Approved Primary Electrical Installation

Contractor Training Class 2025

Clark Public Utilities

Class Timeline

- Four-hour class, with a 10-minute break every 50 minutes

- Coffee
- Bathrooms
- Emergency Exits & Check in Location
- AEDs
- Sign-in

Introductions

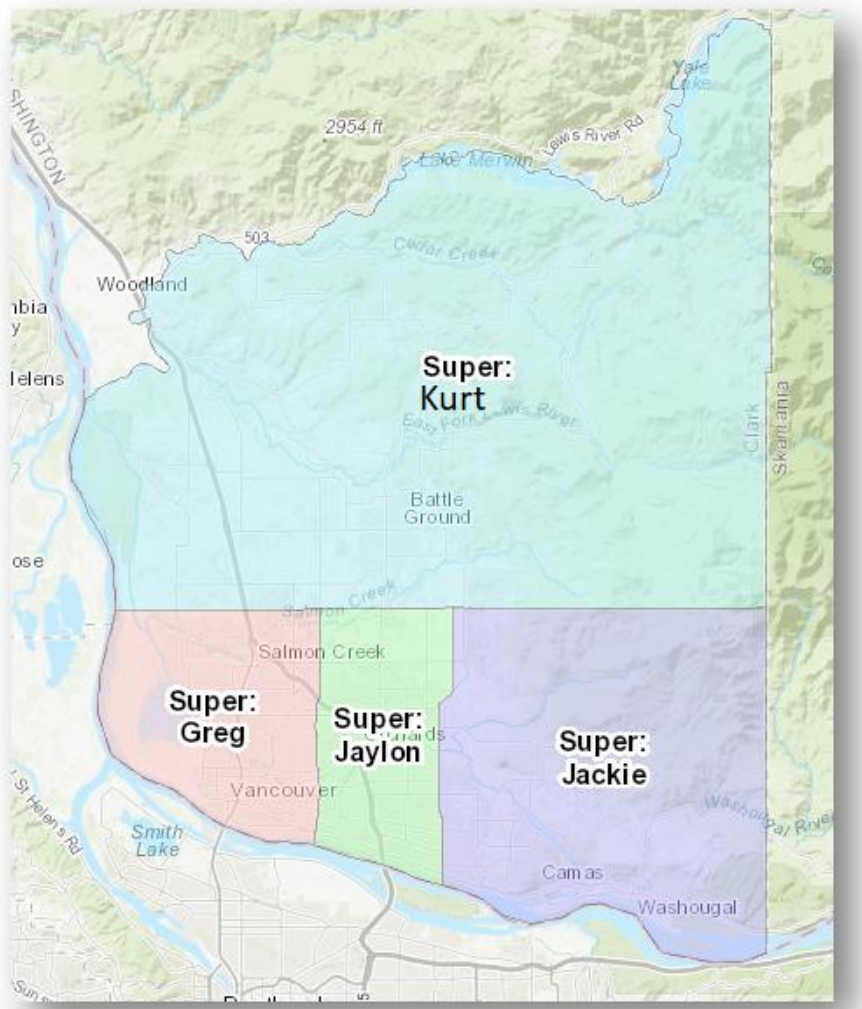
- Brian Roden, T&D Manager
- Carly Beck, Standards Engineer
- Jolynn Burk, Primary Contractor Coordinator

- Construction Superintendents

- New Construction
  - Justin Rindt, New Construction Designer
  - Sean Boyle, Construction Inspector
  - Zach Muonio, Construction Inspector
  - Jim Angel, Construction Inspector

- Construction Coordinators

- Justin Zucconi, Safety Manager



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 require the signed agreement
- Benefits
  - Competitive pricing/free market
  - Reduces pricing
  - Covers the cost of installation
- Safe Quality Installations
- Benefits Our customers

Delisting of Contractor

Program violations:

- Violation of safety practices and standards
  - L&I Hazard Report will be filed
- A specific job fails two inspections
  - Contractor fails to correct unsatisfactory installations within 10 working days
- Non-compliance with the Electrical System Installation Agreement

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
  - Use as a guide; local, state and federal codes supersedes
  - CPU Standards – not construction procedures (look at material directions for procedures)

- Please exhaust these resources before calling with questions

Process of the Job

Call your CPU Designer at least 2 weeks before starting

After primary trench and conduit is installed, call CPU Ops for a primary inspection at least two days ahead of schedule

CPU Ops:
360-992-8839

Process of the Job

- Approved Contractors CANNOT work with or in energized equipment
  - CPU journeyman will unlock equipment and provide a safety watch. No physical help should be assumed or expected.
- CPU journeyman has the right to STOP the standby if OSHA violations are observed (Trenching/shoring, PPEs, etc.)

Safety

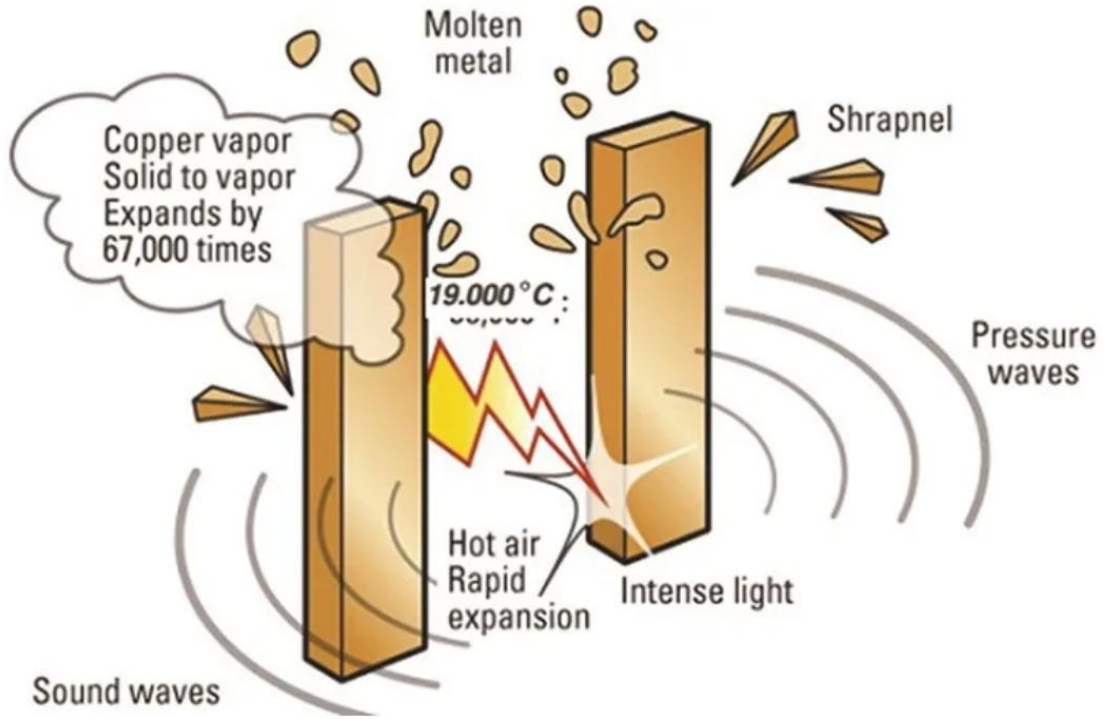
- High-hazard field environments
- Consistency in safe work practices
- Safety violations will be reported to L&I
- Alignment with our Utility Standards
- Trenching & Excavation Hazard Controls

Safety

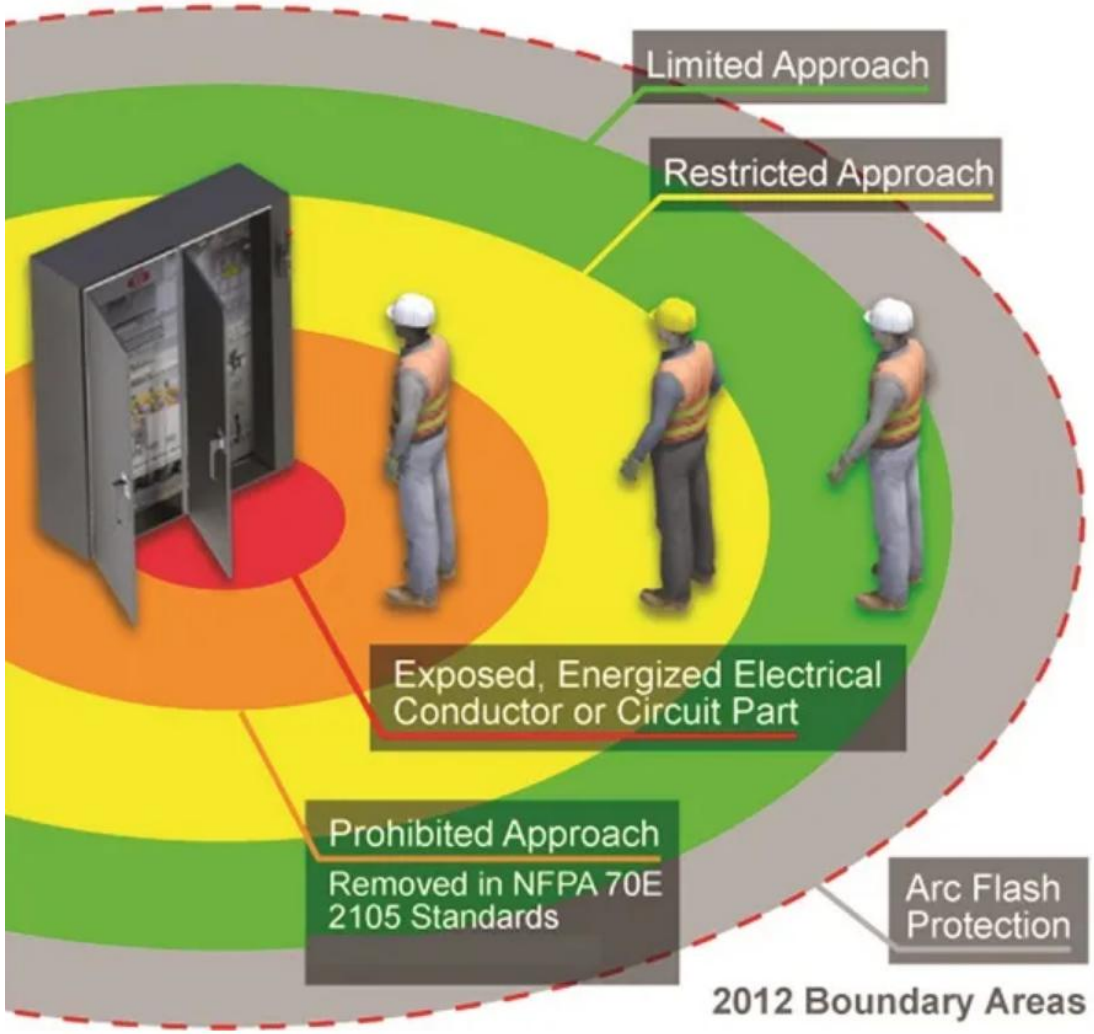
Common Violations seen by our Inspectors:

- Excavating without proper locating techniques (Dig-in)
- Cutting or windowing conduits
- Working within 10’ of overhead primary lines
- Failing to verify de-energized status – always treat conductors as energized
- No Contacting us to clarify hazards before proceeding

Arc Flash



- Workers exposure during arc flash
- Identify approach zones on worksite for all workers.



Arc Flash

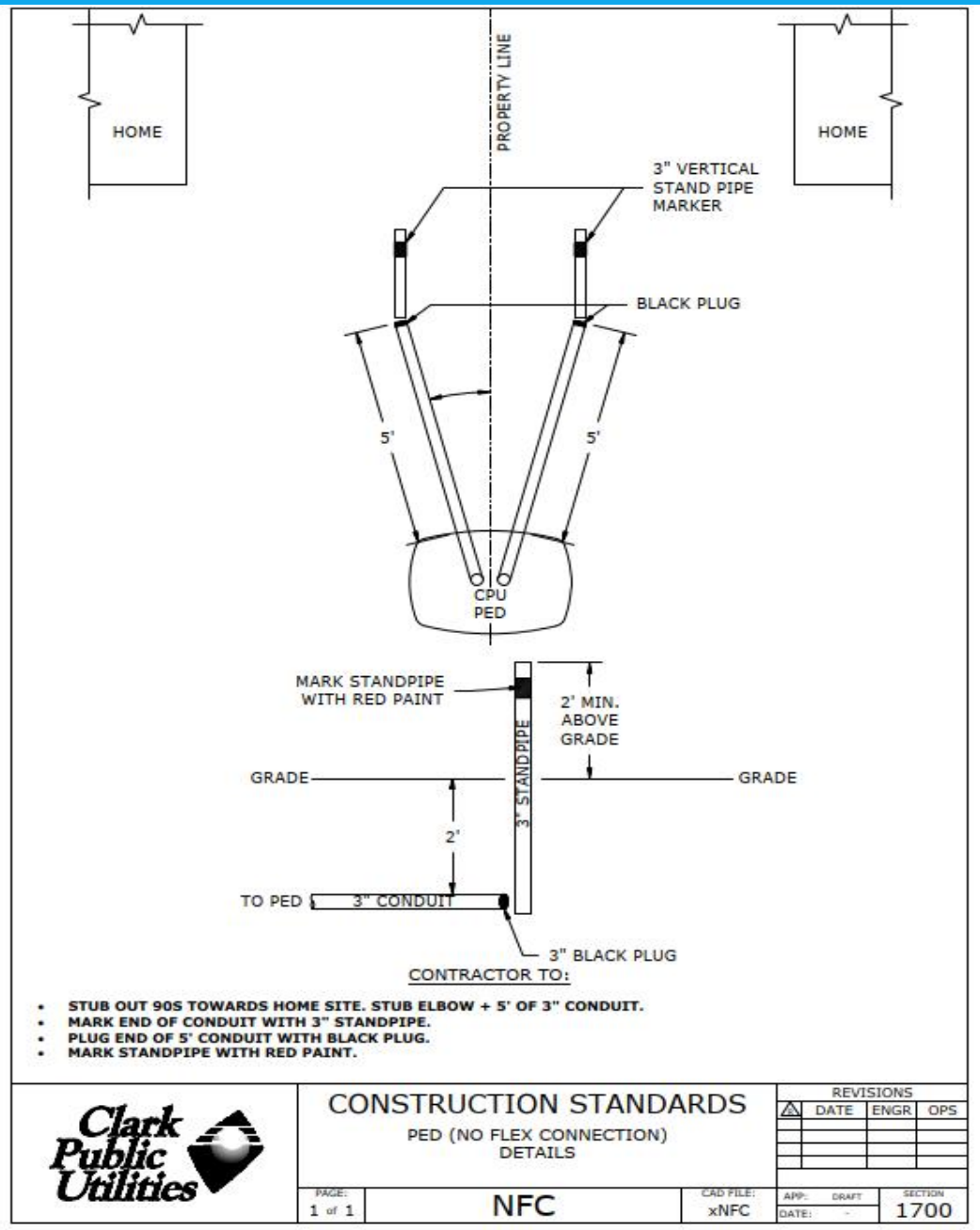
Changes/Updates

- Primary Contractor: You are responsible for your sub-contractors.
- Service Line inspections: Please use the new web form to submit your request: https://www.clarkpublicutilities.com/building-remodeling/schedule-an-inspection/
  - Or contact Construction Services: Construction@ClarkPUD.com, 360-992-8558

Changes/Updates

Continuous Hard pipe Secondary Services conduit

CPU is transitioning to hard piped connects (No Flex). Superior product.



Changes/Updates

Avoiding Splice Pits

- CPU is now designing jobs to avoid splice pits, due to safety and liability concerns.
- CPU designers are creating a separate job for CPU crew to install new device prior to your work starting
- You are liable for your trenches: barricade or ribbon off

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

Comments from the County

- Utility permit (PWU) is required when working within Clark County Public ROW.

- Contractor working on behalf of utility **must** have copy of permit, at all times.

- Traffic Impacts: 1 Lane impacts per WSDOT TC-1 is approved. Any other TCP's will need approval from Clark County Transportation trafficpermitrequests@clark.wa.gov

Land Use Documents

- Easements – must be signed prior to starting
- ROWs – must have permit in hand prior to starting
- 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

Materials

Materials

- 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
  - Never store reels on side

If the CPU test shows the cable is bad, the contractor will replace it at the ***contractor's expense.***

Materials

Notes on Installation/Pulling:

- **<u>Sufficient approved cable lubricant shall be used at the start and during the pull (Polywater J)</u>**
- Bends shall be clean and smooth
- **<u>The total angles shall not exceed 270º unless approved by a CPU engineer</u>**
- Cable attachments shall either be basket/sock or pulling eye
- Never allow tension at the reels during the pull.
  - Cable should be slack going into the conduit
- Keep transformers on level ground

Materials

Notes on Transformer Handling:

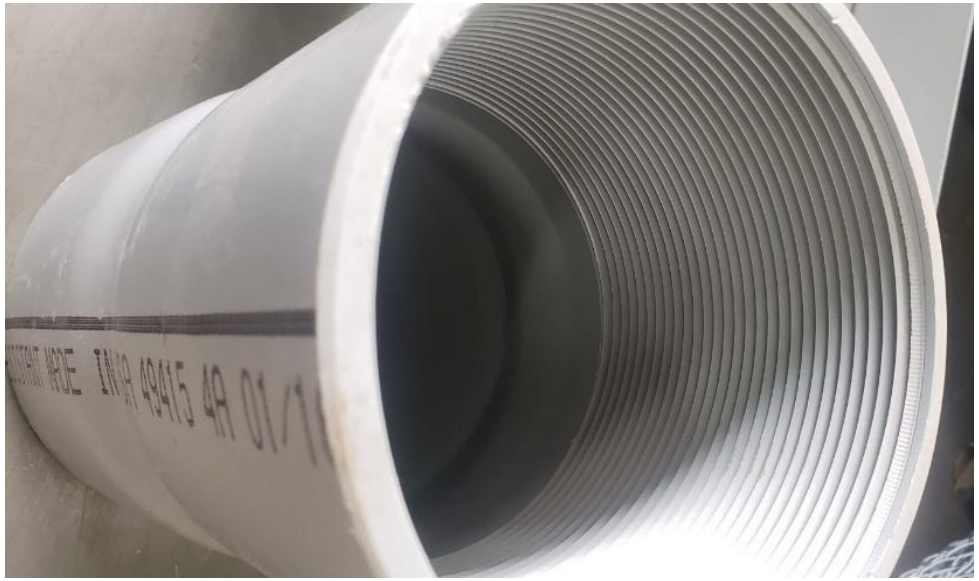
- Keep transformers sitting upright on level ground
- Transformers should be lifted in an upright position
- All lifting lugs must be used simultaneously to provide a safe balanced lift

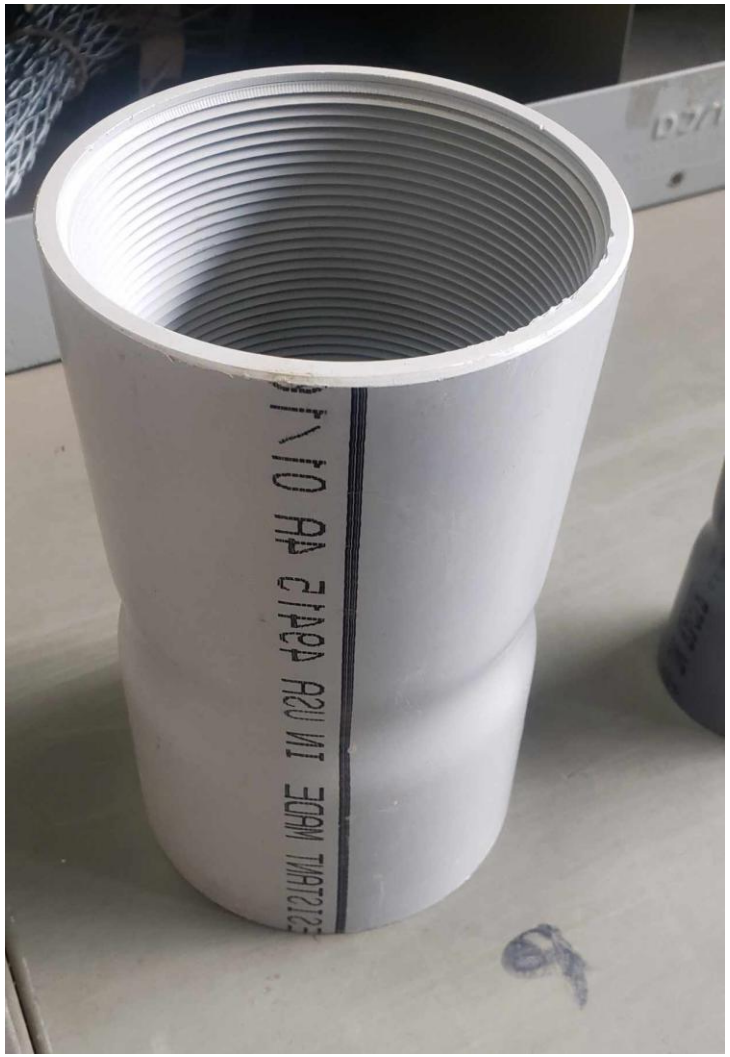
DO NOT store a transformer like this!

Materials

- Conduit installation shall be 2”, 3”, 4”, or 6” ***gray*** polyethylene pipe, SDR ≥ 13.5

- All connections to bore pipe will be made by mechanical coupling (Raceways Technologies #S80-2PE-PVC and Raceway Technologies #S80-4PE-PVC)





Trenching and Conduit

Trenching and Conduit

- Prior to starting:
  - Call (360) 992-8839 to verify the design is up to date
  - Any conduit plumbed into an energized device will require a CPU stand-by and WILL NOT BE TERMINATED
  - Call (360) 992-8839 for a stand-by and primary inspection
  - A stand-by should not last longer than two hours

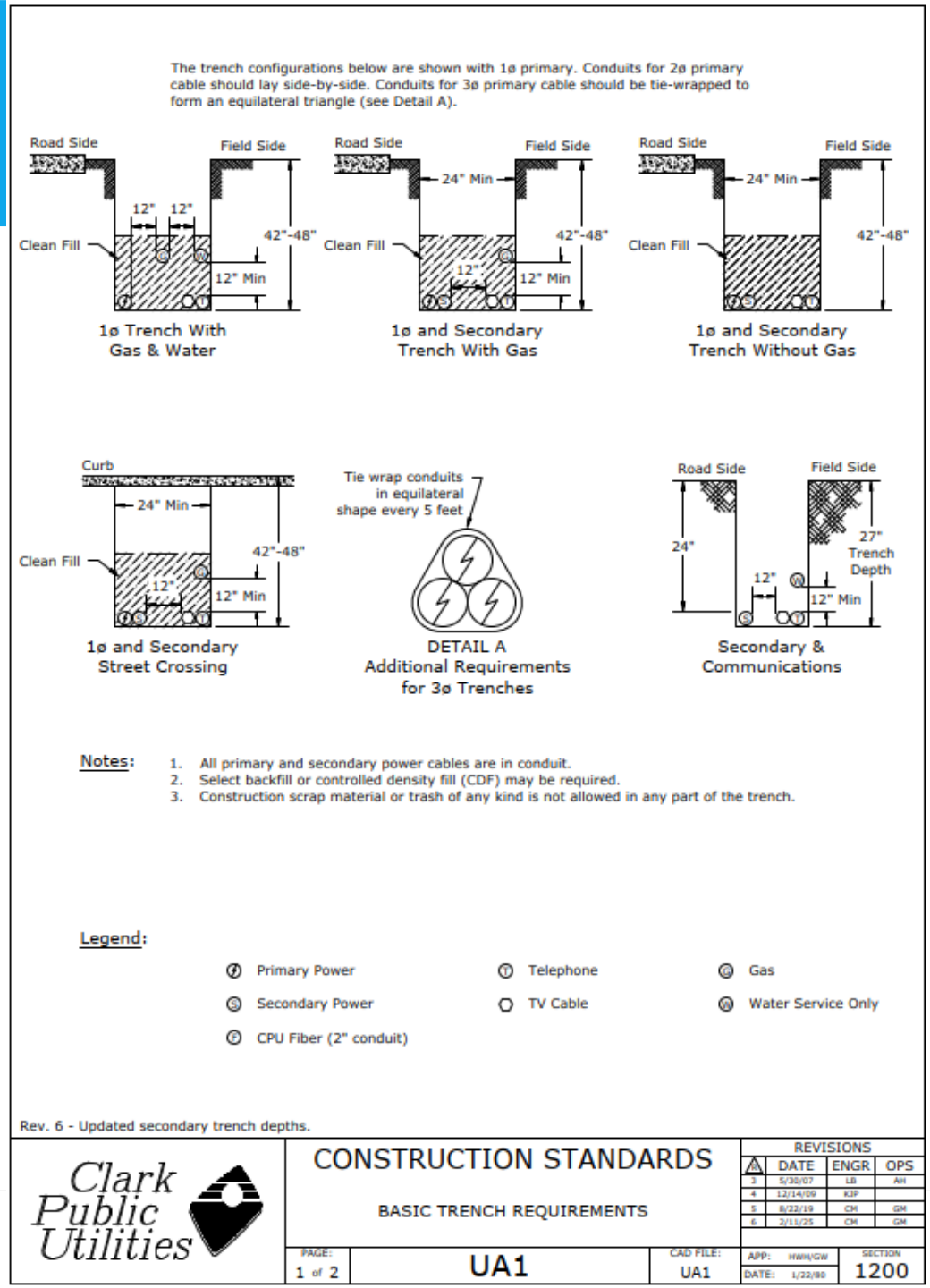
Trenching and Conduit

- Before you dig, call 811 and know the site location
- Trenching needs to be done by an approved contractor within all ROW's and PUE's
  - Most cases require a 42" deep trench
  - We want them 1'-3' from the driveways unless otherwise specified
  - 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 Primary Electrical Contractor Handbook:

- Power towards the road
- Phone towards the field
- Gas towards the field and one foot of separation
- Wet utilities minimum 5-foot separation



The trench configurations below are shown with 1ø primary. Conduits for 2ø primary cable should lay side-by-side. Conduits for 3ø primary cable should be tie-wrapped to form an equilateral triangle (see Detail A).

Notes:

1. All primary and secondary power cables are in conduit.
2. Select backfill or controlled density fill (CDF) may be required.
3. Construction scrap material or trash of any kind is not allowed in any part of the trench.

Legend:

- Primary Power
- Secondary Power
- CPU Fiber (2" conduit)
- Telephone
- TV Cable
- Gas
- Water Service Only

Rev. 6 - Updated secondary trench depths.

