

**Transformer Installation, Grounding and Connections
 208Y/120, 240Y/138, and 480Y/277 V, 3-Phase, 4-Wire
 Subtractive Polarity**

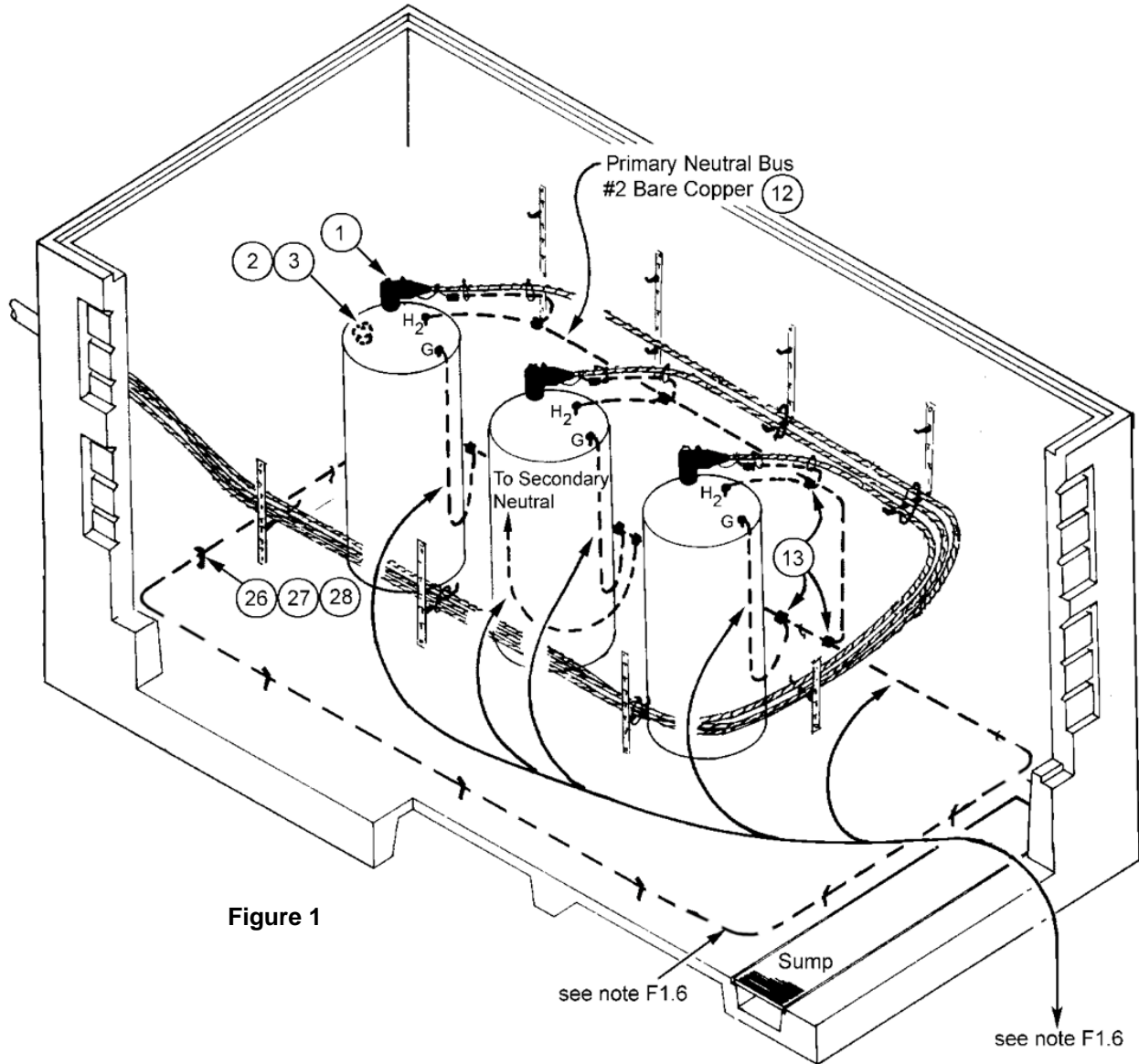


Figure 1

Figure 1 Notes

- F1.1 Cable tagging per U4-3.3
- F1.2 If J-Boxes, switches or other primary equipment is installed in the same vault, connect the primary neutrals to the primary neutral bus. (Equipment grounds may be attached to the ground bus.)
- F1.3 Route primary cable so that it is racked on at least 2 walls.
- F1.4 Generally, secondary is racked above primary.
- F1.5 Install high voltage sign (Stock No. 765181) and lock (URD-SNM-1) on all above grade installations.
- F1.6 Ground bus, equipment ground, and secondary neutral ground are #2 bare, 7 strand, soft drawn copper; all transformer sizes, item 12 on Table 2, Material List.

Also see **General Notes**, Page 5.

Standards Coordinator
Brett Hanson

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

