Phase Transformers

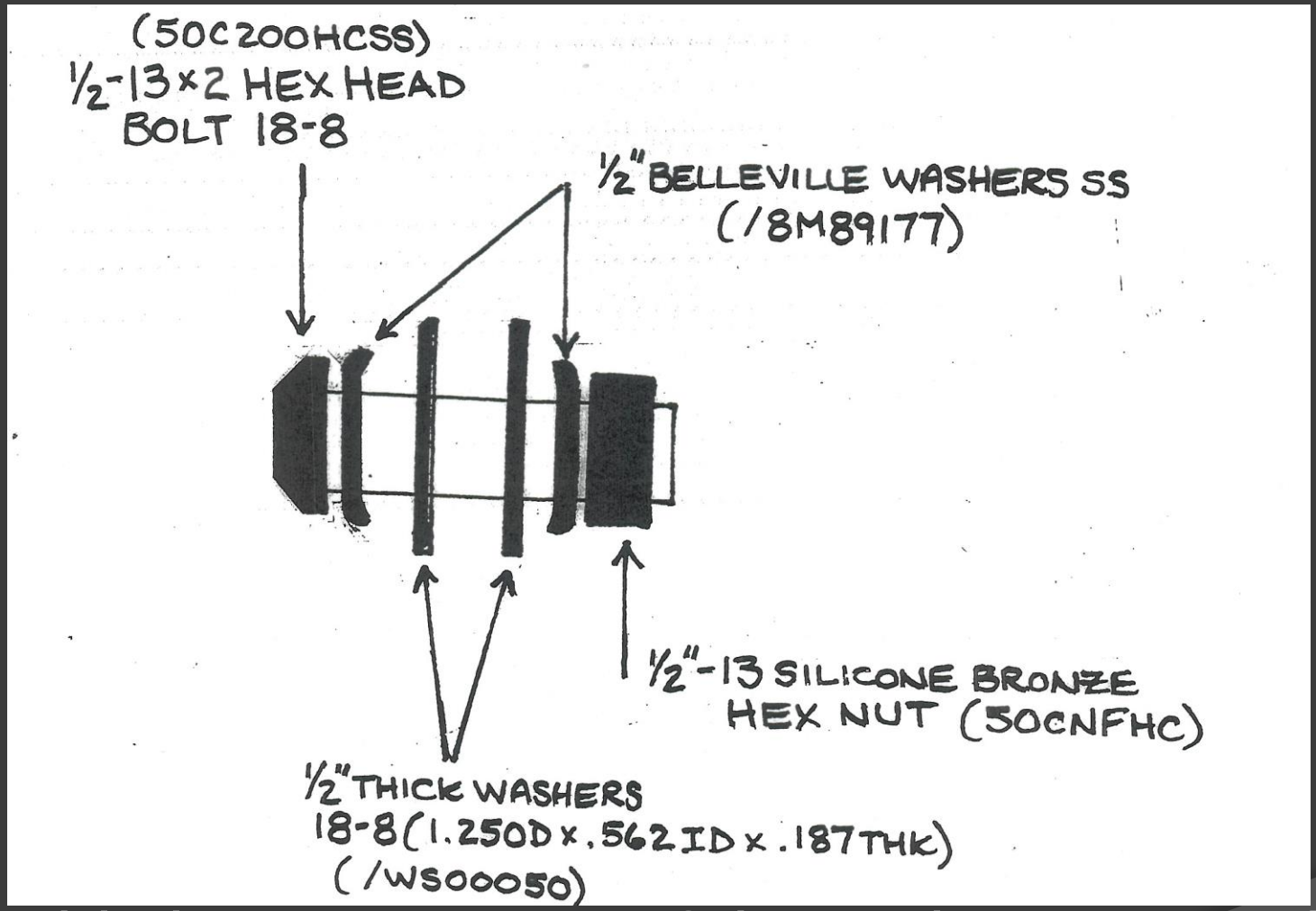
- This is a picture of 480v secondary make up
- It is taped white-neutral, brown-x1, orange-x2, yellow-x3 (BOY)
- Needs hard tagging

Three Phase Transformers



- PETs will be attached
- Hanger brackets will be installed on ≥ 500kVA
- Every connection will have Penetrox

Three Phase Transformers



- This is an example of the stainless steel bolt assembly required to attach PETs

Three Phase Transformers

- Install insulated coverings

Three Phase Transformers

- Example of a level transformer with good grading
- Notice the CPU Transformer #, warning label and voltage stickers

Three Phase Transformers

- Removable protective barriers need to be installed where there is traffic near a transformer
- Transformer also has a secondary vault

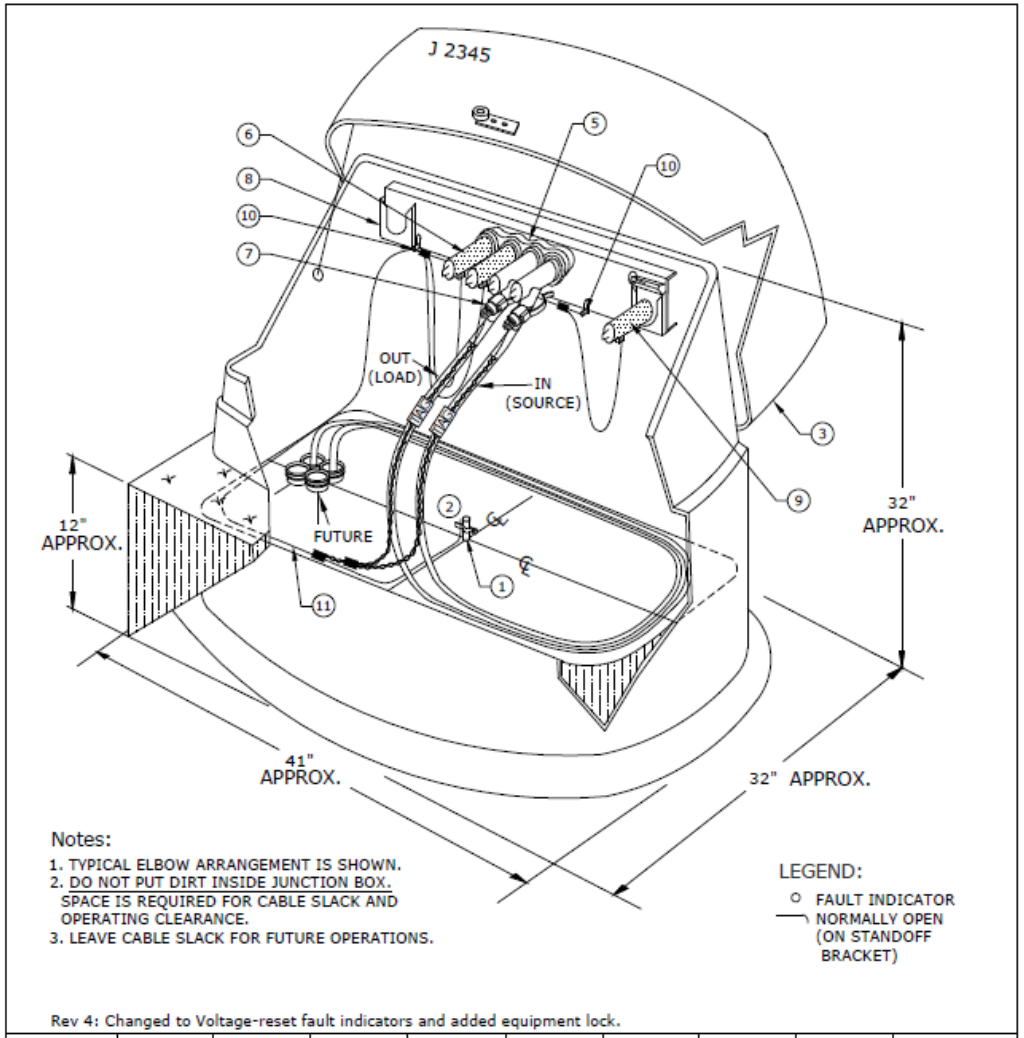
Three Phase Transformers

- This a poor installation and we would require the contractor to correct or pay for the correction