Clark Public Utilities

CONSTRUCTION STANDARDS

BASIC TRENCH REQUIREMENTS

REVISIONS	DATE	ENGR	OPS
3	5/30/07	LB	AH
4	12/14/09	KJP	
5	8/22/19	CM	GM
6	2/11/25	CM	GM

PAGE: 1 of 2

UA1

CAD FILE: UA1

APP: HWH/GW

DATE: 1/22/80

SECTION 1200

Trenching and Conduit

Conduit Installation-**All** power cables will be installed in conduit

Beware installations prior to 2005 were commonly direct buried, not in conduit

Trenching and Conduit

Clark Public Utilities

You are liable for your trenches: barricade 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 unless otherwise specified
  - 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

- 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

Joint Trench: **Pass**

- Straight and free of debris - Streetlight, Primary, Secondary

Trenching and Conduit

- Road Crossing
  - Leave ends of pipe exposed for inspection

Trenching and Conduit

- A bore log shall be provided to CPU via email to: Ops@clarkpud.com at time of trench/conduit inspection request
- 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

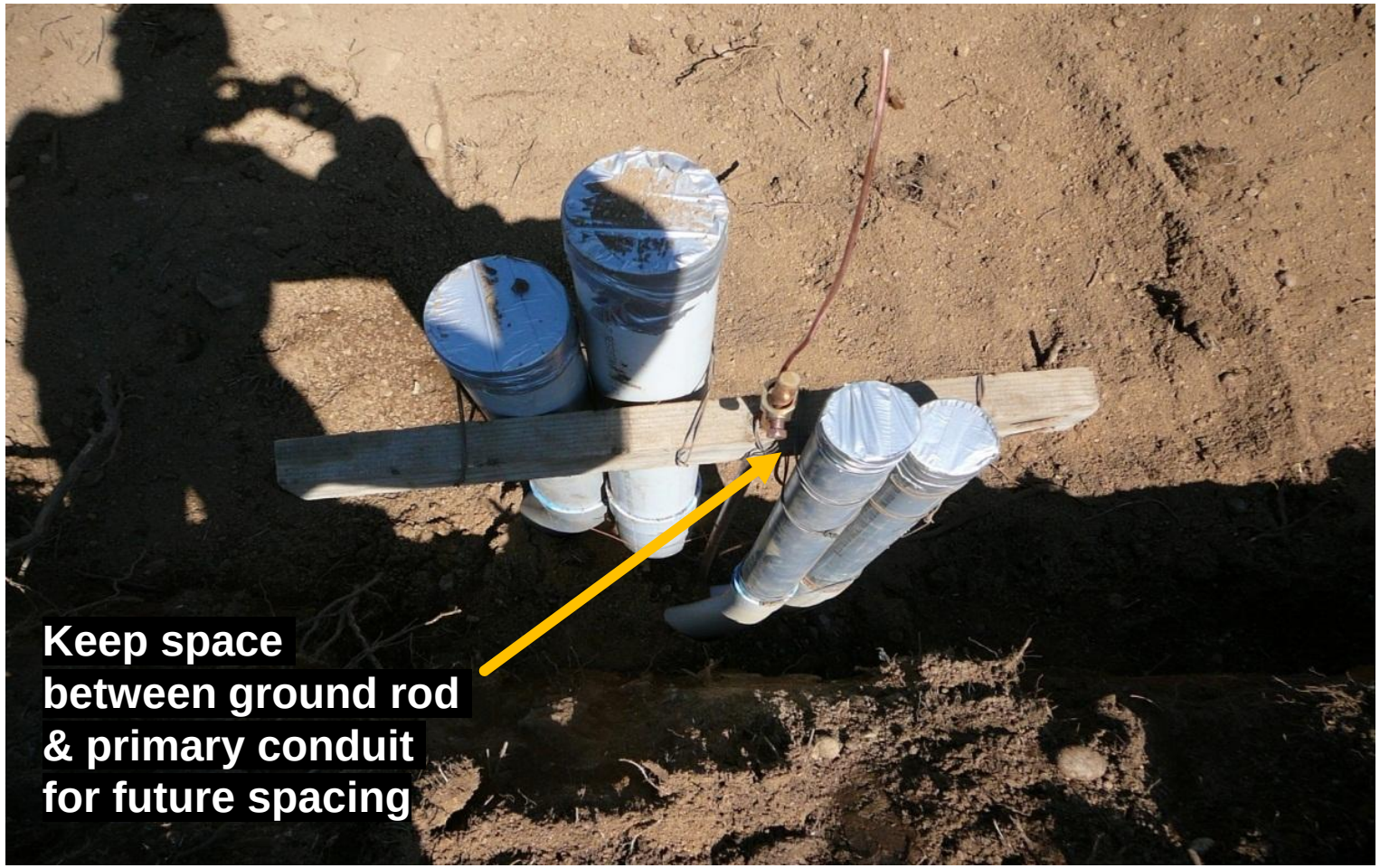
Setting Single-Phase Transformers

(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



Single-Phase Transformers

- After completion of trench and conduit:
  - Call (360) 992-8839 for a primary inspection
  - Any conduit plumbed into an energized device will require a CPU stand-by and WILL NOT BE TERMINATED
  - Call (360) 992-8839 for a stand-by and primary inspection
  - A stand-by should not last longer than two hours

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

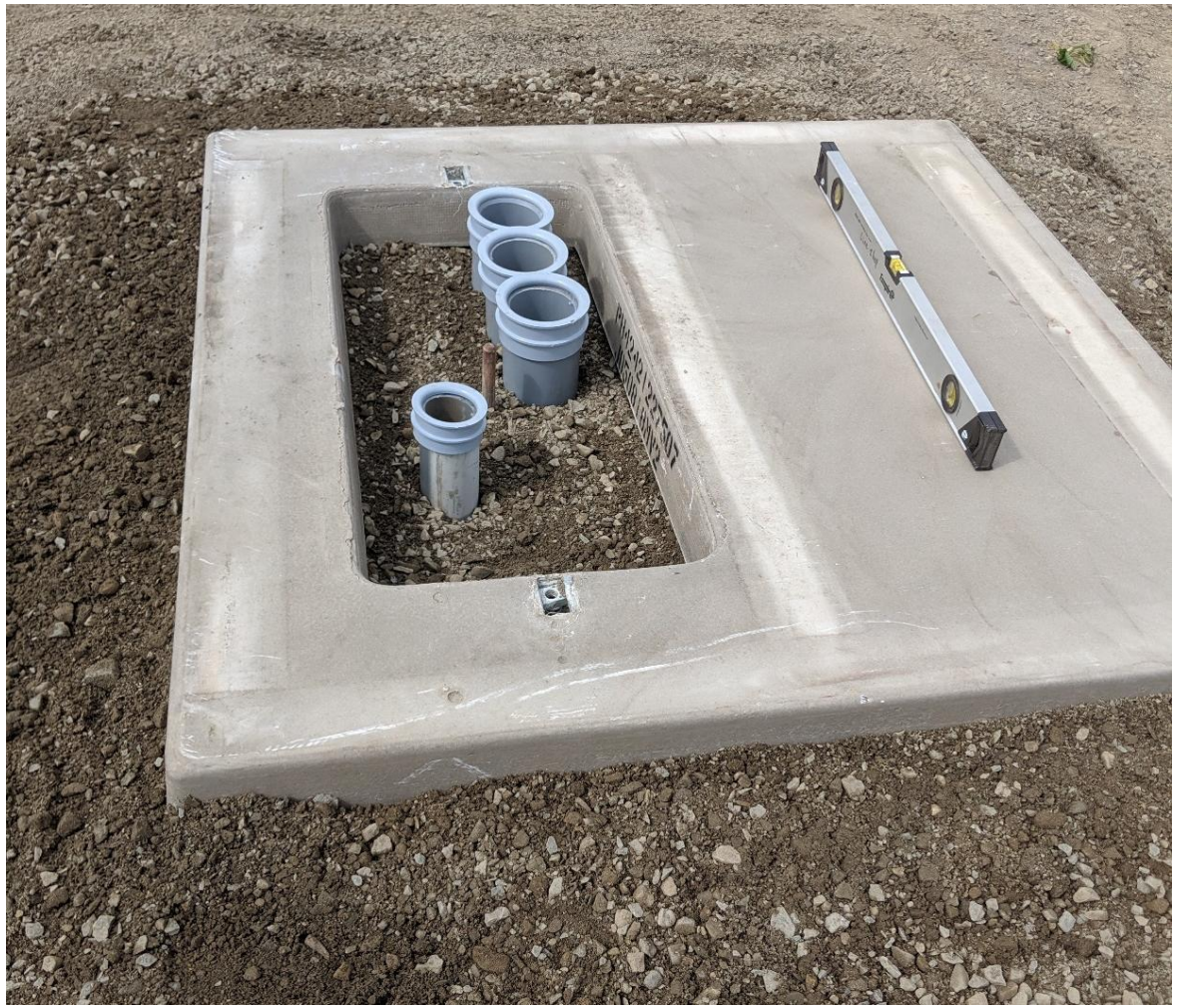
- 5/8” Minus Rock fill minimum 1-1/2 yards
- Soil conditions may require additional fill

Single-Phase Transformers

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

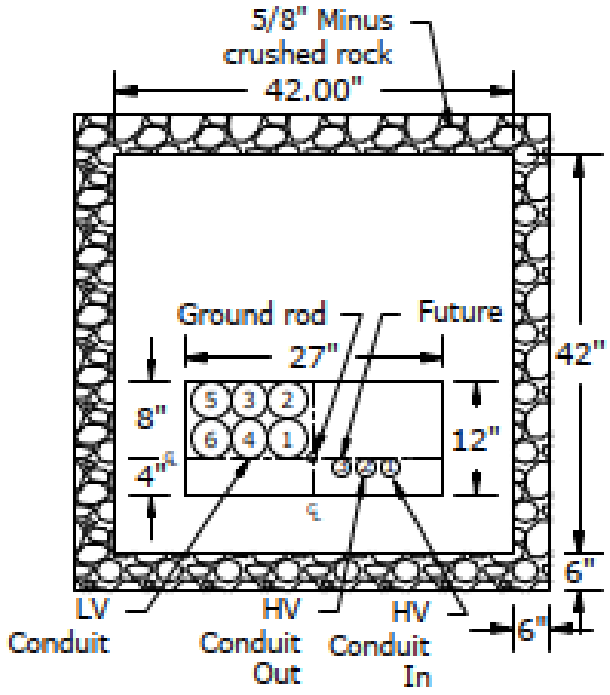
Single-Phase Transformers

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

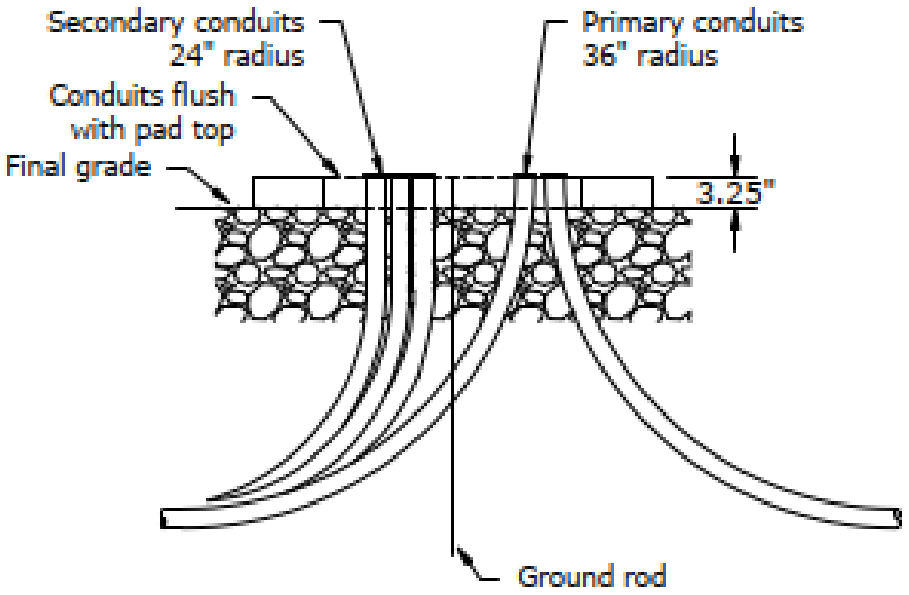


Single-Phase Transformers

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



25-75 KVA PAD
PLAN VIEW



FRONT VIEW

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

Single-Phase Transformers

Clark Public Utilities

Set Transformer on the level pad

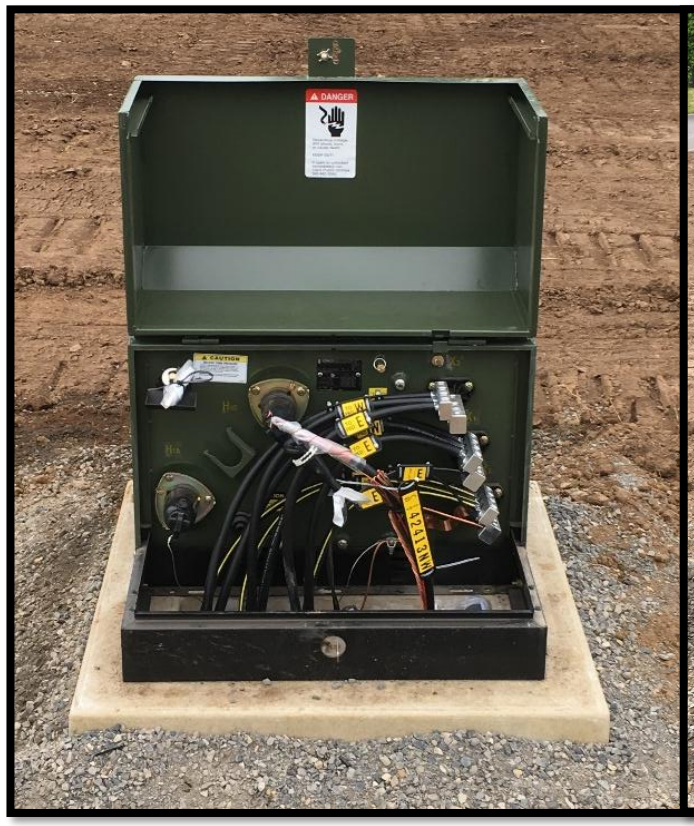
Spreader bar is required to avoid door damage

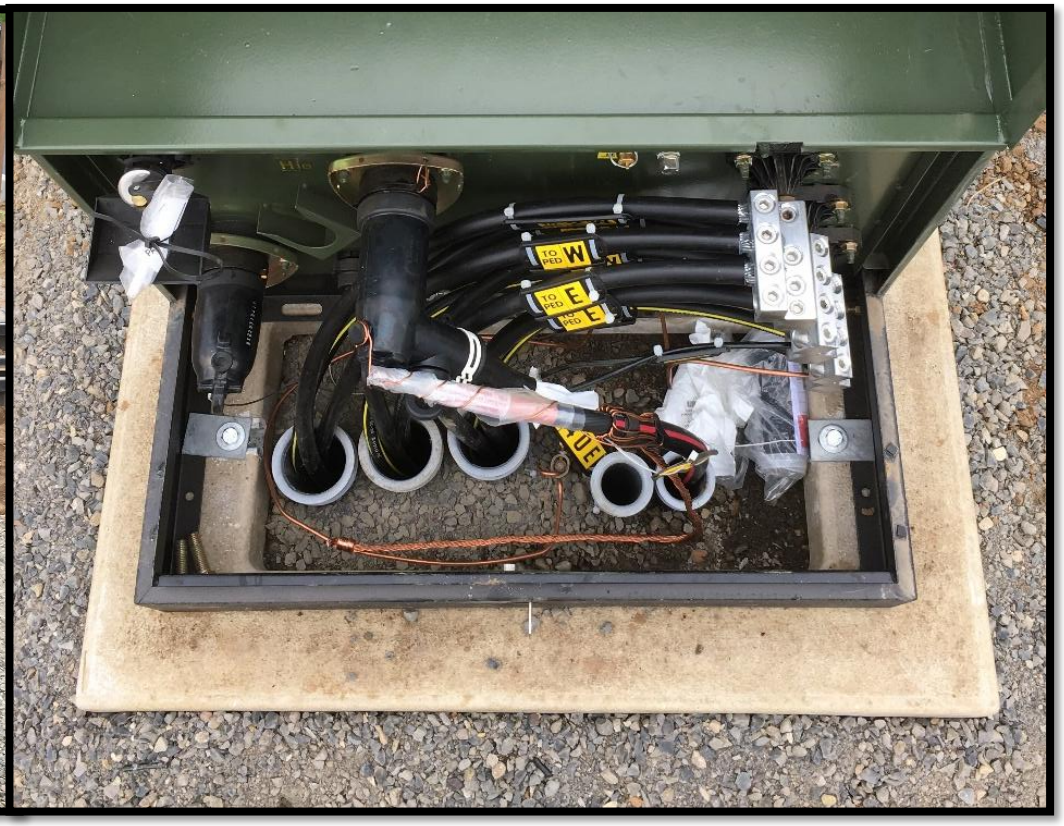
Single-Phase Transformers

- Pack the sides of the pad with rock
- Extra compaction at the rear of the transformer to compensate for settle

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

Water boxes are NOT allowed in front of transformers!

Single-Phase Transformers

- Remove picking bolts after transformer is set
- 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

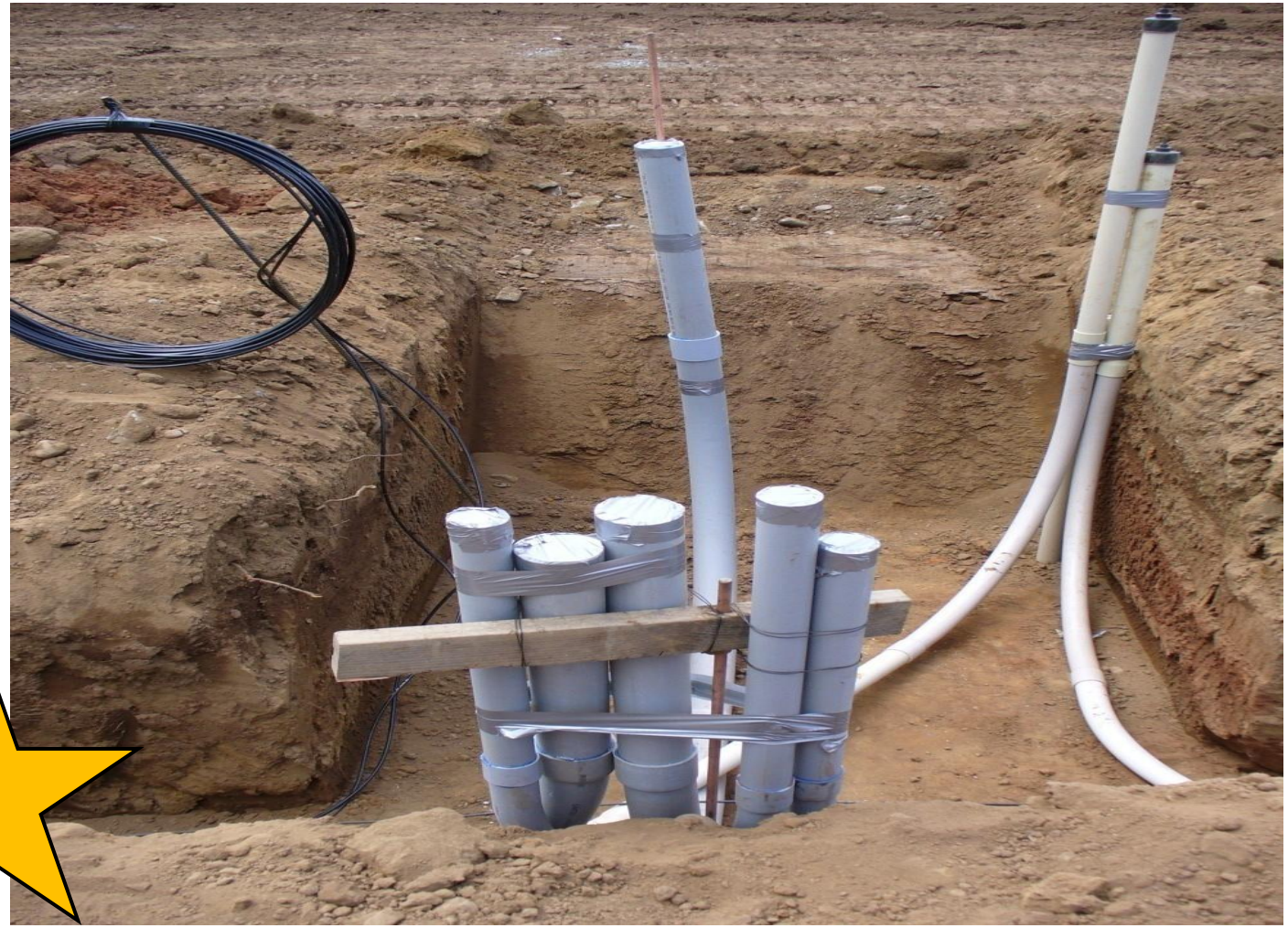
- Lot numbers shall be clearly marked

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

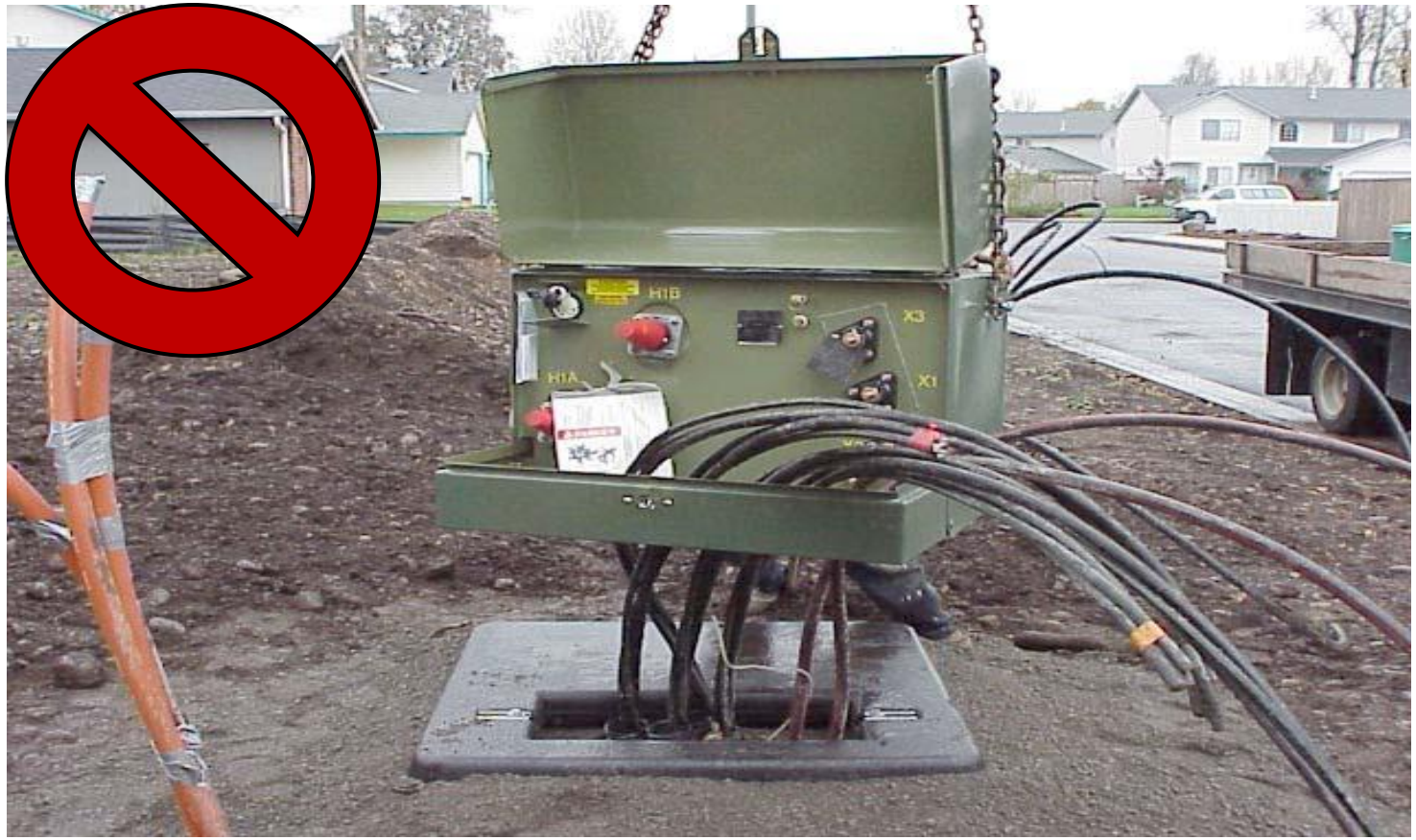
- Compact the gravel, so the transformer does not settle crooked

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
- 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
- Use a 90 to clear out conduit and ensure equipment is clean



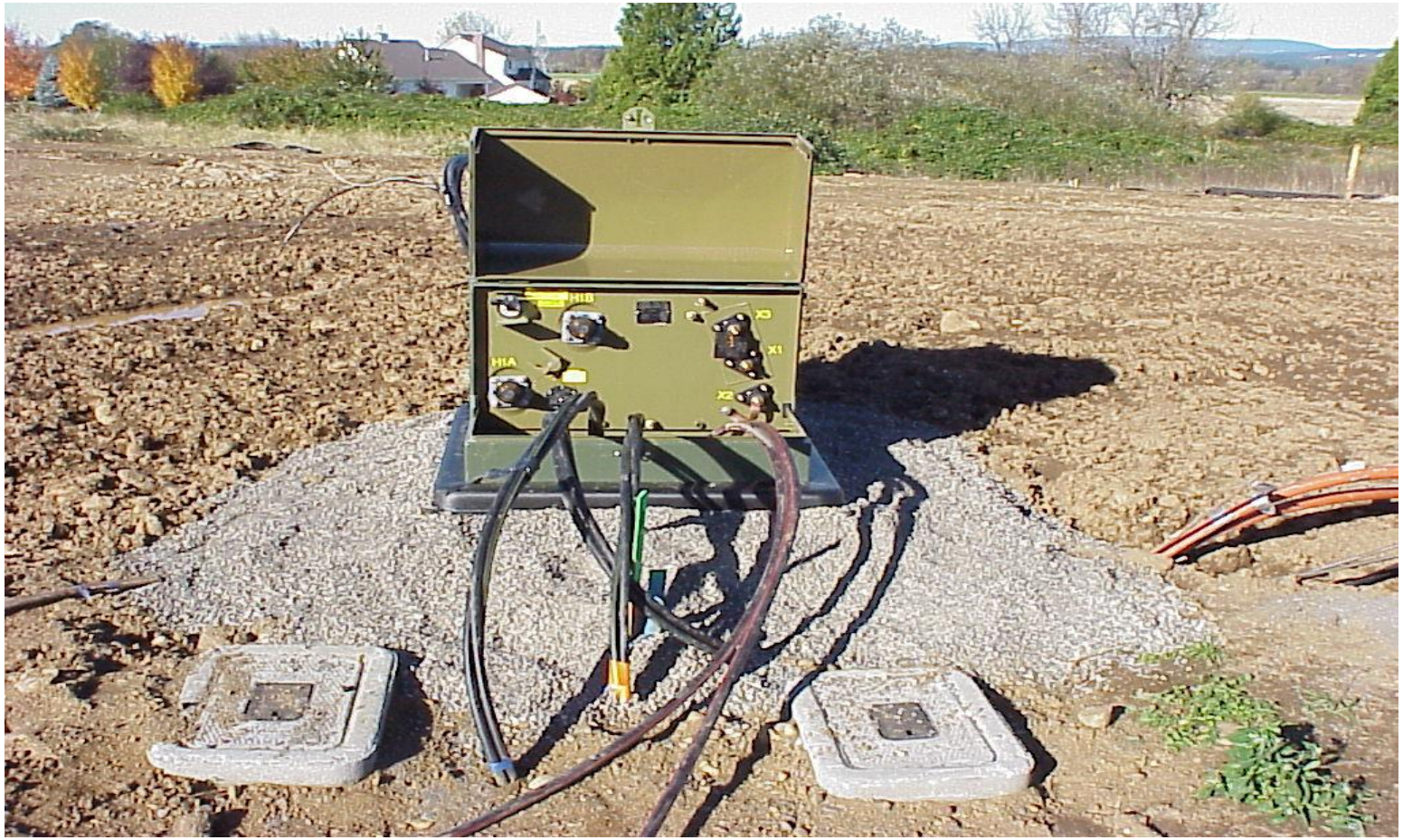
Single-Phase Transformers Subdivisions and Apartments

- Transformer set complete
- Streetlight next to it
- Lock indicates energized but don’t assume

