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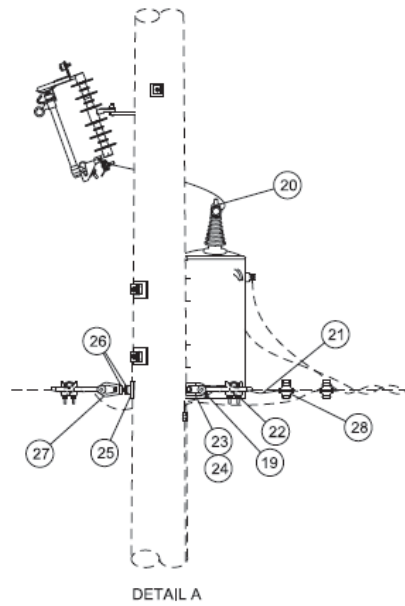
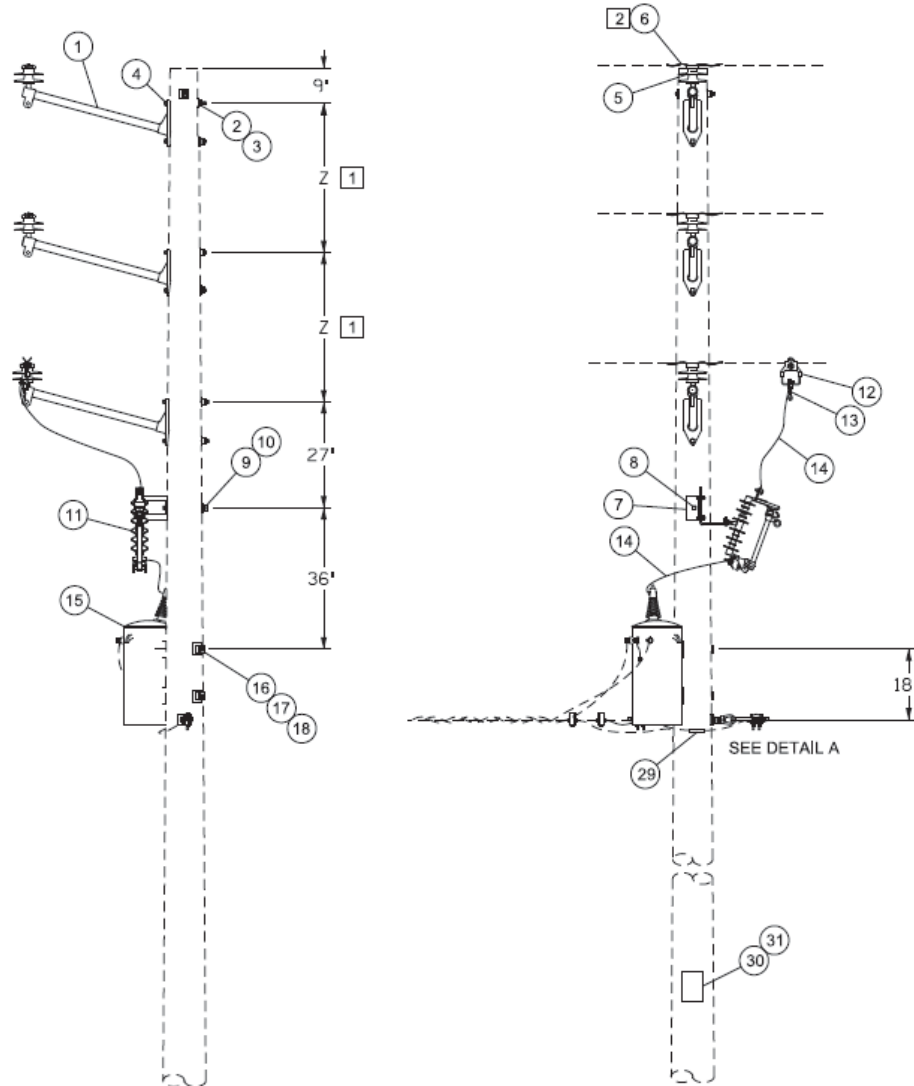
CLUSTER MOUNTING WYE PRIMARY