Single Phase J-Box

Single Phase J-Box

- Construction standard for a single phase J-box



Notes:
1. TYPICAL ELBOW ARRANGEMENT IS SHOWN.
2. DO NOT PUT DIRT INSIDE JUNCTION BOX. SPACE IS REQUIRED FOR CABLE SLACK AND OPERATING CLEARANCE.
3. LEAVE CABLE SLACK FOR FUTURE OPERATIONS.

LEGEND:
FAULT INDICATOR
NORMALLY OPEN (ON STANDOFF BRACKET)

Rev 4: Changed to Voltage-reset fault indicators and added equipment lock.

UJM4	UJM41	UJM42	UJM43	UJM44	UJM45	UJM46	UJM47	UJM48	UJM49

ITEM	MATERIAL LIST DESCRIPTION	QTY	S/N
1	Ground Rod 5/8" x 8'	1	1124
2	Clamp, Ground Rod 5/8", Small	1	281
3	Junction Box, 1Ø	1	194
4	Equipment Lock, UG	1	837

Clark Public Utilities

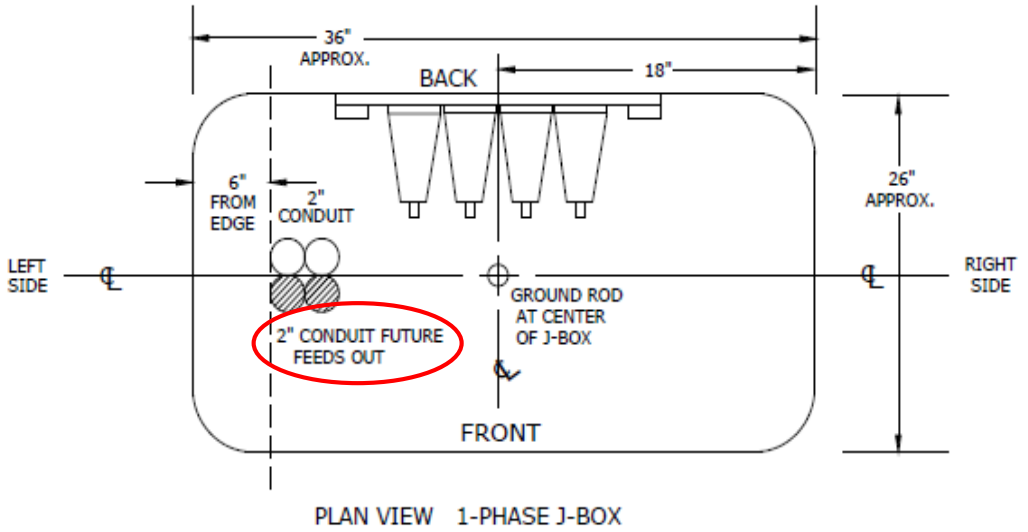
CONSTRUCTION STANDARDS
PRIMARY JUNCTION BOX
SINGLE PHASE

REVISIONS			
	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	9/23/04	LB	AH
3	12/29/04	LB	AH
4	4/29/09	CM	AH

PAGE: 1 of 2 | UJ1 | CAD FILE: UJ1 | APP: JEH | DATE: 2/22/00 | SECTION 1500

Single Phase J-Box

- Construction standard for a single phase J-box, vertical view



PLAN VIEW 1-PHASE J-BOX

Rev 4: Changed to Voltage-reset fault indicators and added equipment lock.

