TRANSFORMERS

INTRODUCTION

1. This section shows different configurations of one, two, and three-phase transformers for the 4kV, 13.2kV, and 26.4kV primary systems used by JEA.

2. On one, two, and three-phase vertical structures, the cutout/arrester bracket shall always be mounted behind the bottom phase even if the lowest phase is not present. The top transformer bolt will always be 54 inches below the top bolt of the cutout/arrester bracket.

3. For horizontal construction, the cutout/arrester bracket shall always be mounted 43 inches below the crossarm mounting bolt. For step-down application, the second crossarm shall always be 54 inches below the top transformer bolt.

4. Jumper pin locations are listed in a table within this section and must be used to support primary jumpers. Call for the sub-structures as indicated in the table.

5. Caution shall be observed if installing a streetlight with the 8' rise bracket on poles with 100kVA or larger transformers. No other equipment shall be mounted on the same pole with a transformer. Standard clearances will be strictly observed when mounting streetlights and taking primary taps from the same pole.

6. Transformers installed on structures utilizing aerial cable should be treated as if it was bare primary. No special plates are required.

7. Listed below are the general rules and allowable exceptions for transformer installations:
   1. No three-phase corner poles or three-phase tap poles will have transformers installed on them.
   2. On a 90 degree single-phase 45 foot corner pole, with primary mounted in the A phase position, the cutout/arrester bracket for a transformer may be installed in the B phase position and still have 54 inches of clearance to the transformer. A 12' guy breaker will be used at the cutout and arrester bracket on the line side.
   3. On a single-phase tap pole, the lateral fuse cutout can be installed with the transformer cutout, provided they are on opposite sides of the pole.
   4. On a three-phase tangent pole, A and B phase may be tapped, with a single-phase transformer installed on the same pole, provided the transformer is tapped off C phase.

   Transformers should not be installed on poles with other equipment such as group switches, reclosers, capacitors, etc. In general, there are no exceptions to the above criteria. The idea that a structure can be physically constructed should not diminish the fact that it may lead to an unsafe condition. Again, if unusual or nonstandard framing is required, the engineer should always review the design with his/her Manager, the appropriate Standards engineer, and the proper C&M personnel before releasing the job to construction.

8. Hot-line clamps are not part of the transformer plates and must be plated separately.

9. Plate options are listed on each page in the upper left-hand corner of each construction standard.

10. For proper energizing and de-energizing procedures when working with closed-delta transformer banks, refer to the end of this chapter. This procedure also addresses the application and installation of a temporary grounding switch for nuisance banks.

11. Secondary Downleads shall no longer be utilized for all transformer installations, but the copper RHW cable is still used for tying secondaries. Plates for 10, 15, 25 & 50 kVA transformers include the CNNTS007 multi-tap connectors. Plates for 75, 100 & 167 kVA transformers include the CNNTS006 four-hole NEMA pad connector with the terminal hardware kit BOLTE001.

12. Three "NEW" options have been added to the transformer plates. For single-phase transformer plates, options have been added to provide 240/480V transformers. For three-phase transformer plates, options have been added to supply 120/208V or 277/480V transformers. See the following examples:

I.12.1. DGA*50/480 = 26.4kV, 1∅, 50kVA transformer, 240/480V

I.12.2. DGC*50/208 = 26.4kV, 3∅ bank, 3-50kVA transformers, 120/208V

I.12.3. RGC*75/480 = 4kV, 3∅ bank, 3-75kVA transformers, 277/480V

NOTE: Only plates DGC*25/208, DGC*50/208, and DGC*75/208, supply transformers that have already had their secondary internal taps changed to provide 208V. All other 208 transformer options must have their internal taps changed in the field or prior to issue by the storeroom.

13. The plates have been updated with the new animal guarding system. The #4 covered copper (CAI RH 010) is used for all jumpers. The bushing cover (GUA AN 002) is mounted around the top skirt of the transformer and arrester bushings. The cutout guard (GUA AN 006) is installed on the top of each cutout.

14. Transformer 50kVA and below require 5/8" bolts. Transformers 75kVA and above require 3/4" bolts.

MULTI-TAP INSTALLATION

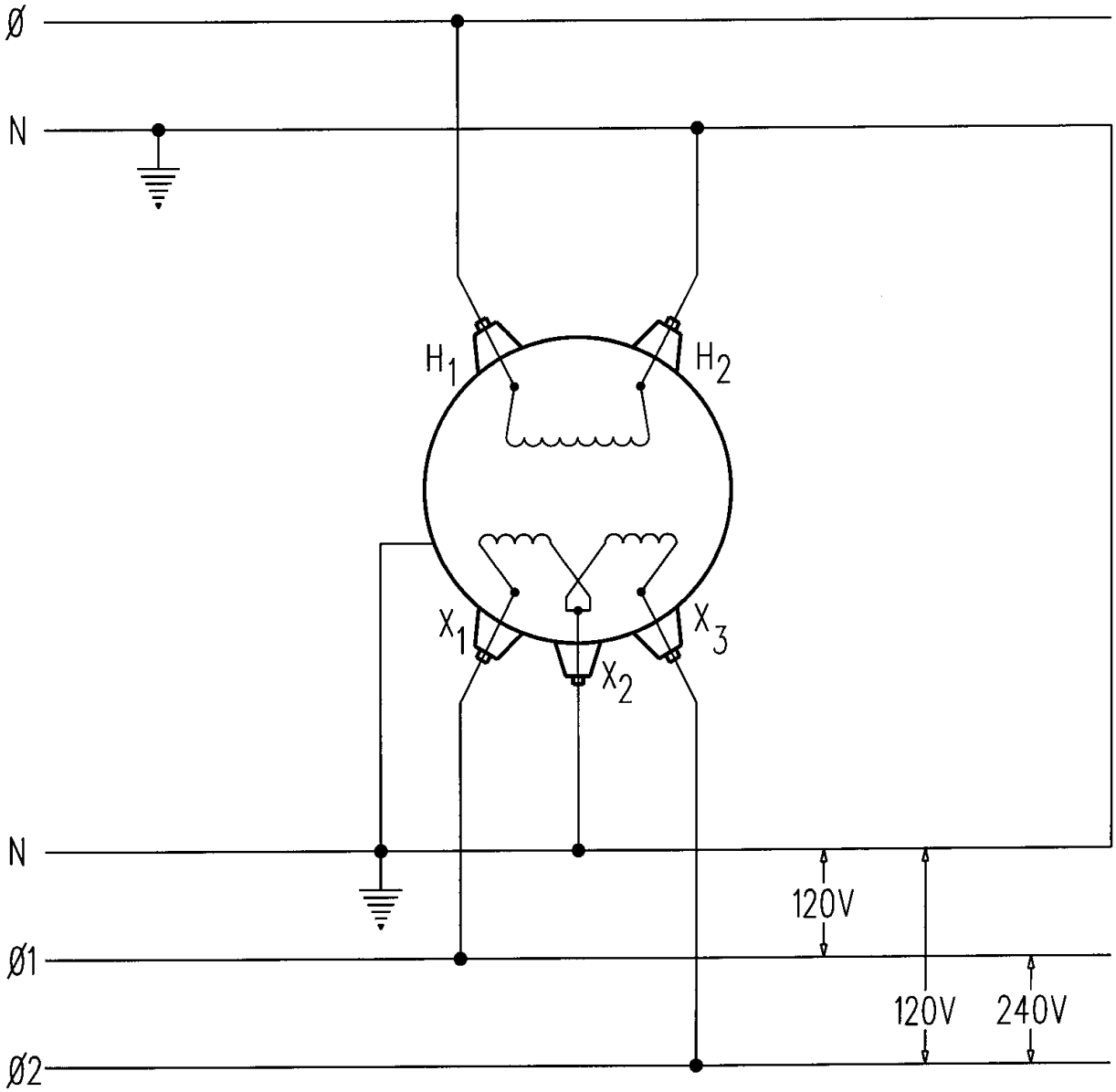
Tie one secondary neutral to the mainline neutral and then continue that secondary neutral to the multi-tap connector.
Tie the remaining secondary neutrals directly to the multi-tap connector.
Take one continuous piece of #4 solid copper and run it from the multi-tap connector to the tank ground then to the pole ground.

JUMPER PIN LOCATION TABLE

CONSTRUCTION	LOCATION	ONE TRANSFORMER				TWO TRANSFORMERS				THREE TRANSFORMERS			
		CONVENTIONAL		STEPDOWN		CONVENTIONAL		STEPDOWN		CONVENTIONAL		STEPDOWN	
		A Ø	B Ø	A Ø	B Ø	A Ø	B Ø	A Ø	B Ø	A Ø	B Ø	A Ø	B Ø
		SUB-STRUCTURES											
TYPE II CROSSARM	127*			P1-1								P1-1	
	192*											P1-1	
TYPE III TANGENT	35	P1-1				P1-1		P1-1		P1-1		P1-1	
	73	P1-1	P1-1			P1-1 / P1-3	P1-1	P1-3	P1-3	P1-3		P1-3	P1-3
	127*											P1-1	
	192*											P1-1	
TYPE IV DEADEND	B30	P1-1				P1-1				P1-1			
	B68	P1-1	P1-1			P1-1 / P1-3	P1-1			P1-3			
	127*										P1-1		

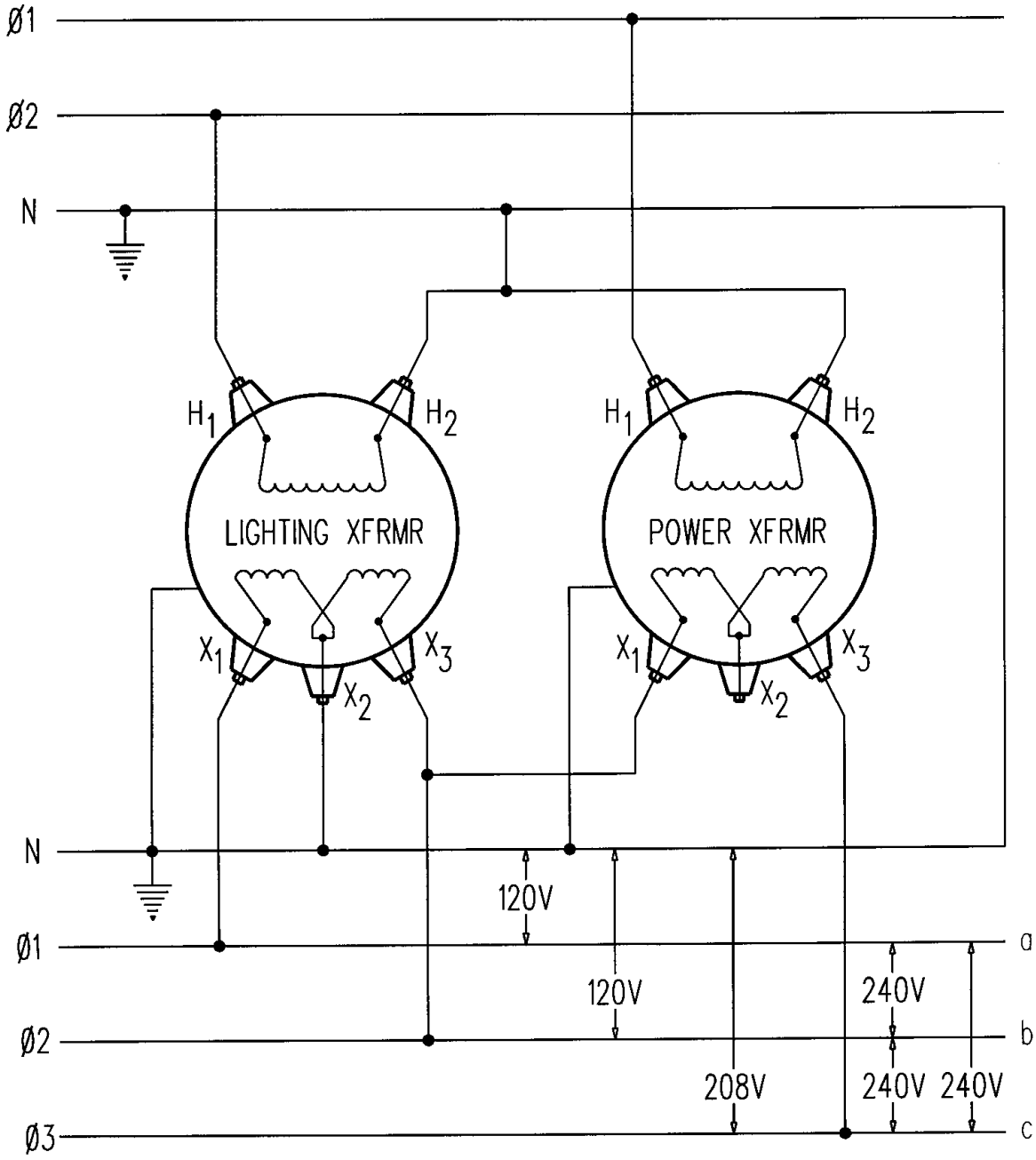
*** Indicates hole must be field drilled**