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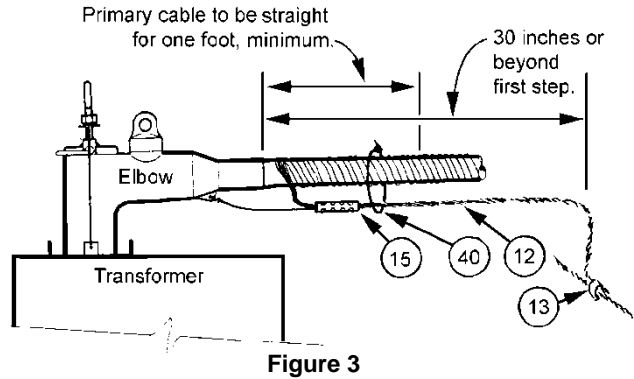
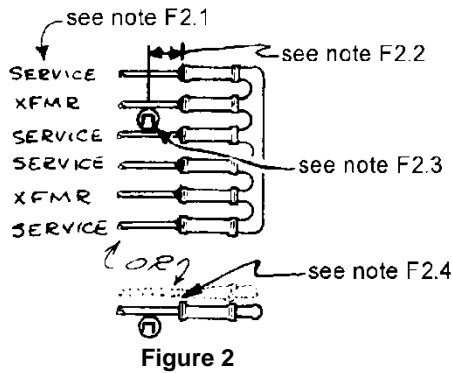


Figure 2 Notes

- F2.1 Stagger transformer leads with service cables.
- F2.2 Support cluster connector on step approximately 3" from end of boot (sleeve).
- F2.3 Sleeve step with 2" PVC or heat shrink tubing.
- F2.4 Cluster connector may be laid flat on step (neutral on bottom).

Figure 5 Notes – Transformers with Cable Leads

- F5.1 Cable tagging per U4-3.3.
- F5.2 When specified, install cable limiters per DU11-4.
- F5.3 When specified, install receptacles and/or vault lights per NTP-60.
- F5.4 All secondary leads to be laid straight on steps (hooks) with no intertwining of the leads.
- F5.5 To avoid induced currents and heating of the steps and racks, **do not** lay separate phase conductors on separate steps.
- F5.6 Connect only the neutrals on all idle services.