Secondary Makeup

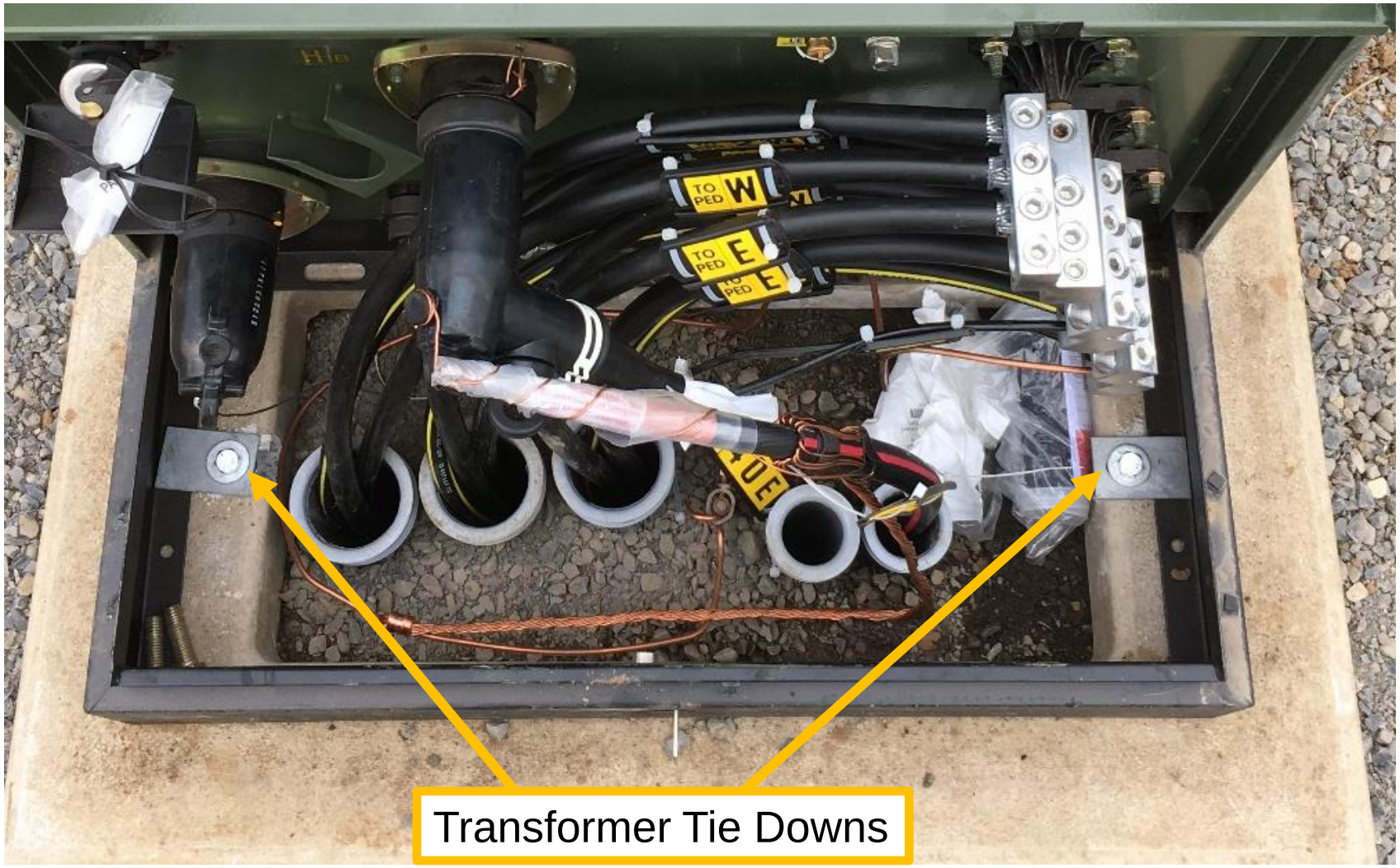
Secondary Makeup

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



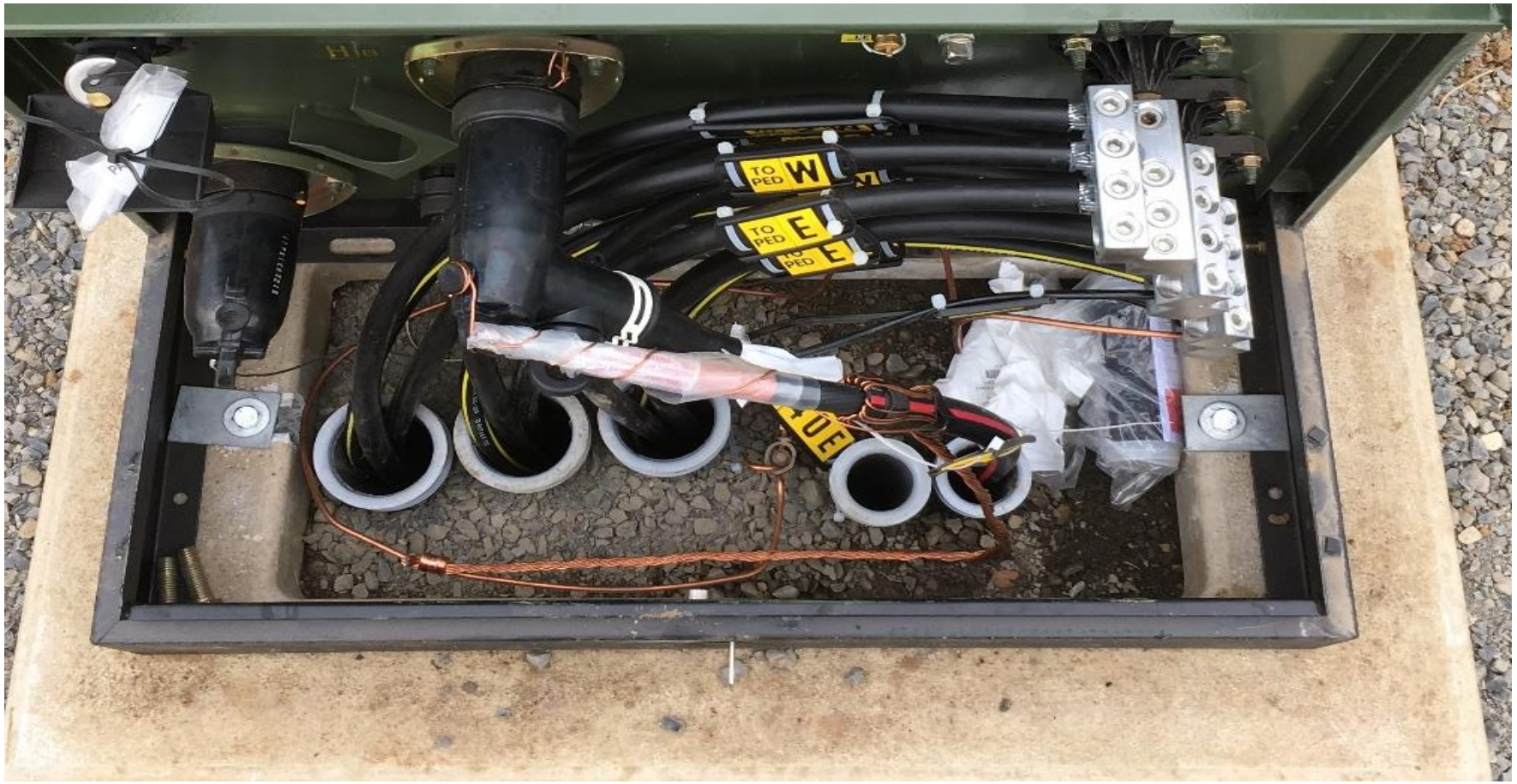
Secondary Makeup

- Conduit Orientation
- Install transformer tie down on both sides



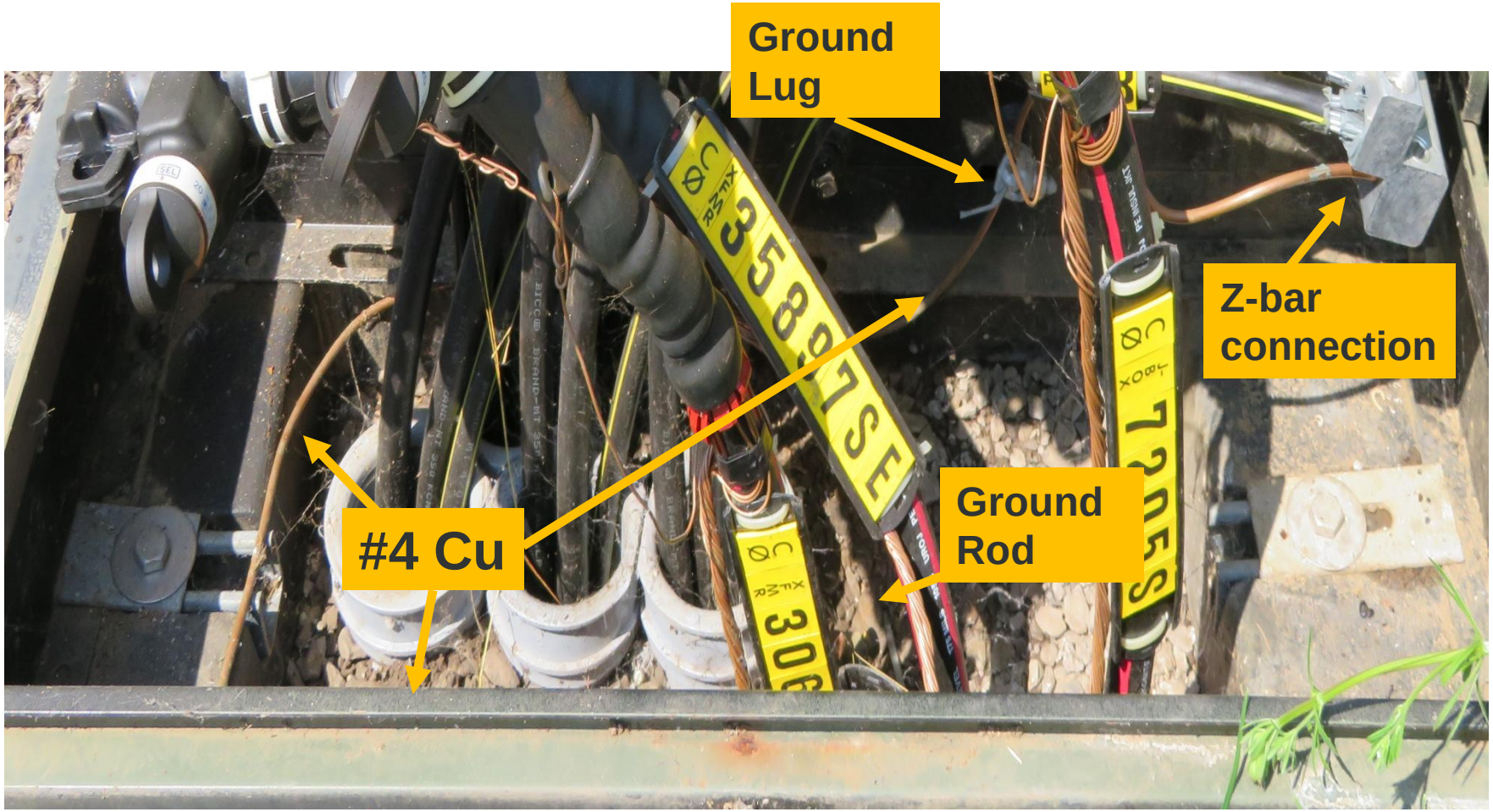
Secondary Makeup

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



Secondary Makeup

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

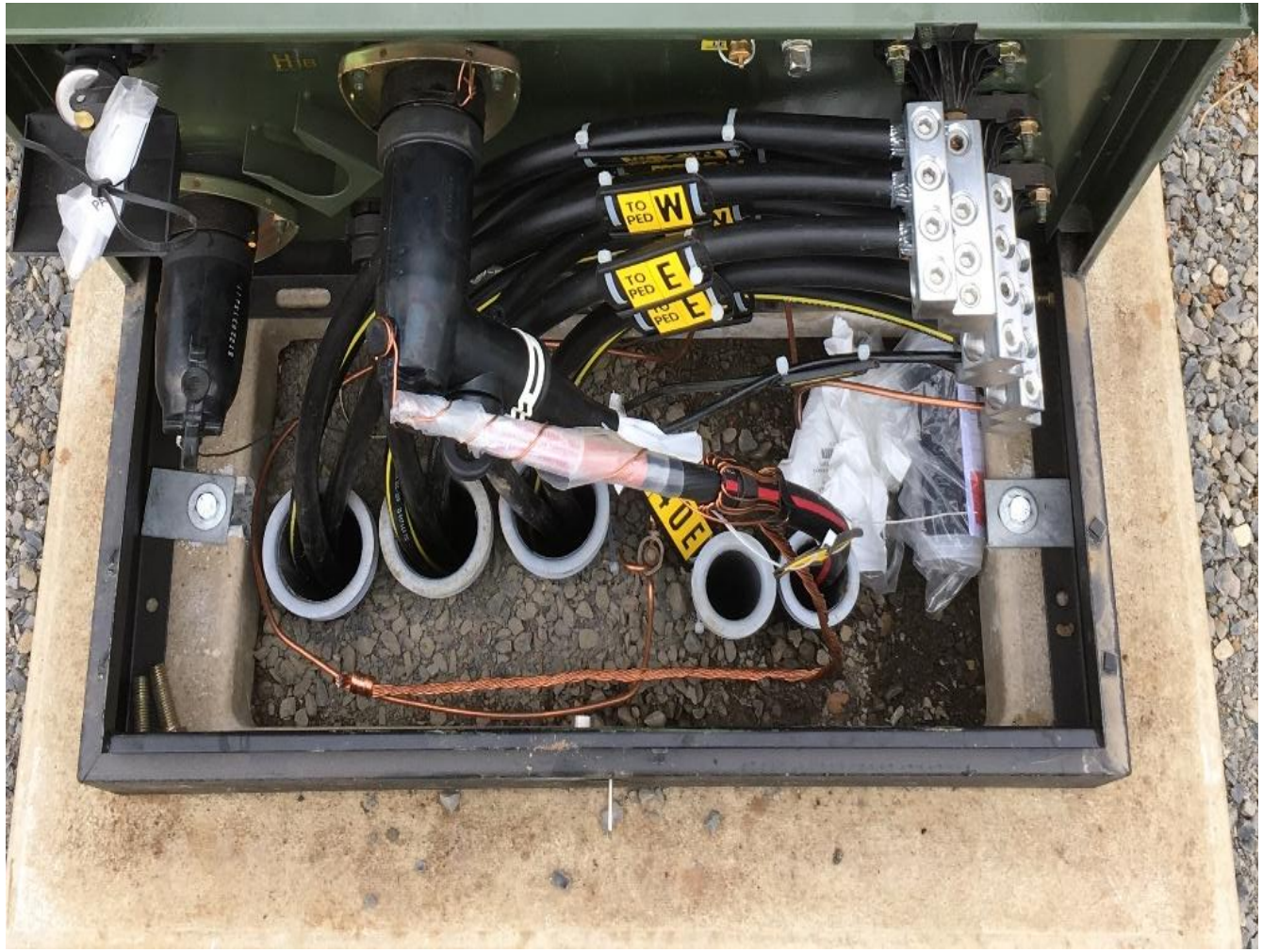


Secondary Makeup

- 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
- Work from the inside out
- Use the top of the z-bar
- Keep the cable uniform
- Tags should be visible

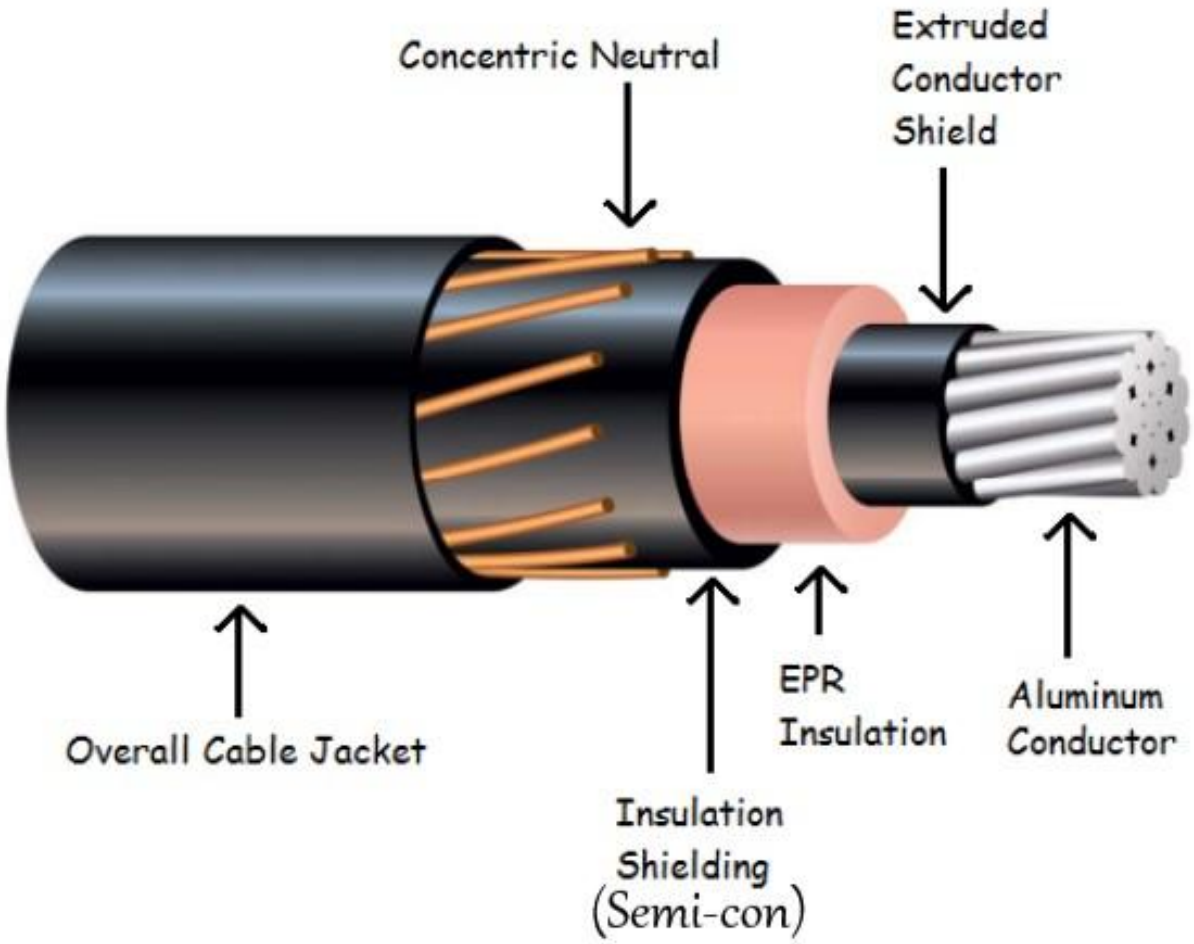
Secondary Makeup

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

Primary Termination in Transformer

Primary Termination in Transformer

- Layers of a primary cable



Primary Termination in Transformer

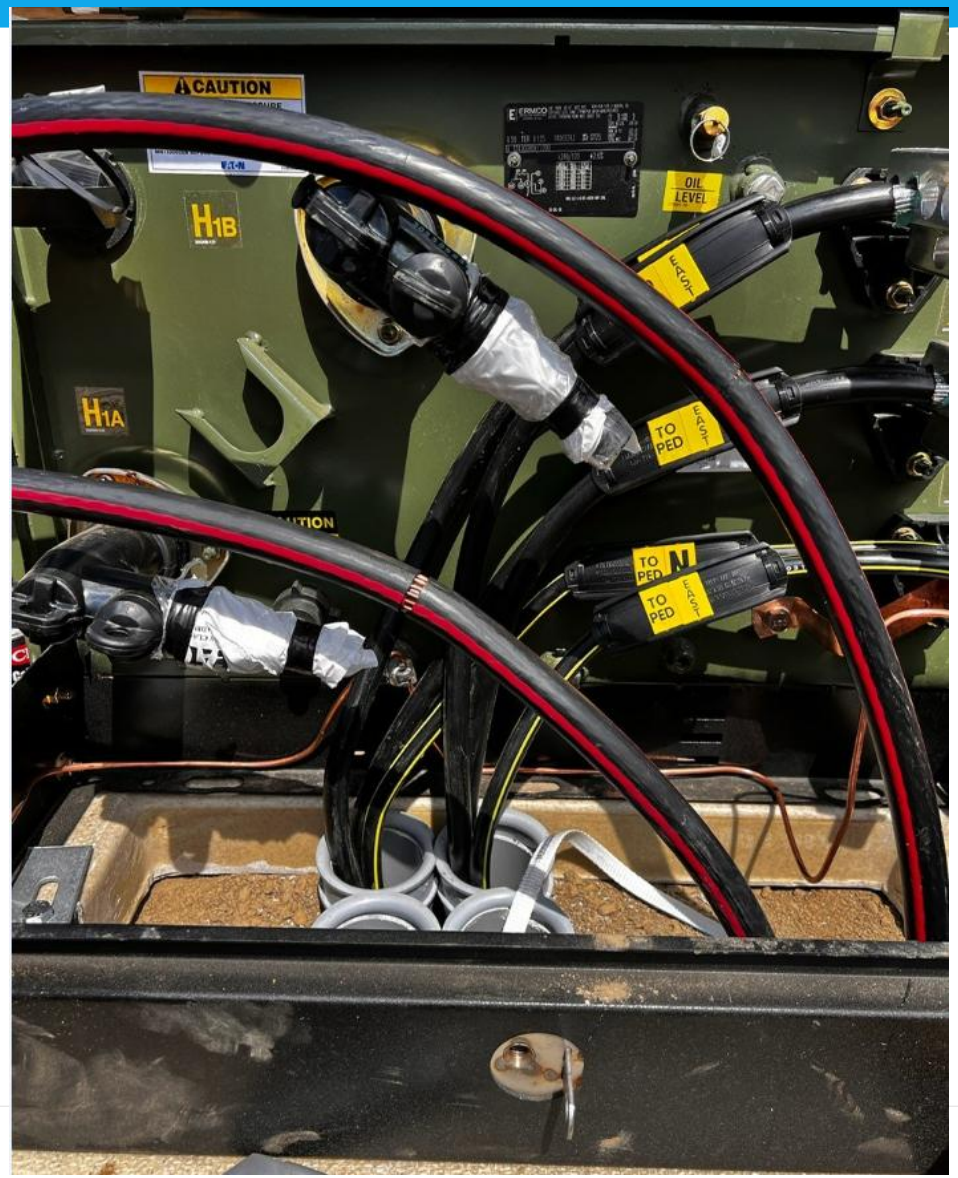
- First thing: **READ THE DIRECTIONS**
  - The directions have step-by-step instructions
  - The same manufacturer can have different measurements from year-to-year
  - Ensure your tools are calibrated correctly