TRANSFORMER WIRING DIAGRAM



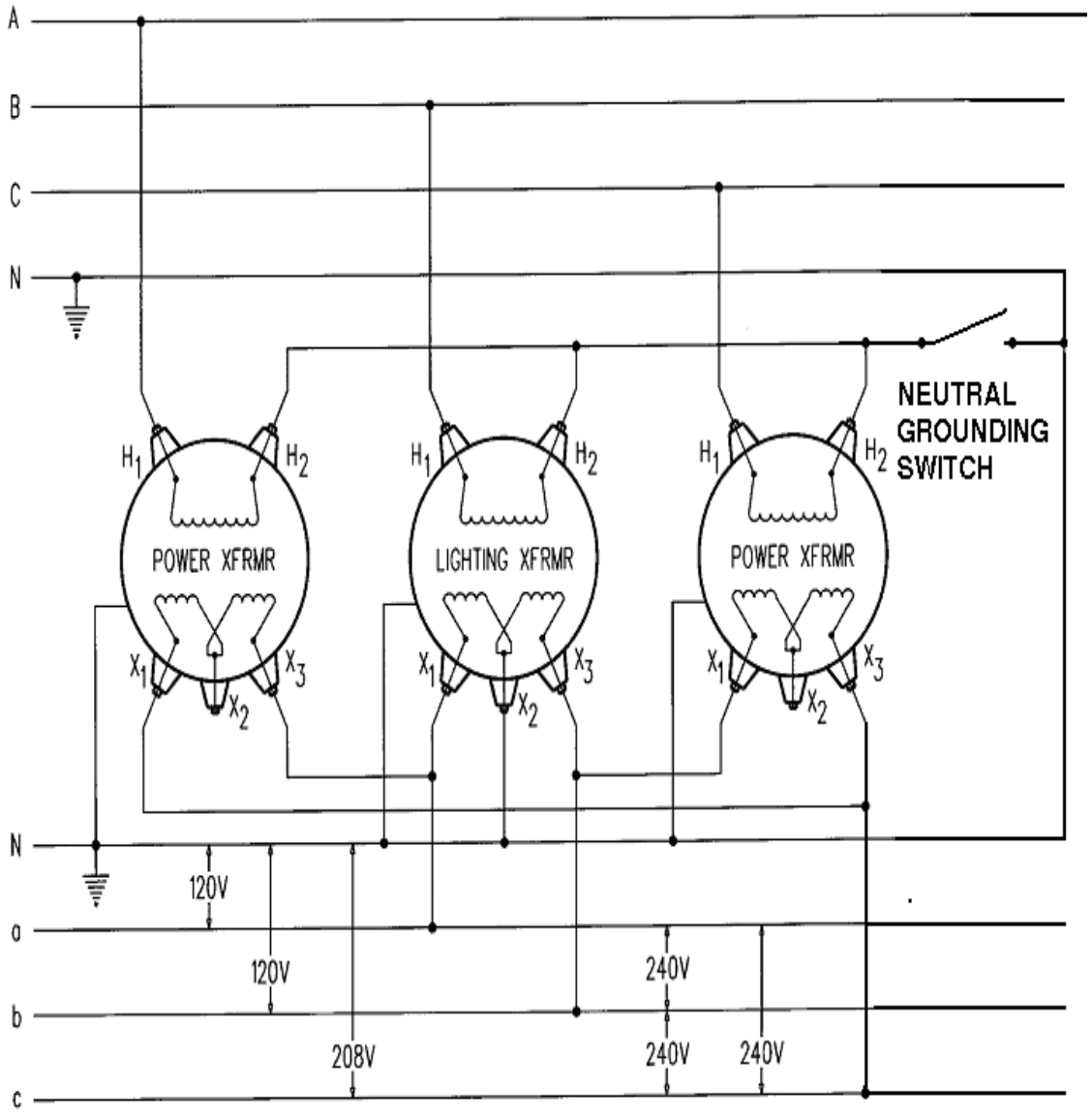
SINGLE-PHASE CONNECTION
120/240 VOLT, 1-PHASE, 3-WIRE SERVICE

