

**Transformer Installation, Grounding and Connections
 120/240 V and 240/480 V, 3-Phase, 4-Wire**

Figure 1

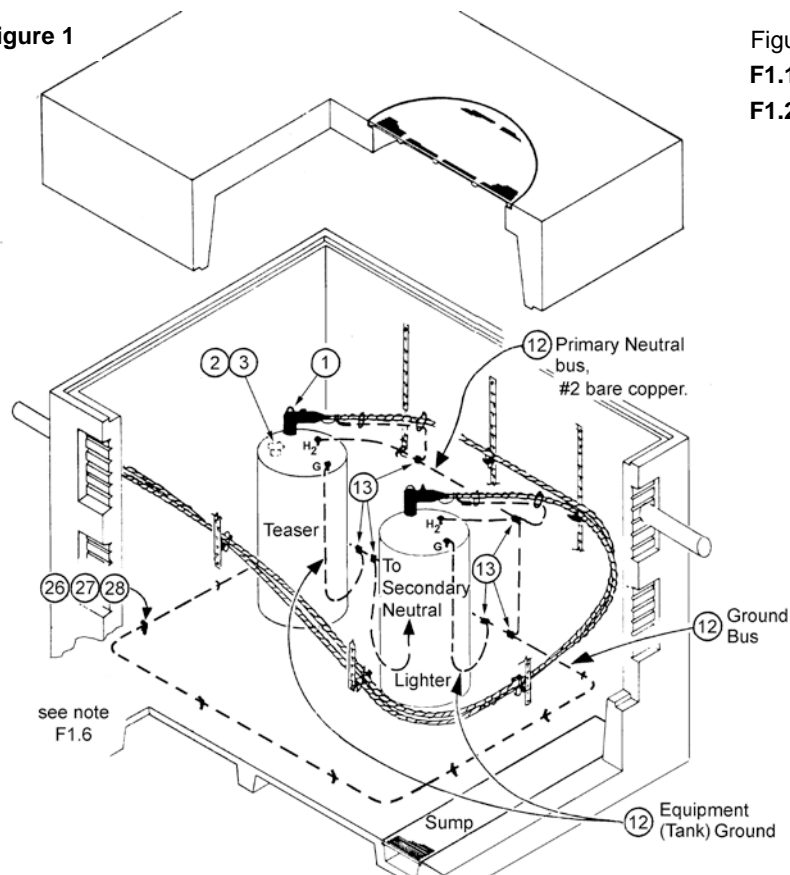
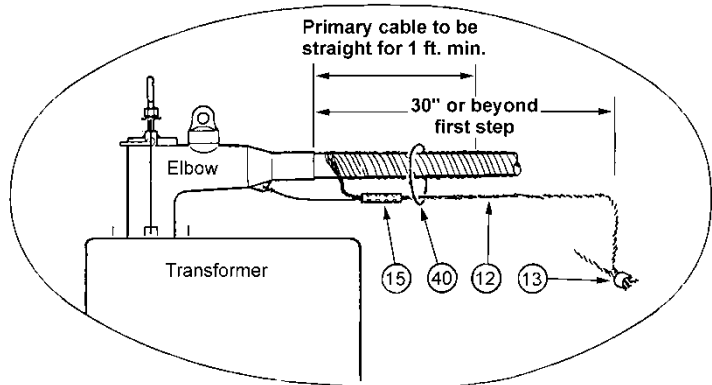


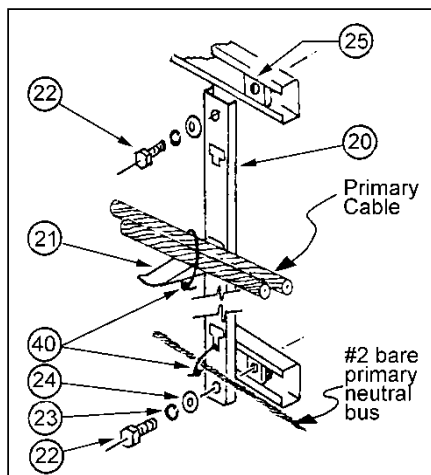
Figure 1 Notes:

- 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. Primary cable to route so that it is racked on at least 2 walls.
- F1.4. Generally, secondary is racked above primary.
- F1.5. Install high voltage sign (765181) and lock (URD-SNM-1) on all above grade installations.
- F1.6. Connect all installed grounding electrodes. See U2-15.1.