Primary Termination in Transformer

- Train the Conductor with slack

Primary Termination in Transformer

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

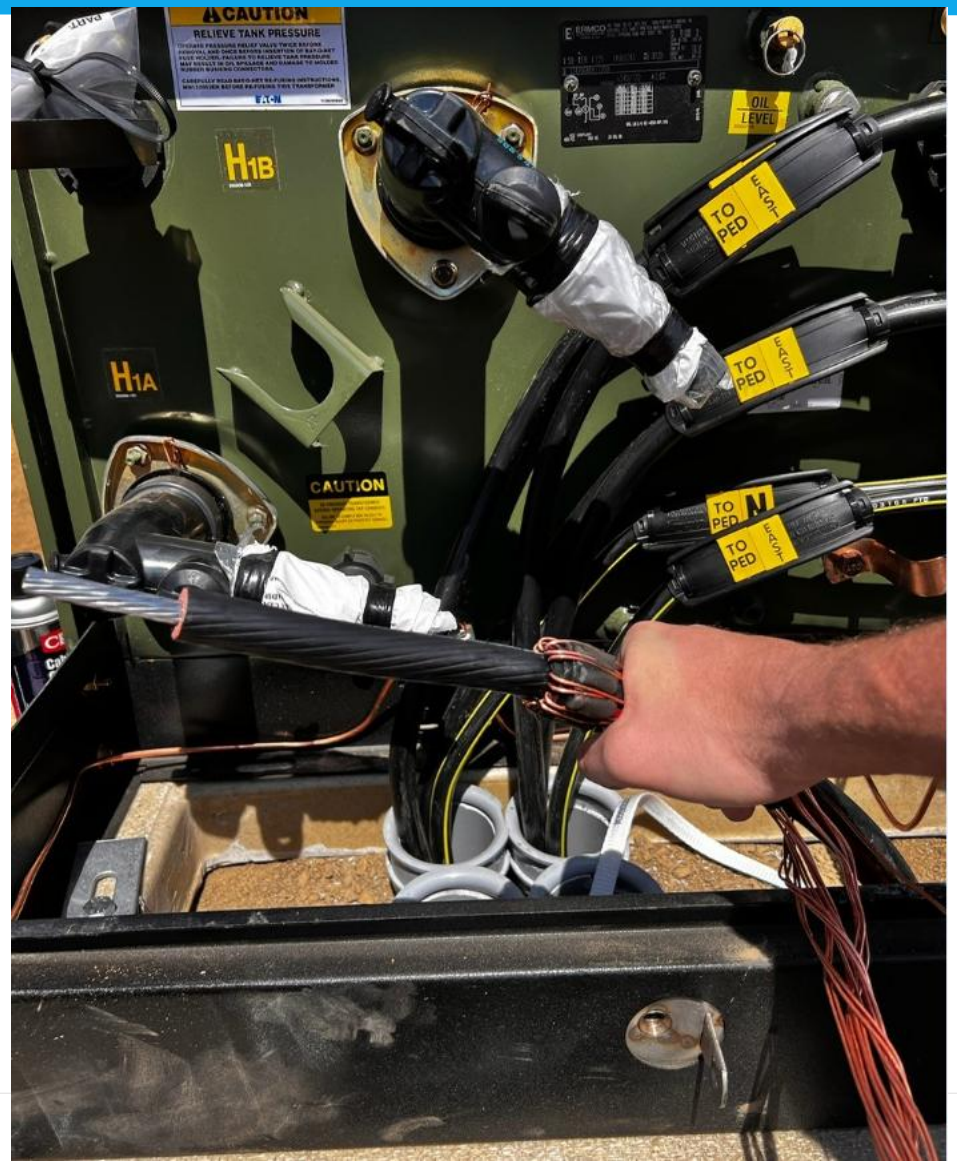


Primary Termination in Transformer

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

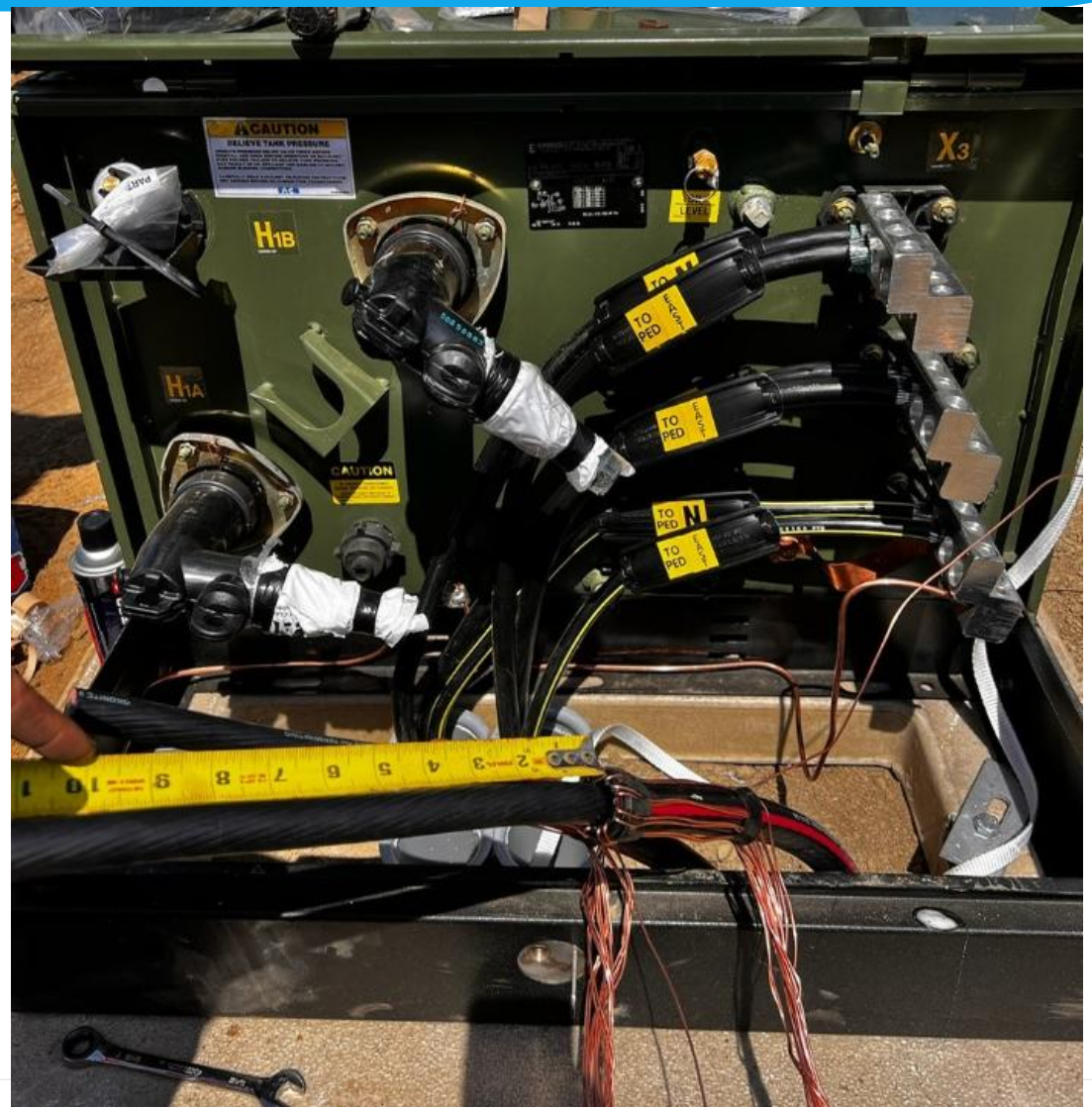
Primary Termination in Transformer

Remove cable jacket



Primary Termination in Transformer

Follow manufacturer's measurement from the concentric

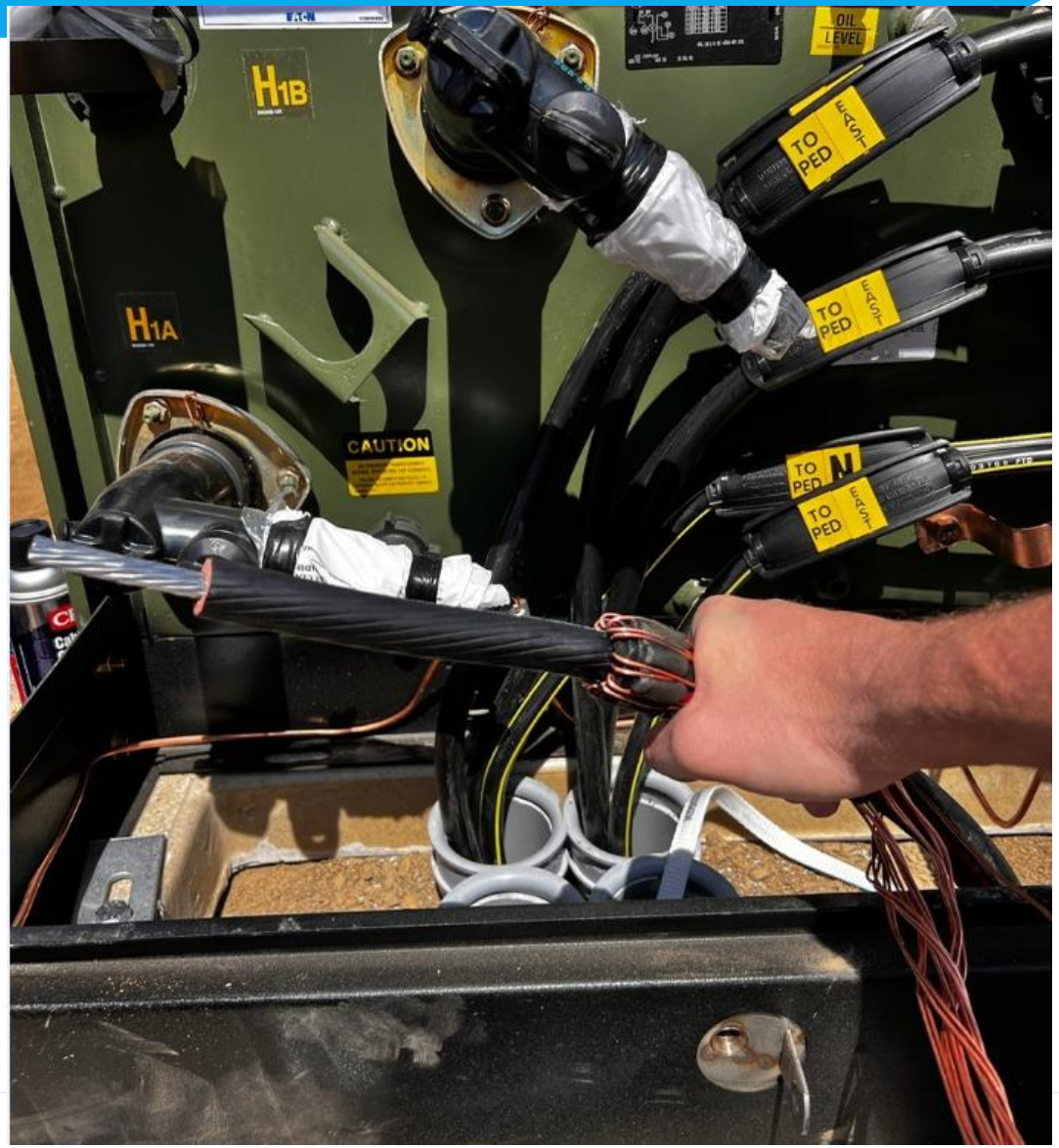


Primary Termination in Transformer

- Cut the conductor

Primary Termination in Transformer

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

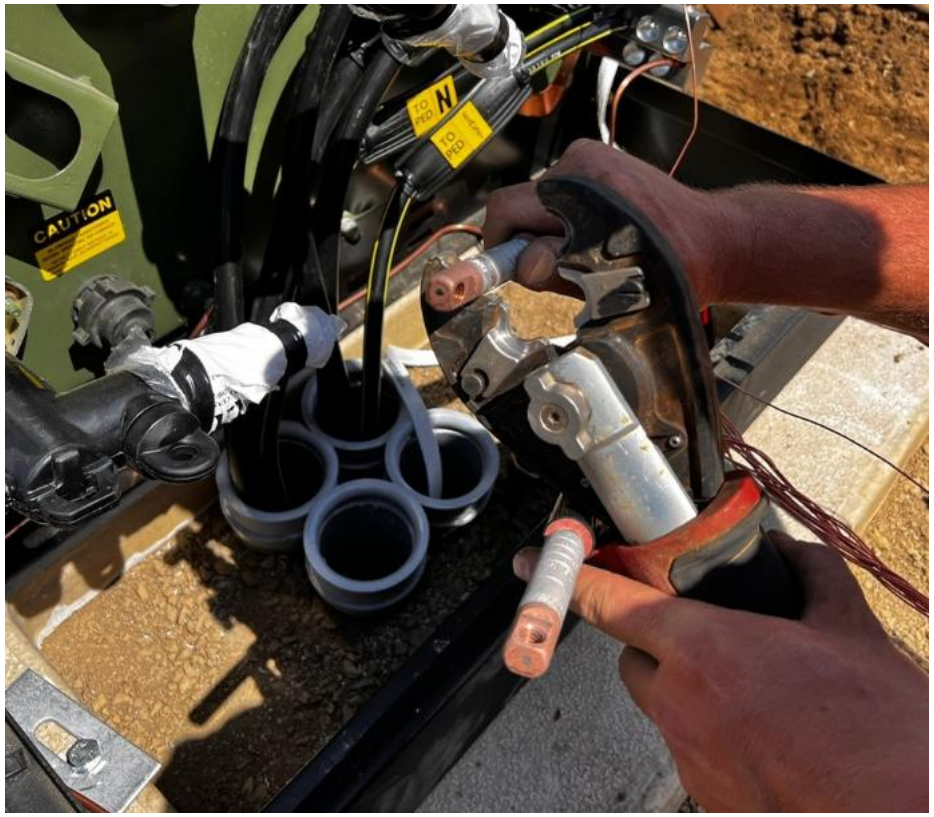


Primary Termination in Transformer

- Apply linket
- Align to the bushing

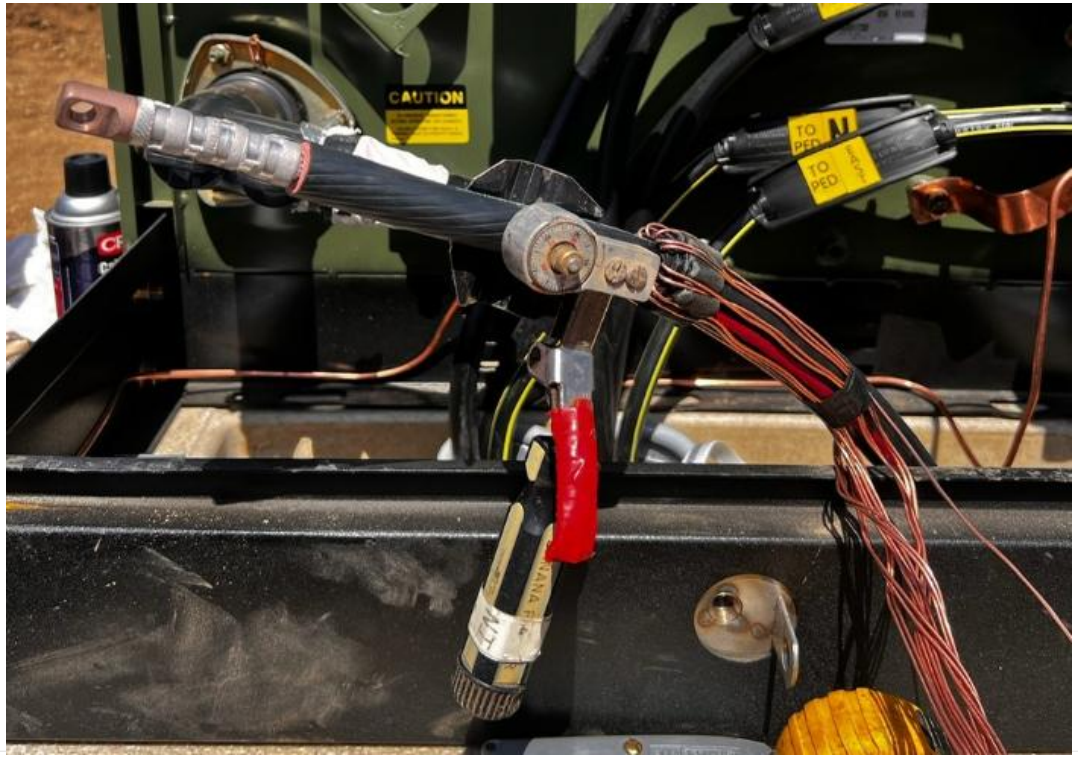
Primary Termination in Transformer

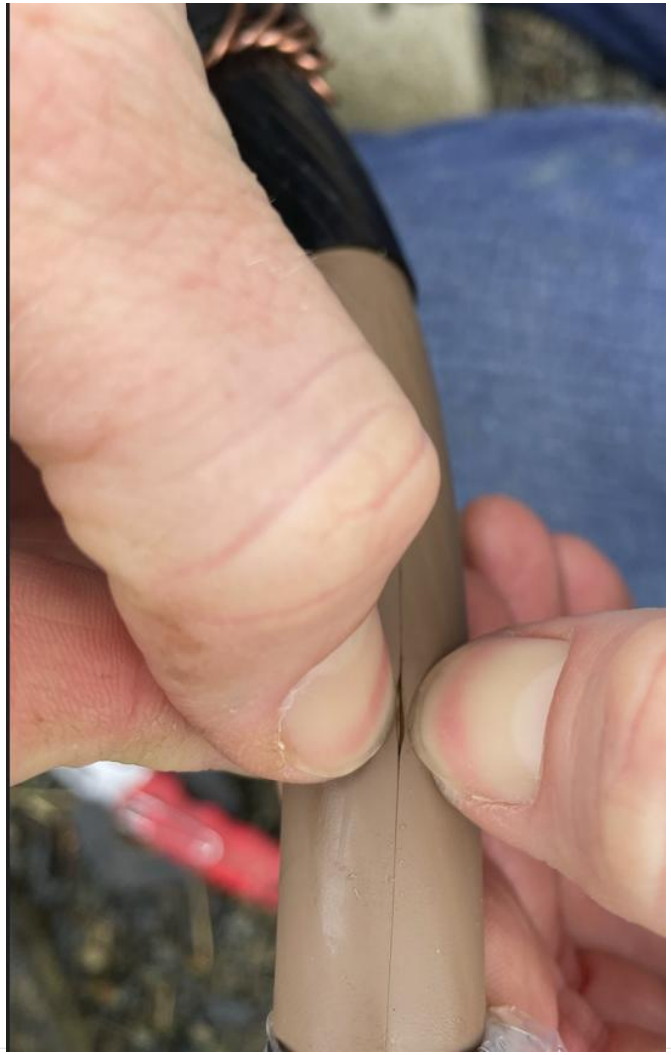
- Press linket
- Rotate every press 90 degrees
- Use a MD-6 press with BG dies



Primary Termination in Transformer

- Use appropriate tools to score semi-con
  - Banana peeler / Clamshell
  - Calibrate Wire Make-up tools





Primary Termination in Transformer

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

Primary Termination in Transformer

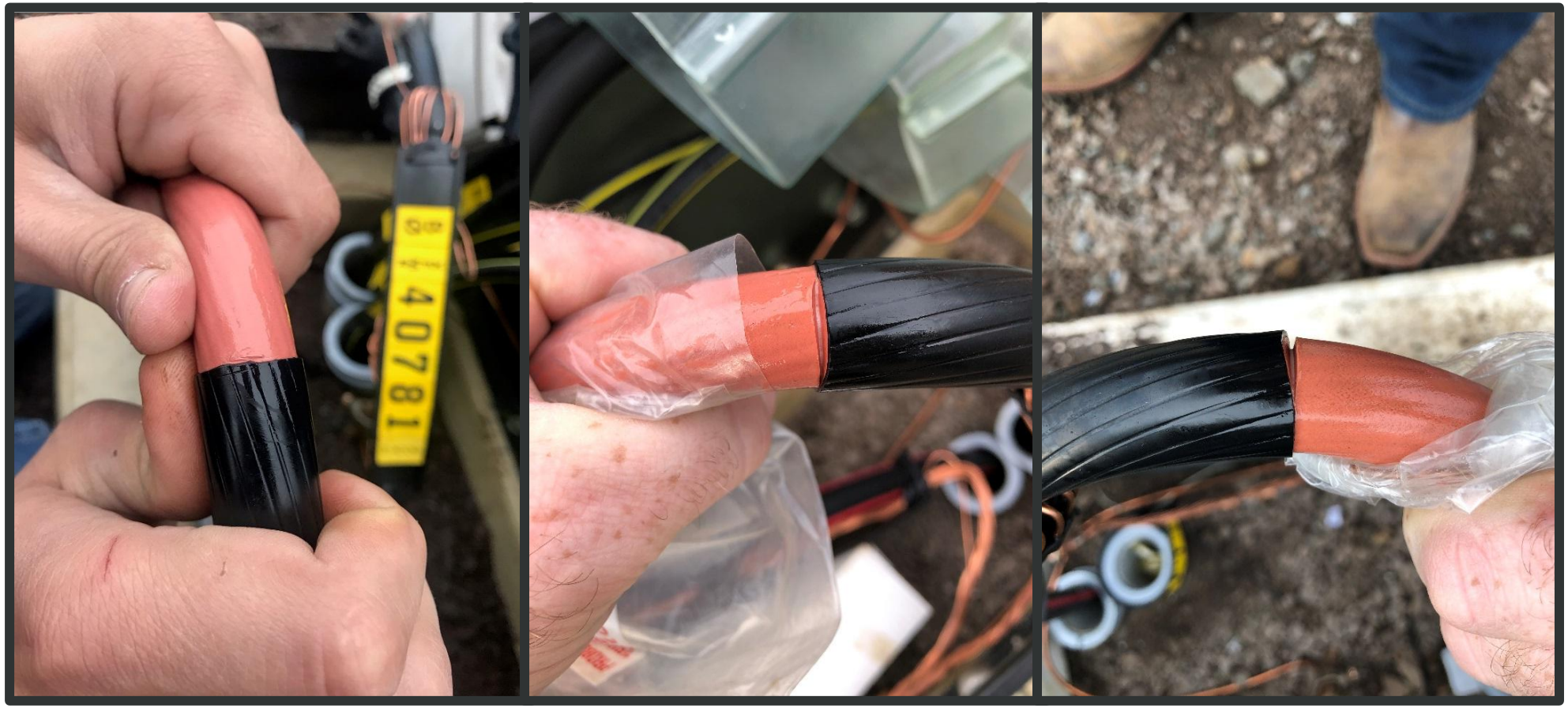
- Peel the semi-con

Primary Termination in Transformer

- Check for nicks or cuts in the insulation

Primary Termination in Transformer

- Nicks and scores ruin the insulation
- Use calibrated tools to avoid scoring insulation
- If nicked or cut, it needs to be replaced at the contractor's expense



Primary Termination in Transformer

- Clean and lubricate the bushing

Primary Termination in Transformer

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

Primary Termination in Transformer

Clean and lubricate the insulation

Primary Termination in Transformer

- Use a clear bag so inspectors do not need to remove for inspection
- 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 in Transformer

- Change to Integral Jacket Seal Elbow:

- One piece to buy (CPU Preferred)

- Two pieces to buy (If unable to get integral jacket seal elbows)

Primary Termination in Transformer

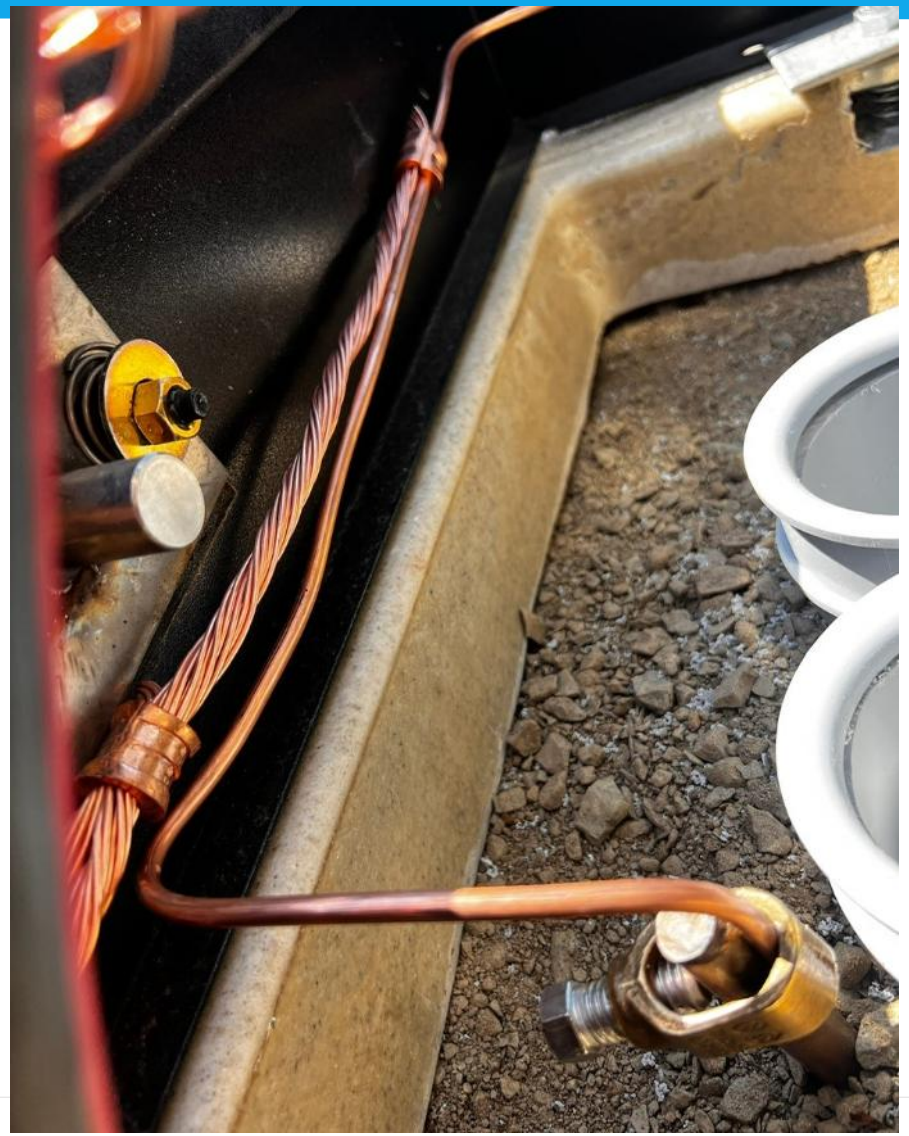
- Separate the bleeder wire
- Twist up the neutral
- **<u>DO NOT</u> install the elbow on the wire**

Primary Termination in Transformer

- Press the neutrals together

Primary Termination in Transformer

- Press neutral to the ground wire



Primary Termination in Transformer

- Piggyback the termination on the elbow

Primary Termination in Transformer

- Proper makeup

Transformer Info, Numbers, Warning/Danger Labels & Cable Tagging

Primary Termination in Transformer

- Please pay close attention to the catalog number when purchasing elbows. All elbows need to come with a test point

*NEW ITEMS & CHANGES ARE ITALICIZED AND BOLD**

CLARK PUBLIC UTILITIES - APPROVED MATERIAL LIST

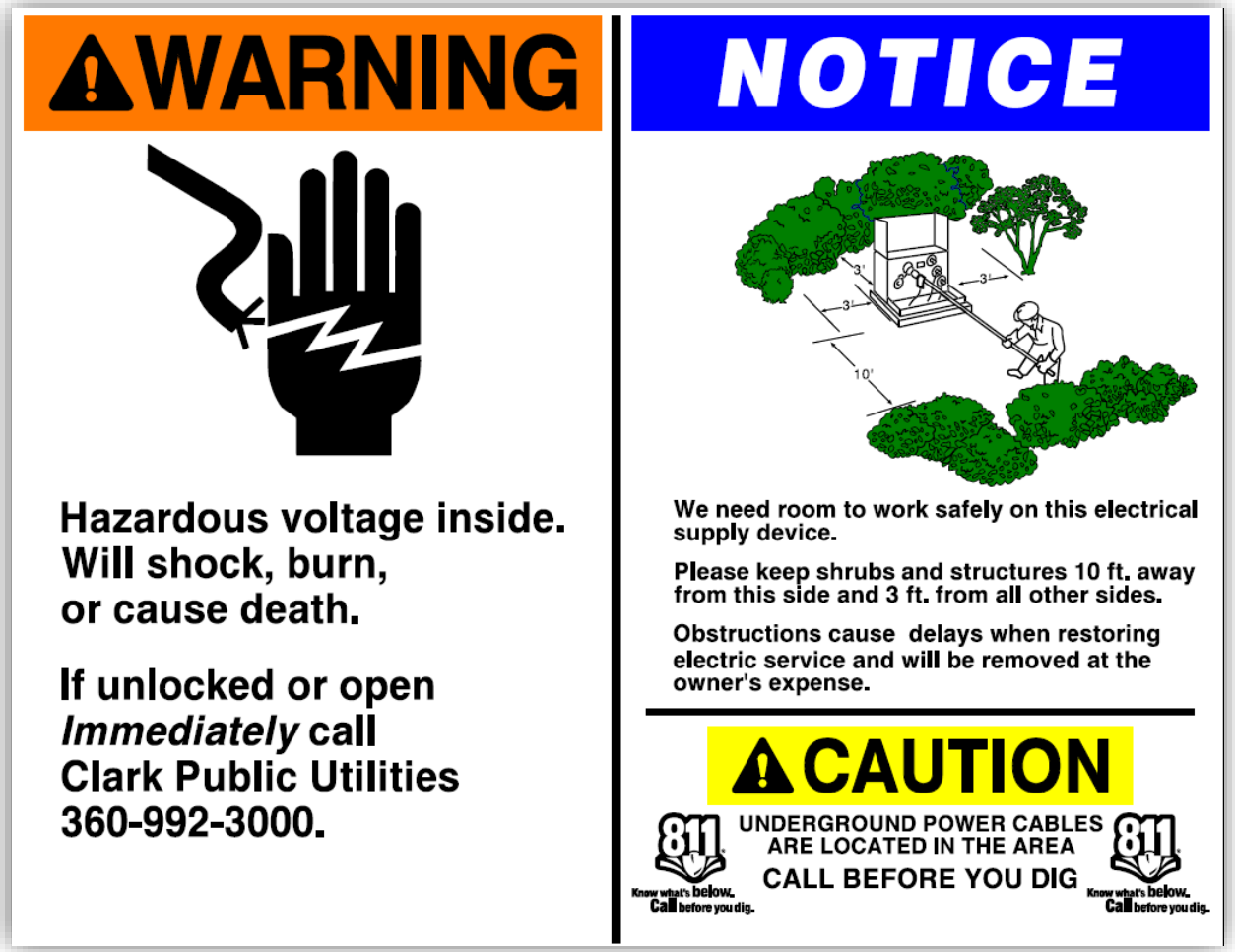
CPU STOCK NO.	DESCRIPTION	APPROVED MANUFACTURERS/PART NUMBER(S)	SUPPLIER CODE		SUPPLIER CODE		SUPPLIER CODE	
557	COUPLING, CONDUIT, 3 IN PVC SXS, DEEP SOCKET	RIDGELINE 40SWC30	1,2,3,11,16,18	ATKORE / HERITAGE 40SWC30	3,11,16,18			
2316	COUPLING, REDUCER, PVC 3" TO 2", SCH 40	BELL END (UL LISTED)	1,2,3,5,10,11,16,18					
2336	COUPLING, REDUCER, PVC 4" TO 2", SCH 40	BELL END (UL LISTED)	1,2,3,5,10,11,16,18					
2266	COVER, CONNECTOR, Z-BAR, 6-POSITION	CMC ZLC-3	1,2	UTILCO PSS B-2	1,2,5,11	HOMAC EZ 5912-3	1,2	B
573	COVER, CONNECTOR, 4-350 PVC (FOR 528)	CMC NC6-350	1,2	HOMAC BB-13	1,2	ALCON CVC	1,2	
574	COVER, CONNECTOR, 6-500 PVC (FOR 531)	CMC NC6-500	1,2					
2176	COVER, CONNECTOR, 6-750 PVC (FOR 2129)	CMC LDC-2	1,2,5	HOMAC, SB2163-12	1,2	POLARIS 50750HK12	2,5	
2182	COVER, CONNECTOR, 8-750 FOR PET	HOMAC SB2163-3	1,2	POLARIS 50750128	2,5			
2435	COVER, FOR GROUND SLEEVE (2433)	PROGLASS LTX4238	1,11,17					
2391	ELBOW CABLE SEALING 1/0 URD, 175 MIL INSUL	3M 8452	1,2,3,5,11,16,18					
2391B	ELBOW CABLE SEALING 1/0 URD, 175 MIL INSUL	RAYCHEM RVS-13-SK	1,2,11,16,18					
1312	ELBOW LB 1/0, 200A, 175/220 MIL INSUL	EATON #LEJ215AB06TY	2,5,11,16,18	ABB (Elastimold) #162LRJS-B5240	1,2,18	HUBBELL 215LEJ45T	1,2	
N/A	ELBOW LB 1/0, 200A, 175/220 MIL INSUL W/O JACKET SEAL - **MUST BE PURCHASED W/ STK# 2391 OR STK# 2391B** APPROVED FOR AN "AS NEEDED" SUBSTITUTION FOR STK#1312 IF UNAVAILABLE.	EATON #LE215AB06TY **Must purchase with Stk# 2391 or 2391B	2,5,11,16,18	ABB (Elastimold) #162LR-B5240-S **Cold Shrink is included	1,2,18	HUBBELL 215LE45TJ **Must purchase with Stk# 2391 or 2391B	1,2	