Clark Public Utilities

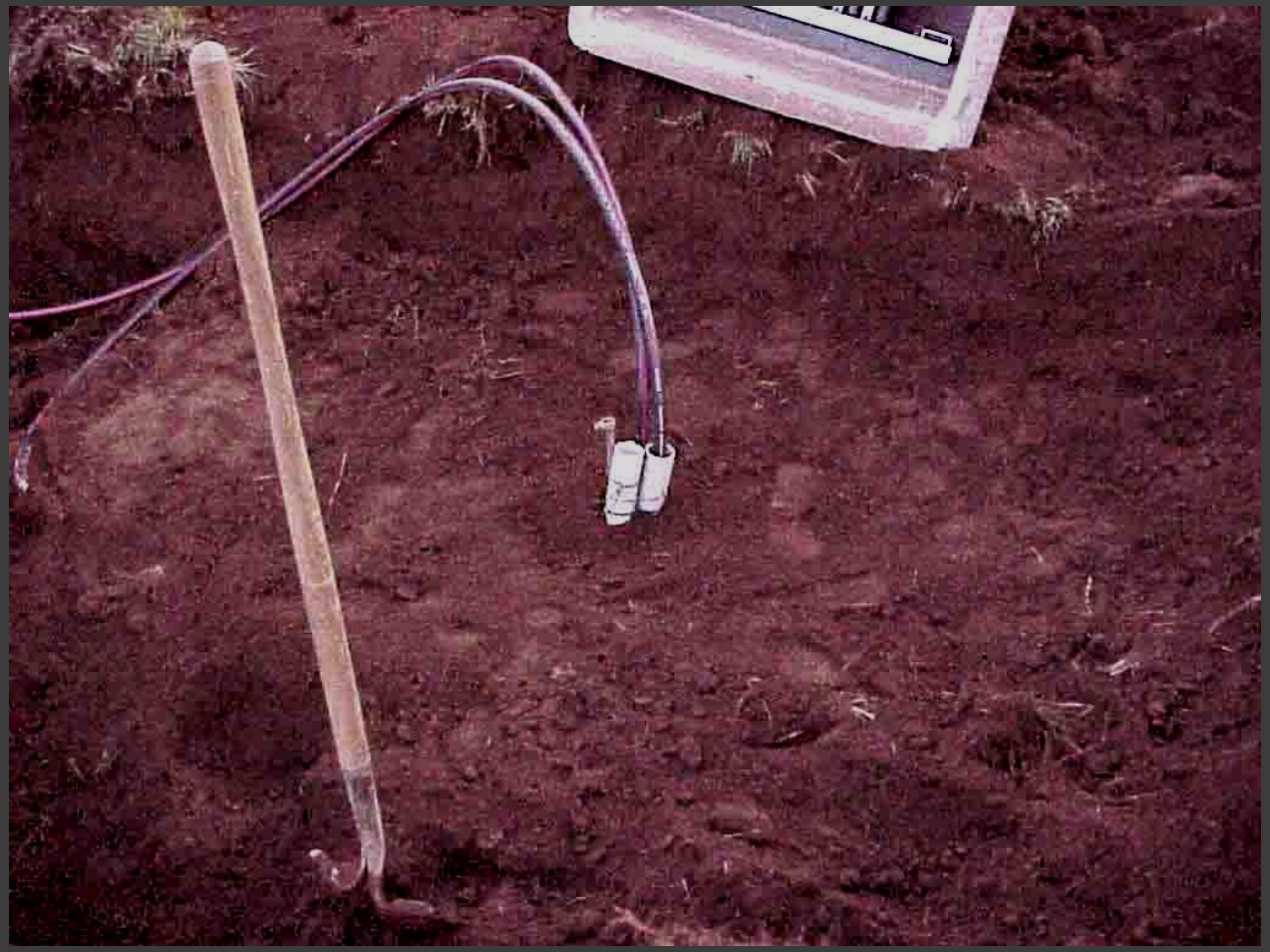
CONSTRUCTION STANDARDS

PRIMARY JUNCTION BOX
SINGLE PHASE

REVISIONS			
	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	9/23/04	LB	AH
3	12/29/04	LB	AH
4	4/29/09	CM	AH

PAGE:		CAD FILE:	APP: JEH	SECTION
2 of 2	UJ1	UJ1	DATE: 2/22/00	1500

Single Phase J-Box



- Wire should not be in yet but tree up
- Backfill and level.

Single Phase J-Box

- Level the J-box
- Orientate with road

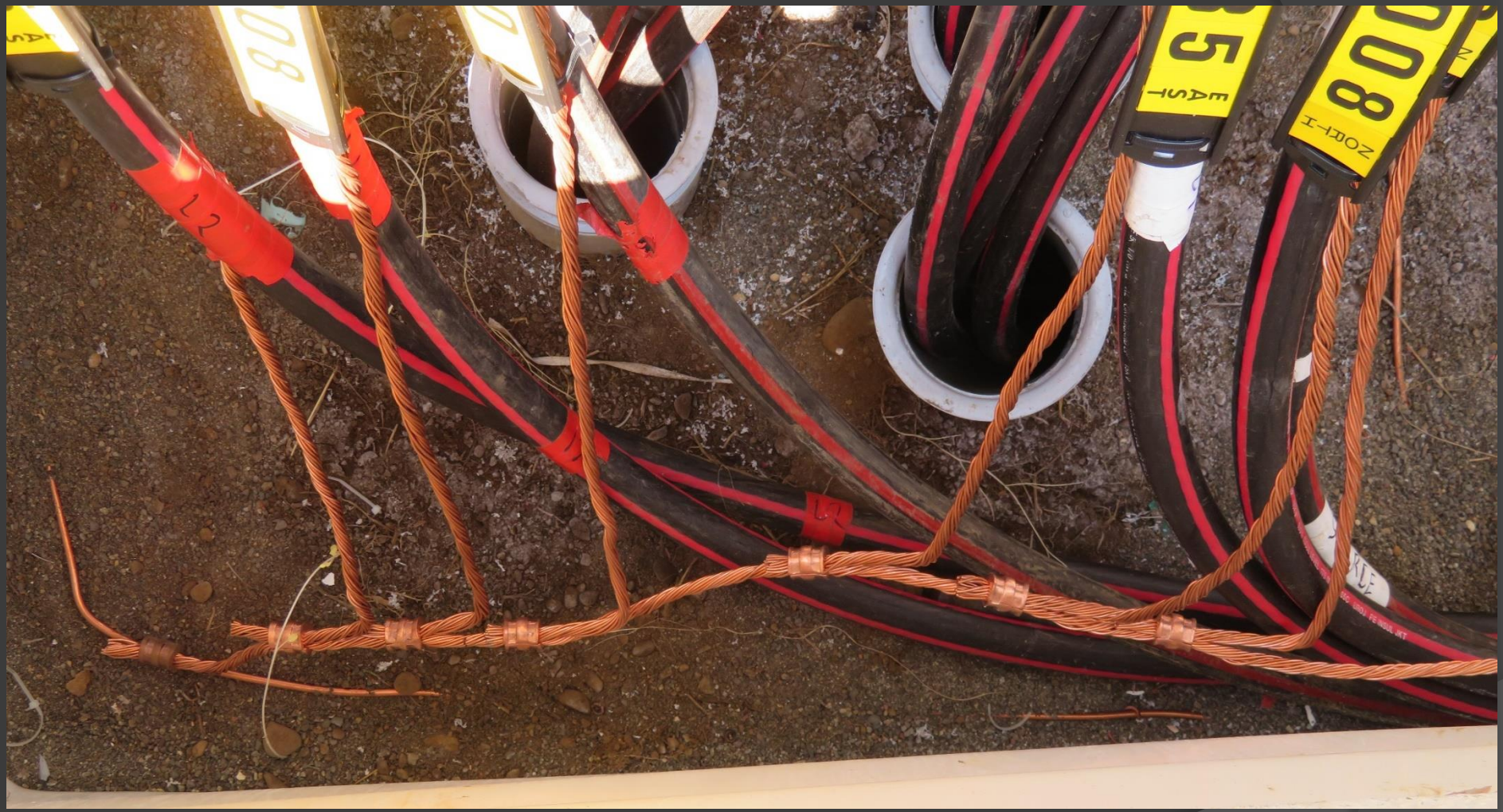
Single Phase J-Box

- Make sure to 5 star the lid closed before backfilling
- Backfill with gravel
- Pull in extra cable for make up

Single Phase J-Box

- Terminate, tape and hard tag the cable
- The source will be on the right
- The load will follow the source from right to left