TRANSFORMER WIRING DIAGRAM



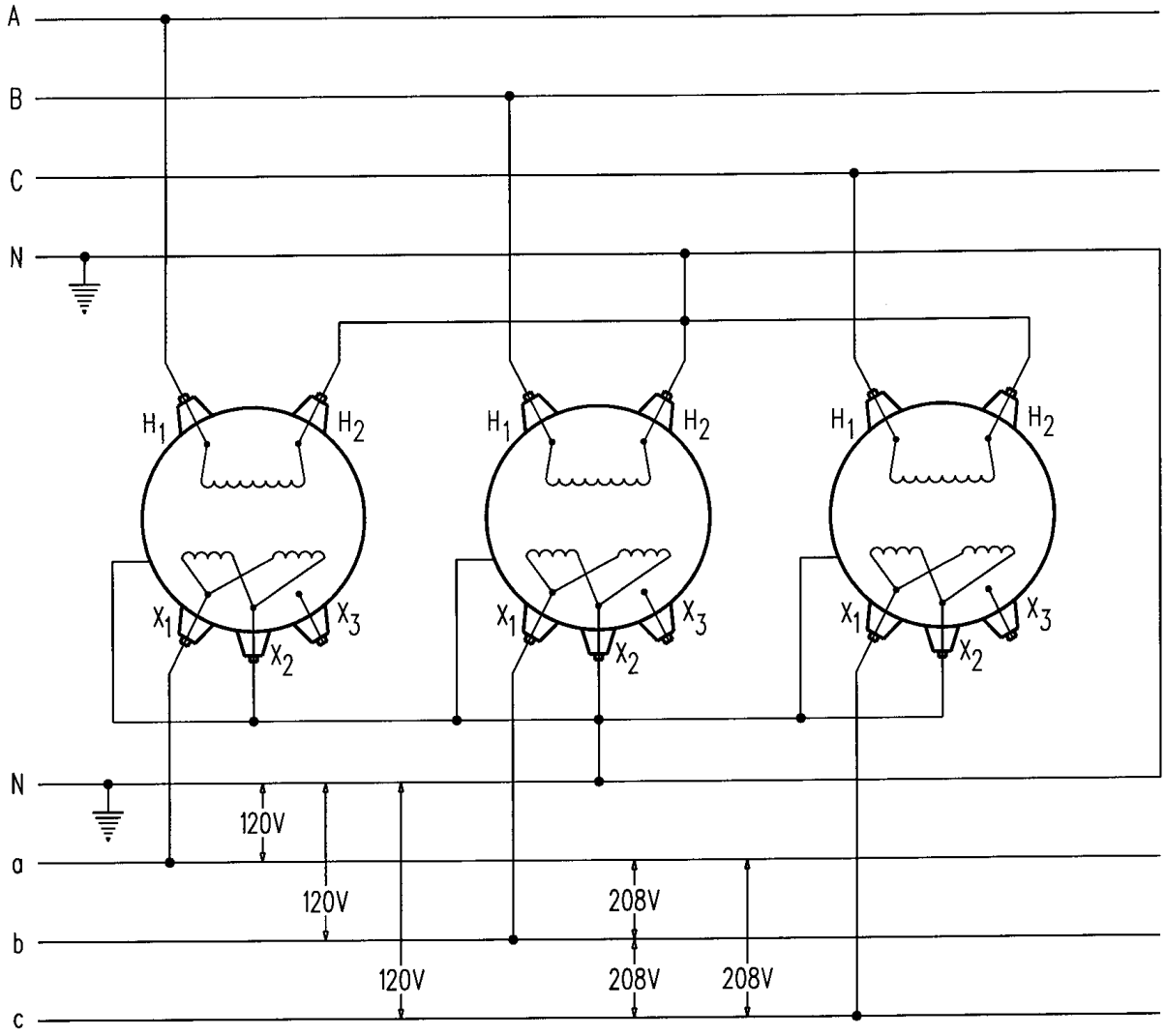
OPEN-WYE, OPEN-DELTA CONNECTION
120/240 VOLT, 3-PHASE, 4-WIRE SERVICE

TRANSFORMER WIRING DIAGRAM



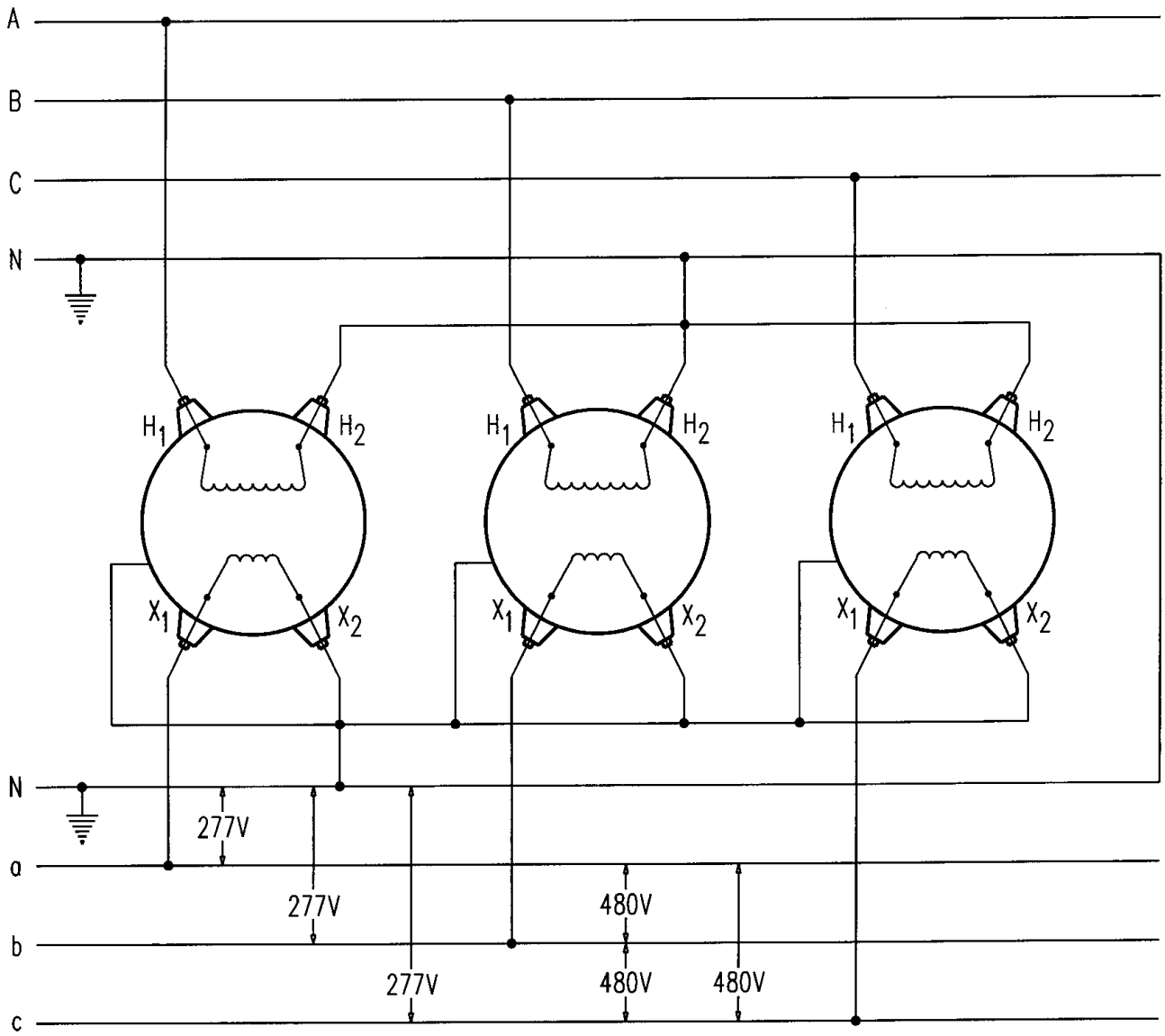
UNGROUNDED WYE-DELTA CONNECTION
120/240 VOLT, 3-PHASE, 4-WIRE SERVICE

TRANSFORMER WIRING DIAGRAM



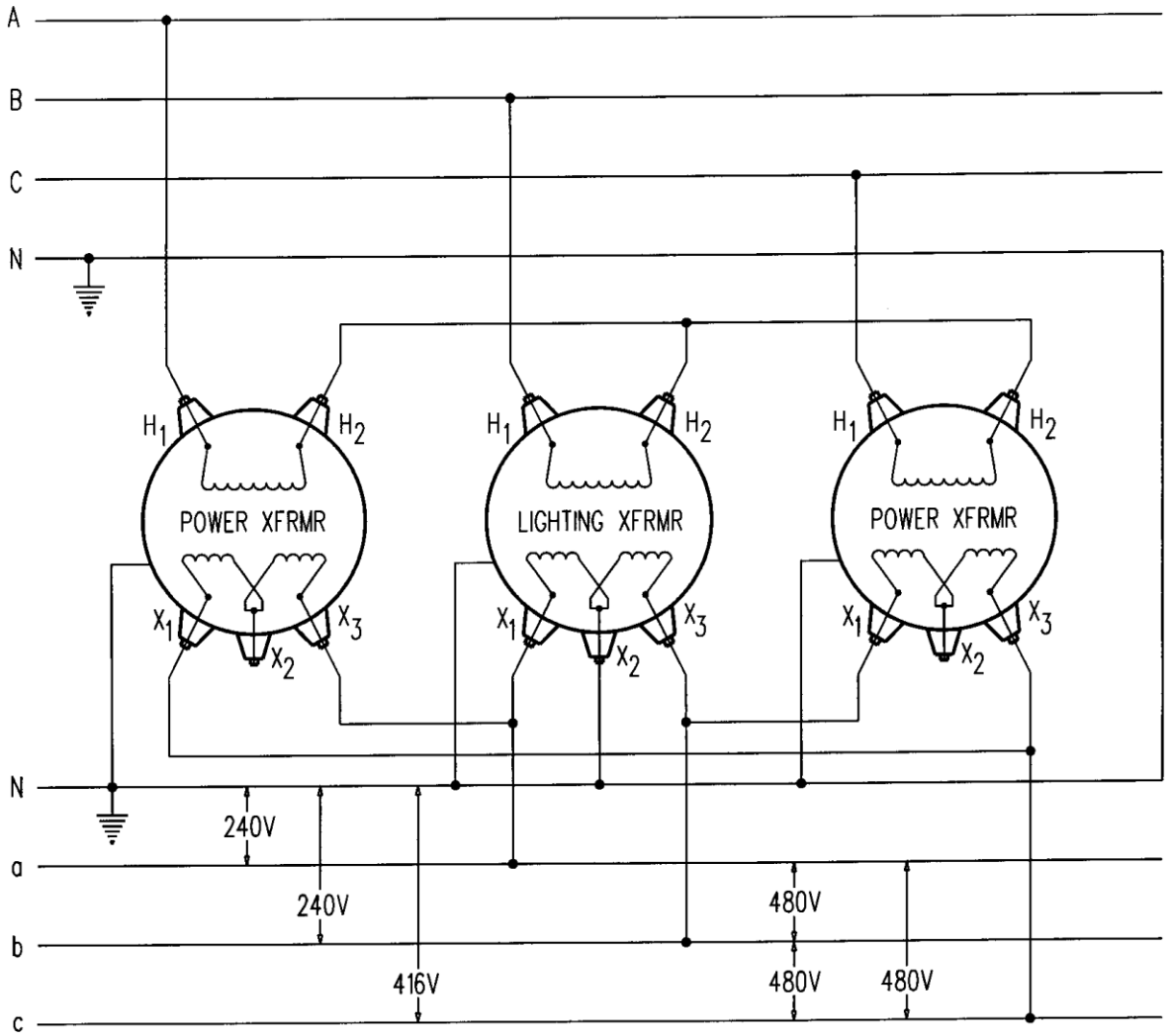
GROUNDED WYE, GROUNDED WYE CONNECTION
120/208 VOLT, 3-PHASE, 4-WIRE SERVICE

TRANSFORMER WIRING DIAGRAM



GROUNDED WYE, GROUNDED WYE CONNECTION
277/480 VOLT, 3-PHASE, 4-WIRE SERVICE

TRANSFORMER WIRING DIAGRAM



FOR REFERENCE ONLY

UNGROUNDED WYE-DELTA CONNECTION
240/480 VOLT, 3-PHASE, 4-WIRE SERVICE

RGAF (FIBERGLASS CONSTRUCTION)

SINGLE-PHASE TRANSFORMER – 4kV

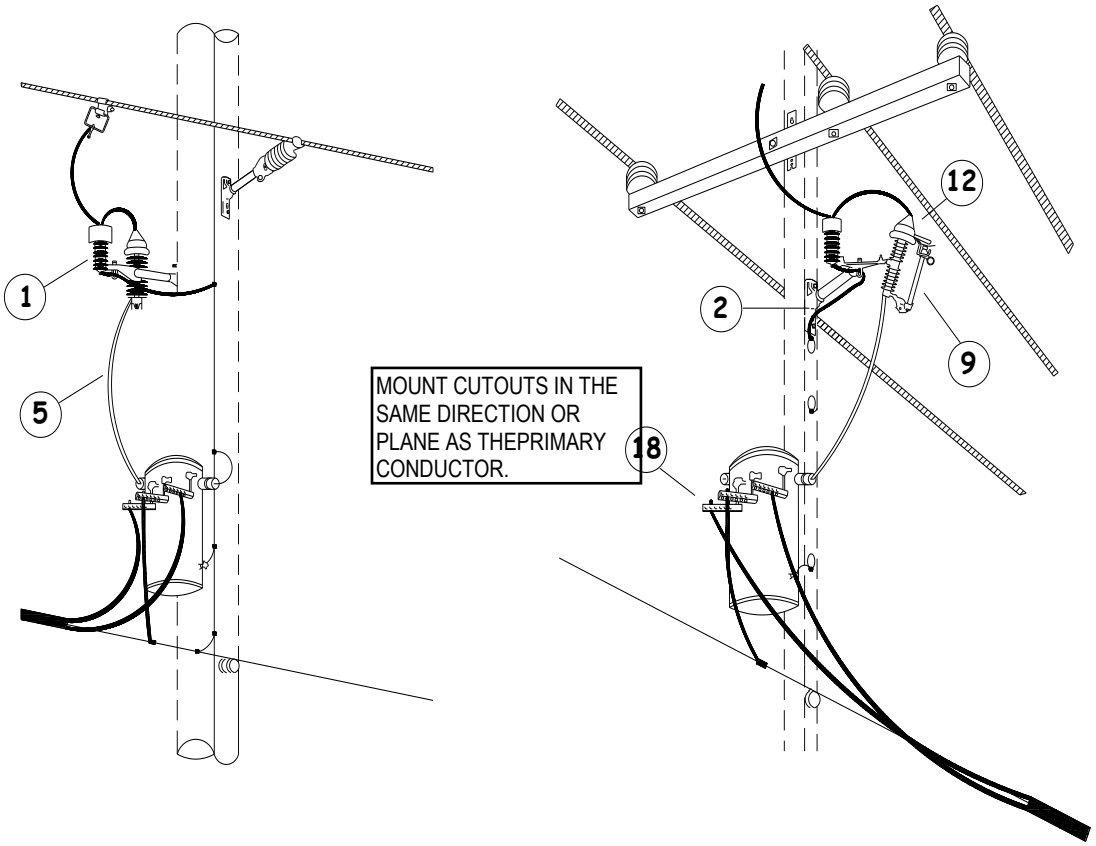
OPTIONS: 10, 15, 25, 50, 75, 100, 167, 25/480, 50/480, 75/480

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 001	1	ARRESTER, LIGHTNING, 3kV, POLYMER MOV (DIST.)
2	BKT AC 009	1	BRACKET, FIBERGLASS, ARRESTER AND CUTOUT
3	BOL MS ***	2	BOLT, MACHINE, SQUARE HEAD, 5/8X14 OR 3/4X14
4	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
5	CAI RH 010	25	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
6	CLA TG 001	1	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
7	CNN VG 003	2	CONNECTOR, VISE TYPE, 6-2 SOL. – 10-2 SOL.
8	COB CO 028	4	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
9	CUT OT 004	1	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
10	FUS OH ***	1	GENERAL CODE FOR FUSE-LINK
11	GUA AN 002	2	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
12	GUA AN 006	1	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
13	TRA ** ***	1	GENERAL CODE FOR TRANSFORMER
14	WAS RD 004	2	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
15	WAS RD 005	4	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
16	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
17	WAS SP 002	4	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
18	CNNTS007	3	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
18	CNNTS006	3	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
19	BOLTE001	12	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

RGAF (FIBERGLASS CONSTRUCTION)

SINGLE-PHASE TRANSFORMER – 4kV



RGBF (FIBERGLASS CONSTRUCTION)

TWO-PHASE TRANSFORMER BANK – 4kV

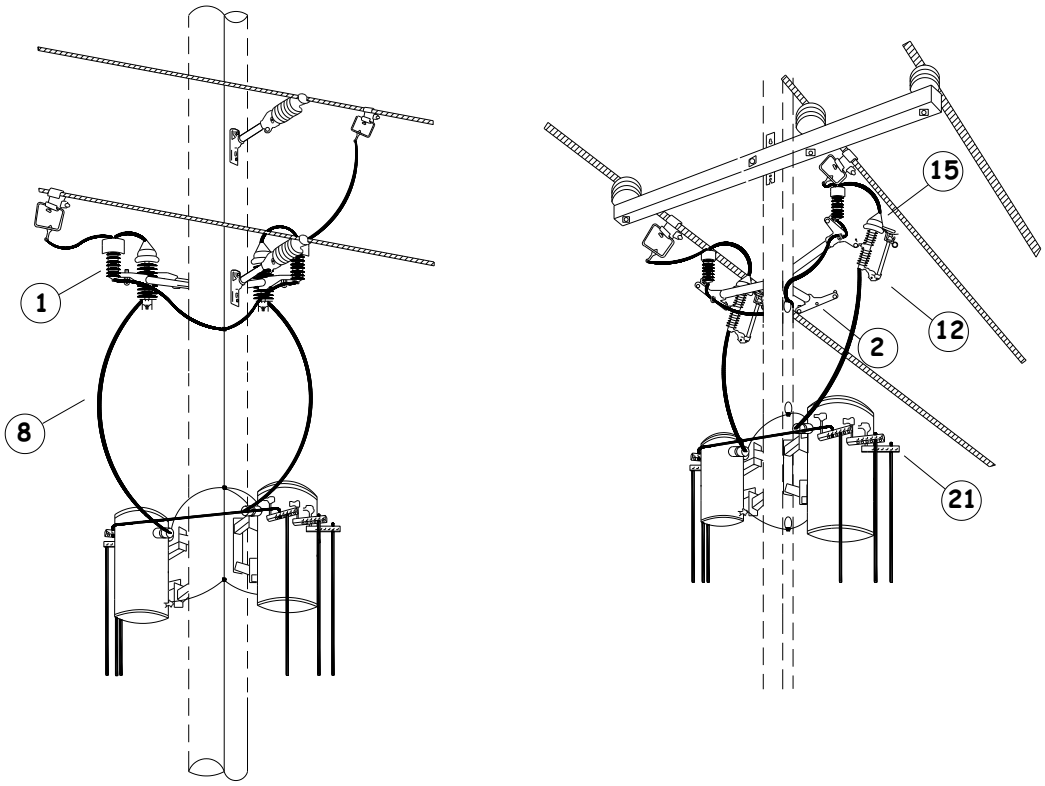
OPTIONS: 10-10, 15-10, 15-15, 25-10, 25-15, 25-25, 50-10, 50-15, 50-25, 50-50, 75-10, 75-15, 75-25, 75-50, 75-75, 100-10, 100-15, 100-25, 100-50, 100-75, 100-100, 167-10, 167-15, 167-25, 167-50, 167-75, 167-100, 167-167

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 001	2	ARRESTER, LIGHTNING, 3kV, POLYMER MOV (DIST.)
2	BKT AC 010	1	BRACKET, FIBERGLASS, ARRESTER AND CUTOUT, TRI-MOUNT
3	BKT TM 001	2	BRACKET, TRANSFORMER MOUNTING
4	BOL MS 015	4	BOLT, MACHINE, SQUARE HEAD, 5/8X2
5	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
6	BOL MS ***	2	BOLT, MACHINE, SQUARE HEAD, 5/8 X 14 OR 3/4X14
7	CAI RH ***	10	GENERAL CODE FOR COPPER RHW CABLE
8	CAI RH 010	30	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
9	CLA TG 001	2	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
10	CNN VG 003	4	CONNECTOR, VISE TYPE, 6-2 SOL. – 10-2 SOL.
11	COB CO 028	20	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
12	CUT OT 004	2	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
13	FUS OH ***	2	GENERAL CODE FOR FUSE-LINK
14	GUA AN 002	4	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
15	GUA AN 006	2	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
16	TRA ** ***	2	GENERAL CODE FOR TRANSFORMER
17	WAS RD 004	4	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
18	WAS RD 005	8	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
19	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
20	WAS SP 002	4	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
21	CNNTS007	5	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
21	CNNTS006	5	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
22	BOLTE001	20	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

RGBF (FIBERGLASS CONSTRUCTION)

TWO-PHASE TRANSFORMER BANK – 4kV



RGCF (FIBERGLASS CONSTRUCTION)

THREE-PHASE TRANSFORMER BANK – 4kV

OPTIONS: **167-167, 167-100, 167-75, 167-50, 167-25, 100-100, 100-75, 100-50, 100-25, 75-75, 75-50, 75-25, 50-50, 50-25, 25-25, 25/208, 50/208, 75/208, 100/208, 167/208, 50/480, 75/480, 100/480, 167/480**