Transformer Numbering

- Contact Construction Services (construction@clarkpud.com) for Transformer numbers. In the email, please include:
  - The Work Request (job) number
  - The specific sticker numbers needed
  - The contact information of who will be picking them up
- Apply the correct number to the top left corner
- See Underground Transformers and Clearances - Section 1400 – UID1 of the Primary Electrical Contractor Handbook for examples

Transformer WARNING Labels

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

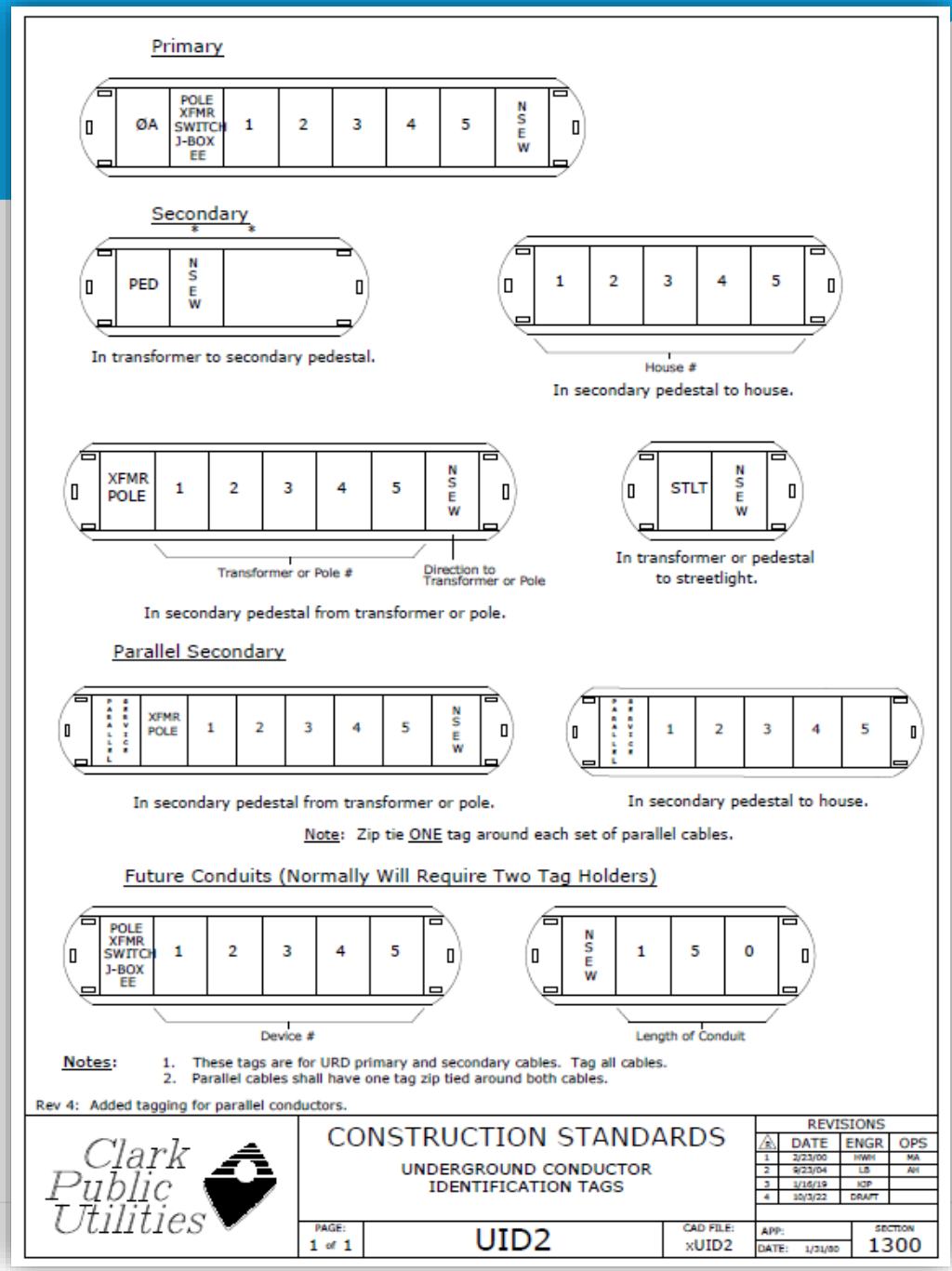


Transformer DANGER Labels

- 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 Termination in Transformer

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

Approved Primary Electrical Installation

Part 2

Contractor Training Class 2025

Clark Public Utilities

Secondary Pedestal

Secondary Pedestal

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

Secondary Pedestal

- Grade Pedestal to the grade line

Secondary Pedestal

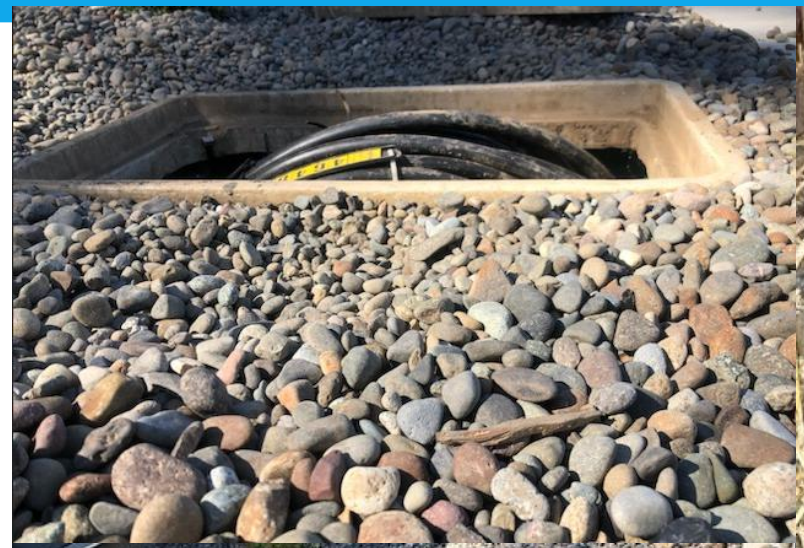
- Grade only to the grade line on the outside
- Do NOT fill the inside
- Start with source cable in the second hole from back and go forward with load(s)

Secondary Pedestal

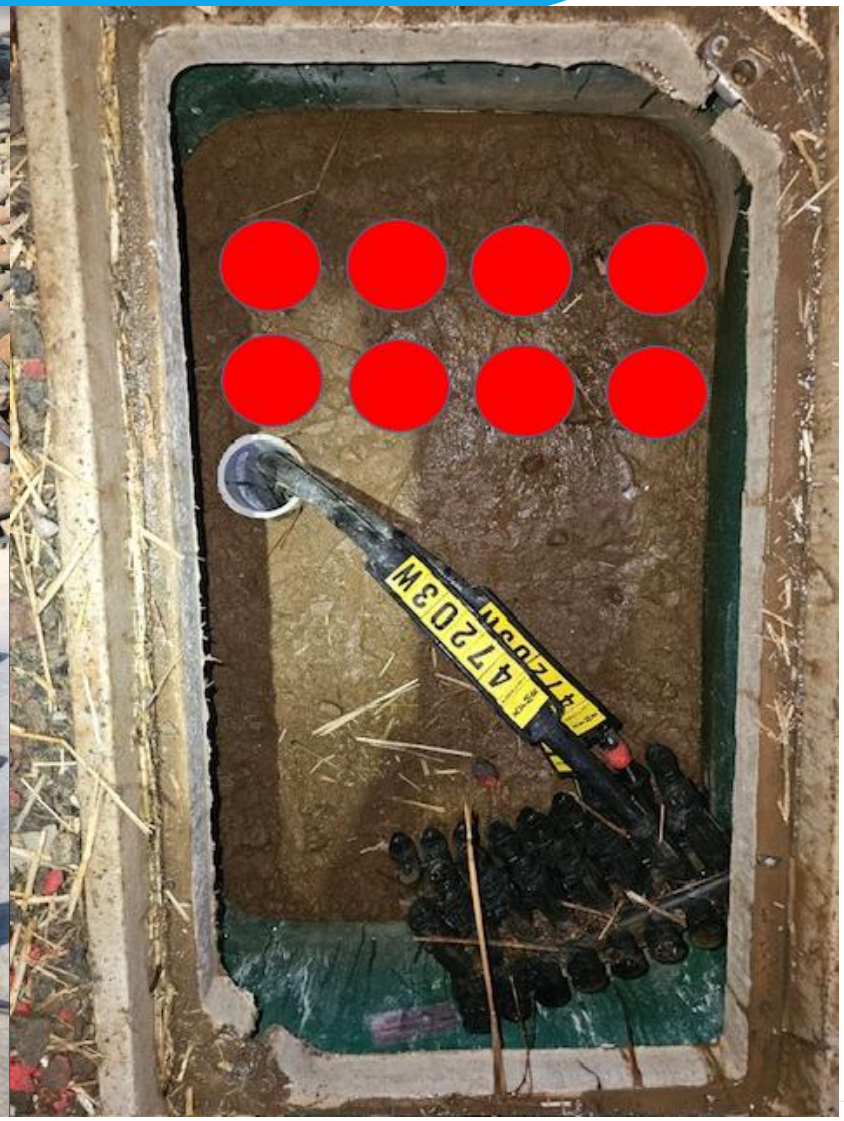
- Be careful when backfilling

Secondary Pedestal

Flush mount Ped
(17” x 30”) Make-up

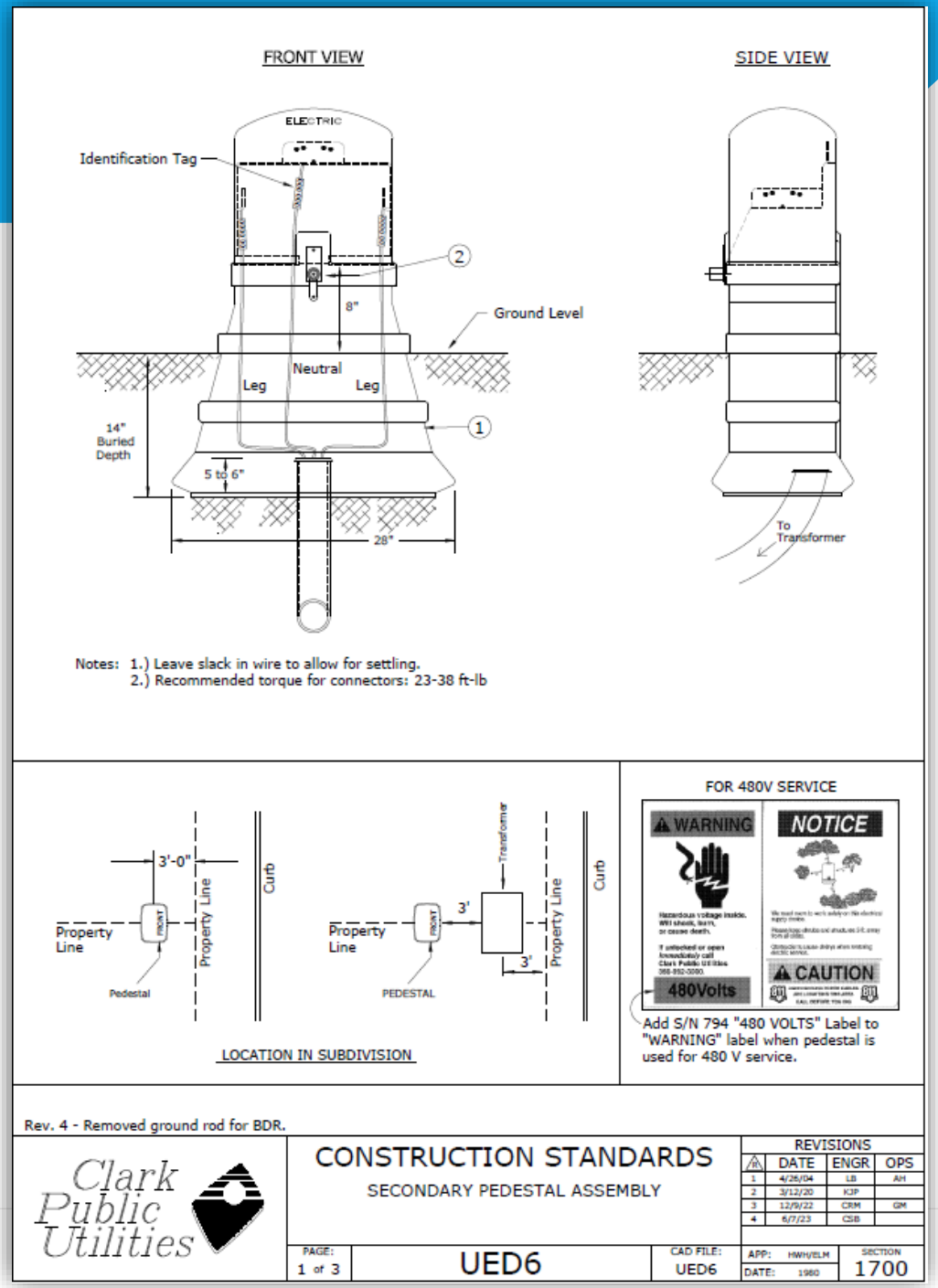


Can’t Shut



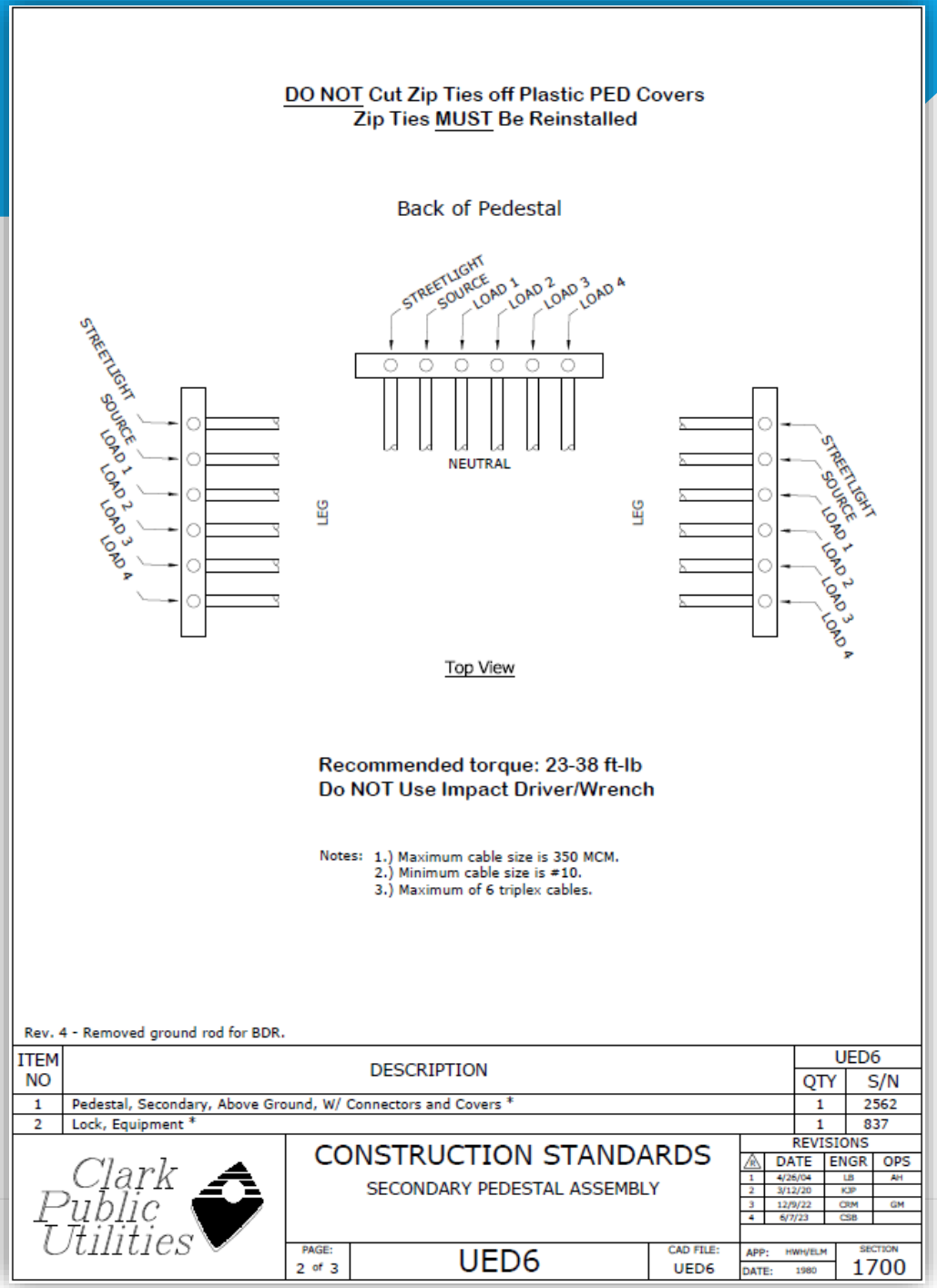
Secondary Pedestal

- 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



DO NOT Cut Zip Ties off Plastic PED Covers
Zip Ties MUST Be Reinstalled

Back of Pedestal

STREETLIGHT SOURCE LOAD 1 LOAD 2 LOAD 3 LOAD 4

NEUTRAL

LEG

LEG

STREETLIGHT SOURCE LOAD 1 LOAD 2 LOAD 3 LOAD 4

STREETLIGHT SOURCE LOAD 1 LOAD 2 LOAD 3 LOAD 4

Top View

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

Notes: 1.) Maximum cable size is 350 MCM.
2.) Minimum cable size is #10.
3.) Maximum of 6 triplex cables.

Rev. 4 - Removed ground rod for BDR.

ITEM NO	DESCRIPTION	UED6 QTY	UED6 S/N
1	Pedestal, Secondary, Above Ground, W/ Connectors and Covers *	1	2562
2	Lock, Equipment *	1	837

Clark Public Utilities

CONSTRUCTION STANDARDS
SECONDARY PEDESTAL ASSEMBLY

REVISIONS	DATE	ENGR	OPS
1	4/26/04	LB	AH
2	3/12/20	KJP	
3	12/9/22	CRM	GM
4	6/7/23	CSB	

PAGE: 2 of 3 | UED6 | CAD FILE: UED6 | APP: HWH/ELM DATE: 1980 | SECTION 1700

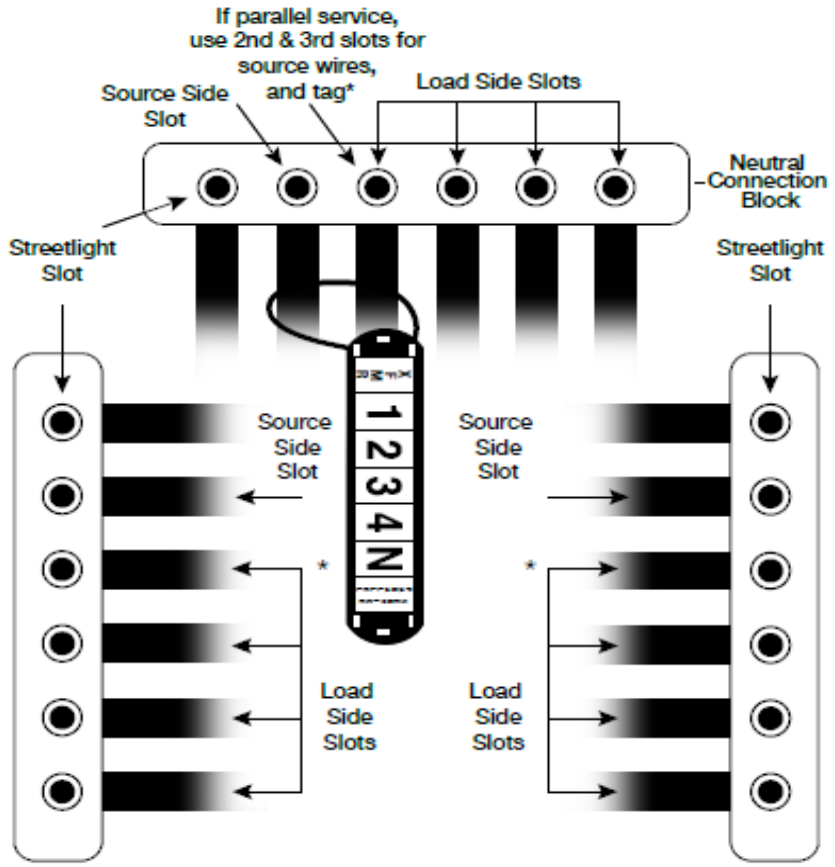
Secondary Pedestal

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

Clark Public Utilities

Secondary Pedestal and Tagging Installation Detail

Secondary Pedestal Connectors
Standard UED6



Meters

Meters

Ensure secondary is ready for our crews

Manufacturers like to include the meter rings inside the meter base. Please remove and discard as we will use our own.

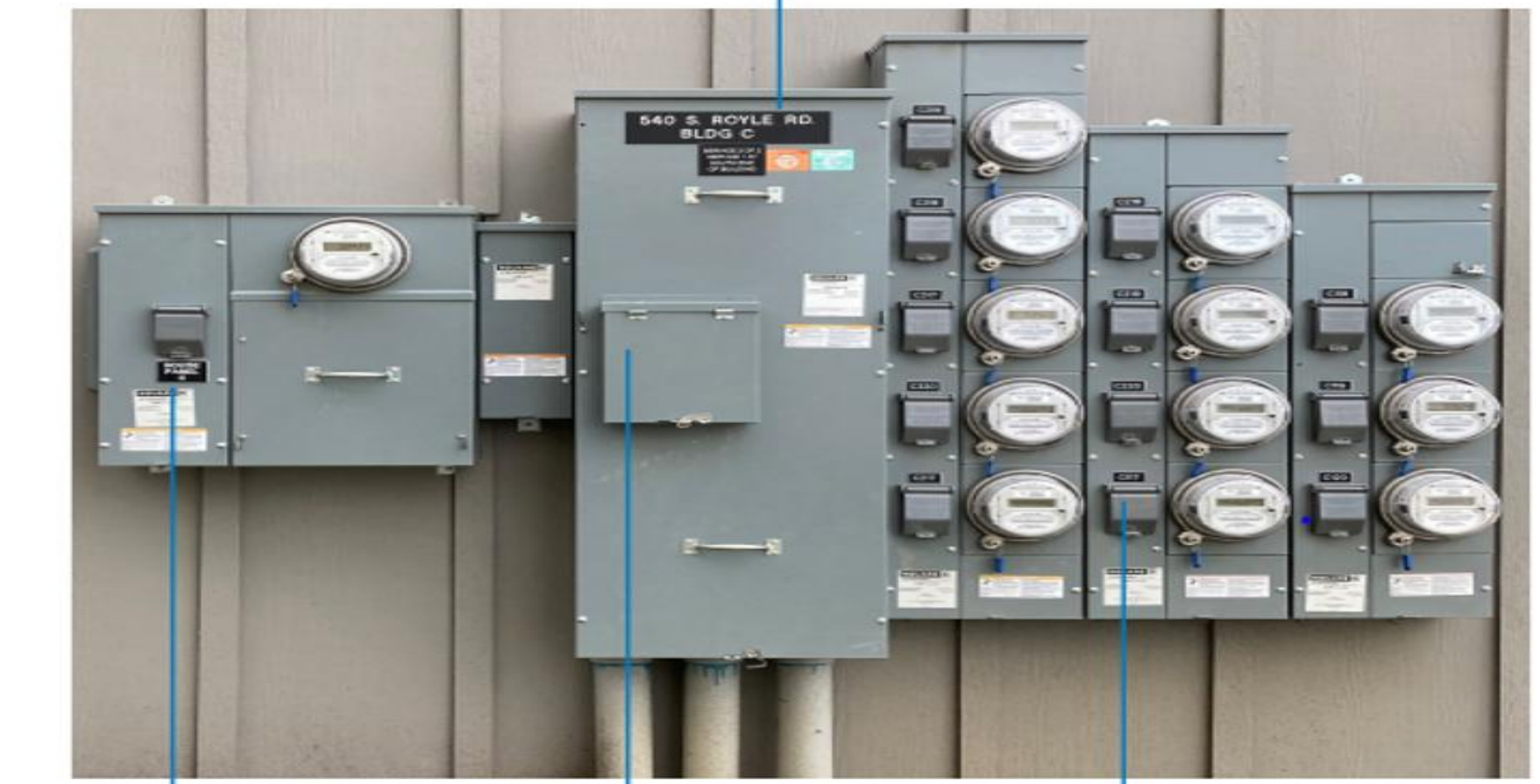
Ensure secondary connections are tight

Meters

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
- On Clark Public Utilities website

Meter Pack


540 S ROYLE RD
BLDG C
Address label
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

Streetlights

City Streetlight Ownership & Maintenance

- Not Maintained by CPU - 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
- Maintained by CPU - 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

- Streetlight standards must be positioned according to the design print

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

- Position the light to the correct spot
- CPU spec is 100% conduit
- Backfill around the base

Streetlights

- Compact around the base as you backfill

Streetlights

- Backfill to the final grade

Streetlights

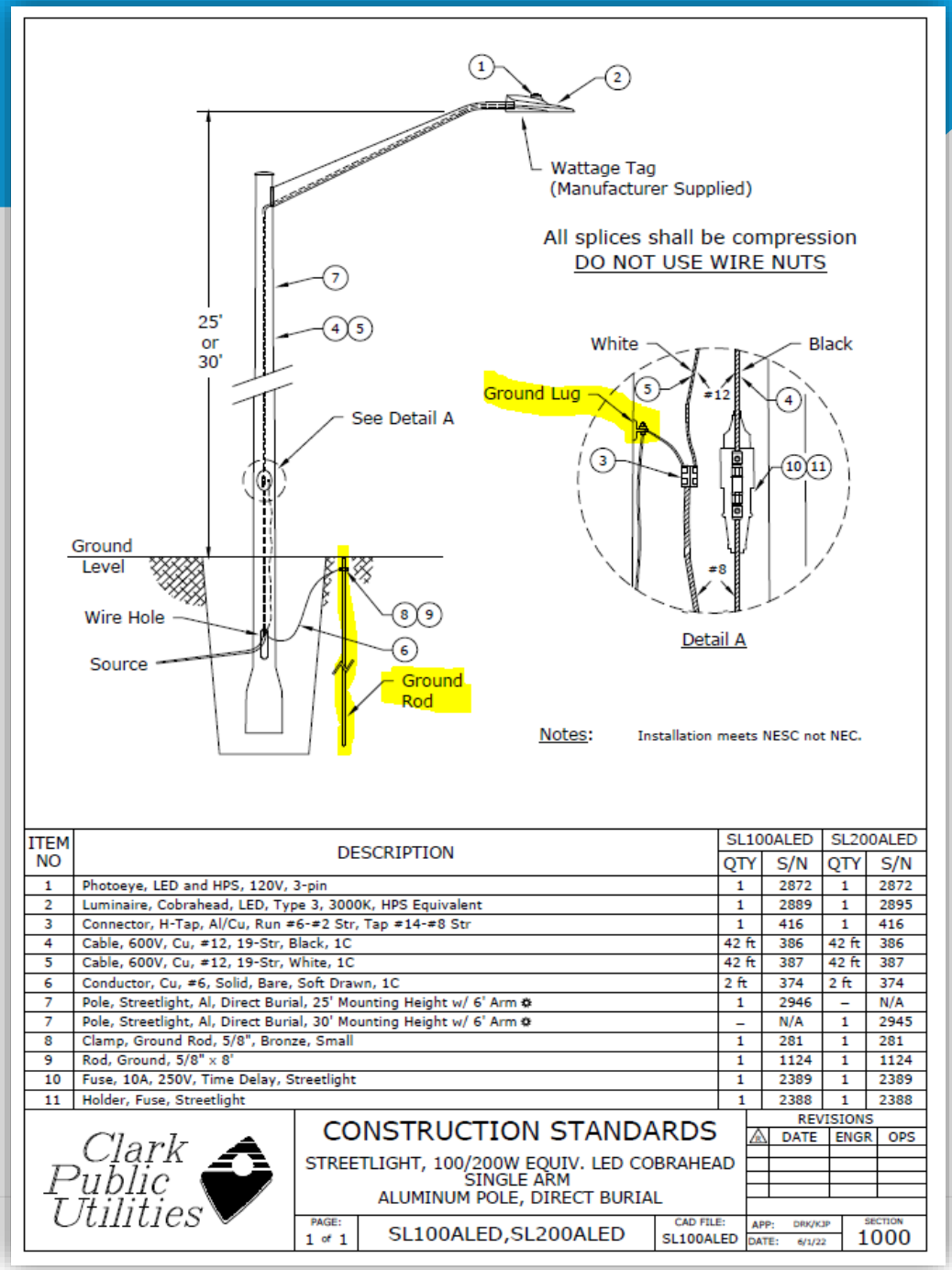
- Install the Light and Arm
- Run the wire from the light down to the base of the standard