Single Phase J-Box



- Piggy back the concentrics
- Attach to the ground wire

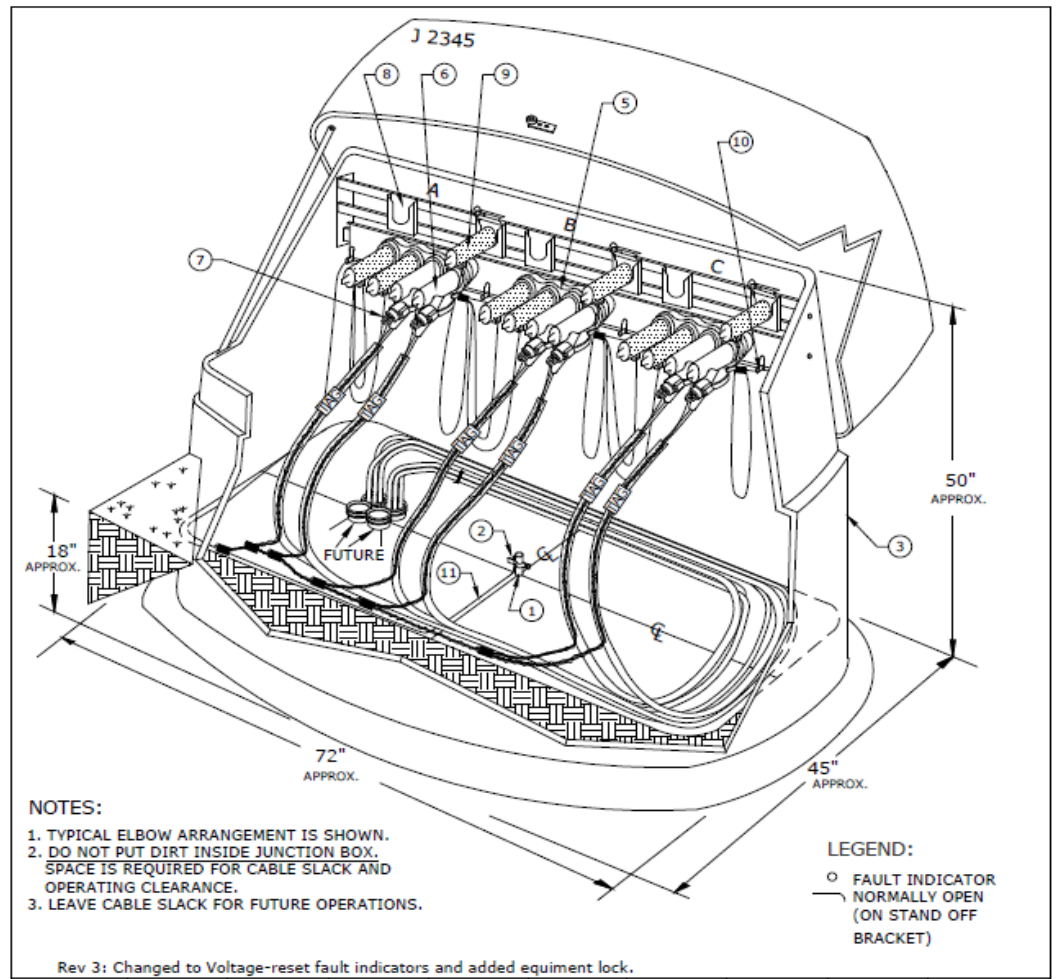
Single Phase J-Box

- Grade to the ground line
- Install the number stickers

Three Phase J-Box

Three Phase J-Box

- Construction standard for a three phase J-box



NOTES:

1. TYPICAL ELBOW ARRANGEMENT IS SHOWN.
2. DO NOT PUT DIRT INSIDE JUNCTION BOX. SPACE IS REQUIRED FOR CABLE SLACK AND OPERATING CLEARANCE.
3. LEAVE CABLE SLACK FOR FUTURE OPERATIONS.

LEGEND:

FAULT INDICATOR NORMALLY OPEN (ON STAND OFF BRACKET)

Rev 3: Changed to Voltage-reset fault indicators and added equiment lock.

UJM4	UJM41	UJM42	UJM43	UJM44	UJM45	UJM46	UJM47	UJM48	UJM49

ITEM	MATERIAL LIST DESCRIPTION	QTY	S/N
1	Ground Rod 5/8" x 8'	1	1124
2	Clamp, Ground Rod, Small	1	281
3	Junction Box, 3Ø	1	2047
4	Equipment Lock, UG	1	837

Clark Public Utilities

CONSTRUCTION STANDARDS

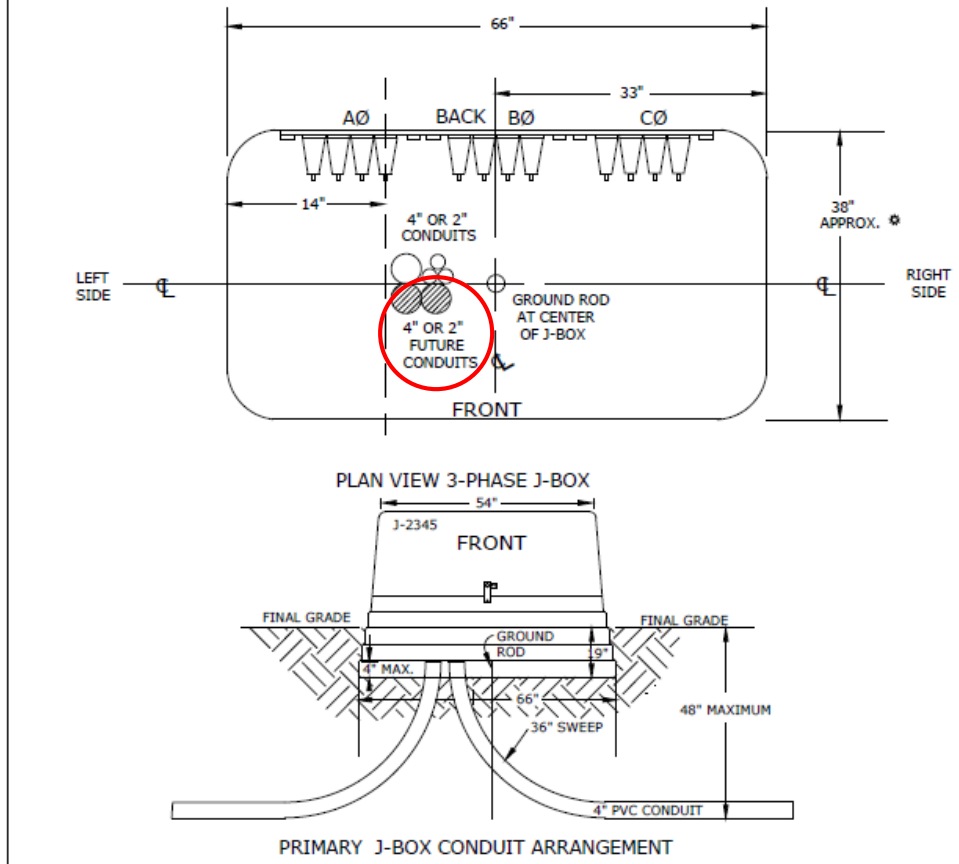
PRIMARY JUNCTION BOX
THREE PHASE

REVISIONS			
	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	9/23/04	LB	AH
2	12/29/04	LB	AH
3	4/29/09	CM	AH