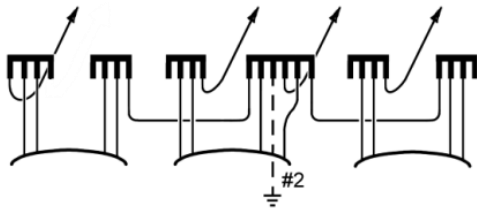
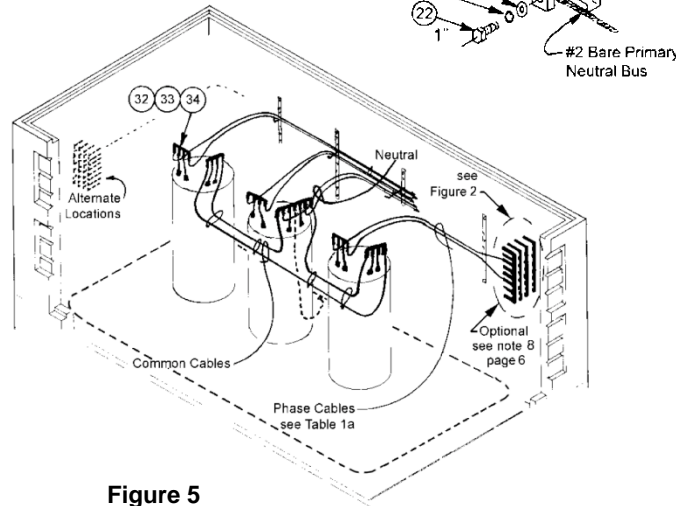
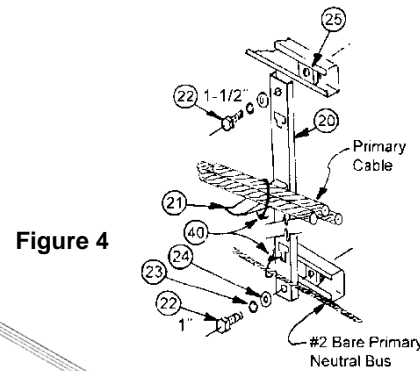


Figure 6

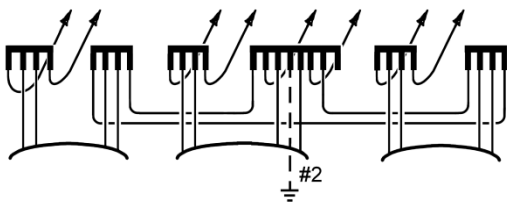


Figure 7

Table 1a. Copper Cable Sizes—Transformers with Leads

208Y/120 V and 240Y/138 V

kVA	Phase	Neutral	Figure
3–25	1–4/0	1–4/0	6
3–50	1–500	1–500	6
3–75	2–350	2–350	7

480Y/277 V

kVA	Phase	Neutral	Figure
3–25	1–2/0	1–2/0	6
3–50	1–4/0	1–4/0	6
3–75	1–4/0	1–4/0	6

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Table 1b. Copper Cable Sizes--Transformers with Spades

208Y/120 and 240Y/138			
kVA	Phase	Neutral	Figure
3-100	2-500	2-500	9
3-167*	2-750	2-750	9
3-167*	3-500	3-500	10
480Y/277 V			
kVA	Phase	Neutral	Figure
3-100	1-500	1-500	8
3-167*	2-350	2-350	9

Figure 8

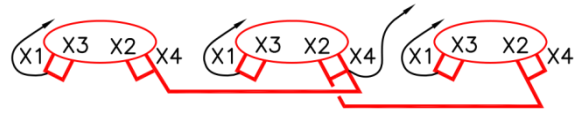


Figure 9

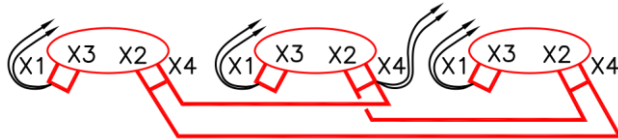
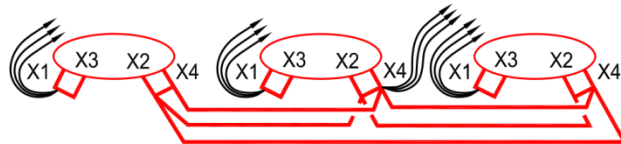