Streetlights

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

Streetlights
Aluminum Poles

- Aluminum poles require ground rod
- Run #6 Cu from ground lug in pole to ground rod



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

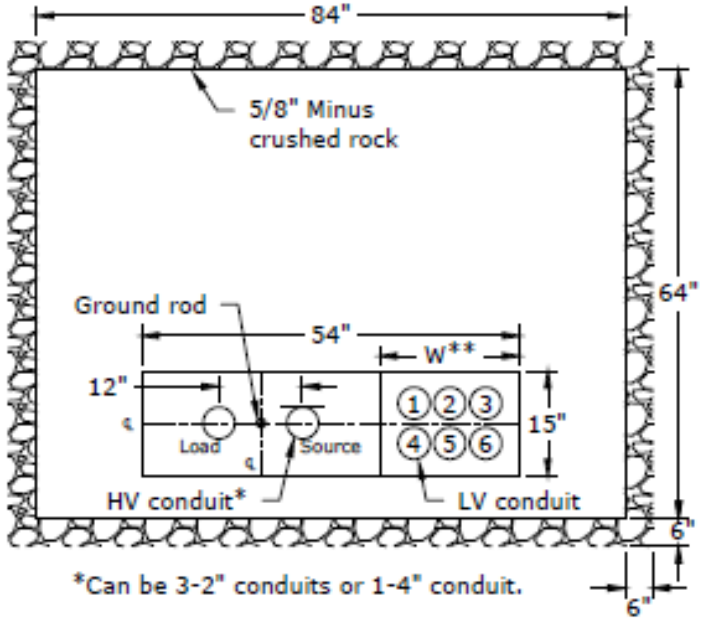
- Bring in the secondary pipe and attach it to the board
- Primary will be on the left and secondary will be on the right

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 Transformers

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

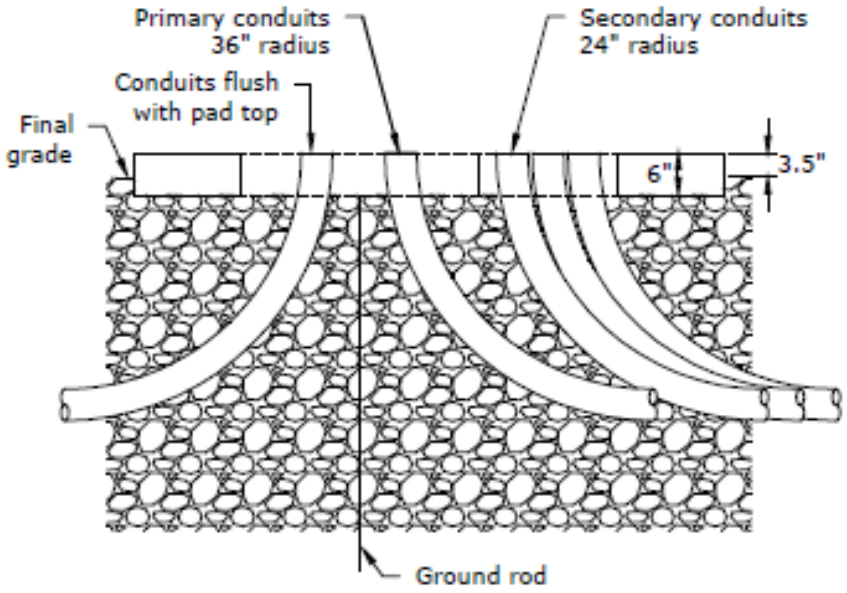


*Can be 3-2" conduits or 1-4" conduit.

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

**Varies by manufacturer

PLAN VIEW



FRONT VIEW

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

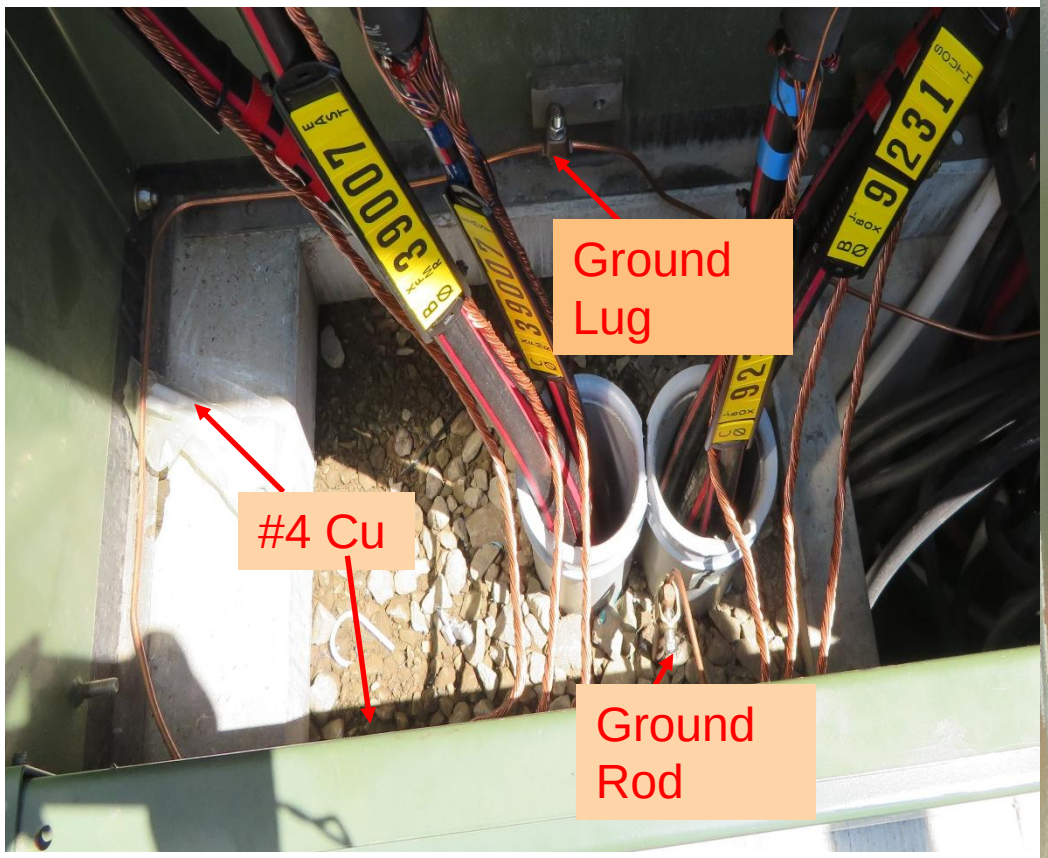
- Example of a secondary compartment
- CPU prefers conduit plugs instead of duct tape

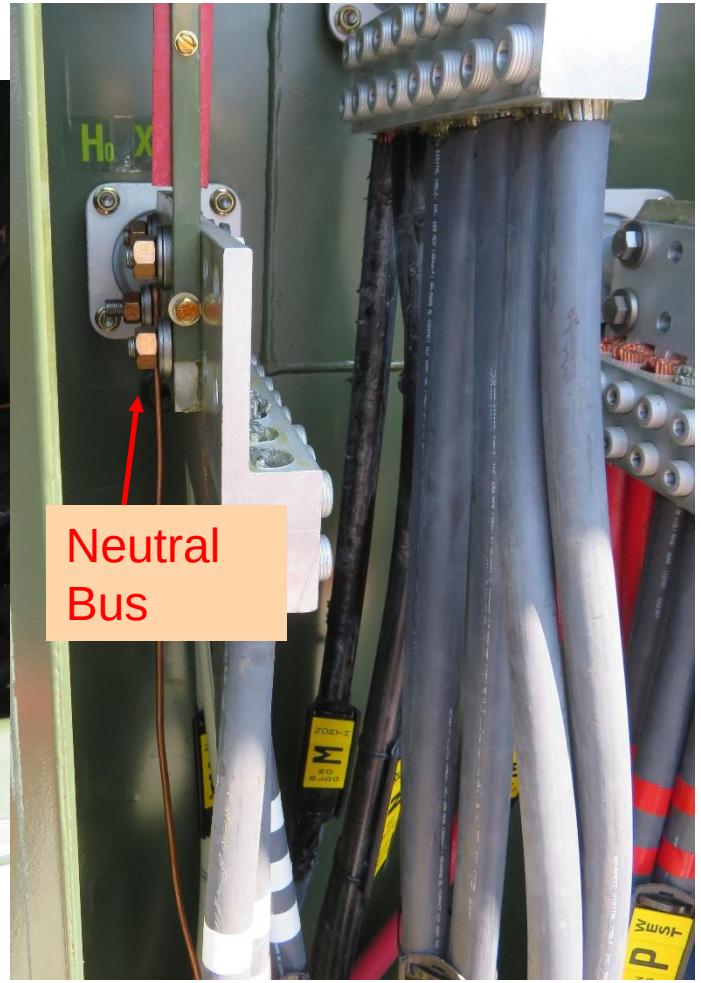
Three-Phase Transformers

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

Three-Phase Transformers

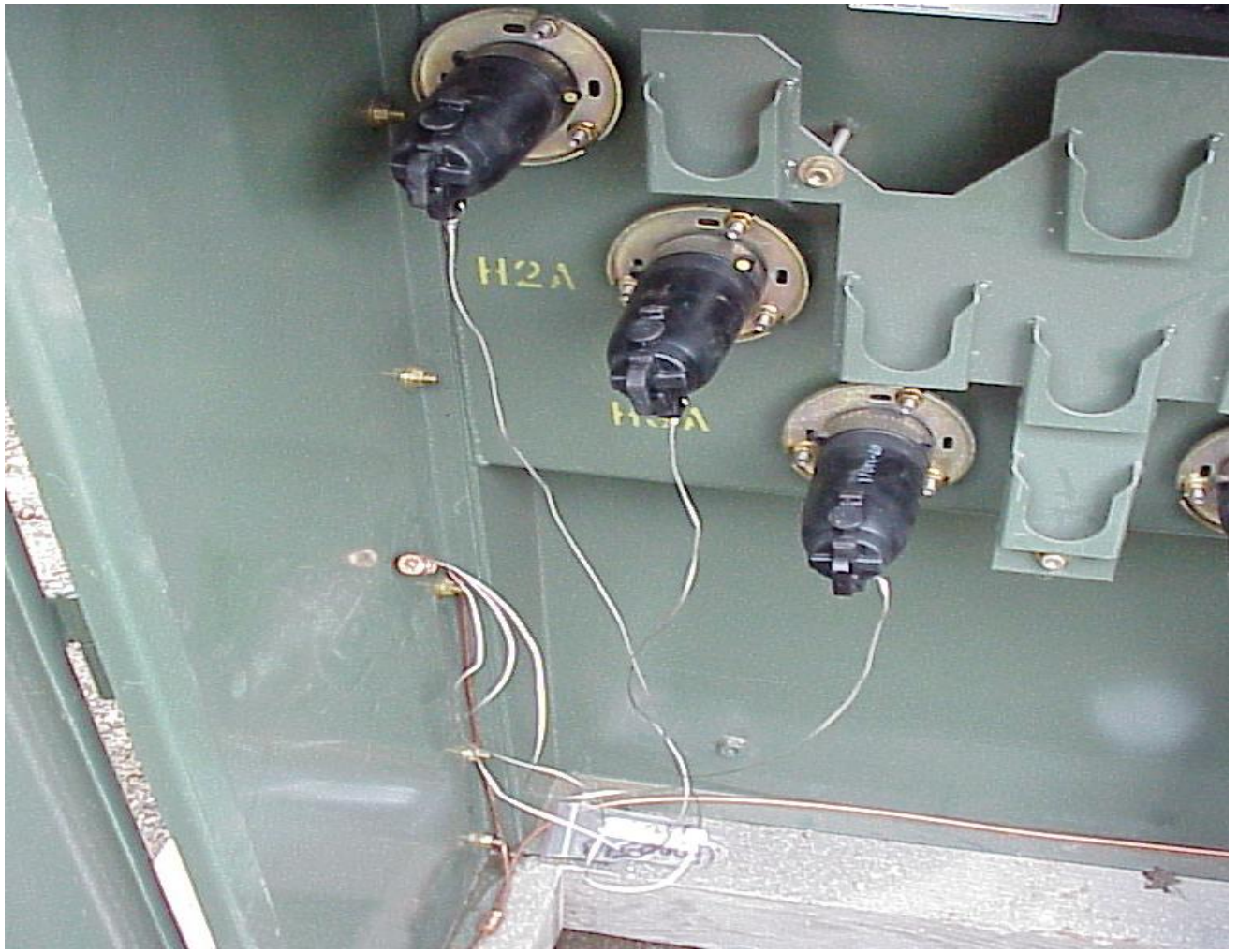
- Install #4 CU from the ground rod, around the cabinet to the ground lug, then to the secondary neutral bus





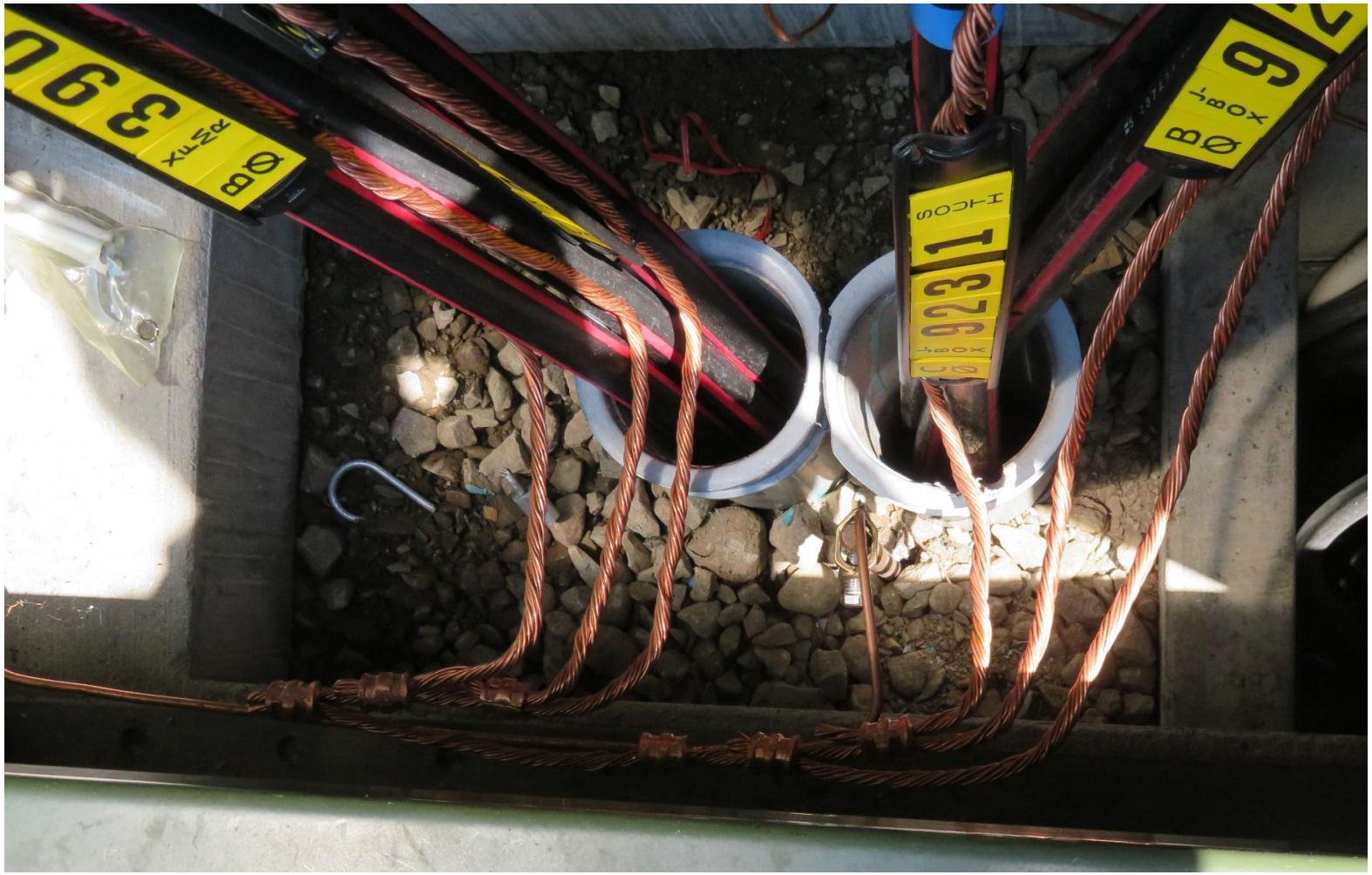
Three-Phase Transformers

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



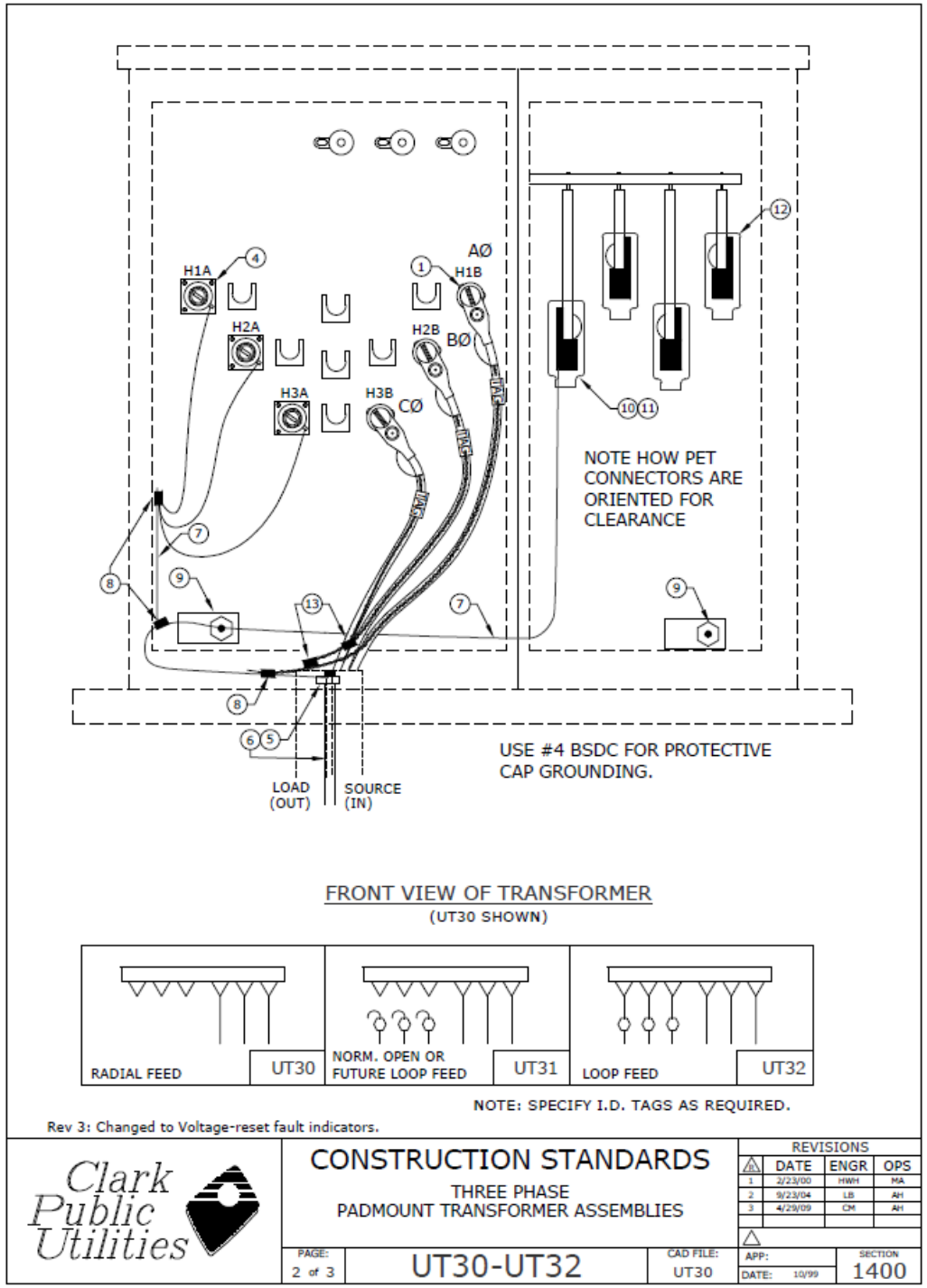
Three-Phase Transformers

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



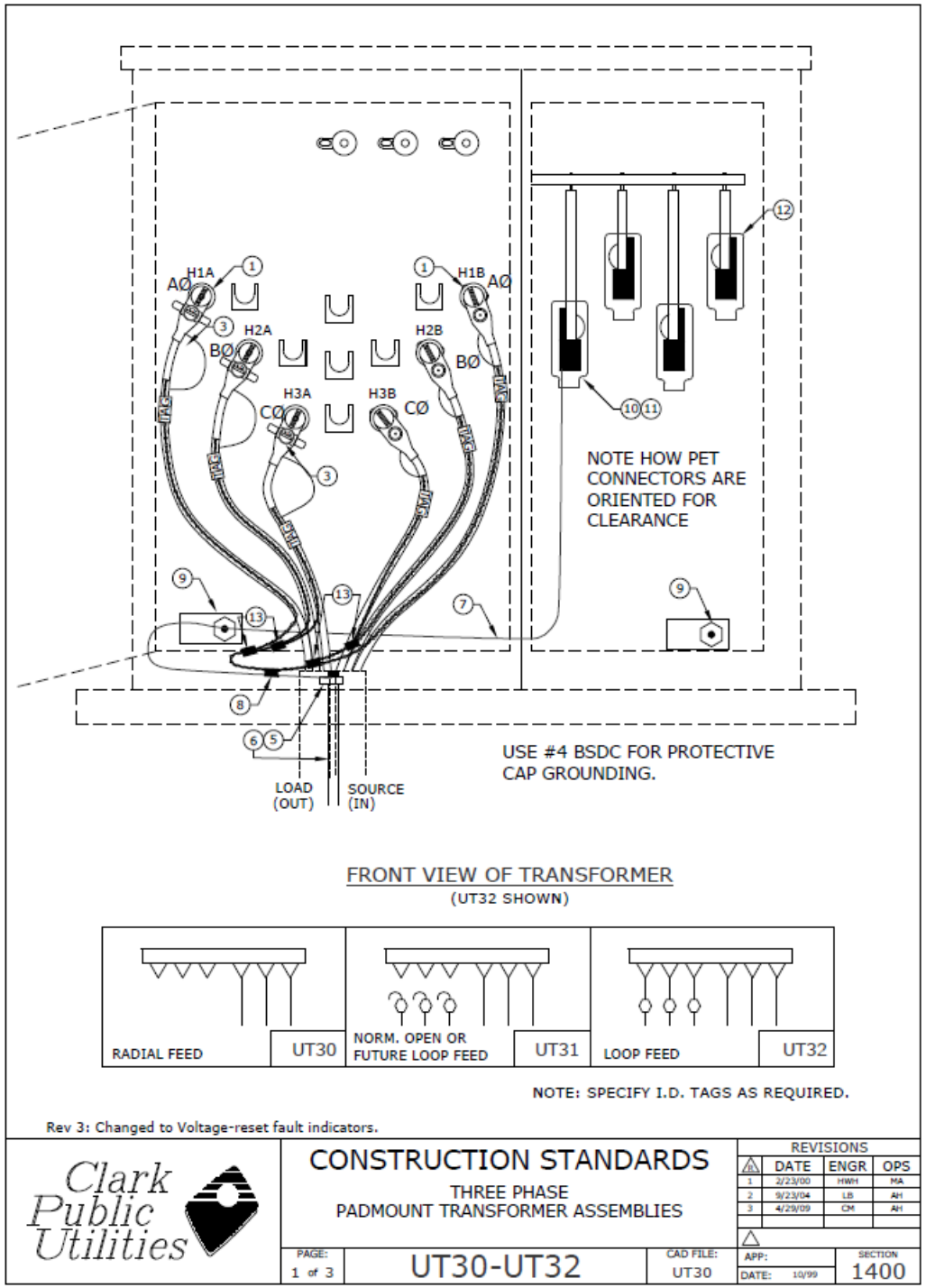
Three-Phase Transformers

- This Std UT30 – radial
- The phase labeling must align
- Make sure to tape Red, White, Blue – A,B,C (Extremely Important)



Three-Phase Transformers

- This 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 a 208v secondary make up
- It is taped white-neutral, black-x1, red-x2, blue-x3
- Cut a hole in the covers for the support