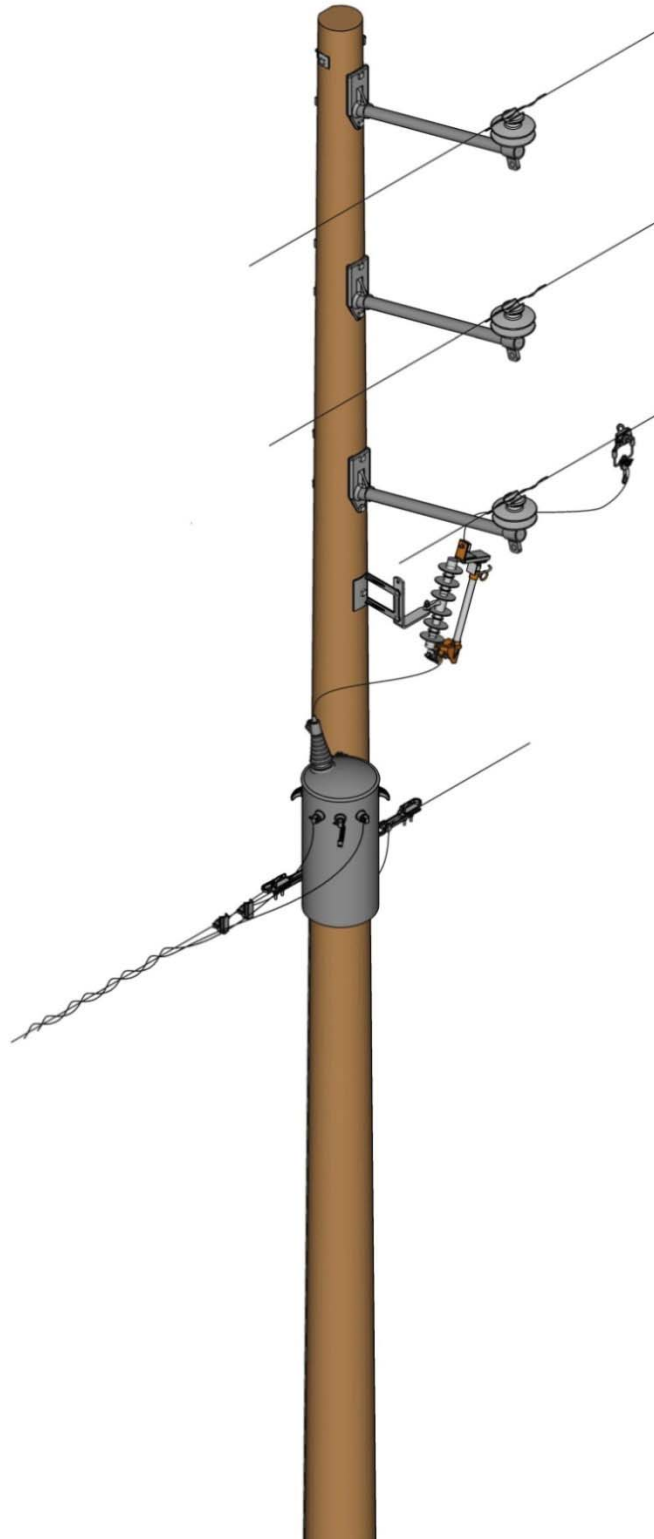
T160 / We#

TRANSFORMER CONNECTION DIAGRAMS WYE PRIMARY

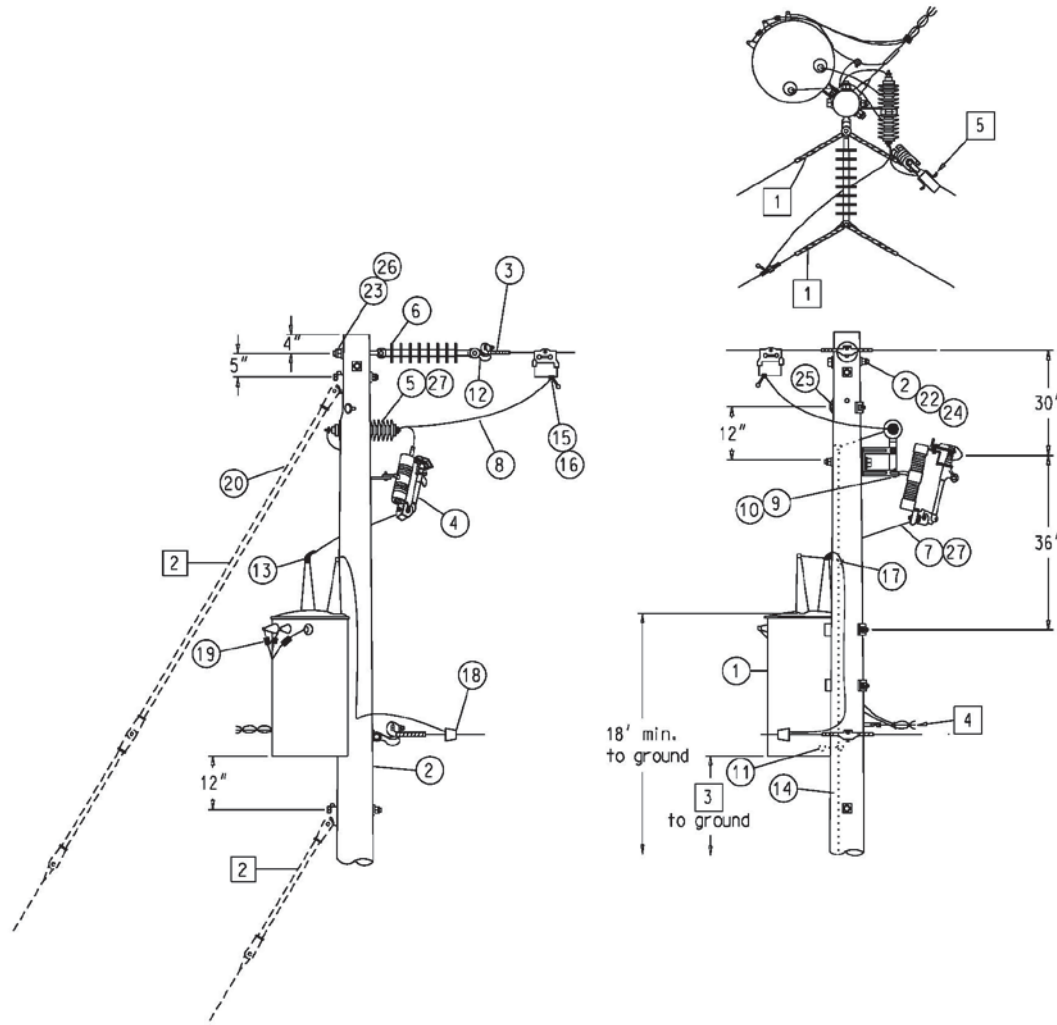
T165 / We#

TRANSFORMER CONNECTION DIAGRAMS OPEN WYE PRIMARY





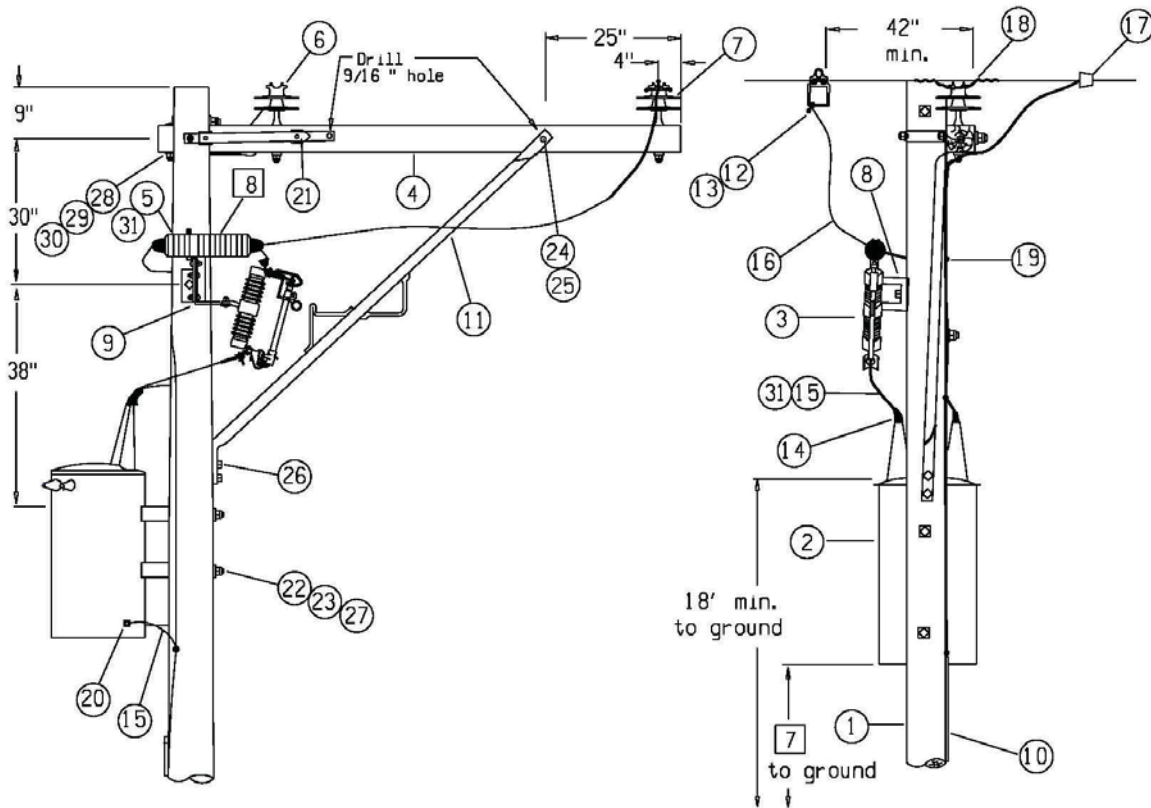
Click [here](#) to see and rotate this drawing in 3D.
For more information on using the drawing toolbar, see Std REF50.



□ Notes:

1. Use line guard on AA conductors and armor rod on ACSR conductors.
2. See [Section G Standards](#) for guying requirements.
3. The minimum distance between the bottom of the transformer and the ground shall be: 16 feet over traveled portion of roadways, 15 feet over shoulder of roadways, and 10 feet over walkways.
4. Service shall not be located above top transformer mounting bolt.
5. Position cutout so fuse holder will not strike neutral when opened.
6. Refer to Std T45 for arrester mounting on new settings.
7. For transformers with two primary bushings, the H2 bushing connection shall be to the system primary neutral, using a #4 CU poly-covered conductor. The #4 CU poly-covered conductor may be stapled to the pole alongside of the pole ground.