PAGE: 1 of 2 | UJ3 | CAD FILE: UJ3 | APP: AH | DATE: 2/22/00 | SECTION 1500

Three Phase J-Box

- Construction standard for a three phase J-box – vertical view



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Clark Public Utilities

CONSTRUCTION STANDARDS

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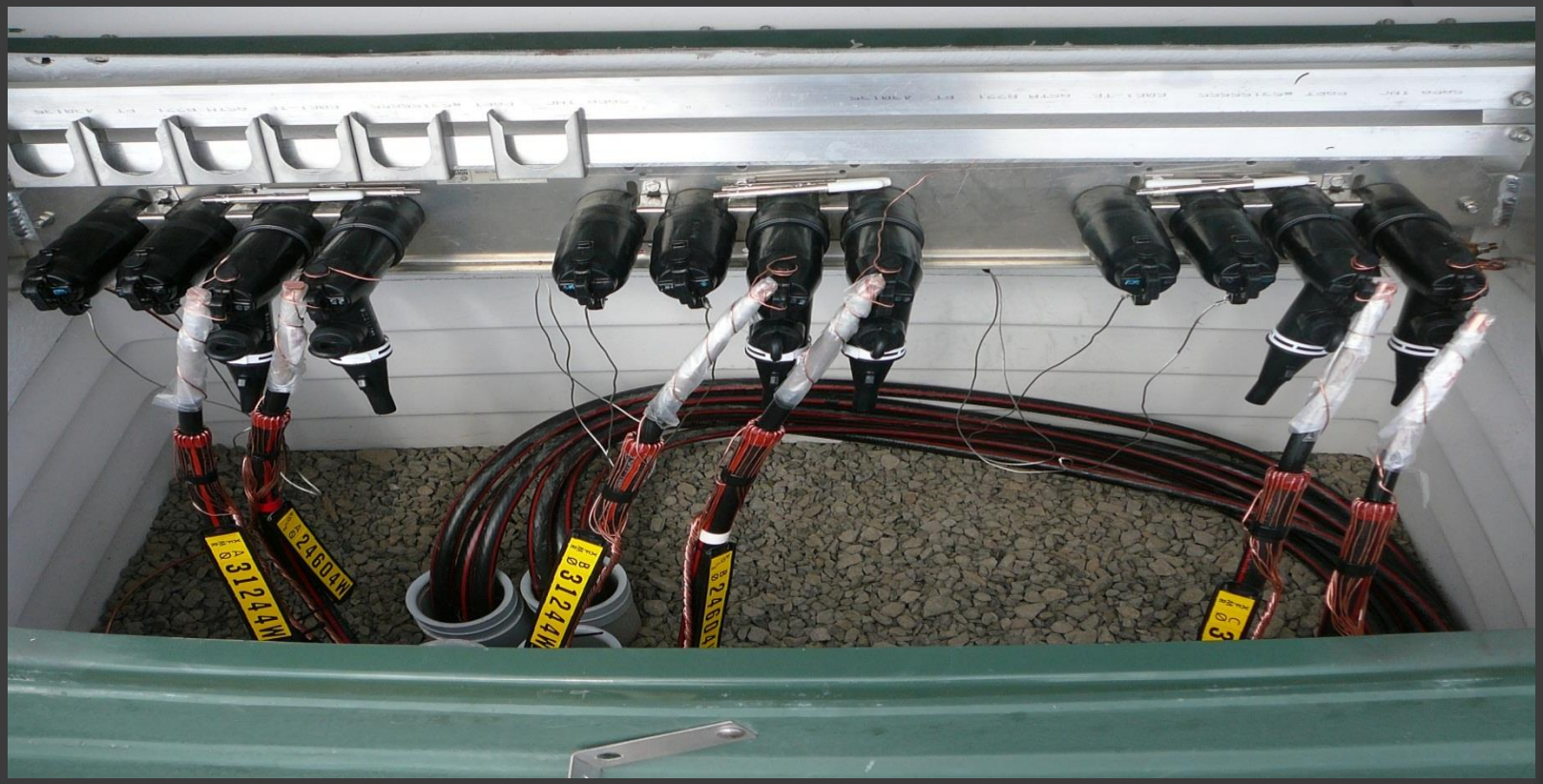
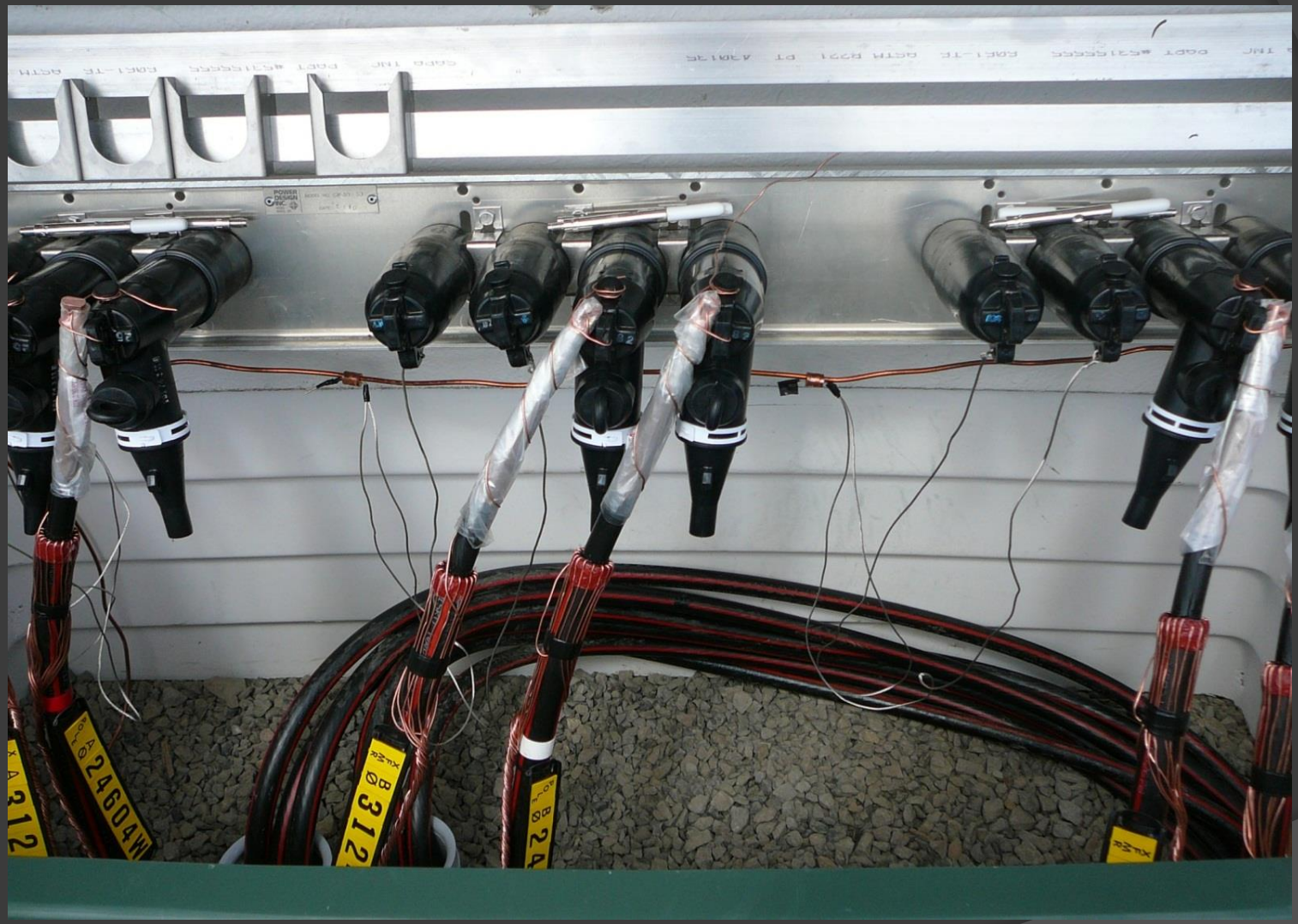
PAGE:		CAD FILE:	APP: AH	SECTION
2 of 2	UJ3	UJ3	DATE: 2/22/00	1500

Three Phase J-Box



- Terminate, tape and hard tag the cable
- The source will be on the right
- The load will follow the source from right to left
- Phasing is ABC left to right