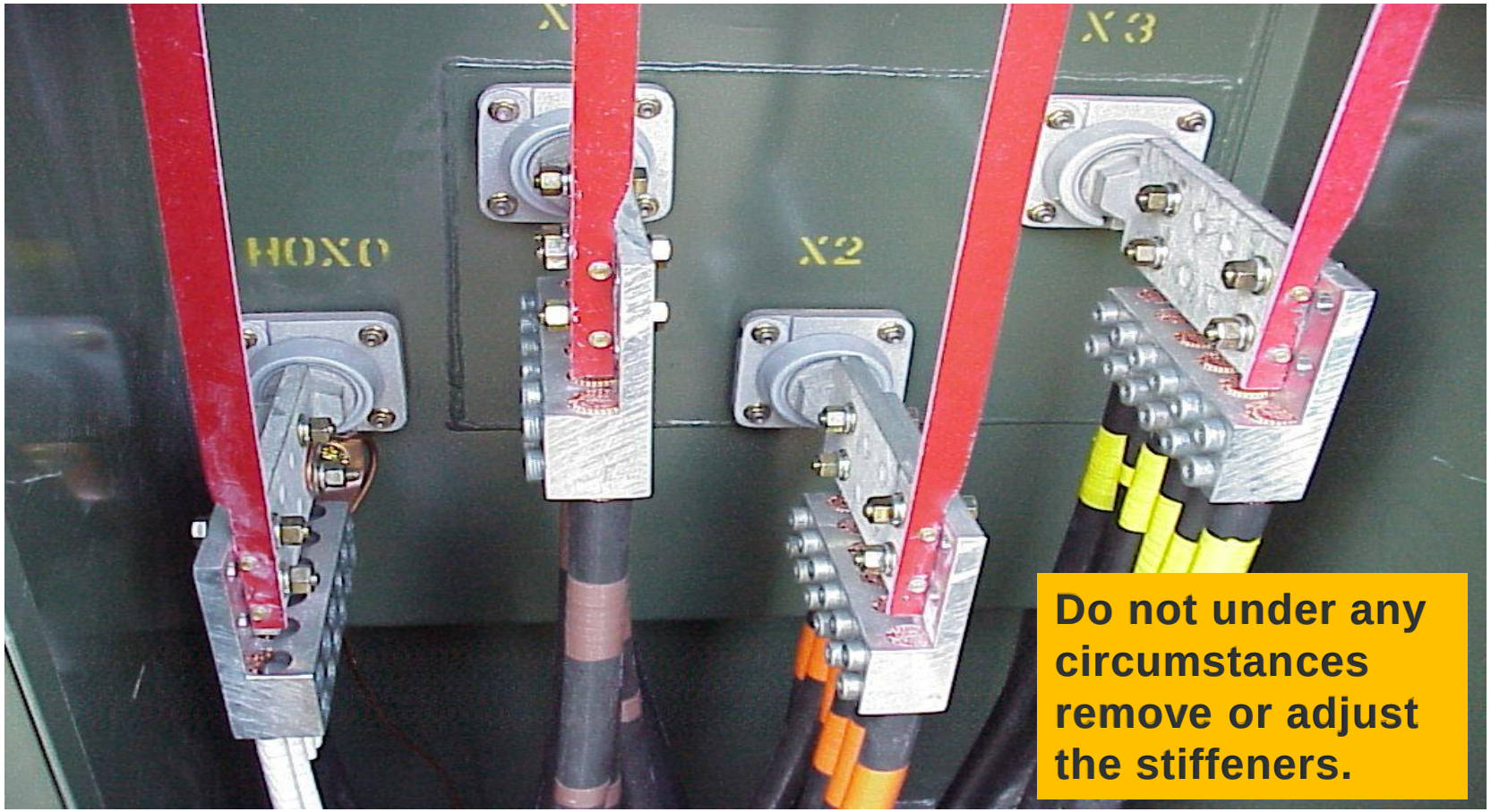
Clark Public Utilities

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

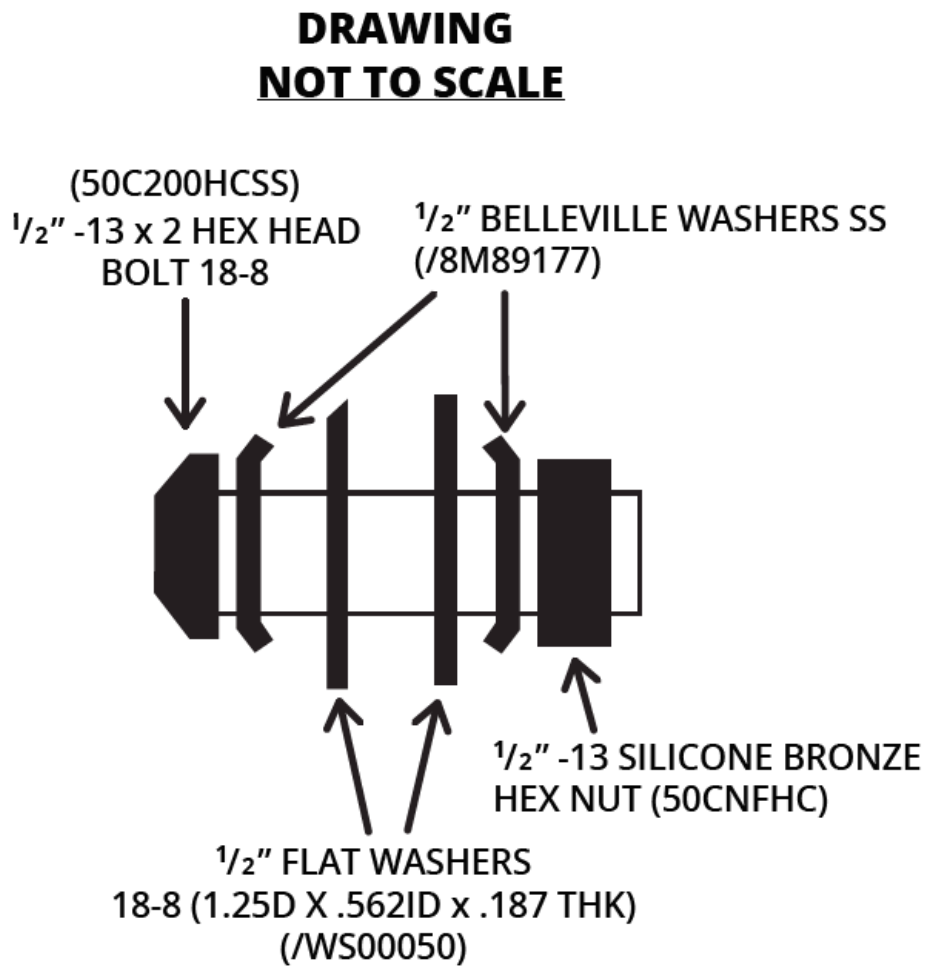
Three-Phase Transformers

- PETs will be attached
- Stiffener 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
- If stiffeners are installed, cut hole in the cover prior to installation – **DO NOT ADJUST OR REMOVE STIFFENERS**