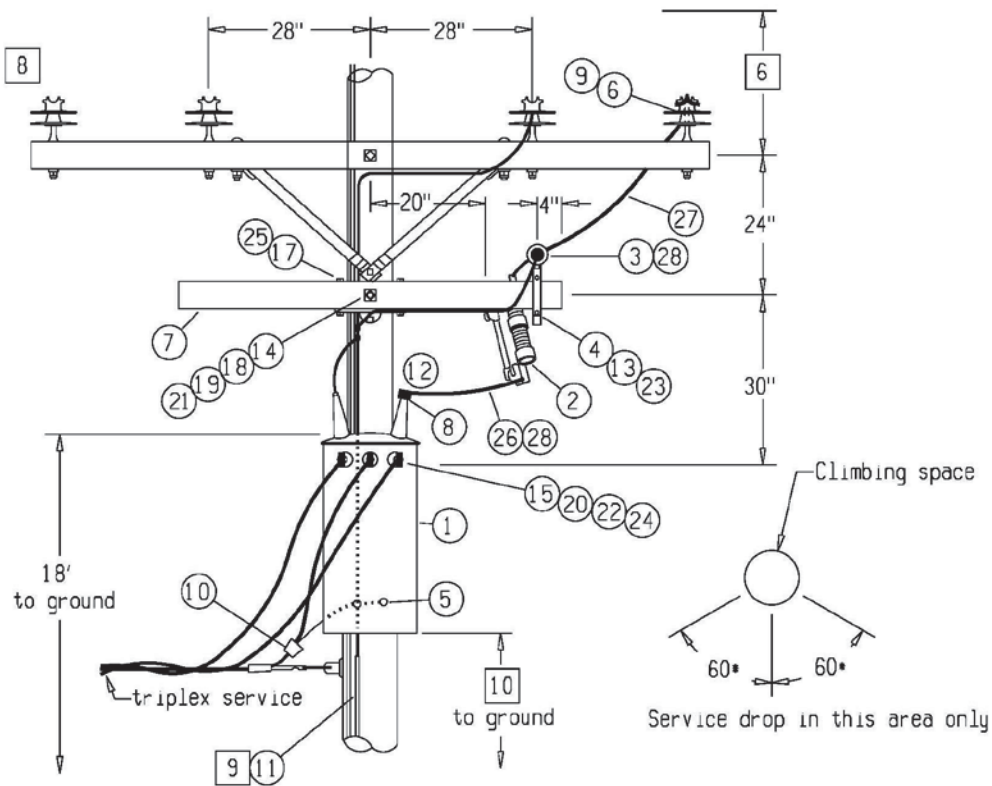
ITEM	MATERIAL	NO.REQ.	ITEM	MATERIAL	NO.REQ.
1	TRANSFORMER	1	15	HOT LINE CLAMP	134-1700 1
2	POLE (CLASS AS REQ)	1	16	STIRRUP	134-73 1
3	ARMOR ROD OR LINE GUARD	134-____ OR 135-____ AS REQ	17	CONNECTOR	135-2085 4
4	CUTOUT	134-2906 1	18	CONNECTOR	135-____ 2
5	ARRESTER	134-0375 1	19	CONNECTOR (AS REQ)	135-____ 3
6	DEADEND STRAIN INSULATOR	134-5200 1 OR 3	20	GUY	- AS REQ
7	#4 POLY COVERED COPPER	133-6641 2 FT	21	5/8" X ____" MACHINE BOLT	135-03 4
8	#6 BARE STRANDED COPPER	133-0917 AS REQ	22	5/8" X ____" LOCKNUT	135-4480 7
9	MODIFIED NEMA BRACKET	134-1423 1 IF REQ	23	3" X 3" CURVED WASHER	135-9500 2
10	CUTOUT-ARRESTER BRACKET	134-1422 1	24	2-1/4" X 2-1/4" FLAT WASHER	135-9400 9
11	TANK GROUNDING CONNECTOR	135-3100 1	25	5/8" X ____" SHOULDER EYEBOLT	135-022 1
12	ANGLE SUSPENSION CLAMP	134-____ OR 135-____ 2	26	5/8" X ____" EYEBOLT	135-01 2
13	INSULATING BUSHING COVER	135-3210 1 IF REQ	27	1/2" CARLON	135-3835 40"
14	GROUND-SEE SECTION GR STDS	1			



□ Notes:

1. Drill 6 pin crossarm for alley arm brace item 11.
2. Service shall not be located above top transformer mounting bolt.
3. Highest communication attachment shall be 40" from service conductor attachment, except for the following conditions:
 - A. Existing ungrounded tank - service above tank bottom - communication shall be 40" from tank.
 - B. Tank grounded - service greater than 10" above tank bottom – communication shall be 30" from tank.
 - C. The above dimensions shall be increased where necessary to maintain 30" between power supply secondaries and communication in span.
4. See [Std CA10](#) for installation of cutout and arrester.
5. Crossarm brace 134-1260 is used as a back brace. Drill out the small hole to fit the 5/8" through bolt in the pole.
6. See Line Work Method ([LWM](#)) 4008 for instructions on operation of cutouts.
7. The minimum distance between the bottom of the transformer and the ground shall be: 16 feet over traveled portion of roadways, 15 feet over shoulder of roadways and 11 feet over walkways.
8. If this is a new setting, see Std T45 for the location of the arrester.
9. See [Std OHC50](#) for proper use of preformed ties.
10. For transformers with two primary bushings, the H2 bushing connection shall be to the system primary neutral, using a #4 CU poly-covered conductor. The #4 CU poly-covered conductor may be stapled to the pole alongside of the pole ground.

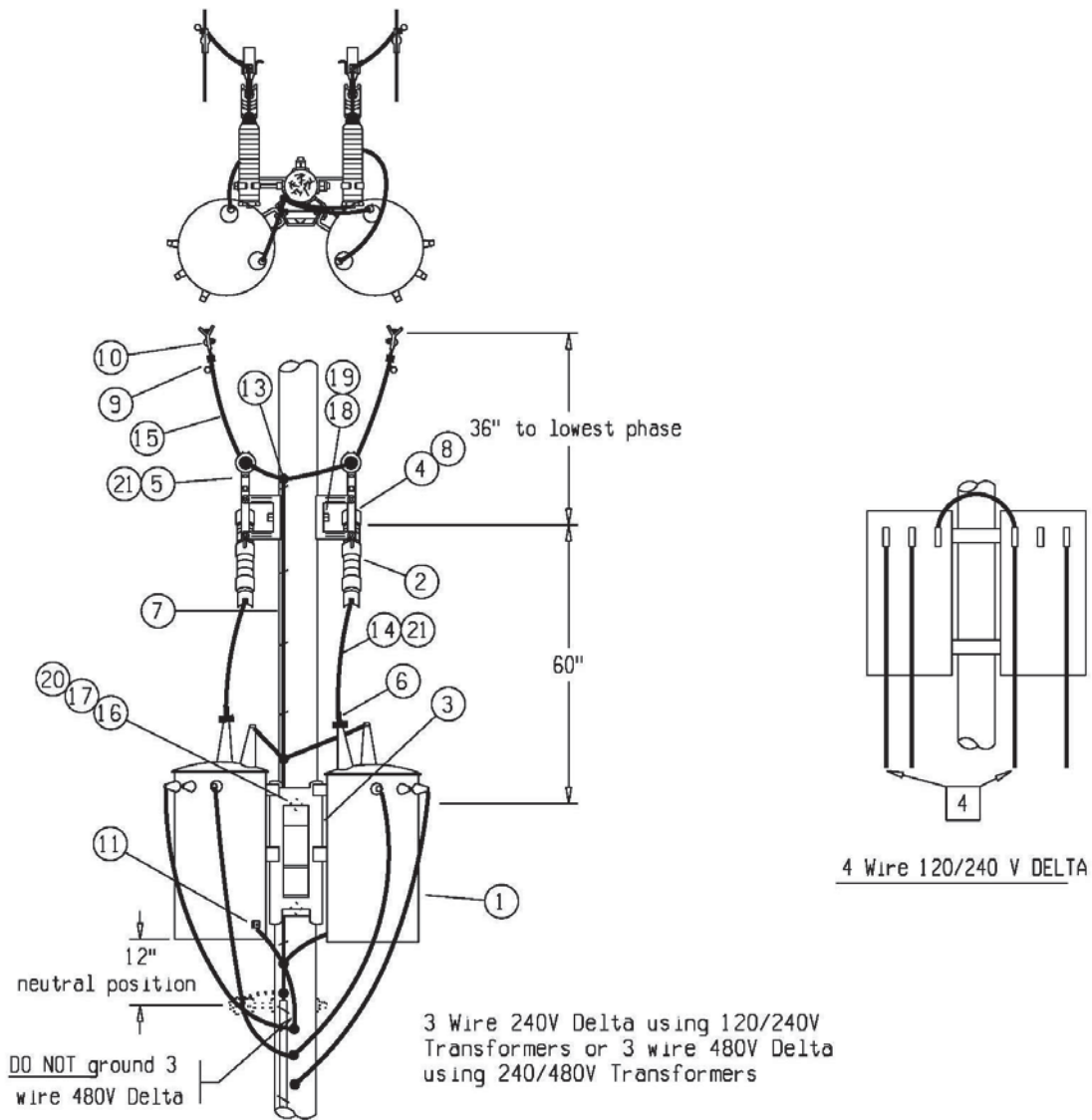
ITEM	MATERIAL	NO.REQ.	ITEM	MATERIAL	NO.REQ.
1	POLE	132-_____	17	CONNECTOR	135-_____
2	TRANSFORMER	-	18	PREFORMED TIE [9]	134-78
3	CUTOUT	134-2906	19	CONNECTOR	135-2085
4	6 PIN CROSSARM [1]	134-0151	20	TANK GROUNDING CONNECTOR	135-3100
5	ARRESTER	134-0375	21	CROSSARM BRACE [5]	134-1260
6	INSULATOR PIN	135-4516	22	5/8" X _____ MACHINE BOLT	135-03_____
7	PIN INSULATOR	134-4955	23	5/8" LOCKNUT	135-4480
8	CUTOUT – ARRESTER BRACKET	134-1422	24	1/2" X 4-1/2" CARRIAGE BOLT	135-0116
9	MODIFIED NEMA BRACKET	134-1423	25	1/2" LOCKNUT	135-4470
10	GROUND	-	26	1/2" X 4" LAG SCREW	135-5300
11	7 FT ALLEY ARM BRACE	134-1250	27	2-1/4" X 2-1/4" FLAT WASHER	135-9400
12	HOT LINE CLAMP	134-1700	28	3/8" X 5" CARRIAGE BOLT	135-0109
13	STIRRUP	134-73	29	3/8" LOCKNUT	135-4460
14	INSULATED BUSHING COVER	135-3210	30	1/2" ROUND WASHER	135-9150
15	#4 POLY COVERED COPPER	133-6641	31	1/2" CARLON – IF REQUIRED	135-3835
16	#6 BARE STRANDED COPPER	133-0917			