Figure 10



* See note 8, page 6

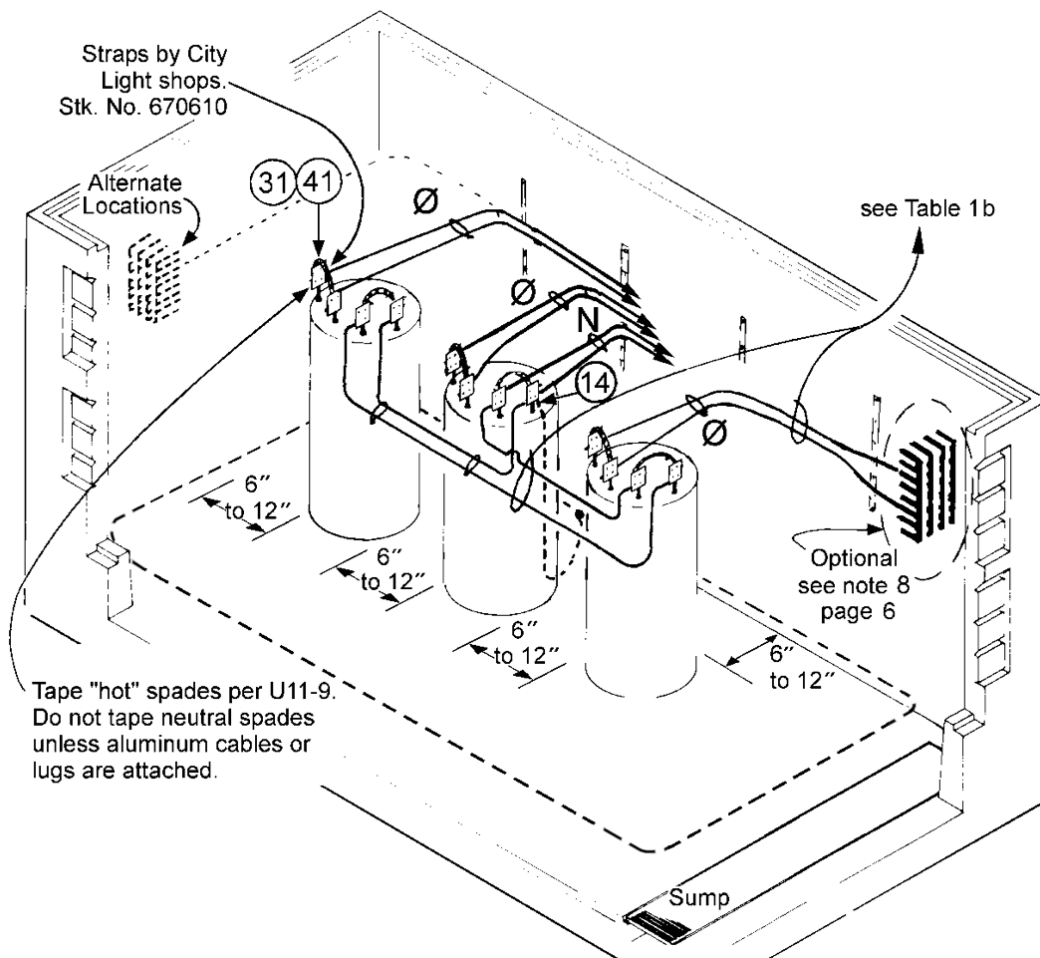


Figure 11

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Table 2. Material List (notes next page)