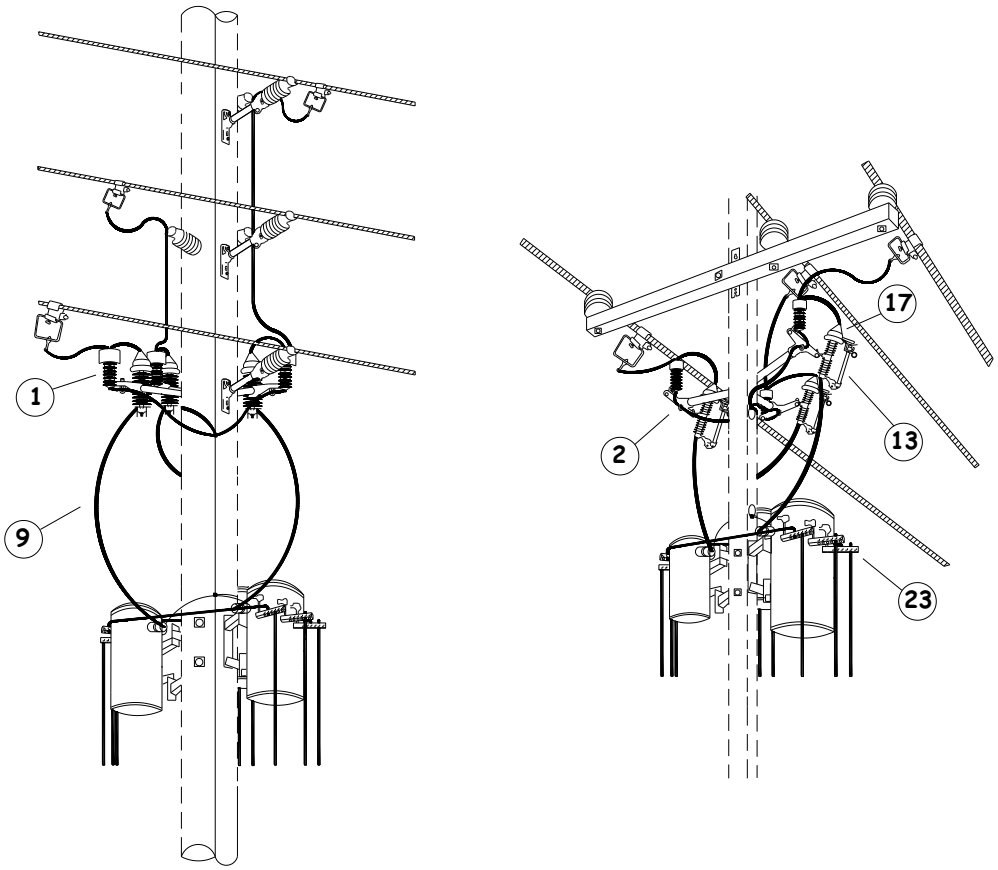
NOTE: **100KVA AND 167KVA TRANSFORMERS MUST HAVE THEIR INTERNAL SECONDARY TAPS CHANGED IN THE FIELD TO PROVIDE 208 VOLTAGE.**

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 001	3	ARRESTER, LIGHTNING, 3kV, POLYMER MOV (DIST.)
2	BKT AC 002	1	BRACKET, ARRESTER AND CUTOUT, TRI-MOUNT
3	BKT AC 008	1	BRACKET, FIBERGLASS, ARRESTER OR CUTOUT (FOR CLOSED DELTA)
4	BKT TM 001	3	BRACKET, TRANSFORMER MOUNTING
5	BOL MS 015	6	BOLT, MACHINE, SQUARE HEAD, 5/8X2
6	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
7	BOL MS ***	4	BOLT, MACHINE, SQUARE HEAD, 5/8 X 14 OR 3/4X14
8	CAI RH ***	20	GENERAL CODE FOR COPPER RHW CABLE
9	CAI RH 010	45	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
10	CLA TG 001	3	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
11	CNN VG 003	6	CONNECTOR, VISE TYPE, 6-2 SOL. - 10-2 SOL.
12	COB CO 028	30	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
13	CUT OT 004	4	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV (4^{TH} FOR CLOSED DELTA)
14	FUS OH ***	3	GENERAL CODE FOR FUSE-LINK
15	FUS OH 007	1	FUSE LINK, 40T (FOR CLOSED DELTA GROUNDING SWITCH)
16	GUA AN 002	6	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
17	GUA AN 006	3	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
18	TRA ** ***	3	GENERAL CODE FOR TRANSFORMER
19	WAS RD 004	6	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
20	WAS RD 005	12	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
21	WAS SF 003	6	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
22	WAS SP 002	6	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
23	CNNTS007	7	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
23	CNNTS006	7	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
24	BOLTE001	28	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

RGCF (FIBERGLASS CONSTRUCTION)

THREE-PHASE TRANSFORMER BANK – 4kV



WGAF (FIBERGLASS CONSTRUCTION)

SINGLE-PHASE TRANSFORMER – 13.2kV

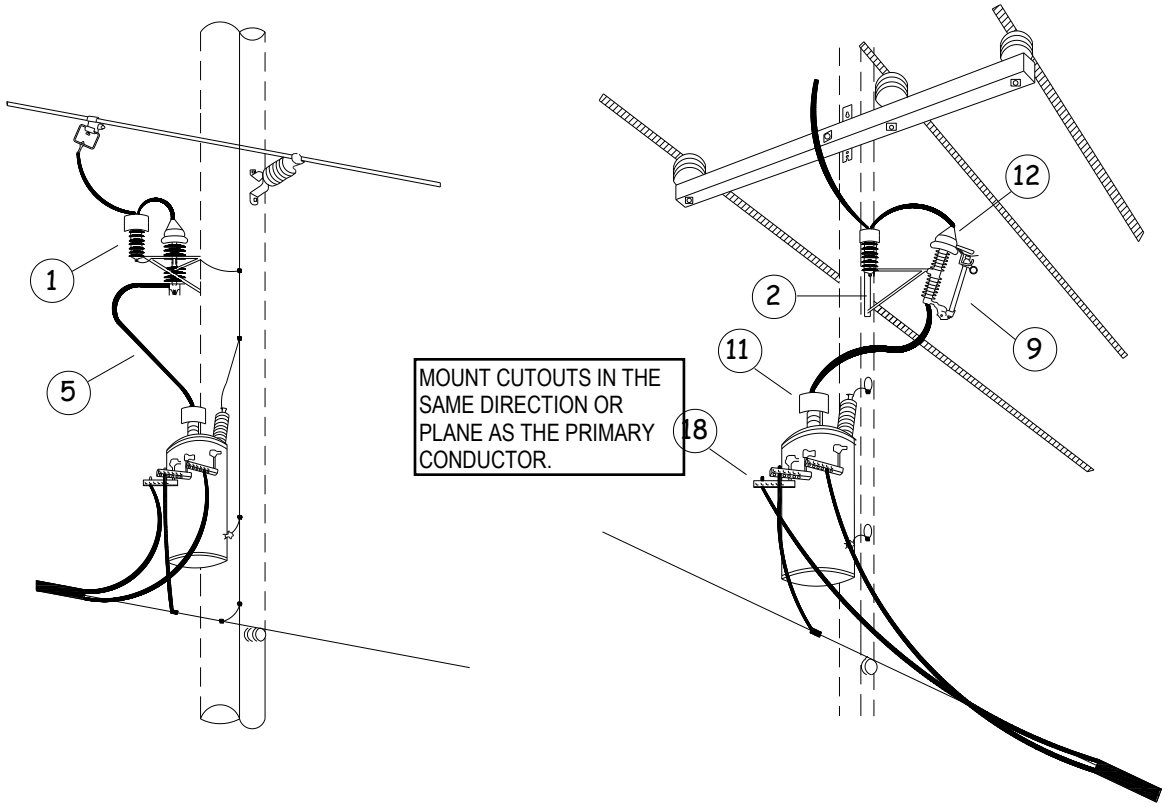
OPTIONS: 10, 15, 25, 50, 75, 100, 167, 25/480, 50/480, 75/480

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 002	1	ARRESTER, LIGHTNING, 10kV, POLYMER MOV (DIST.)
2	BKT AC 009	1	BRACKET, FIBERGLASS, ARRESTER AND CUTOUT
3	BOL MS ***	2	BOLT, MACHINE, SQUARE HEAD, 5/8X14 OR 3/4X14
4	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
5	CAI RH 010	25	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
6	CLA TG 001	1	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
7	CNN VG 003	2	CONNECTOR, VISE TYPE, 6-2 SOL. – 10-2 SOL.
8	COB CO 028	4	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
9	CUT OT 004	1	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
10	FUS OH ***	1	GENERAL CODE FOR FUSE-LINK
11	GUA AN 002	2	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
12	GUA AN 006	1	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
13	TRA ** ***	1	GENERAL CODE FOR TRANSFORMER
14	WAS RD 004	2	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
15	WAS RD 005	4	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
16	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
17	WAS SP 002	4	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
18	CNNTS007	3	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
18	CNNTS006	3	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
19	BOLTE001	12	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

WGAF (FIBERGLASS CONSTRUCTION)

SINGLE-PHASE TRANSFORMER – 13.2kV



WGBF (FIBERGLASS CONSTRUCTION)

TWO-PHASE TRANSFORMER BANK – 13.2kV

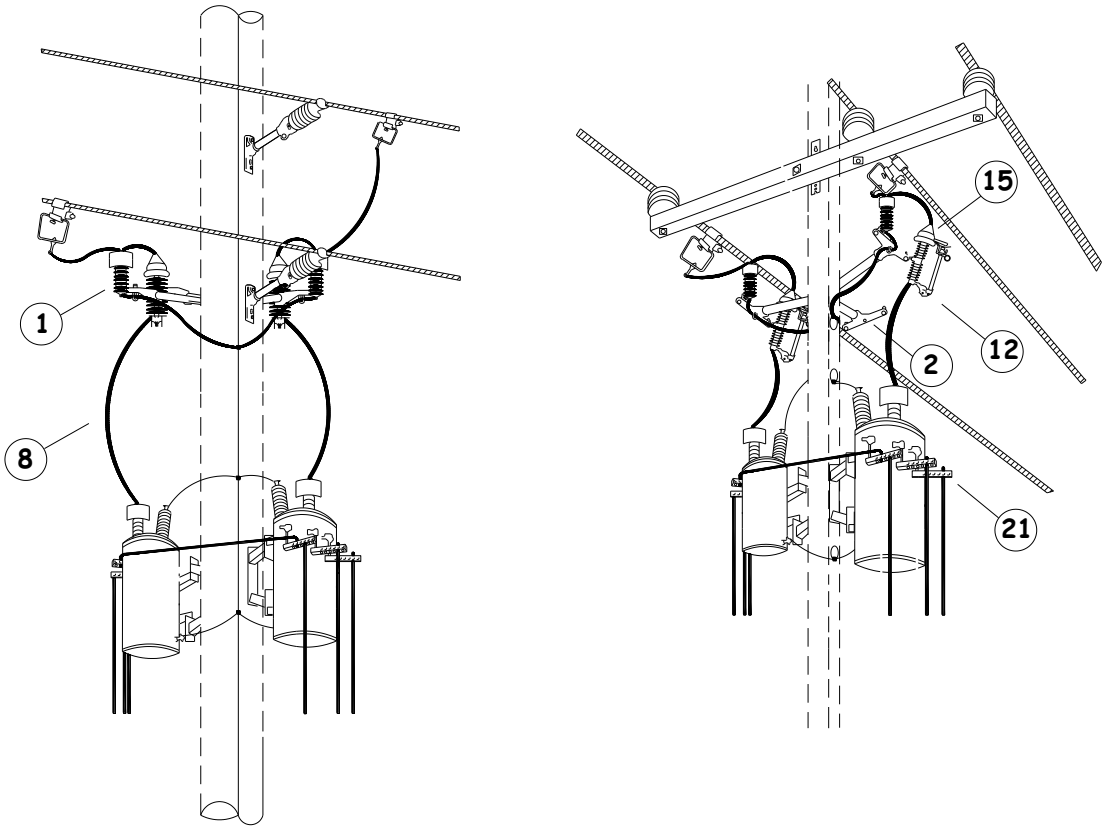
OPTIONS: 10-10, 15-10, 15-15, 25-10, 25-15, 25-25, 50-10, 50-15, 50-25, 50-50, 75-10, 75-15, 75-25, 75-50, 75-75, 100-10, 100-15, 100-25, 100-50, 100-75, 100-100, 167-10, 167-15, 167-25, 167-50, 167-75, 167-100, 167-167

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 002	2	ARRESTER, LIGHTNING, 10kV, POLYMER MOV (DIST.)
2	BKT AC 010	1	BRACKET, FIBERGLASS, ARRESTER AND CUTOUT, TRI-MOUNT
3	BKT TM 001	2	BRACKET, TRANSFORMER MOUNTING
4	BOL MS 015	4	BOLT, MACHINE, SQUARE HEAD, 5/8X2
5	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
6	BOL MS ***	2	BOLT, MACHINE, SQUARE HEAD, 5/8 X 14 OR 3/4X14
7	CAI RH ***	10	GENERAL CODE FOR COPPER RHW CABLE
8	CAI RH 010	30	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
9	CLA TG 001	2	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
10	CNN VG 003	4	CONNECTOR, VISE TYPE, 6-2 SOL. – 10-2 SOL.
11	COB CO 028	20	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
12	CUT OT 004	2	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
13	FUS OH ***	2	GENERAL CODE FOR FUSE-LINK
14	GUA AN 002	4	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
15	GUA AN 006	2	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
16	TRA ** ***	2	GENERAL CODE FOR TRANSFORMER
17	WAS RD 004	4	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
18	WAS RD 005	8	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
19	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
20	WAS SP 002	4	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
21	CNNTS007	5	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
21	CNNTS006	5	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
22	BOLTE001	20	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

WGBF (FIBERGLASS CONSTRUCTION)

TWO-PHASE TRANSFORMER BANK – 13.2kV



WGCF (FIBERGLASS CONSTRUCTION)

THREE-PHASE TRANSFORMER BANK – 13.2kV

OPTIONS: **167-167, 167-100, 167-75, 167-50, 167-25, 100-100, 100-75, 100-50, 100-25, 75-75, 75-50, 75-25, 50-50, 50-25, 25-25, 25/208, 50/208, 75/208, 100/208, 167/208, 50/480, 75/480, 100/480, 167/480**