**CAUTION: HIGH VOLTAGE
 MAY EXIST ON SECONDARY
 BUSHINGS. CONNECT
 CENTER-POINT GROUND ON
 LIGHTER AND CONNECT
 TEASER TO LIGHTER
 BEFORE ENERGIZING
 PRIMARIES.**



Elbow Detail



Racking Detail

Figure 2

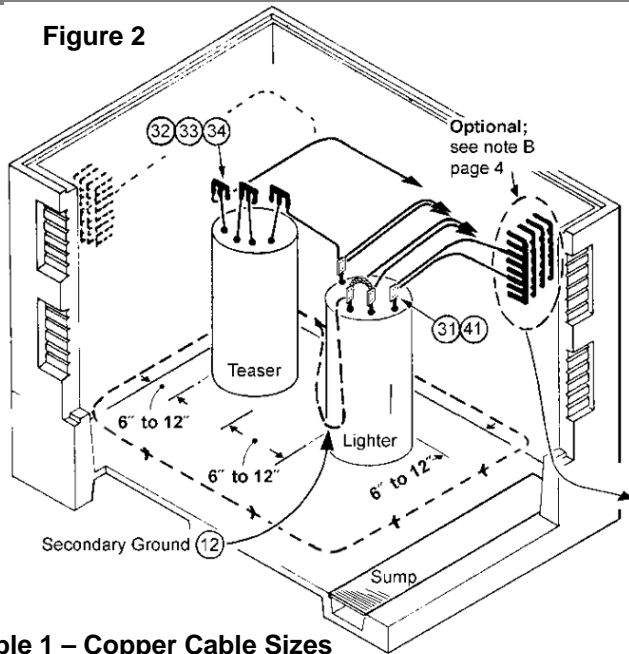


Figure 2 Notes

- F2.1. Cable tagging per U4-3.3.
- F2.2. When specified, install cable limiters per DU11-4.
- F2.3. When specified, install receptacles and/or vault lights per Construction Standard NTP-60.
- F2.4. All secondary leads to be laid straight on steps (hooks) with no intertwining of the leads.
- F2.5. To avoid induced currents and heating of the steps and racks, **do not** lay separate phase conductors on separate steps.
- F2.6. Connect only the neutrals on all idle services.

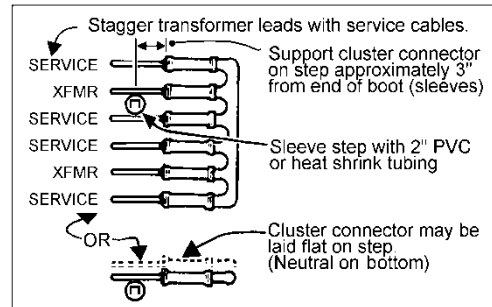
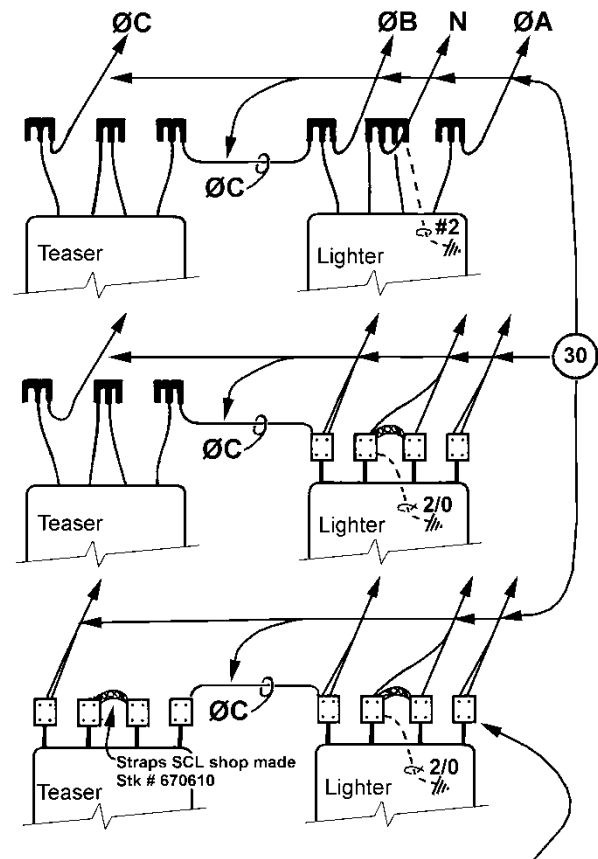