Item	Quantity	Description		Stock No.
1	3	ELBOW, Deadbreak, 15.2 kV to ground		686416
2	0, 1, 2 or 3	CAP, Insulating, Deadend (for 2 bushing transformers)		686411
3	as required	BAIL, Hold Down, 1 for each elbow & each dead end cap		012587
12	90 ft.	WIRE, Bare, stranded, copper #2		610434
13	8	CONNECTOR, Parallel, crimpet, #2 to #2		677326E
14	see page 5	TERMINAL, Compression, copper lug	#2	677071E
			2/0	677077E
15	3	SPLICE, straight, copper, #2 to #2		677357E
20	8 estimated	RACK, 18 hole, galvanized, 30"		721666E
21	8 estimated	HOOK, Cable Rack, galvanized steel	4"	720625E
			7-1/2"	720626E
			14"	720631E
22	8 estimated	MACHINE BOLT, zinc plated, 1/2" x 1"	1/2" x 1"	784825E
	8 estimated		1/2" x 1-1/2"	784827E
23	16 estimated	LOCK WASHER, galvanized, 1/2"		584255E
24	16 estimated	FLAT WASHER, galvanized, 1/2"		585025E
25	16 estimated	UNISTRUT NUT, P 4010, 1/2"		723607E
26	6 estimated	PIPE STRAP, 1 Hole, galvanized, 1/4"		713440E
27	6 estimated	ANCHOR, light duty, 1/4" - 20 (see note T2.1, page 5)		780074E
28	6 estimated	SCREW, Slotted, round-head, brass (see note T2.2, p5)	1/4"-20 x 3/4"	785827E
		SCREW, Cap, silicon bronze, hex head (see note T2.2, p5)	1/2"-13 x 1"	784585E
30	see page 5	CABLE, 600 V, XLP, copper	2/0	613733
			4/0	613735
			350	613738
			500	613740
			750	613743
31	see page 5	TERMINAL, Compression, copper lug	350	677087E
			500	677091E
			750	677100
32	see page 5	CONNECTOR, Multiple Cluster	3 position	678800
			4 position	678707
			6 position	678713
			8 position	678715
33	see page 5	TERMINAL, Lug, extra long barrel	#2 Cu, for grounding only	012729
		TERMINAL, Lug for multiple connectors	#2 Cu	678687E
			2/0 Cu	678687E
			4/0 Cu	678689E
			300 to 350 Cu stranded compact	678699E
			400 to 500 Cu stranded compact	678700E
34	see page 5	INSULATING SLEEVE		678620E
		SLEEVE PLUG		678618E
35	1	SPLICE, Compression, (see note T2.3, page 5), #2 to #2		677357E
36	1 roll	SEALANT, Electrical, 3-3/4", (see note T2.3, page 5)		736470E
37	1 roll	TAPE, Electrical, plastic, 3/4", (see note T2.3, page 5)		736655E
40	6 estimated	TIE STRAP, plastic	7"	735805E
	20 estimated		14"	735811E
41		Nuts, bolts, washers and tape per Guideline U11-9		-

Table 2 Notes

- T2.1** Item 27: Not needed for vaults furnished with inserts cast in the walls or for 814 and 818 precast vaults.
- T2.2** Item 28: Use 1/2" if 814 or 818 precast vault.
- T2.3** Items 32, 33 and 34: Use only with transformers with cable leads (25 to 75 kVA).

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Table 3. Material Quantity Estimates – Transformers with Cable Leads and Spade Lugs

KVA	Voltage	Wire, ft. §					Cluster				Terminals ▲					Steeves	Plugs	Copper Comp Lugs				
		2/0	4/0	350	500	750	3P	4P	6P	8P	#2*	2/0	4/0	350	500			#2	2/0	350	500	750
Cable Leads																						
3-25	208Y/120	–	10	–	–	–	–	5	1	–	1	–	4	–	–	26	5	–	–	–	–	
	480Y/277	10	–	–	–	–	–	5	1	–	1	4	–	–	26	5	–	–	–	–	–	
	240Y/138	–	10	–	–	–	–	5	1	–	1	–	4	–	–	30	6	–	–	–	–	
3-50	208Y/120	–	–	–	10	–	–	5	1	–	1	–	–	–	4	26	5	–	–	–	–	
	480Y/277	–	10	–	–	–	–	5	1	–	1	–	4	–	–	26	5	–	–	–	–	
	240Y/138	–	–	–	10	–	–	5	1	–	1	–	–	–	4	30	6	–	–	–	–	
3-75	208Y/120	–	–	20	–	–	–	5	–	1	1	–	–	6	–	28	1	–	–	–	–	
	480Y/277	–	10	–	–	–	–	5	1	–	1	–	4	–	–	26	5	–	–	–	–	
	240Y/138	–	–	20	–	–	–	5	–	1	1	–	–	6	–	32	3	–	–	–	–	
Spades																						
3-100	208Y/120	–	–	–	20	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	6	
	480Y/277	–	–	–	10	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	4	
	240Y/138	–	–	–	20	–	–	–	–	1	–	–	–	–	4	–	–	1	–	–	4	
3-167	208Y/120	–	–	–	30€	20€	–	–	–	–	–	–	–	–	–	–	–	1	–	–	10€	
	480Y/277	–	–	20	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	6	–	
	240Y/138	–	–	–	20	–	–	–	–	1	–	–	–	–	4	–	–	1	–	–	4	