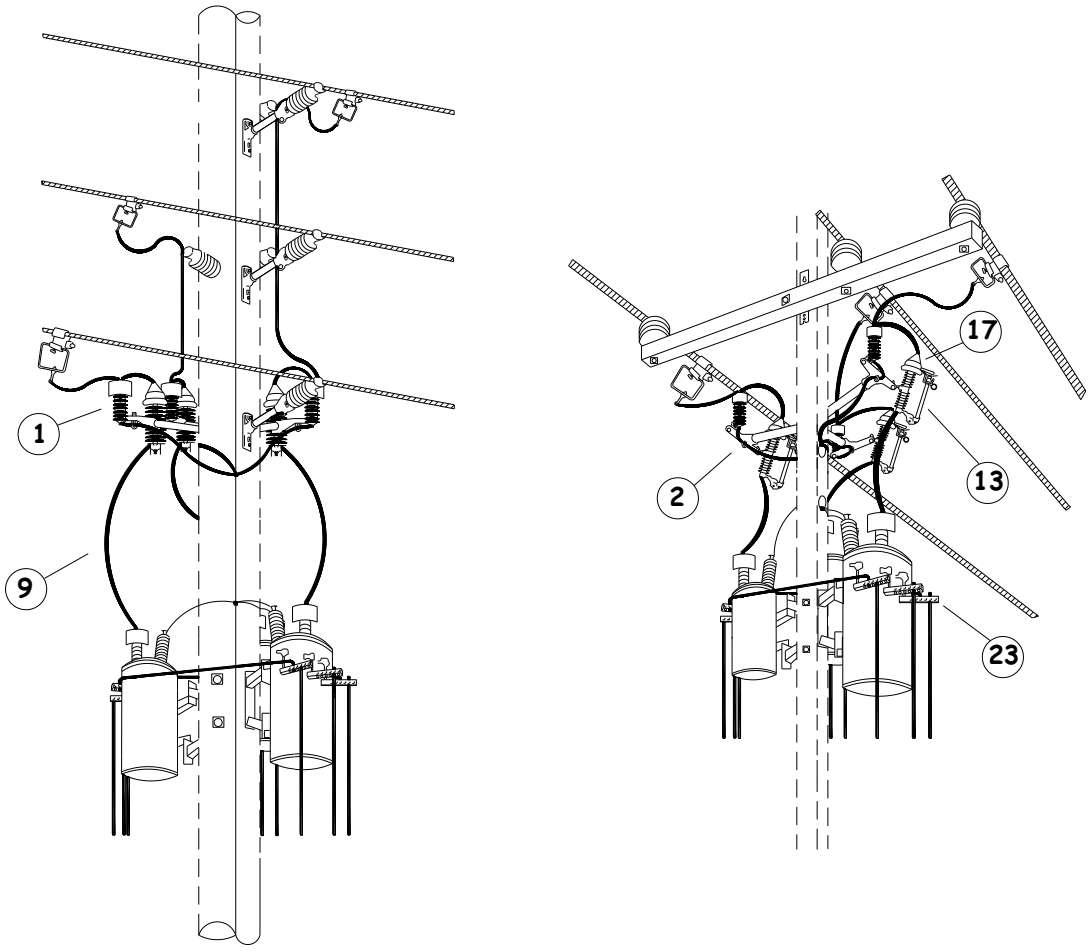
NOTE: **100KVA AND 167KVA TRANSFORMERS MUST HAVE THEIR INTERNAL SECONDARY TAPS CHANGED IN THE FIELD TO PROVIDE 208 VOLTAGE.**

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 002	3	ARRESTER, LIGHTNING, 10kV, POLYMER MOV (DIST.)
2	BKT AC 002	1	BRACKET, ARRESTER AND CUTOUT, TRI-MOUNT
3	BKT AC 008	1	BRACKET, FIBERGLASS, ARRESTER OR CUTOUT (FOR CLOSED DELTA)
4	BKT TM 001	3	BRACKET, TRANSFORMER MOUNTING
5	BOL MS 015	6	BOLT, MACHINE, SQUARE HEAD, 5/8X2
6	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
7	BOL MS ***	4	BOLT, MACHINE, SQUARE HEAD, 5/8 X 14 OR 3/4X14
8	CAI RH ***	20	GENERAL CODE FOR COPPER RHW CABLE
9	CAI RH 010	45	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
10	CLA TG 001	3	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
11	CNN VG 003	6	CONNECTOR, VISE TYPE, 6-2 SOL. - 10-2 SOL.
12	COB CO 028	30	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
13	CUT OT 004	4	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV (4TH FOR CLOSED DELTA)
14	FUS OH ***	3	GENERAL CODE FOR FUSE-LINK
15	FUS OH 007	1	FUSE LINK, 40T (FOR CLOSED DELTA GROUNDING SWITCH)
16	GUA AN 002	6	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
17	GUA AN 006	3	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
18	TRA ** ***	3	GENERAL CODE FOR TRANSFORMER
19	WAS RD 004	6	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
20	WAS RD 005	12	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
21	WAS SF 003	6	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
22	WAS SP 002	6	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
23	CNNTS007	7	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
23	CNNTS006	7	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
24	BOLTE001	28	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

WGCF (FIBERGLASS CONSTRUCTION)

THREE-PHASE TRANSFORMER BANK – 13.2kV



DGAF (FIBERGLASS CONSTRUCTION)

SINGLE-PHASE TRANSFORMER – 26.4kV

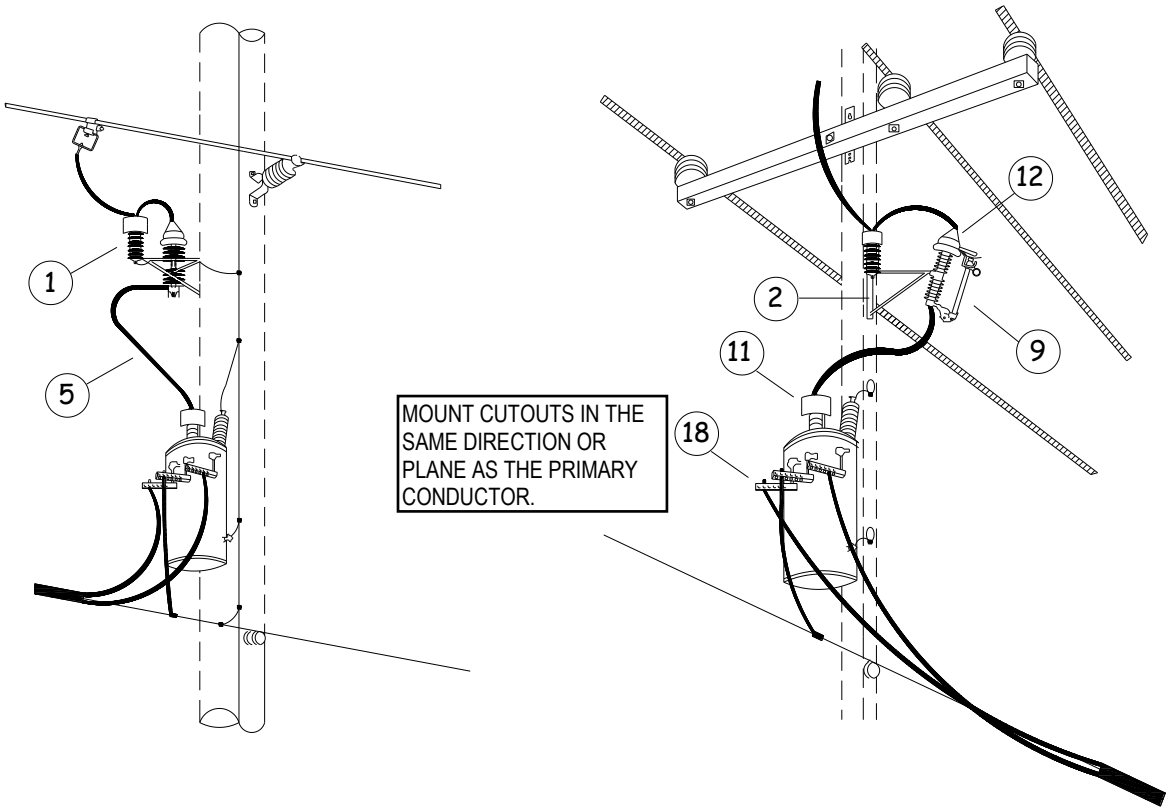
OPTIONS: 10, 15, 25, 50, 75, 100, 167, 25/480, 50/480, 75/480

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 003	1	ARRESTER, LIGHTNING, 21kV, POLYMER MOV (DIST.)
2	BKT AC 009	1	BRACKET, FIBERGLASS, ARRESTER AND CUTOUT
3	BOL MS ***	2	BOLT, MACHINE, SQUARE HEAD, 5/8X14 OR 3/4X14
4	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
5	CAI RH 010	20	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
6	CLA TG 001	1	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
7	CNN VG 003	2	CONNECTOR, VISE TYPE, 6-2 SOL. – 10-2 SOL.
8	COB CO 028	4	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
9	CUT OT 004	1	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
10	FUS OH ***	1	GENERAL CODE FOR FUSE-LINK
11	GUA AN 002	2	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
12	GUA AN 006	1	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
13	TRA ** ***	1	GENERAL CODE FOR TRANSFORMER
14	WAS RD 004	2	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
15	WAS RD 005	4	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
16	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
17	WAS SP 002	4	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
18	CNNTS007	3	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
18	CNNTS006	3	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
19	BOLTE001	12	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

DGAF (FIBERGLASS CONSTRUCTION)

SINGLE-PHASE TRANSFORMER – 26.4kV



DGBF (FIBERGLASS CONSTRUCTION)

TWO-PHASE TRANSFORMER BANK – 26.4kV

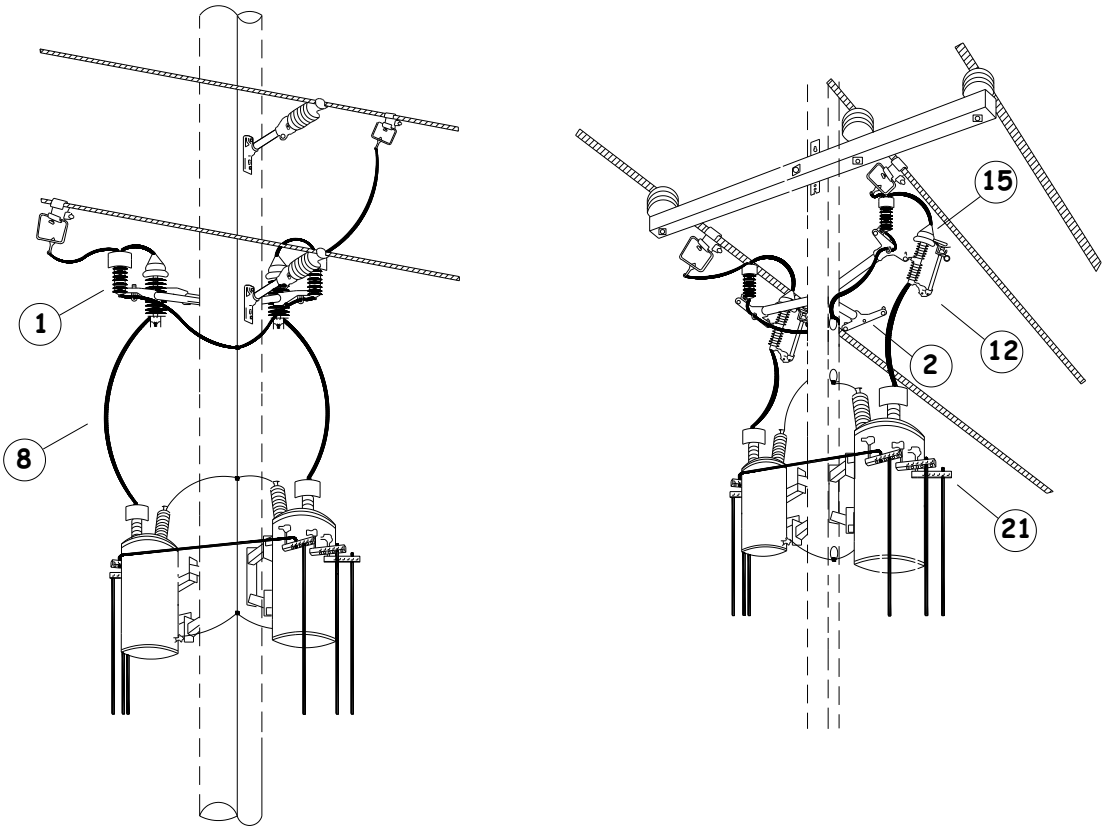
OPTIONS: 10-10, 15-10, 15-15, 25-10, 25-15, 25-25, 50-10, 50-15, 50-25, 50-50, 75-10, 75-15, 75-25, 75-50, 75-75, 100-10, 100-15, 100-25, 100-50, 100-75, 100-100, 167-10, 167-15, 167-25, 167-50, 167-75, 167-100, 167-167

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 003	2	ARRESTER, LIGHTNING, 21kV, POLYMER MOV (DIST.)
2	BKT AC 010	1	BRACKET, FIBERGLASS, ARRESTER AND CUTOUT, TRI-MOUNT
3	BKT TM 001	2	BRACKET, TRANSFORMER MOUNTING
4	BOL MS 015	4	BOLT, MACHINE, SQUARE HEAD, 5/8X2
5	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
6	BOL MS ***	2	BOLT, MACHINE, SQUARE HEAD, 5/8 X 14 OR 3/4X14
7	CAI RH ***	10	GENERAL CODE FOR COPPER RHW CABLE
8	CAI RH 010	40	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
9	CLA TG 001	2	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
10	CNN VG 003	4	CONNECTOR, VISE TYPE, 6-2 SOL. – 10-2 SOL.
11	COB CO 028	20	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
12	CUT OT 004	2	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
13	FUS OH ***	2	GENERAL CODE FOR FUSE-LINK
14	GUA AN 002	4	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
15	GUA AN 006	2	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
16	TRA ** ***	2	GENERAL CODE FOR TRANSFORMER
17	WAS RD 004	4	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
18	WAS RD 005	8	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
19	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
20	WAS SP 002	4	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
21	CNNTS007	5	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
21	CNNTS006	5	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
22	BOLTE001	20	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