Three Phase J-Box

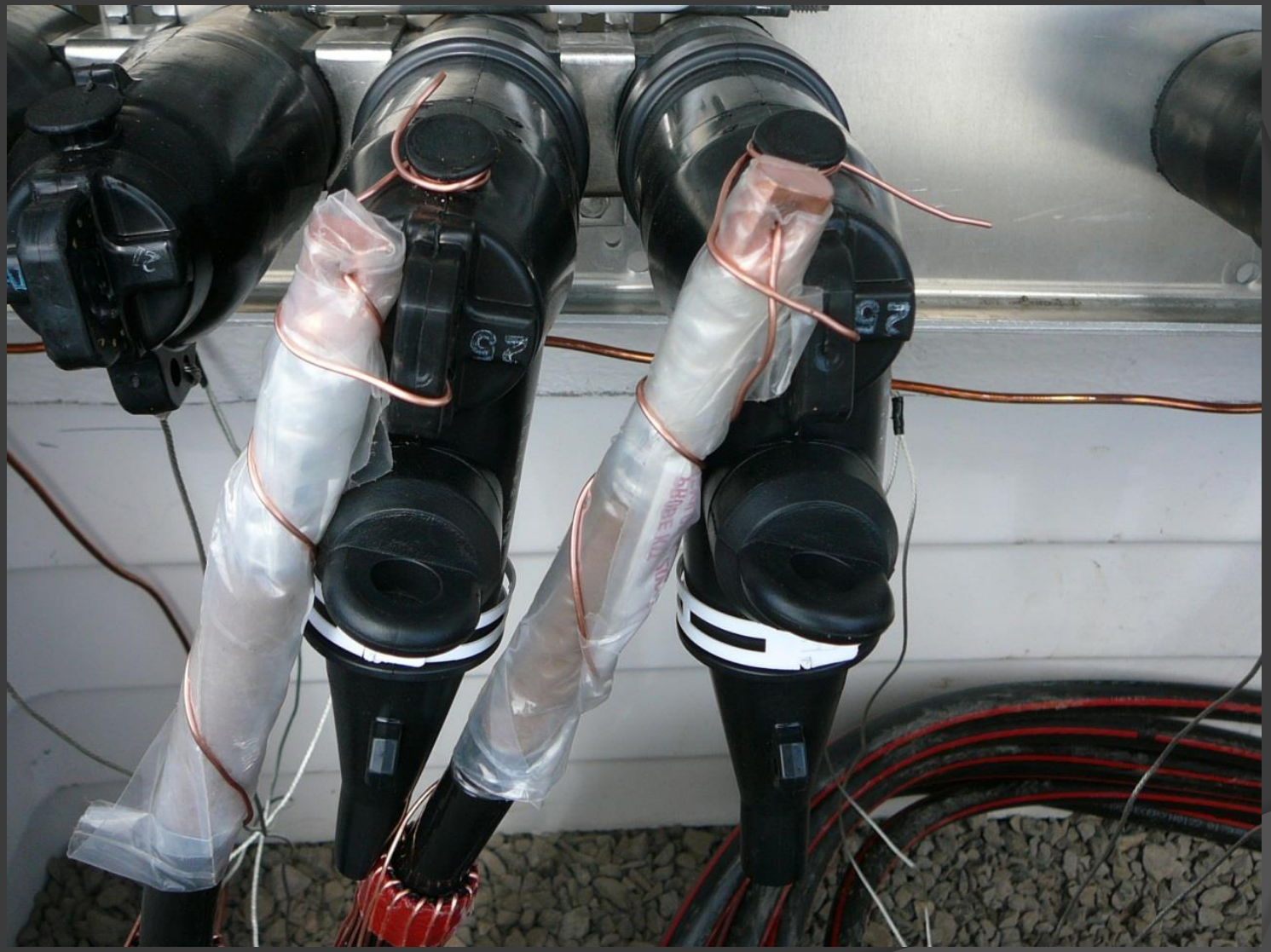


- Attach the dust cover bleeder wires to the ground wire

Three Phase J-Box

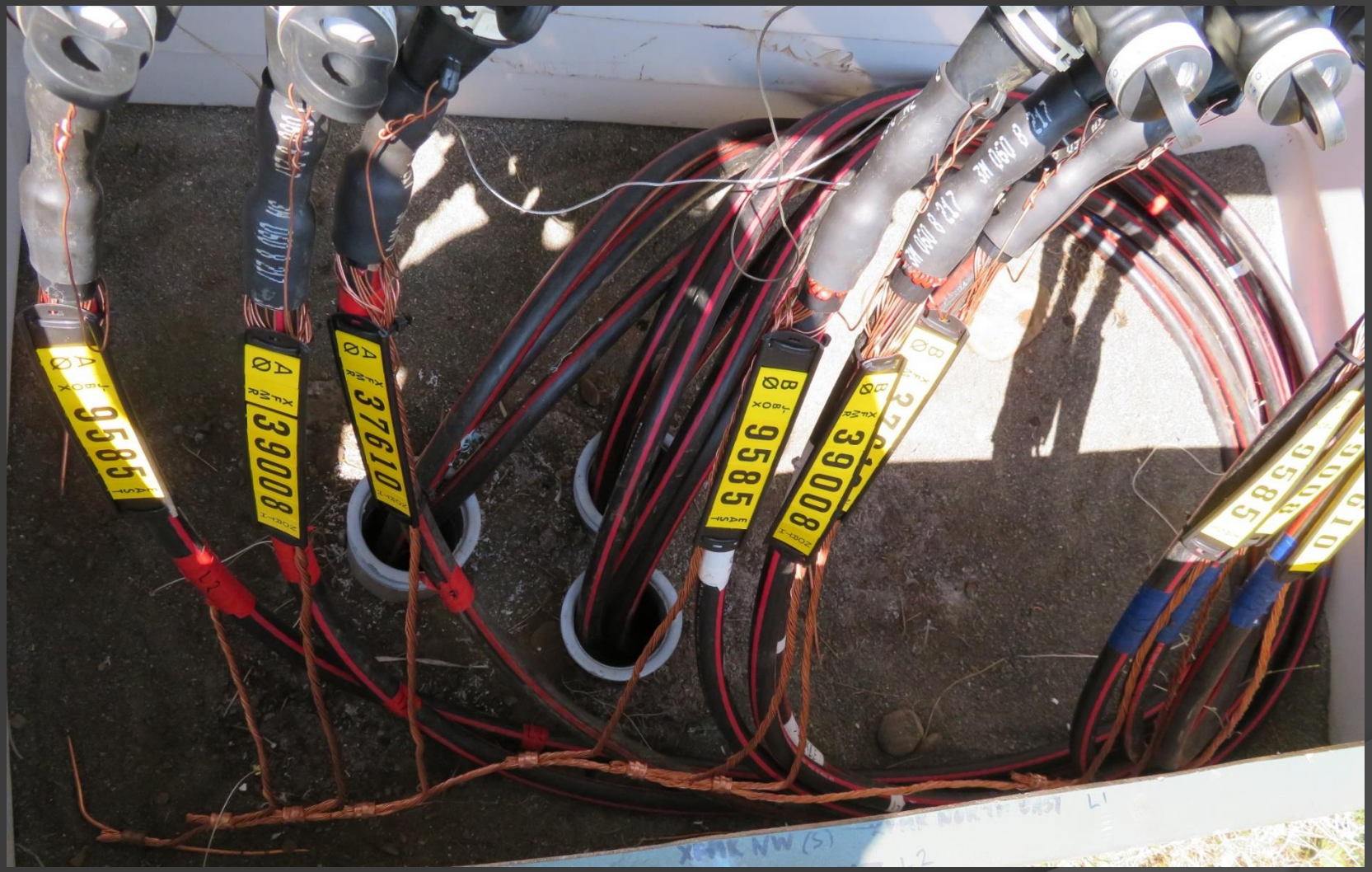
- Roll the wire out of the conduit

Three Phase J-Box



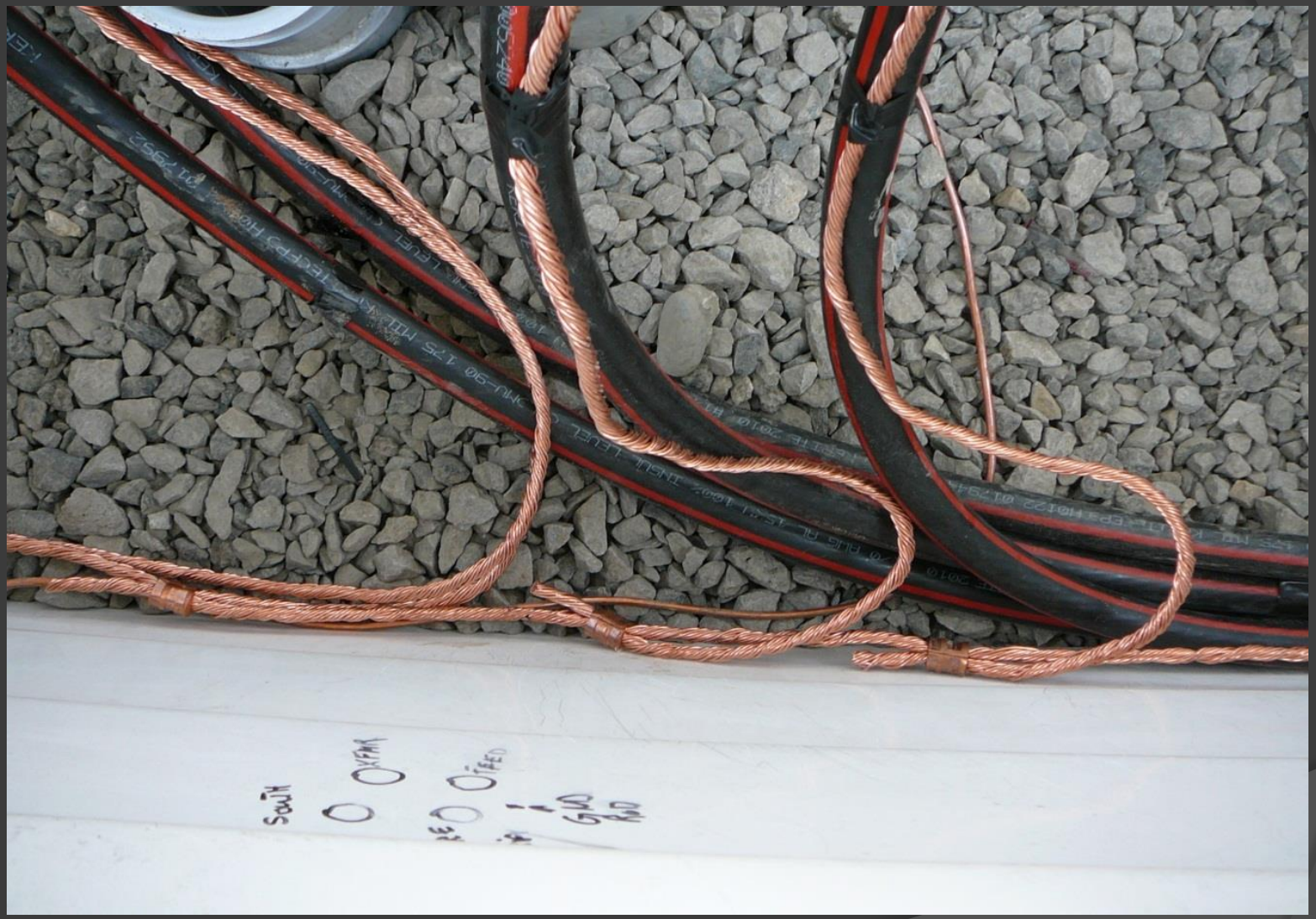
- Example of good make up

Three Phase J-Box



- Keep the neutrals in front of the wire and organized with slack

Three Phase J-Box



- Example of neutral slack

Three Phase J-Box

- The neutral crosses behind the primary

Three Phase J-Box

- A good make up

Conduit Futures

Conduit Futures

- Use a marker pipe or 90º elbow
- Plug the end in the ground
- Do NOT glue 90º elbow
- Place a 3M locate disk at the end of the pipe

Conduit Futures

- Place a Loop Enclosure (LE) over the pipe
- Make sure to bury the LE

Conduit Futures

- Hard tag both ends of the future
- The more information the better
- Indicate if future is a 90º elbow or a stand pipe

Conduit Futures

- This is a conduit plug
- Attach pulling tape to the eye
- Make sure to leave slack in the pulling tape