Table 1 – Copper Cable Sizes

	ΦA	ΦB	ΦC	N
kVA	120/240 V 3Φ			
025-25	4/0	4/0	4/0	4/0
050-25	4/0	4/0	4/0	4/0
050-50	4/0	4/0	4/0	4/0
075-25	500	500	4/0	500
075-50	500	500	4/0	500
075-75	500	500	500	500
100-25	500	500	4/0	500
100-50	500	500	4/0	500
100-75	500	500	500	500
100-100	500	500	500	500
167-25	750	750	4/0	500
167-50	750	750	4/0	500
167-75	750	750	500	500
167-100	750	750	500	500
167-167	750	750	750	500
	240/480 V 3Φ			
025-25	2/0	2/0	2/0	2/0
050-25	2/0	2/0	2/0	2/0
050-50	2/0	2/0	2/0	2/0
075-25	4/0	4/0	2/0	4/0
075-50	4/0	4/0	2/0	4/0
075-75	4/0	4/0	4/0	4/0
100-25	350	350	2/0	350
100-50	350	350	2/0	350
100-75	350	350	4/0	350
100-100	350	350	350	350
167-25	500	500	2/0	500
167-50	500	500	2/0	500
167-75	500	500	4/0	500
167-100	500	500	350	500
167-167	500	500	500	500

Note: 2-500 may be substituted for 750.



Tape all "hot" spades (including high leg) per U11-9. Do not tape neutral spades unless aluminum cables or lugs are attached.

Figure 3

Table 2 – Material List

Item	Quantity	Description	Stock No.
Primary			
01	02	ELBOW, deadbreak, 15.2 kV to ground	686416
02	00, 1 or 2	CAP, insulating, deadend (for 2 bushing transformers)	686411
03	00, 1 or 2	BAIL, hold down, 1 for each elbow and each dead end cap	686563
Grounding			
12	100 ft.	WIRE, bare, stranded, copper #2	610434
13	02	CONNECTOR, parallel, crimpet, #2 to #2	677326E
14	see Table 3	TERMINAL, compression, copper lug, #2	677071E
15	02	SPLICE, copper, straight, #2 to #2	677357E
Racking and Mounting			
20	06 estimated	RACK, 18 hole, galvanized, 30"	721666E
21	06 estimated	HOOK, cable rack, galvanized steel	4"
	08 estimated		7-1/2"
	02 estimated		14"
22	06 estimated	MACHINE BOLT, zinc plated 1/2" x 1"	1/2" x 1"
			1/2" x 1-1/2"
23	12 estimated	LOCK WASHER, galvanized, 1/2"	584255E
24	12 estimated	FLAT WASHER, galvanized, 1/2"	585025E
25	12 estimated	UNISTRUT NUT, P 4010, 1/2"	723607E
26	10 estimated	PIPE STRAP, 1 hole, galvanized, 1/4"	713440E
27*	10 estimated	ANCHOR, light duty, 1/4" - 20	780074E
28**	10 estimated	SCREW, slotted, round-head, brass	1/4" - 20 x 3/4"
Secondary			
30	see Table 3	CABLE, 600 V, XLP, copper	2/0
			4/0
			350
			500
			750
31	see Table 3	TERMINAL, compression, copper lug	2/0 transformer ground
			4/0
			350
			500
			750
32	see Table 3	CONNECTOR, multiple cluster	3 position
			4 position
33	see Table 3	TERMINAL, lug for multiple connectors	#2 Cu
			2/0 Cu
			4/0 Cu
			300 to 350 Cu stranded compact
			400 to 500 Cu stranded compact
34	see Table 3	INSULATING SLEEVE	678620E
Miscellaneous			
40	04 estimated	TIE STRAP, plastic	7"
	16 estimated		14"
41		Nuts, bolts, washers and tape per Guideline U11-9	–