DGBF (FIBERGLASS CONSTRUCTION)

TWO-PHASE TRANSFORMER BANK – 26.4kV



DGCF (FIBERGLASS CONSTRUCTION)

THREE-PHASE TRANSFORMER BANK – 26.4kV

OPTIONS: **167-167, 167-100, 167-75, 167-50, 167-25, 100-100, 100-75, 100-50, 100-25, 75-75, 75-50, 75-25, 50-50, 50-25, 25-25, 25/208, 50/208, 75/208, 100/208, 167/208, 50/480, 75/480, 100/480, 167/480**

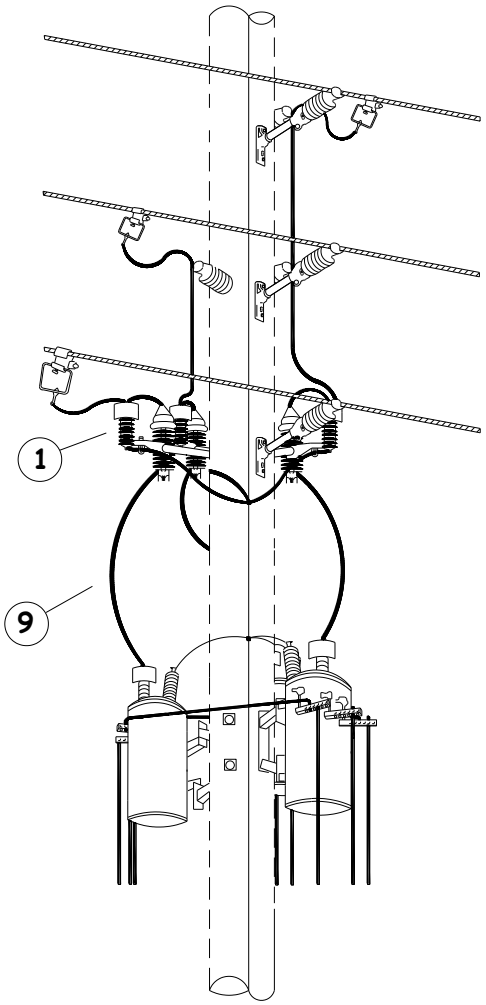
NOTE: **100KVA AND 167KVA TRANSFORMERS MUST HAVE THEIR INTERNAL SECONDARY TAPS CHANGED IN THE FIELD TO PROVIDE 208 VOLTAGE.**

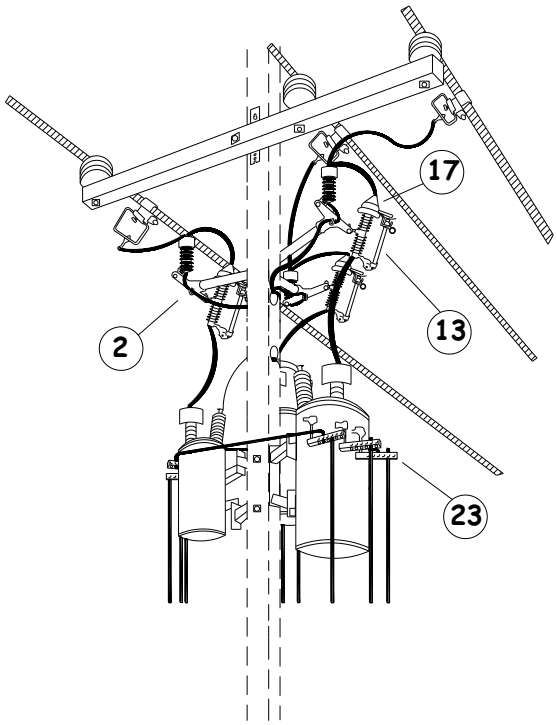
BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 003	3	ARRESTER, LIGHTNING, 21kV, POLYMER MOV (DIST.)
2	BKT AC 010	1	BRACKET, FIBERGLASS, ARRESTER AND CUTOUT, TRI-MOUNT
3	BKT AC 008	1	BRACKET, FIBERGLASS, ARRESTER OR CUTOUT (FOR CLOSED DELTA)
4	BKT TM 001	3	BRACKET, TRANSFORMER MOUNTING
5	BOL MS 015	6	BOLT, MACHINE, SQUARE HEAD, 5/8X2
6	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
7	BOL MS ***	4	BOLT, MACHINE, SQUARE HEAD, 5/8 X 14 OR 3/4X14
8	CAI RH ***	20	GENERAL CODE FOR COPPER RHW CABLE
9	CAI RH 010	60	CABLE, NO. 4 COVERED SOFT DRAWN COPPER, FT
10	CLA TG 001	3	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
11	CNN VG 003	6	CONNECTOR, VISE TYPE, 6-2 SOL. - 10-2 SOL.
12	COB CO 028	30	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
13	CUT OT 004	4	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV (4TH FOR CLOSED DELTA)
14	FUS OH ***	3	GENERAL CODE FOR FUSE-LINK
15	FUS OH 007	1	FUSE LINK, 40T (FOR CLOSED DELTA GROUNDING SWITCH)
16	GUA AN 002	6	GUARD, ANIMAL, FOR USE WITH TRANSFORMERS AND ARRESTERS
17	GUA AN 006	3	GUARD, ANIMAL, FOR USE WITH FUSE CUTOUTS, SILICONE RUBBER
18	TRA ** ***	3	GENERAL CODE FOR TRANSFORMER
19	WAS RD 004	6	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
20	WAS RD 005	12	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
21	WAS SF 003	6	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
22	WAS SP 002	6	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
			FOR 10, 15, 25, AND 50 KVA TRANSFORMERS
23	CNNTS007	7	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR ¾" STUD, RANGE: 10 – 500, 6 PORTS
	OR		FOR 75, 100, AND 167 KVA TRANSFORMERS
23	CNNTS006	7	CONNECTOR, TRANSFORMER SECONDARY SET SCREW TYPE WITH INHIBITOR, 4-HOLE NEMA, RANGE: 10 – 500, 3 PORTS
	AND		
24	BOLTE001	28	BOLT; TERMINAL KIT; ½" X 2" BOLT, WASHERS, AND NUT

DGCF (FIBERGLASS CONSTRUCTION)

THREE-PHASE TRANSFORMER BANK – 26.4kV





DGRA

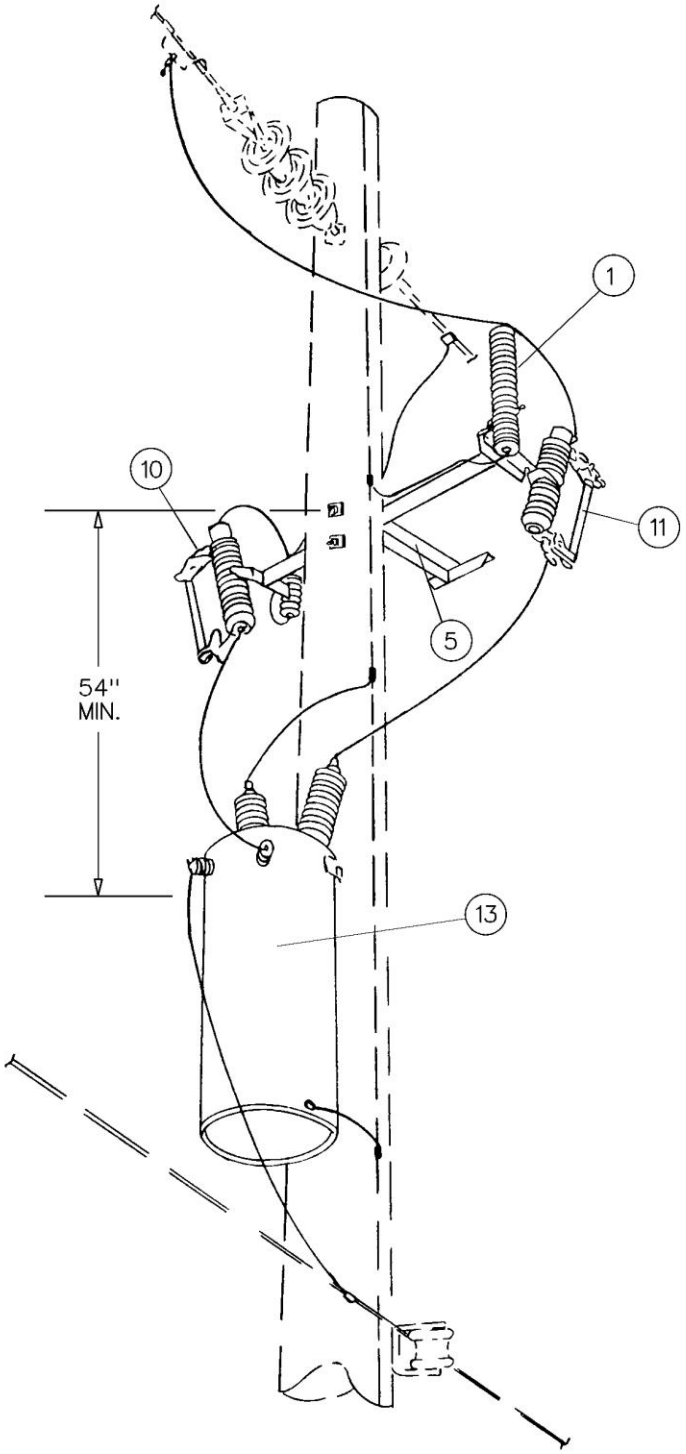
SINGLE-PHASE STEP-DOWN TRANSFORMER – 26.4KV TO 4KV

OPTIONS: 50, 75, 100, 167, 250
BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 001	1	ARRESTER, LIGHTNING, 3KV, POLYMER MOV (DIST.)
2	ARR LI 003	1	ARRESTER, LIGHTNING, 21KV, POLYMER MOV (DIST.)
3	BOL MS 020	2	BOLT, MACHINE, SQUARE HEAD, 5/8X14
4	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
5	BKT AC 002	1	BRACKET, ARRESTER AND CUTOUT, TRI-MOUNT
6	CAI RH ***	22	GENERAL CODE FOR COPPER RHW CABLE
7	CLA TG 001	1	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
8	COB CO 028	20	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
9	CNN VG 003	2	CONNECTOR, VISE TYPE, 6-2 SOL. - 10-2 SOL.
10	CUT OT X01	1	CUTOUT, FUSED, 125KV BIL, 100 AMP, 27KV
11	CUT OT 004	1	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
12	FUS OH ***	2	GENERAL CODE FOR FUSE-LINK
13	TRA SB ***	1	GENERAL CODE FOR TRANSFORMER
14	WAS RD 004	2	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
15	WAS RD 005	4	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
16	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
17	WAS SP 002	4	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT

DGRA

SINGLE-PHASE STEP-DOWN TRANSFORMER – 26.4KV TO 4KV



DGRB

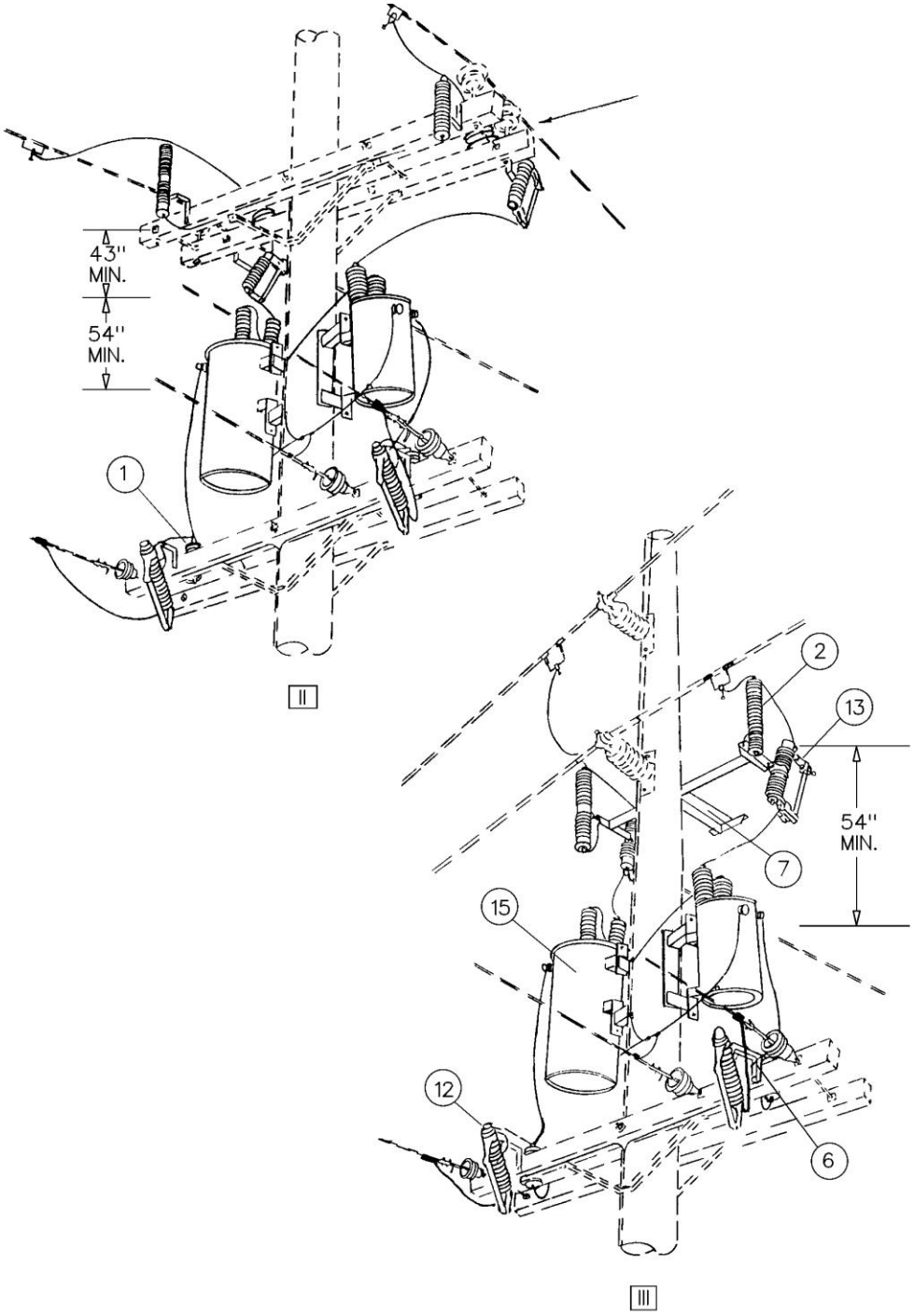
TWO-PHASE STEP-DOWN TRANSFORMER BANK – 26.4KV TO 4KV