Three-Phase Transformers

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

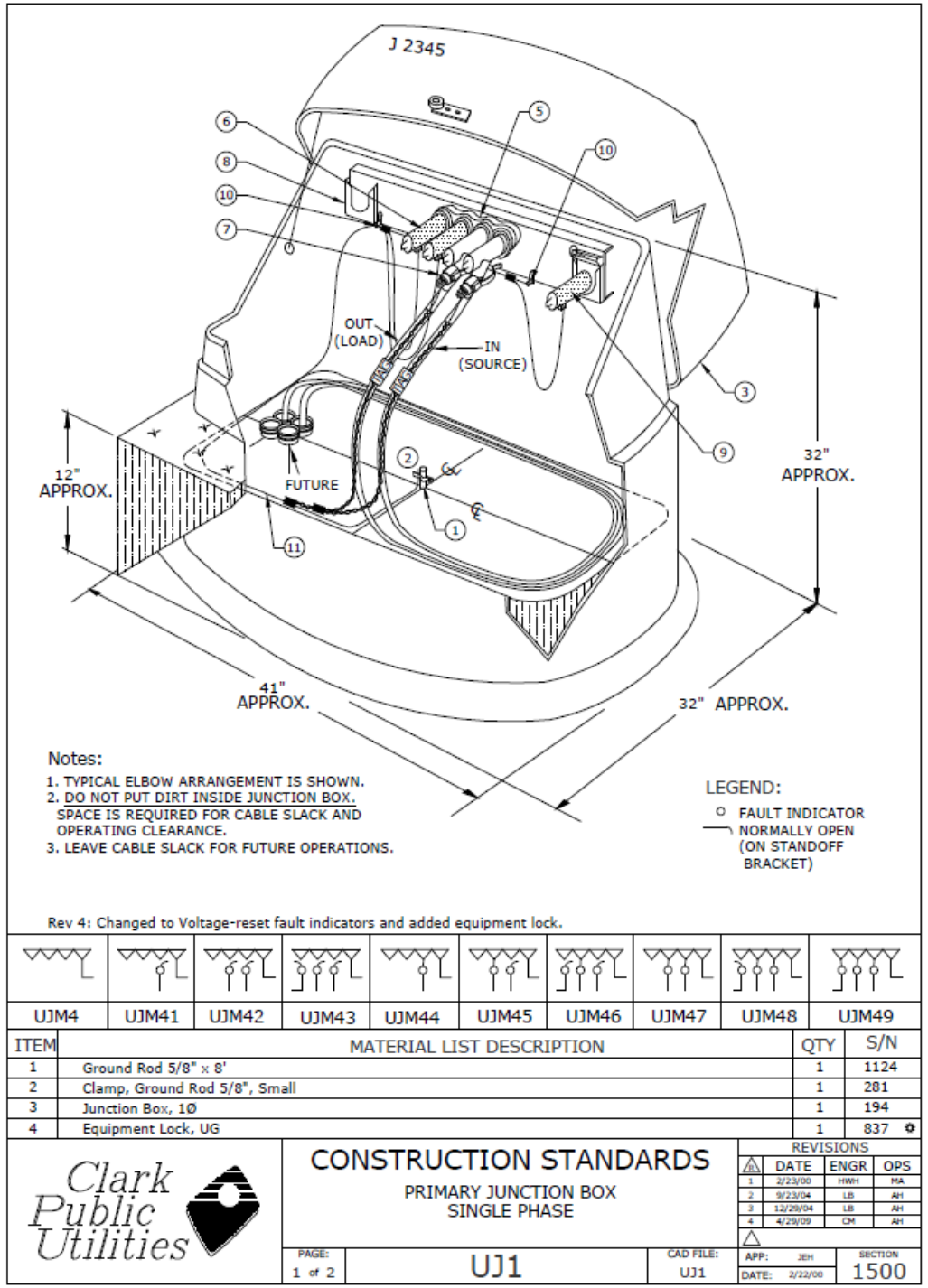
Three-Phase Transformers

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

Single Phase J-Box

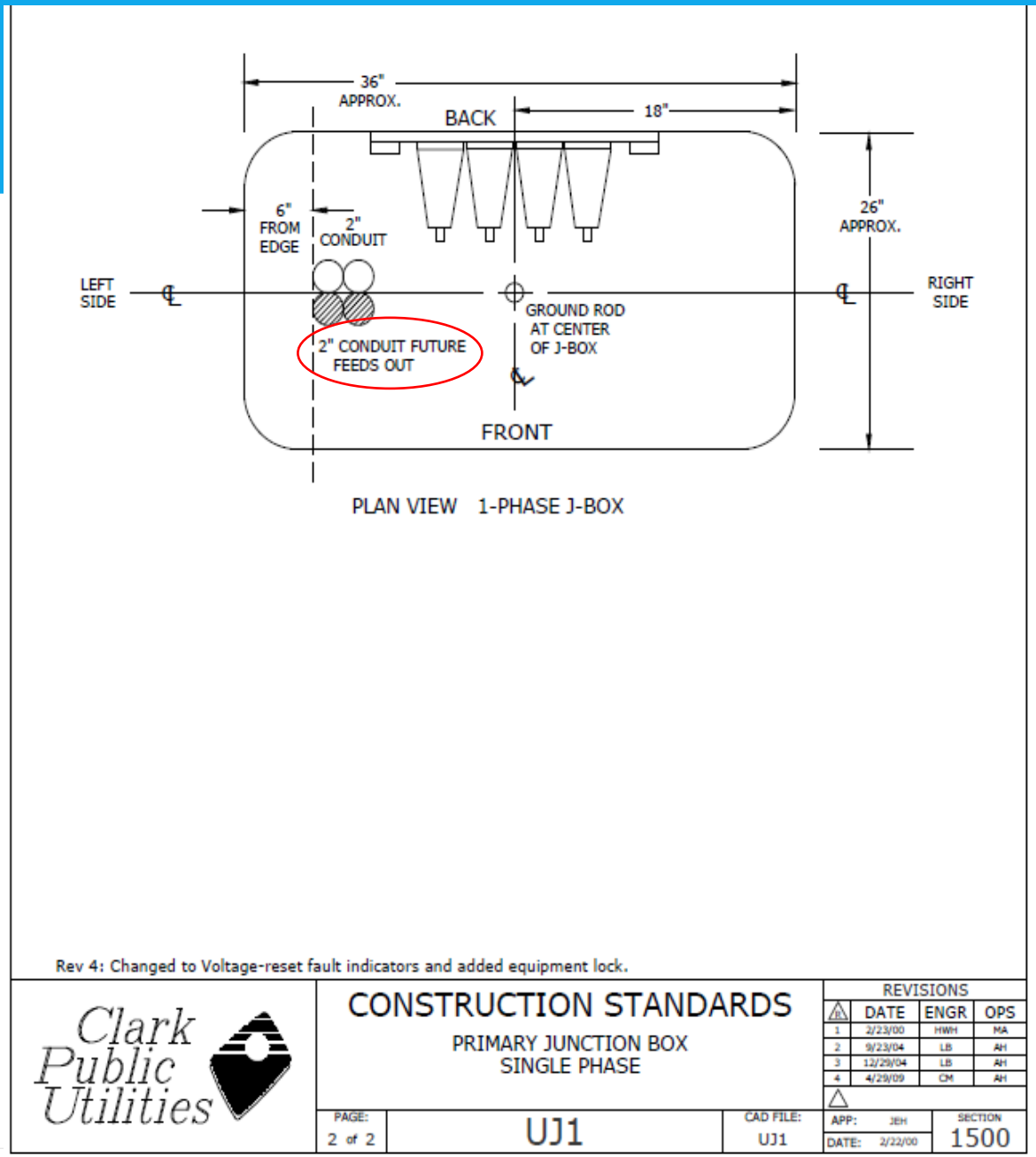
Single Phase J-Box

- Construction standard for single phase J-box



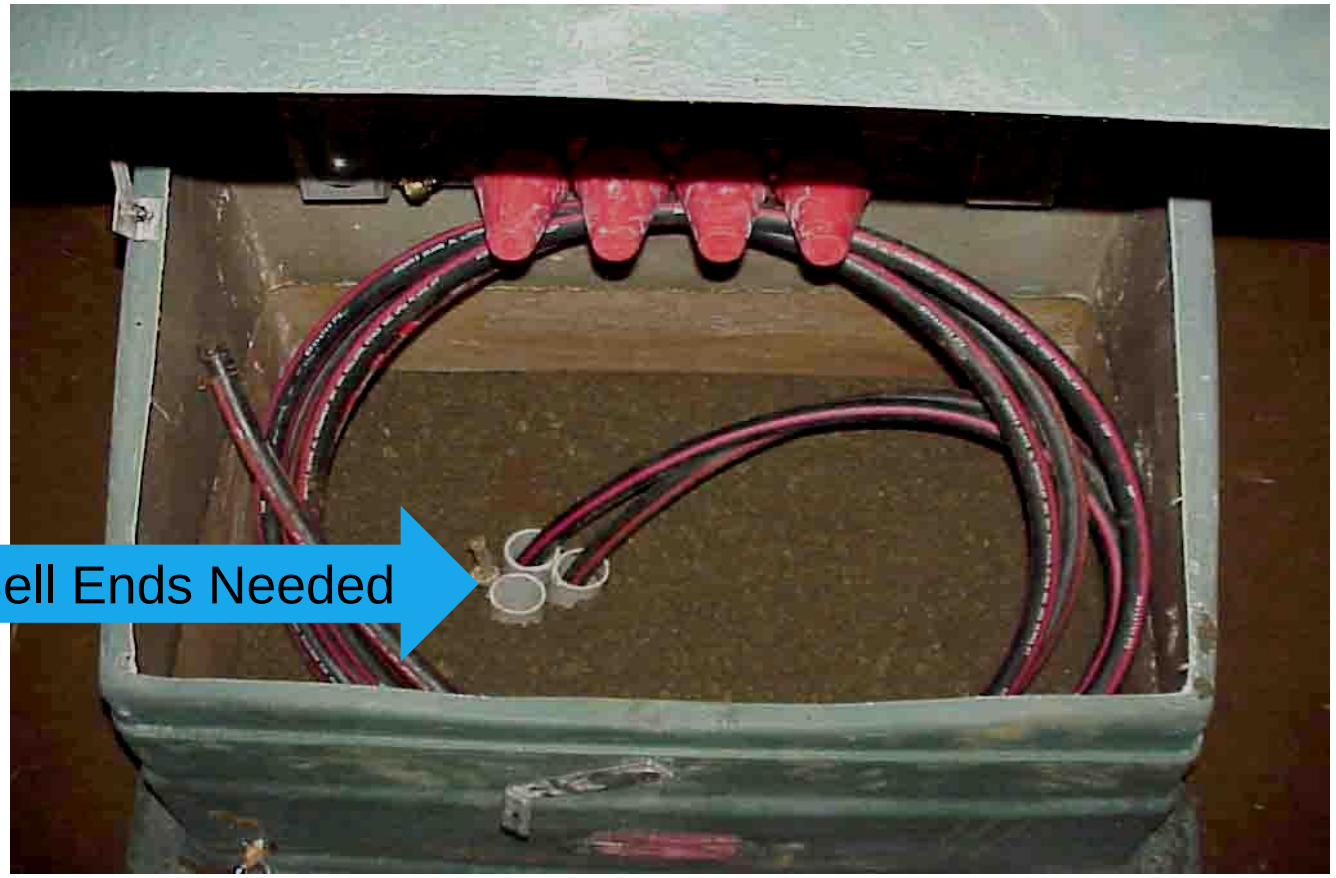
Single Phase J-Box

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



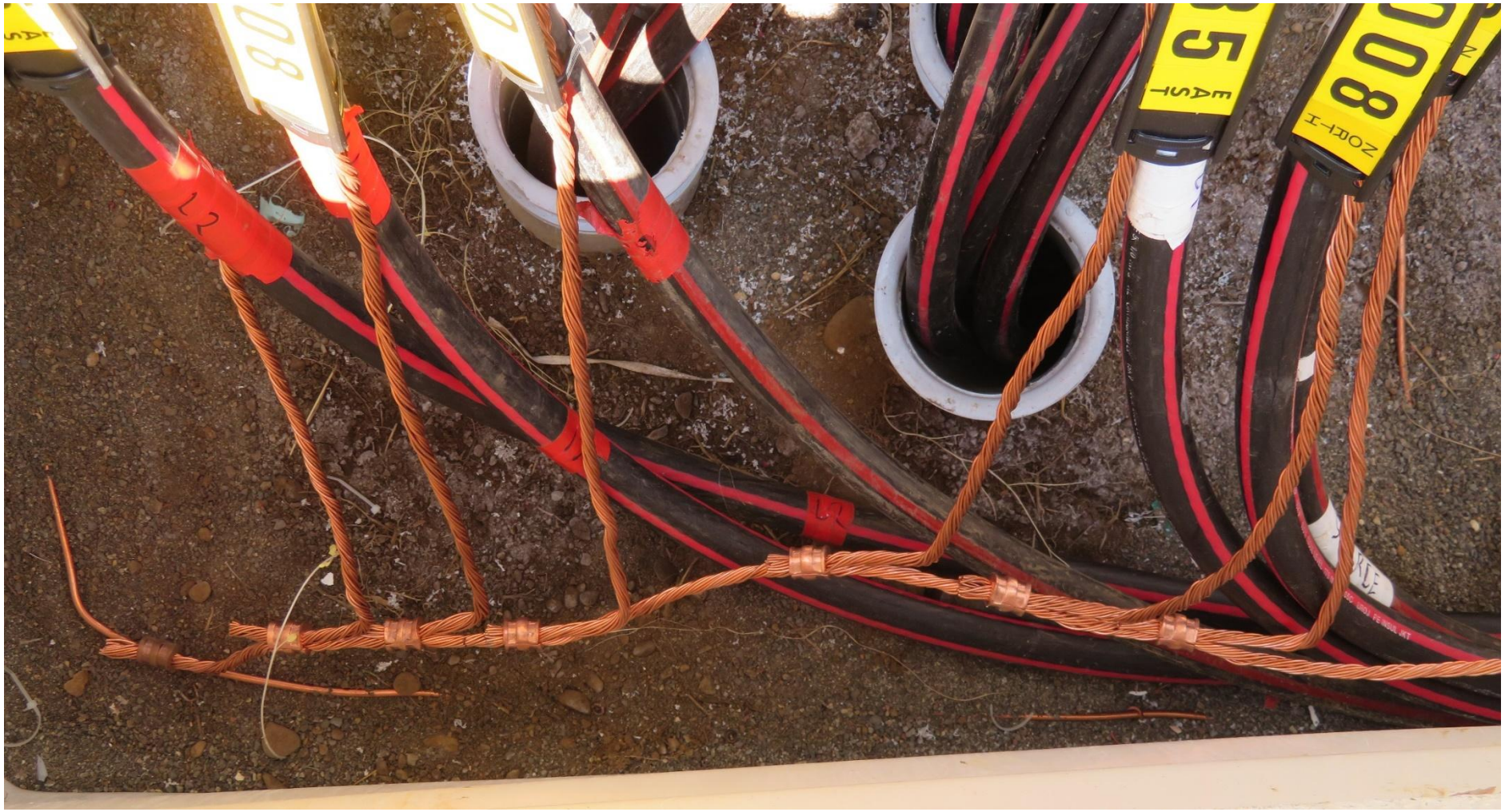
Single Phase J-Box

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



Single Phase J-Box

- Piggyback the Concentrics
- Attach the ground wire



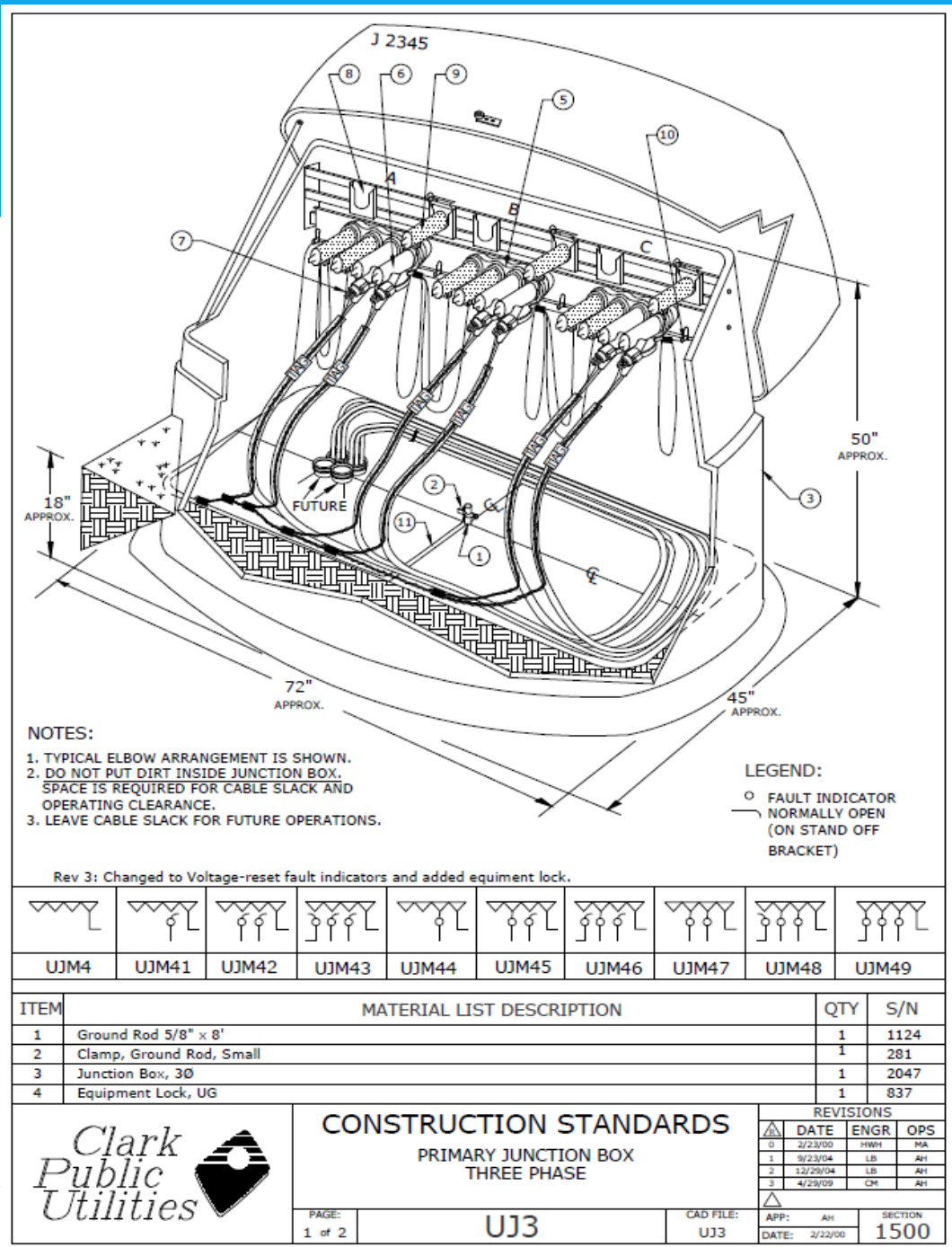
Single Phase J-Box

- Grade to the ground line
- Install the number stickers

Three Phase J-Box

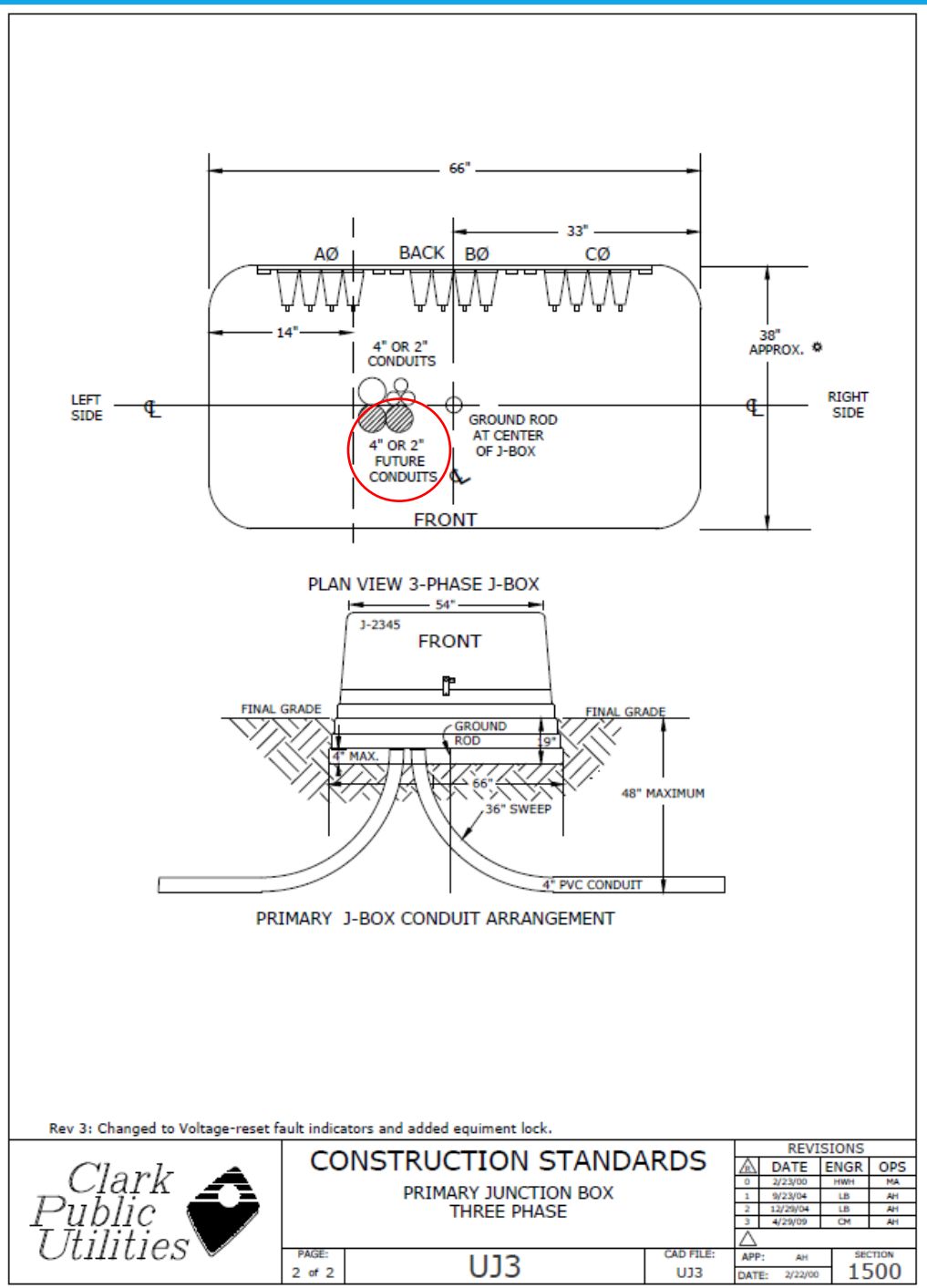
Three Phase J-Box

- Construction standard for a three phase J-box



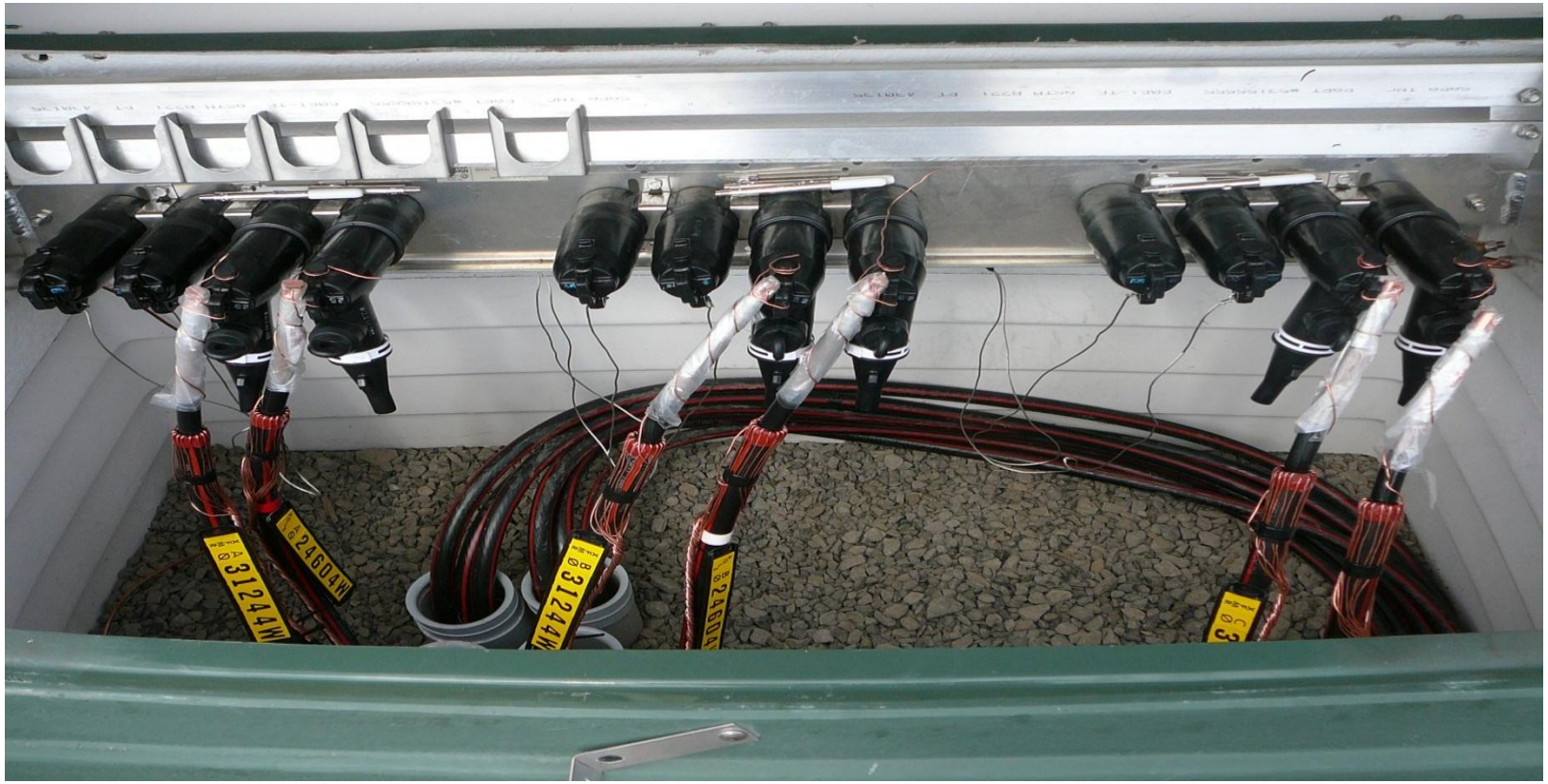
Three Phase J-Box

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



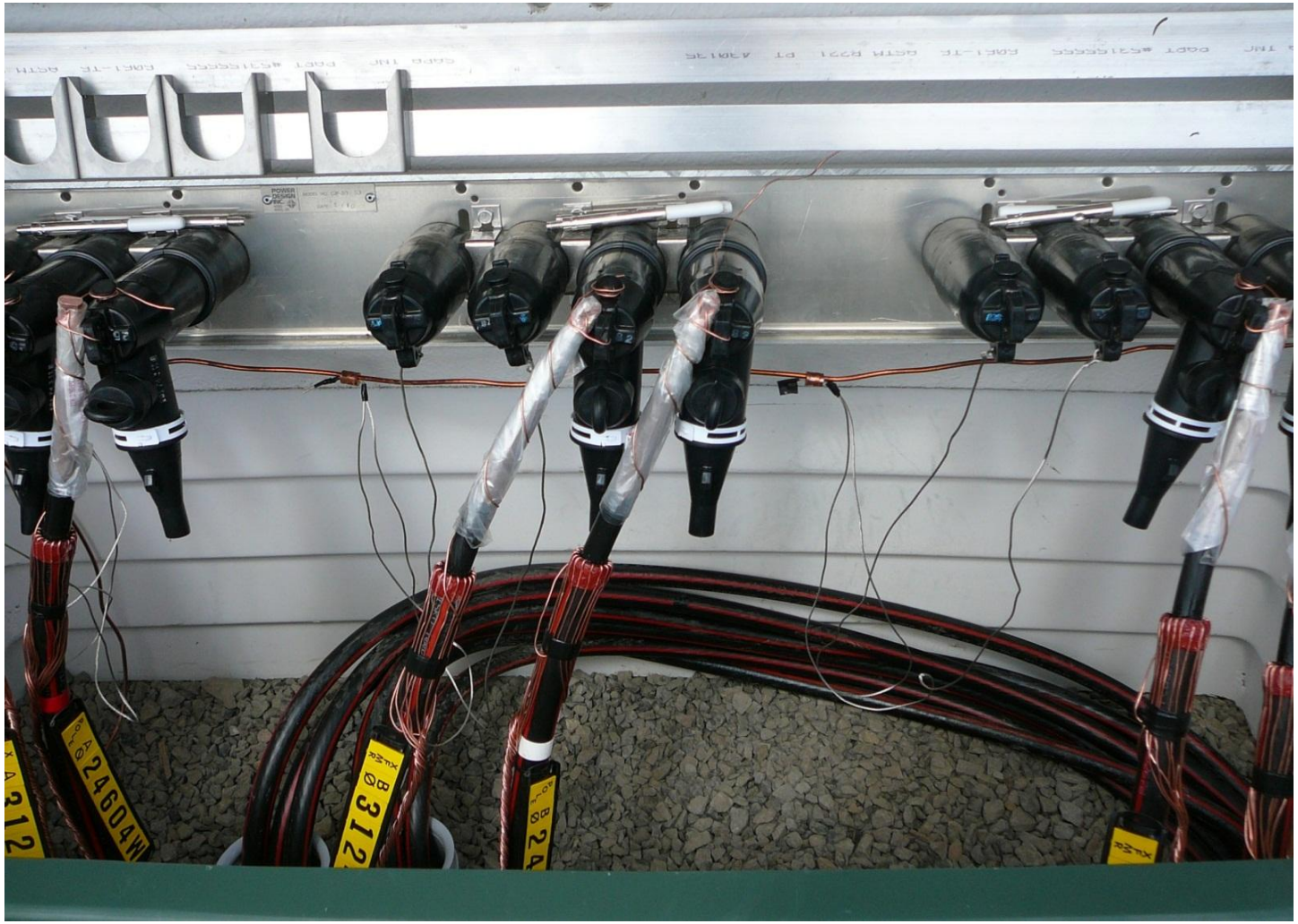
Three Phase J-Box

- 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



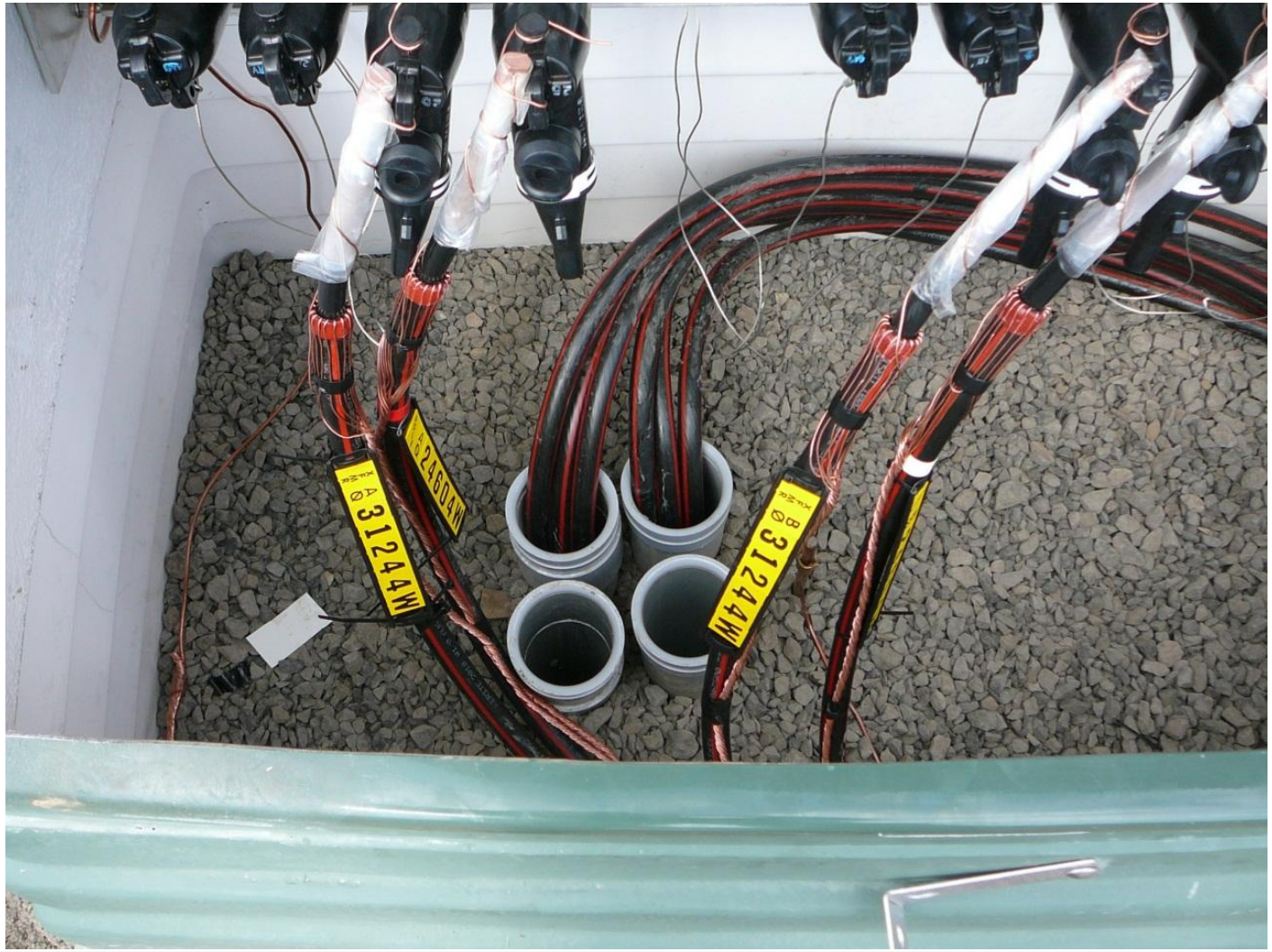
Three Phase J-Box

- Attach the dust cover bleeder wires to the ground wire



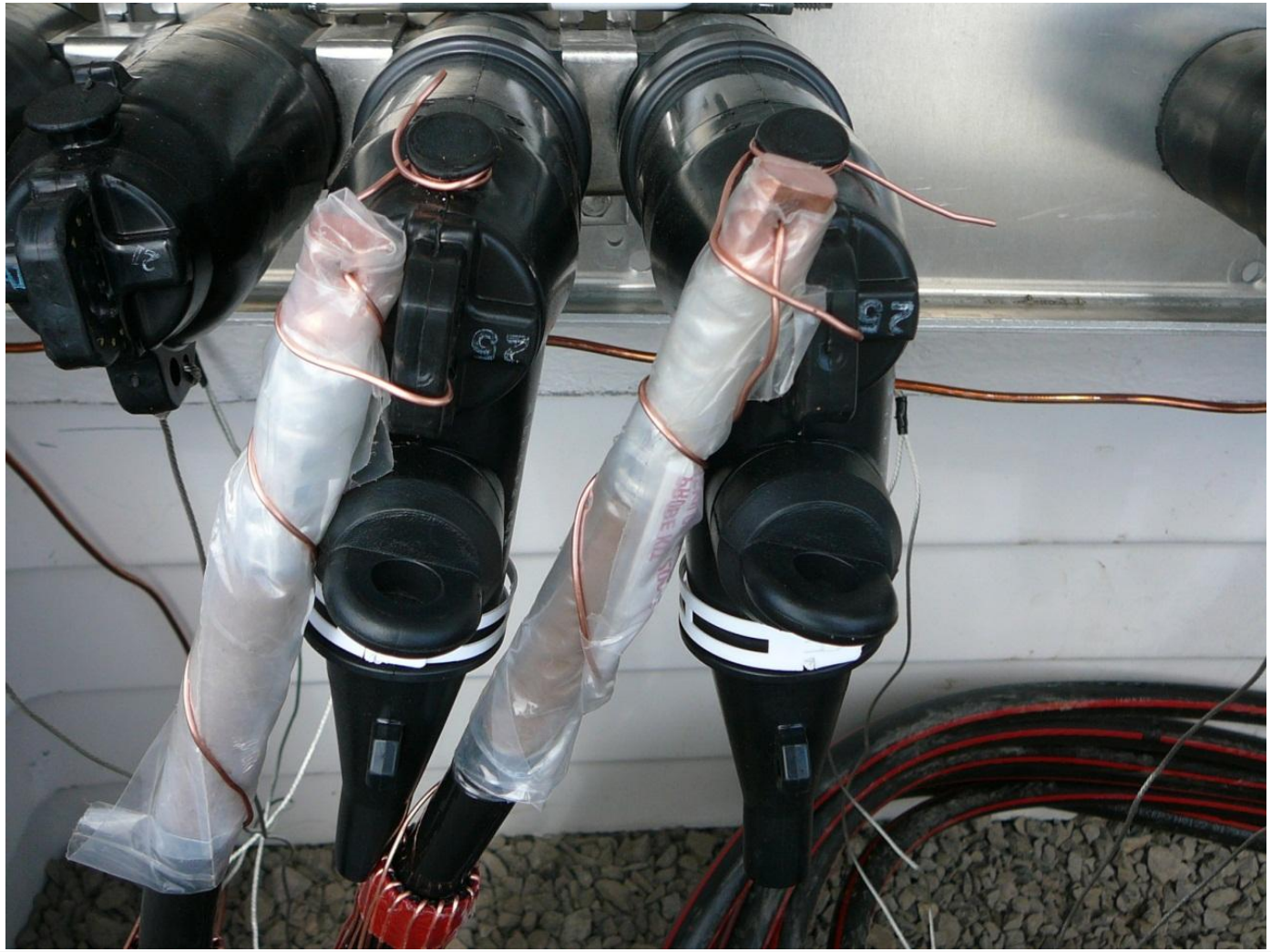
Three Phase J-Box

- Roll the wire out of the conduit



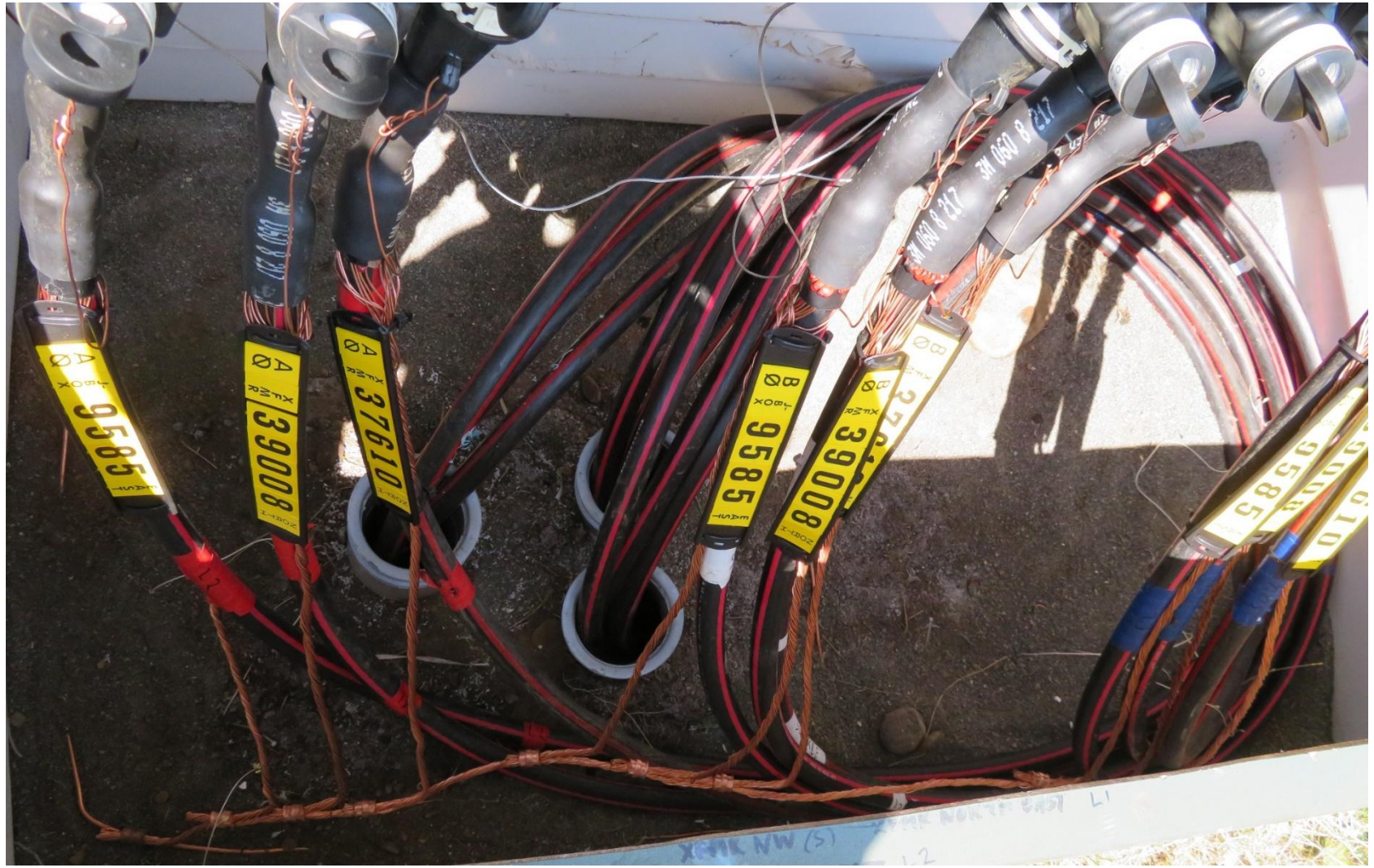
Three Phase J-Box

- Example of a good makeup



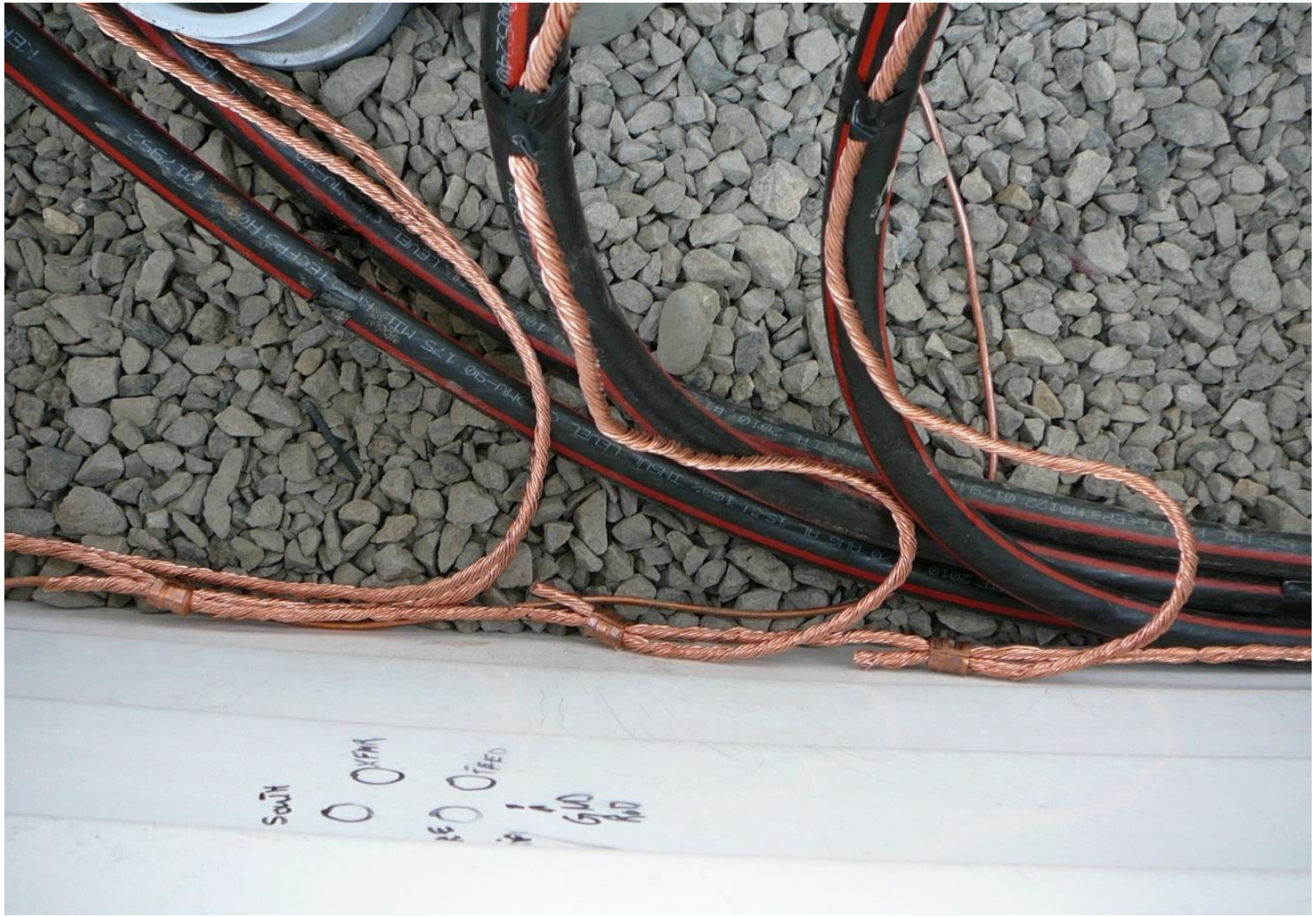
Three Phase J-Box

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



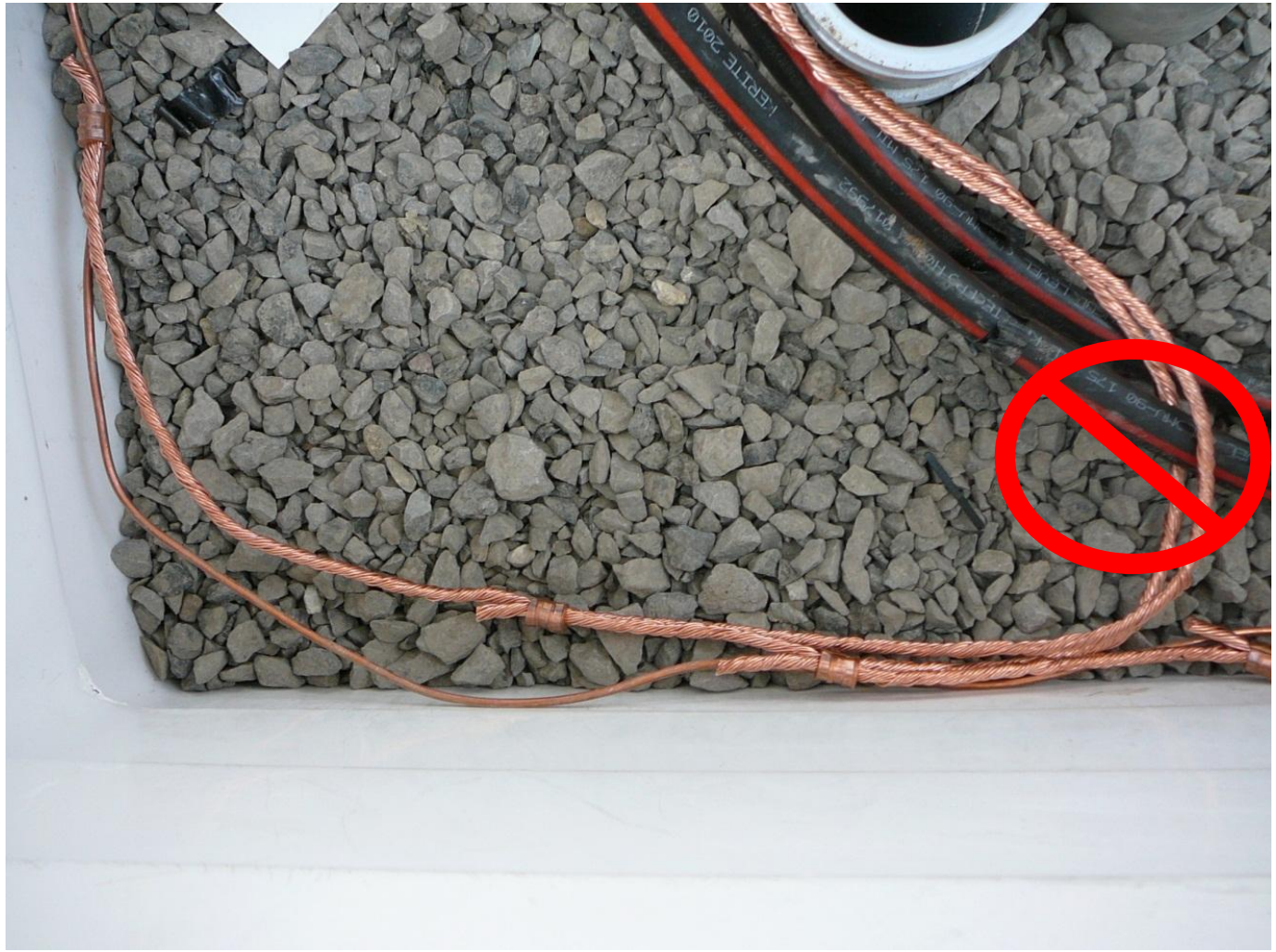
Three Phase J-Box

- Example of neutral slack



Three Phase J-Box

- In this case, the neutral crosses behind, trapping the primary, this is not acceptable



Three Phase J-Box

- Energized
- Close and Call CPU

Conduit Futures

Conduit Futures

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

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

- All pipe above ground shall be schedule 80
- 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
- Use long sweep 90 for primary
- Seal the ends of the wire when they will not be terminated
- Wire tail should be long enough to reach over the top of the pole
- Do not cut any bends of conduit

Plumbing Risers

- Do not do this!

Plumbing Risers

- Contractor is responsible for the cable
- You are taking a chance leaving the cable like this
- Pull riser wire last

Plumbing Risers

- Example of contractor protecting the wire at the bottom of the pole.

Questions?

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

Approved Primary Electrical Installation

Clark Public Utilities

Contractor Training Class 2025