* Item 27: Not needed for vaults furnished with inserts cast in the walls or for 814 and larger vaults.

** Item 28: Use 1/2" if 814 or 818 precast vault.

General Notes

- A. Generally, up to 4 sets of service cables may be connected directly on the transformer spades or cluster connectors if:
 - A1. Service cables to be connected on cluster connectors are no larger than 500 kcmil.
 - A2. Service cables to be connected on the transformer spades are no larger than 750 kcmil.
- B. Cluster connectors shown on the vault walls are to be ordered separately with the following considerations:
 - B1. Residential, light industrial or light commercial type.
 - B1.1. Available in 3, 4, 6 and 8 position with streetlight tap (Stock Nos. 678800, 678707, 678713, and 678715).
 - B1.2. Maximum cable size is 500 kcmil per position since the cluster connector requires 7/8 inch bolt spacing, hook type lugs (Stock Nos. 678687E thru 678700E).
 - B1.3. Each cluster connector weighs approximately 4-1/2 pounds.
 - B2. Heavy duty type
 - B2.1. Available in 4, 6 & 8 position (Stock Nos. 678760 thru 678763).
 - B2.2. Maximum cable size is 1000 kcmil per position. These connectors require 1-3/4 inch bolt spacing lugs (Stock Nos. 651255 thru 651272 for aluminum and 677065E thru 677100 for copper).
 - B2.3. Each heavy duty cluster connector weighs approximately 16 pounds.
- C. The decision on whether to use 500 or 750 kcmil cable will depend upon:
 - C1. Number and **size** of service cables.
 - C2. Heavy duty vs. "lighter" duty cluster connectors.
 - C3. Number of positions available on transformer spades with or without stacking type lugs.
 - C4. Hand vs. motor driven compression tools (motor driven press is required for lugs above 500 kcmil.)
- D. Connect all installed grounding electrodes. See U2-15.1.

Table 3 – Estimated Material Quantities

Estimated quantities are given as the minimum number required. The numbers following in parentheses indicate estimated additional quantities required to run to cluster connectors on vault walls, as 5(40). Assumes transformer with cable leads come with terminal lugs for cluster connectors.