OPTIONS: 50, 75, 100, 167, 250
BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 001	2	ARRESTER, LIGHTNING, 3KV, POLYMER MOV (DIST.)
2	ARR LI 003	2	ARRESTER, LIGHTNING, 21KV, POLYMER MOV (DIST.)
3	BOL MS 015	4	BOLT, MACHINE, SQUARE HEAD, 5/8X2
4	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
5	BOL MS 036	2	BOLT, MACHINE, SQUARE HEAD, 3/4X14
6	BKT AC 003	8	BRACKET, ARRESTER OR CUTOUT, CROSSARM MOUNTING
7	BKT AC 002	1	BRACKET, ARRESTER AND CUTOUT, TRI-MOUNT
8	BKT TM 001	2	BRACKET, TRANSFORMER MOUNTING
9	CLA TG 001	2	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
10	COB CO 028	40	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
11	CNN VG 003	4	CONNECTOR, VISE TYPE, 6-2 SOL. - 10-2 SOL.
12	CUT OT X01	2	CUTOUT, FUSED, 125KV BIL, 100 AMP, 27KV
13	CUT OT 004	2	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
14	FUS OH ***	4	GENERAL CODE FOR FUSE-LINK
15	TRA SB ***	2	GENERAL CODE FOR TRANSFORMER
16	WAS RD 004	4	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
17	WAS RD 005	6	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
18	WAS SP 002	2	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT

DGRB

TWO-PHASE STEP-DOWN TRANSFORMER BANK – 26.4KV TO 4KV



DGRC

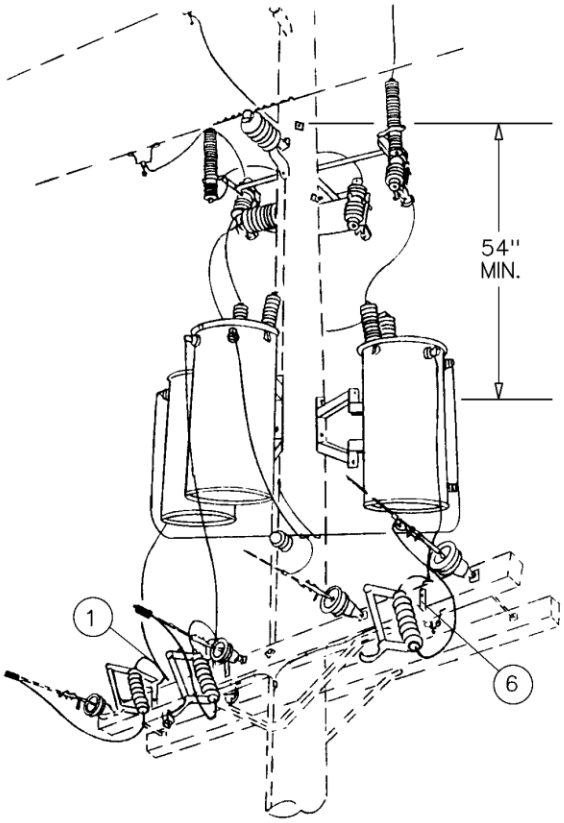
THREE-PHASE STEP-DOWN TRANSFORMER BANK – 26.4KV TO 4KV

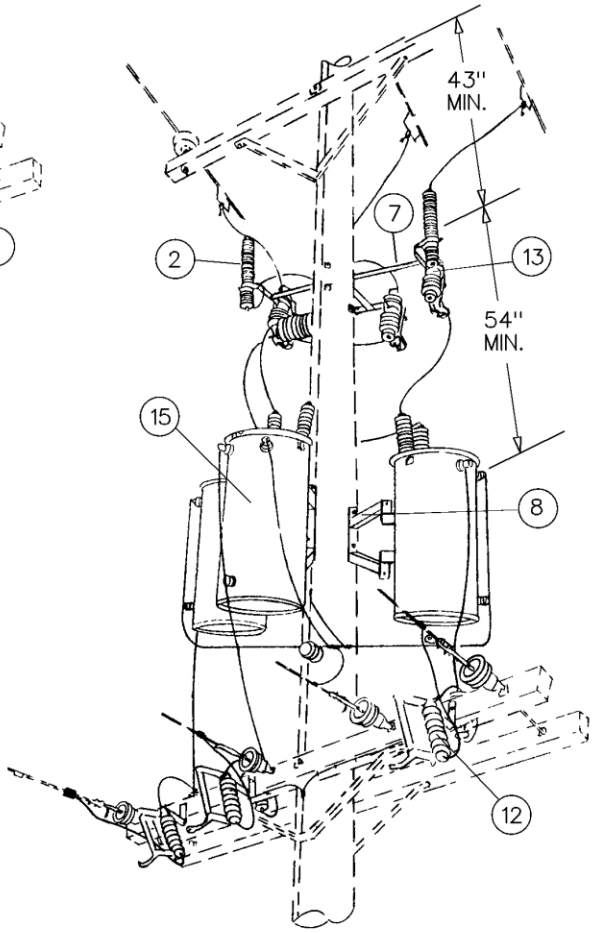
OPTIONS: 50, 75, 100, 167, 250
BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ARR LI 001	3	ARRESTER, LIGHTNING, 3KV, POLYMER MOV (DIST.)
2	ARR LI 003	3	ARRESTER, LIGHTNING, 21KV, POLYMER MOV (DIST.)
3	BOL MS 015	6	BOLT, MACHINE, SQUARE HEAD, 5/8X2
4	BOL MS 035	2	BOLT, MACHINE, SQUARE HEAD, 3/4X12
5	BOL MS 036	4	BOLT, MACHINE, SQUARE HEAD, 3/4X14
6	BKT AC 003	6	BRACKET, ARRESTER OR CUTOUT, CROSSARM MOUNTING
7	BKT AC 002	1	BRACKET, ARRESTER AND CUTOUT, TRI-MOUNT
8	BKT TM 001	3	BRACKET, TRANSFORMER MOUNTING
9	CLA TG 001	2	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
10	COB CO 028	60	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
11	CNN VG 003	6	CONNECTOR, VISE TYPE, 6-2 SOL. - 10-2 SOL.
12	CUT OT X01	3	CUTOUT, FUSED, 125KV BIL, 100 AMP, 27KV
13	CUT OT 004	3	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
14	FUS OH ***	6	GENERAL CODE FOR FUSE-LINK
15	TRA SB ***	3	GENERAL CODE FOR TRANSFORMER
16	WAS RD 004	6	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
17	WAS RD 005	14	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
18	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
19	WAS SP 002	6	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT

DGRC

THREE-PHASE STEP-DOWN TRANSFORMER BANK – 26.4KV TO 4KV





LG2

CONSTANT CURRENT TRANSFORMER FOR U.G. STREETLIGHT CIRCUIT

OPTIONS: NONE

BOLT PLATE: NONE

NO.	ITEM ID	QTY	DESCRIPTION
1	ANC ST 001	24	ANCHOR, STUD BOLT, 1/4X3/4 IN.
2	ARR LI ***	1	GENERAL CODE FOR ARRESTER
3	BKT AC 003	4	BRACKET, ARRESTER AND CUTOUT, CROSSARM MOUNT
4	BKT TM 001	1	BRACKET, TRANSFORMER MOUNTING
5	BKT TM 003	2	BRACKET, TRANSFORMER ADAPTER PLATE
6	BOL DA 020	3	BOLT, DOUBLE ARMING, 3/4X24
7	BOL MS 015	2	BOLT, MACHINE, SQUARE HEAD, 5/8X2
8	BOL MS 037	3	BOLT, MACHINE, SQUARE HEAD, 3/4X16
9	BOL MS 038	1	BOLT, MACHINE, SQUARE HEAD, 3/4X18
10	BOX SE 001	1	BOX, CONCRETE SECONDARY SERVICE, 17”X28”
11	CAI CL 004	60	CABLE, PRIMARY, 5kV, 8CU
12	CLA TG 001	1	CLAMP, TRANSFORMER TANK GROUND, #6 SOL. - #1 STR.
13	CNN CP 020	2	CONNECTOR, COMPRESSION, CU, 1/0
14	CNN CP 021	2	CONNECTOR, COMPRESSION, CU, #2 STR.
15	CNN VG 003	2	CONNECTOR, VISE TYPE, 6-2 SOL. - 10-2 SOL.
16	CNN WC 003	2	CONNECTOR, TERMINAL, 12-10 AWG
17	COB CO 028	20	CONDUCTOR, BARE COPPER, #4 SOFT DRAWN
18	COD ST 003	20	CONDUIT, STEEL, 1 IN.
19	COD ST 006	20	CONDUIT, STEEL, 2 IN.
20	COI BW 003	10	WIRE, THWN, 12 SOL. BLACK
21	COI BW 005	10	WIRE, THWN, 12 SOL., WHITE
22	COI BW 021	25	WIRE, THWN, 6 STR., BLACK
23	COI BW 022	25	WIRE, THWN, 6 STR., WHITE
24	CUT OT 004	3	CUTOUT, FUSED, 150KV BIL, 100 AMP, 27KV
25	CXA ST 001	3	CROSSARM, STEEL, 5” X 5” X 10’
26	FUS UG 009	1	FUSE, UNDERGROUND, 15A, NON-15
27	INS VP 001	3	INSULATOR, VERTICAL POST, 34.5Kv
28	MET HU 002	1	HUB, CONDUIT, 1 IN., INTERCHANGEABLE
29	STL PC 001	1	PHOTOELECTRIC CONTROL, ELECTRONIC, 105-130V
30	STL PC 004	1	PHOTOELECTRIC CONTROL BRACKET
31	STP ST 001	6	STRAP, CONDUIT, STEEL, 1 IN.
32	STP ST 005	6	STRAP, CONDUIT, STEEL, 2 IN.
33	STU LI 003	3	STUD, LINE POST
34	TRA SL 001	1	6.6 AMP REGULATED OUTPUT TRANSFORMER
35	WAS RD 004	2	WASHER, ROUND, 1-3/4 IN. DIA., FOR 5/8 IN. BOLT
36	WAS RD 005	23	WASHER, ROUND, 2 IN. DIA., FOR 3/4 IN. BOLT
37	WAS SF 003	4	WASHER, SQUARE, FLAT, 3 IN., FOR 3/4 IN. BOLT
38	WAS SP 002	4	WASHER, SPRING, DOUBLE HELIX, FOR 3/4 IN. BOLT
39	WEA HE 001	1	WEATHERHEAD, 2 IN.
40	--	1	CURRENT TRANSFORMER

LG2 (CONTINUED)

CONSTANT CURRENT TRANSFORMER FOR U.G. STREETLIGHT CIRCUITN (CONTINUED)