Plumbing Risers

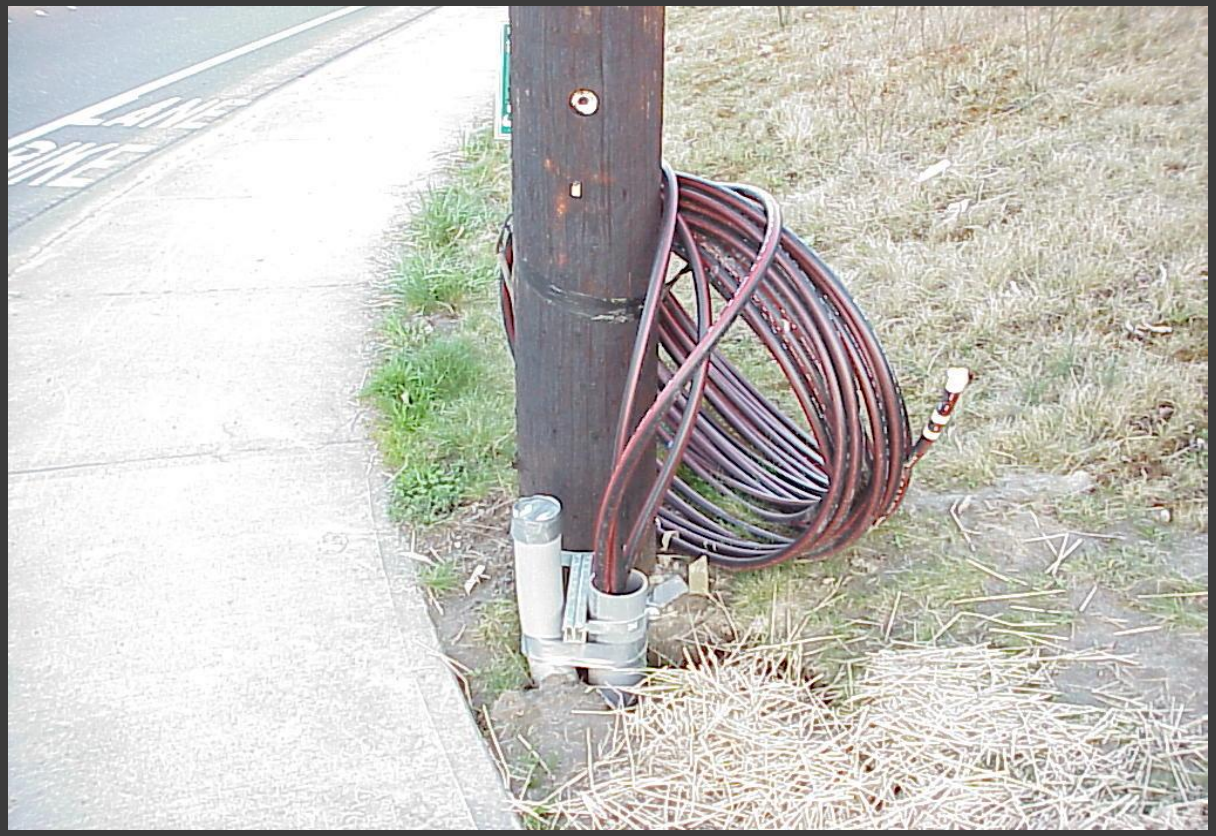
Plumbing Risers

- Do not move the bracket the engineer installs
- Strap pipe to the end of the bracket.
- Make sure the pipe is plumb with the pole

Plumbing Risers

- Use long sweep 90 for primary
- Use a short sweep for secondary
- Seal the ends of the wire when they will not be terminated

Plumbing Risers

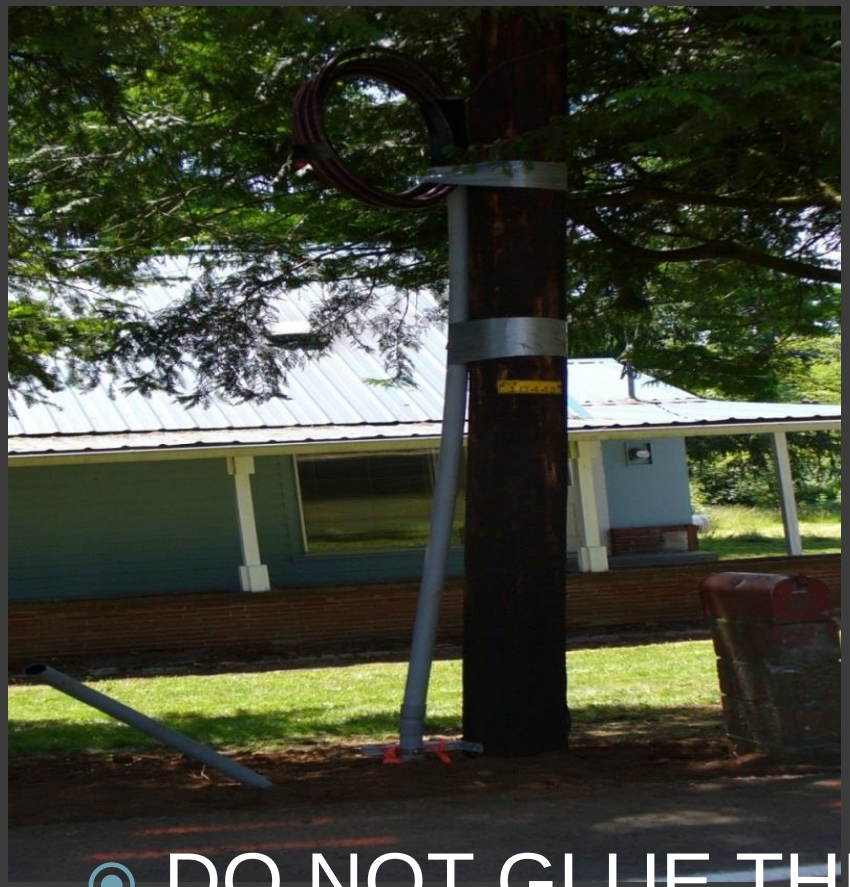


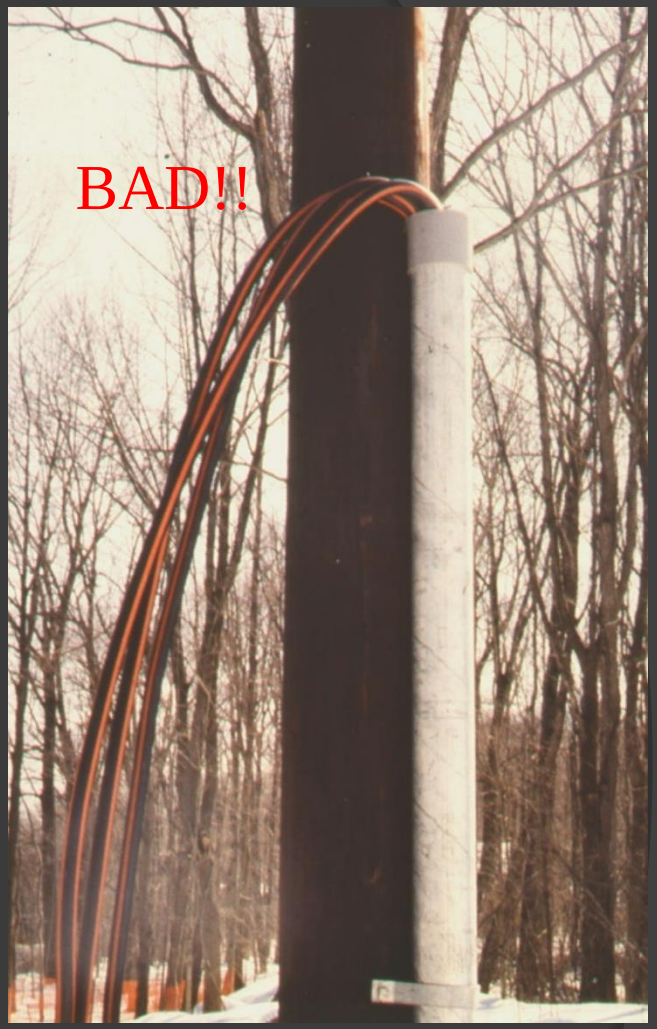
- The bell end of the 90 will be down, in the trench
- Wire tail should be long enough to reach over the top of the pole
- Do not cut any bends of conduit

Plumbing Risers

- Either hide the wire or put up one stick of *Schedule 80 PVC*
- DO NOT GLUE THE PIPE
- Tie up the wire so it is not hanging on the pipe

Plumbing Risers





- DO NOT GLUE THE PIPE
- DO NOT CUT ANY BENDS OF PIPE
- DO NOT VIOLATE THE MINIMUM BENDING RADIUS OF THE CABLE (8 times diameter)

Plumbing Risers

- Contractor is responsible for the cable – you are taking a chance leaving it like this

Closing

- Please, remember that Clark Public Utilities is customer owned
  - Treat our customers and employees with respect
  - We are here to help
  - Thank you for making this a successful program


Questions?