Transformer Bank Size	Item 30					Items 14 & 31						Item 32		Item 33					Item 34					
	Cable, 1/C, 600V, XLP, Cu					Terminal Lug, Cu, Compression						Connector, Multiple Cluster		Terminal Lug, Al/Cu for Cluster Connector					Sleeves Insulating for Cluster Connector					
	2/0	4/0	350	500	750	#2	2/0	4/0	350	500	750	3PSN	4PSN	#2*	2/0	4/0	350	500	CAP #2	2/0	4/0	350	500	
120/240	2/0	4/0	350	500	750	#2	2/0	4/0	350	500	750	3PSN	4PSN	#2*	2/0	4/0	350	500	CAP #2	2/0	4/0	350	500	
25&25	-	5(40)	-	-	-	-	-	-	-	-	-	5	1	1	-	6	-	-	4	1	-	6	-	-
50&25	-	5(40)	-	-	-	-	-	-	-	-	-	5	1	1	-	6	-	-	4	1	-	6	-	-
50&50	-	5(40)	-	-	-	-	-	-	-	-	-	5	1	1	-	6	-	-	4	1	-	6	-	-
75&25	-	5(10)	-	0(30)	-	-	-	-	-	-	-	5	1	1	-	3	-	3	4	1	-	3	-	3
75&50	-	5(10)	-	0(30)	-	-	-	-	-	-	-	5	1	1	-	3	-	3	4	1	-	3	-	3
75&75	-	-	-	5(40)	-	-	-	-	-	-	-	5	1	1	-	-	-	6	4	1	-	-	-	6
100&25	-	5(10)	-	0(30)	-	-	1	1(0)	-	3	-	3	-	-	-	2	-	-	3	-	-	2	-	-
100&50	-	5(10)	-	0(30)	-	-	1	1(0)	-	3	-	3	-	-	-	2	-	-	3	-	-	2	-	-
100&75	-	-	-	5(40)	-	-	1	0	-	1(3)	-	3	-	-	-	-	2	-	3	-	-	-	2	-
100&100	-	-	-	5(40)	-	-	1	-	-	2(4)	0	-	-	-	-	-	-	-	-	-	-	-	-	-
167&25	-	5(10)	-	0(10)	0(20)	-	1	1(0)	0	0(1)	0(2)	3	-	-	-	2	-	-	-	-	-	2	-	-
167&50	-	5(10)	-	0(10)	0(20)	-	1	1(0)	0	0(1)	0(2)	3	-	-	-	2	-	-	-	-	-	5	-	-
167&75	-	-	-	5(20)	0(20)	-	1	-	-	2(1)	0(2)	3	-	-	-	-	-	-	-	-	-	-	5	-
167&100	-	-	-	5(20)	0(20)	-	1	-	-	2(1)	0(2)	-	-	-	-	-	-	-	-	-	-	-	-	-
167&167	-	-	-	0(10)	0(40)	-	1	-	-	0(1)	2(5)	-	-	-	-	-	-	-	-	-	-	-	-	-
240/480	2/0	4/0	350	500	750	#2	2/0	4/0	350	500	750	3PSN	4PSN	#2*	2/0	4/0	350	500	CAP #2	2/0	4/0	350	500	
25&25	5(40)	-	-	-	-	-	-	-	-	-	-	5	1	1	6	-	-	-	4	1	6	-	-	-
50&25	5(40)	-	-	-	-	-	-	-	-	-	-	5	1	1	6	-	-	-	4	1	6	-	-	-
50&50	5(40)	-	-	-	-	-	-	-	-	-	-	5	1	1	6	-	-	-	4	1	6	-	-	-
75&25	5(10)	5(30)	-	-	-	-	-	-	-	-	-	5	1	1	3	3	-	-	4	1	3	3	-	-
75&50	5(10)	5(30)	-	-	-	-	-	-	-	-	-	5	1	1	3	3	-	-	4	1	3	3	-	-
75&75	-	5(40)	-	-	-	-	-	-	-	-	-	5	1	1	-	6	-	-	4	1	-	6	-	-
100&25	5(10)	-	0(30)	-	-	-	2	-	0(3)	-	-	3	-	-	2	-	-	-	3	-	2	-	-	-
100&50	5(10)	-	0(30)	-	-	-	2	-	0(3)	-	-	3	-	-	2	-	-	-	3	-	2	-	-	-
100&75	-	5(10)	0(30)	-	-	-	1	1	0(3)	-	-	3	-	-	-	2	-	-	3	-	-	2	-	-
100&100	-	-	5(40)	-	-	-	1	-	2(4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
167&25	5(10)	-	-	0(30)	-	-	2	-	-	(3)	-	3	-	-	2	-	-	-	3	-	2	-	-	-
167&50	5(10)	-	-	0(30)	-	-	2	-	-	(3)	-	3	-	-	2	-	-	-	3	-	2	-	-	-
167&75	-	5(10)	-	0(30)	-	-	1	1	-	(3)	-	3	-	-	-	2	-	-	3	-	-	2	-	-
167&100	-	-	5(10)	0(30)	-	-	1	-	2(1)	(3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
167&167	-	-	-	5(40)	-	-	1	-	-	2(4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Long barrel for transformer ground