§ Does not include cable between transformers and service or collector buss/clusters.

▲ Transformers with cable leads come with lugs.

* Extra long barrel terminal lug Stock No. 012729.

€ Option 2-750 is preferred; 3-500 is an option.

General Notes

1. Cable tagging per U4-3.3
2. If J-Boxes, switches or other primary equipment is installed in the same vault, connect the primary neutrals to the primary neutral bus. (Equipment grounds may be attached to the ground bus.)
3. Primary cable to route so that it is racked on at least 2 walls.
4. Generally, secondary is racked above primary.
5. Install high voltage sign (Stock No. 765181) and lock (URD-SNM-1) on all above grade installations.
6. Generally, up to 4 sets of service cables may be connected directly on the transformer spades or cluster connectors providing:
 - 6.1 Service cables are no larger than 500 kcmil if to be connected on residential/light commercial-industrial type cluster connectors.
 - 6.2 Service cables are no larger than 750 kcmil if to be connected on the transformer spades or to heavy duty type cluster connectors.
7. Cluster connectors shown on the vault walls are optional depending upon the number and size of customer service cables per phase. They must be ordered in addition to the items shown above. The following considerations apply:
 - 7.1 Residential, light industrial or light commercial type.
 - Maximum cable size is 500 kcmil per position since the cluster connector requires 7/8-inch bolt spacing, hook type lugs (Stock Nos. 678687E through 678700E).
 - Available in 3, 4, 6 and 8 position with streetlight tap (Stock Nos. 678800, 678707, 678713 and 678715).
 - Each cluster connector weighs approximately 4-1/2 pounds.
 - 7.2 Heavy duty type
 - Maximum cable size is 1000 kcmil per position. These connectors require 1-3/4 inch bolt spacing lugs (Stock Nos. 651255 through 651272 for aluminum and 677065E through 677100 for copper).
 - Available in 4, 6 and 8 position (Stock Nos. 678760 through 678763).
 - Each heavy duty cluster connector weighs approximately 16 pounds.

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8. The decision on whether to use 500 or 750 kcmil cable will depend upon:
 - 8.1 Number and size of service cables.
 - 8.2 Heavy duty vs. "lighter" duty cluster connectors.
 - 8.3 Number of positions available on transformer spades with or without stacking type lugs.
 - 8.4 Hand vs. motor driven compression tools (motor driven press is required for lugs above 500 kcmil.)
 9. The materials shown here are based on the use of 138/277 volt transformers (with the two secondary windings connected in series) for 480Y/277 volt services rather than 277 volt transformers.
 10. See U11-9 for materials and waterproofing for transformers with spade type secondary terminals (100 kVA and larger).
 11. Connect all installed grounding electrodes. See U2-15.1.
 12. To facilitate temporary metering on transformers with secondary cable leads:
 - Install a multiple connector with a streetlight tap.
 - Extend #12 wire Stock No 612220 from streetlight tap, a minimum of 24 inches.
 - Strip wire end and connect a wire nut.
 - Wrap each wire with colored tape to match the secondary conductor phase tape.
- To facilitate temporary metering on transformers with secondary spades:
- Extend #12 wire Stock No 612220 from spade, a minimum of 24 inches.
 - Strip wire end and connect a wire nut.
 - Wrap each wire with colored tape to match the secondary conductor phase tape.