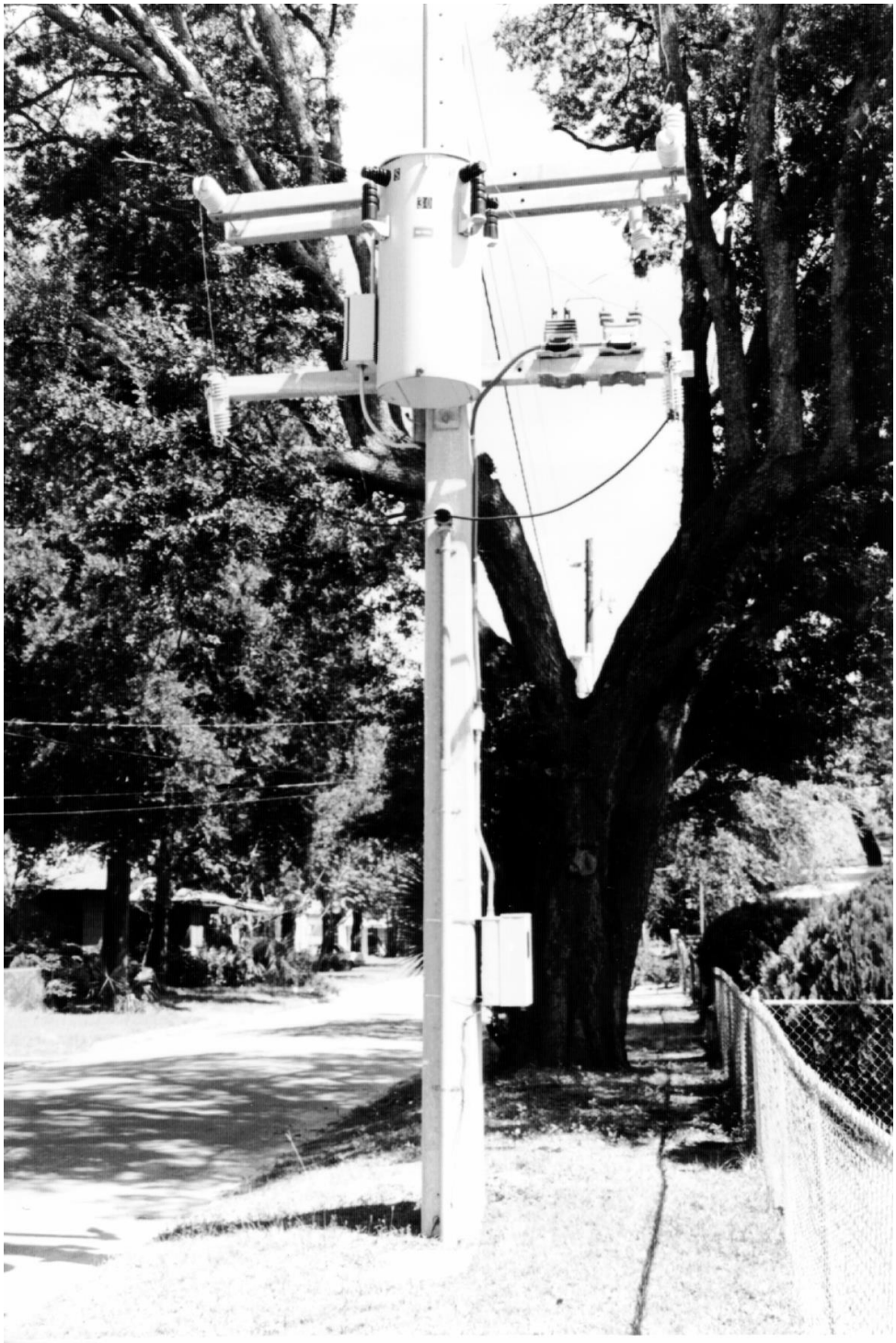
41	--	1	POTENTIAL TRANSFORMER
42	--	20FT	1 INCH EMT
43	--	1	FS BOX
44	--	3	1 INCH SEALTITE STRAIGHT CONNECTOR
45	--	1	1 INCH SEALTITE 45 DEGREE CONNECTOR
46	--	8FT	3/8 IN. THREADED ROD
47	--	8	3/8 IN. NUTS
48	--	8	3/8 IN. WASHERS
49	--	1	1 INCH EMT COUPLING
50	--	2	1 INCH EMT CONNECTORS
51	--	12FT	CONDUCTOR, COPPER, #4 SOFT DRAWN
52	--	4FT	CONDUCTOR, COPPER, #6 SOFT DRAWN
53	--	1	SINGLE GANG METER CAN
54	--	1	4-POLE TEST BLOCK
55	--	2	C.T. TERMINAL CONNECTORS
56	--	6	1 IN. PIPE STRAPS
57	--	8FT	KINDORF OR UNISTRUT CHANNEL

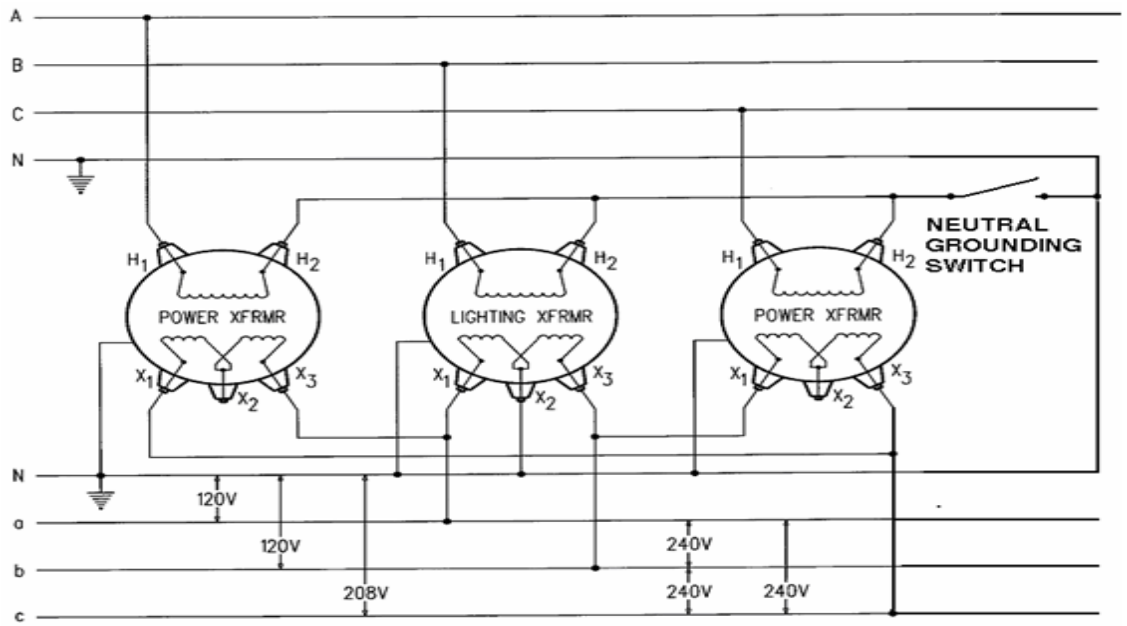
LG2

CONSTANT CURRENT TRANSFORMER FOR U.G. STREETLIGHT CIRCUIT

LG2

CONSTANT CURRENT TRANSFORMER FOR U.G. STREETLIGHT CIRCUIT





UNGROUNDED WYE-DELTA CONNECTION
120/240 VOLT, 3-PHASE, 4-WIRE SERVICE

SWITCHING UNGROUNDED CLOSED-DELTA TRANSFORMER BANKS

INTRODUCTION

The ungrounded Closed-Delta transformer connection is used by the JEA to provide 240 volt delta secondary service. The primary neutral is not grounded to avoid zero-sequence current flow into the bank due to primary feeder voltage imbalance or faults. This procedure is to be followed on all JEA primary voltages.

DISCUSSION

Ferroresonance and extremely light transformer loading are the general major causes of transformer and arrester failures when energizing Closed-Delta banks. Temporarily grounding the high-side neutral will limit the over-voltage which may occur due to ferroresonance, but will not limit over-voltages due to open phases on the line-side of the bank. Over-voltages due to transformer loading can be reduced by properly switching the lighting transformer and power transformers. Larger Closed-Delta banks usually do not experience any problems with ferroresonance.

The following types or scenarios for Closed-Delta banks are covered in this Standards Bulletin:

***Banks with all transformers 75kVA or larger**
***Banks with any transformer less than 75kVA**
Type 1 - (new location)
Type 2 - (power transformer fuse blown, no grounding switch)
Type 3 - (lighting transformer fuse blown, no grounding switch)
Type 4 - (no fuse blown, no grounding switch)
Type 5 - (power transformer fuse blown, grounding switch present)
Type 6 - (lighting transformer fuse blown, grounding switch present)
Type 7 - (no fuse blown, grounding switch present)

SWITCHING PROCEDURE

Banks with all transformers 75kVA or larger

Energization - Energize the power transformers first and the lighting transformer last.

De-energization - De-energize the lighting transformer first and then the power transformers.

Banks with any transformers less than 75kVA

Type 1 - (new location)

Step 1 - A 150kV BIL cutout shall be permanently installed on the side of the pole opposite to the lighting transformer to be used for temporarily grounding the high-side neutral. The cutout shall be mounted using the bracket BKT AC 007 and #4 CU for the jumpers from the cutout to the high-side neutral and the pole ground. Connection of the jumpers to each shall be made using the connector CNN VG 003, and within 12 inches of the H2 bushing closest to the grounding switch, on the floating neutral, for the line side jumper.

Step 2 - Install a 40T or larger fuse-link in the cutout barrel and close it in to ground the high-side neutral.

Step 3 - Energize the power transformers first and the lighting transformer last.

Step 4 - After all three transformers have been energized, the barrel of the cutout temporarily grounding the high-side neutral **MUST** be removed and stored on the pole in a suitable location that is safe to personnel for future access and from hazard to other JEA equipment.

Type 2 - (power transformer fuse blown, no grounding switch)

Step 1 - De-energize the lighting transformer first and then the remaining power transformer.

Step 2 - A 150kV BIL cutout shall be permanently installed on the side of the pole opposite to the lighting transformer to be used for temporarily grounding the high-side neutral. The cutout shall be mounted using the bracket BKT AC 007 and #4 CU for the jumpers from the cutout to the high-side neutral and the pole ground. Connection of the jumpers to each shall be made using the connector CNN VG 003, and within 12 inches of the H2 bushing closest to the grounding switch, on the floating neutral, for the line side jumper.

Step 3 - Install a 40T or larger fuse-link in the cutout barrel and close it in to ground the high-side neutral.

Step 4 - Energize the power transformers first and the lighting transformer last.

Step 5 - After all three transformers have been energized, the barrel of the cutout temporarily grounding the high-side neutral **MUST** be removed and stored on the pole in a suitable location that is safe to personnel for future access and from hazard to other JEA equipment.

Type 3 - (lighting transformer fuse blown, no grounding switch)

Step 1 - De-energize the remaining power transformers.

Step 2 - A 150kV BIL cutout shall be permanently installed on the side of the pole opposite to the lighting transformer to be used for temporarily grounding the high-side neutral. The cutout shall be mounted using the bracket BKT AC 007 and #4 CU for the jumpers from the cutout to the high-side neutral and the pole ground. Connection of the jumpers to each shall be made using the connector CNN VG 003, and within 12 inches of the H2 bushing closest to the grounding switch, on the floating neutral, for the line-side jumper.

Step 3 - Install a 40T or larger fuse-link in the cutout barrel and close it in to ground the high-side neutral.

Step 4 - Energize the power transformers first and the lighting transformer last.

Step 5 - After all three transformers have been energized, the barrel of the cutout temporarily grounding the high-side neutral **MUST** be removed and stored on the pole in a suitable location that is safe to personnel for future access and from hazard to other JEA equipment.

Type 4 – (no fuses blown, no grounding switch – work is required on bank)

Step 1 - De-energize the lighting transformer first and then the power transformers.

Step 2 - A 150kV BIL cutout shall be permanently installed on the side of the pole opposite to the lighting transformer to be used for temporarily grounding the high-side neutral. The cutout shall be mounted using the bracket BKT AC 007 and #4 CU for the jumpers from the cutout to the high-side neutral and the pole ground. Connection of the jumpers to each shall be made using the connector CNN VG 003, and within 12 inches of the H2 bushing closest to the grounding switch, on the floating neutral, for the line side jumper.

Step 3 - Install a 40T or larger fuse-link in the cutout barrel and close it in to ground the high-side neutral.

Step 4 – Perform required work.

Step 5 - Energize the power transformers first and the lighting transformer last.

Step 6 - After all three transformers have been energized, the barrel of the cutout temporarily grounding the high-side neutral **MUST** be removed and stored on the pole in a suitable location that is safe to personnel for future access and from hazard to other JEA equipment.

Type 5 - (power transformer fuse blown, grounding switch present)

Step 1 - De-energize the lighting transformer first and then the remaining power transformer.

Step 2 - Install a 40T or larger fuse-link in the cutout barrel of the grounding switch and close it in to ground the high-side neutral.

Step 3 - Energize the power transformers first and the lighting transformer last.

Step 4 - After all three transformers have been energized, the barrel of the cutout temporarily grounding the high-side neutral **MUST** be removed and stored on the pole in a suitable location that is safe to personnel for future access and from hazard to other JEA equipment.

Type 6 - (lighting transformer fuse blown, grounding switch present)

Step 1 - De-energize the remaining power transformers.

Step 2 - Install a 40T or larger fuse-link in the cutout barrel of the grounding switch and close it in to ground the high-side neutral.

Step 3 - Energize the power transformers first and the lighting transformer last.

Step 4 - After all three transformers have been energized, the barrel of the cutout temporarily grounding the high-side neutral **MUST** be removed and stored on the pole in a suitable location that is safe to personnel for future access and from hazard to other JEA equipment.

Type 7 – (no fuses blown, grounding switch present – work is required on bank)

Step 1 - Install a 40T or larger fuse-link in the cutout barrel and close it in to ground the high-side neutral.

Step 2 - De-energize the lighting transformer first and then the power transformers.

Step 3 – Perform required work.

Step 4 - Energize the power transformers first and the lighting transformer last.

Step 5 - After all three transformers have been energized, the barrel of the cutout temporarily grounding the high-side neutral **MUST** be removed and stored on the pole in a suitable location that is safe to personnel for future access and from hazard to other JEA equipment.