□ Notes:

1. Service attachment method and deadend clamp shown are for illustrative purposes only.
2. This setting is preferably built on an intermediate or yard pole, because the transformer must be de-energized before anyone can climb above it. See [Safety Rules Book](#).
3. See [Std CA10](#) for installation of cutout and arrester.
4. See Line Work Method [\(LWM\) 4008](#) for instructions on the operation of cutouts.
5. See [Stds TR section](#) for primary underbuild materials.
6. Contact the Material & Standards group for proper spacing.
7. See Stds TR section to determine proper method of distribution crossarm attachment to transmission pole. Any holes drilled for transformer attachment, service or secondary shall be parallel to the transmission line.
8. Span lengths are limited when using this horizontal spacing. Contact the Materials & Standards group for maximum allowable span lengths for specific wire sizes.
9. The transmission ground shall be covered with moulding from 4 feet above the distribution conductors to the distribution ground connection. The transmission static ground and the distribution ground wire may be interconnected and ground with one ground rod.
10. The minimum distance between the bottom of the transformer and the ground shall be 16 feet over traveled portion of roadways and 15 feet over shoulder of roadways.
11. For transformers with two primary bushings, the H2 bushing connection shall be to the system primary neutral, using a #4 CU poly-covered conductor. The #4 CU poly-covered conductor may be stapled to the pole alongside of the pole ground.

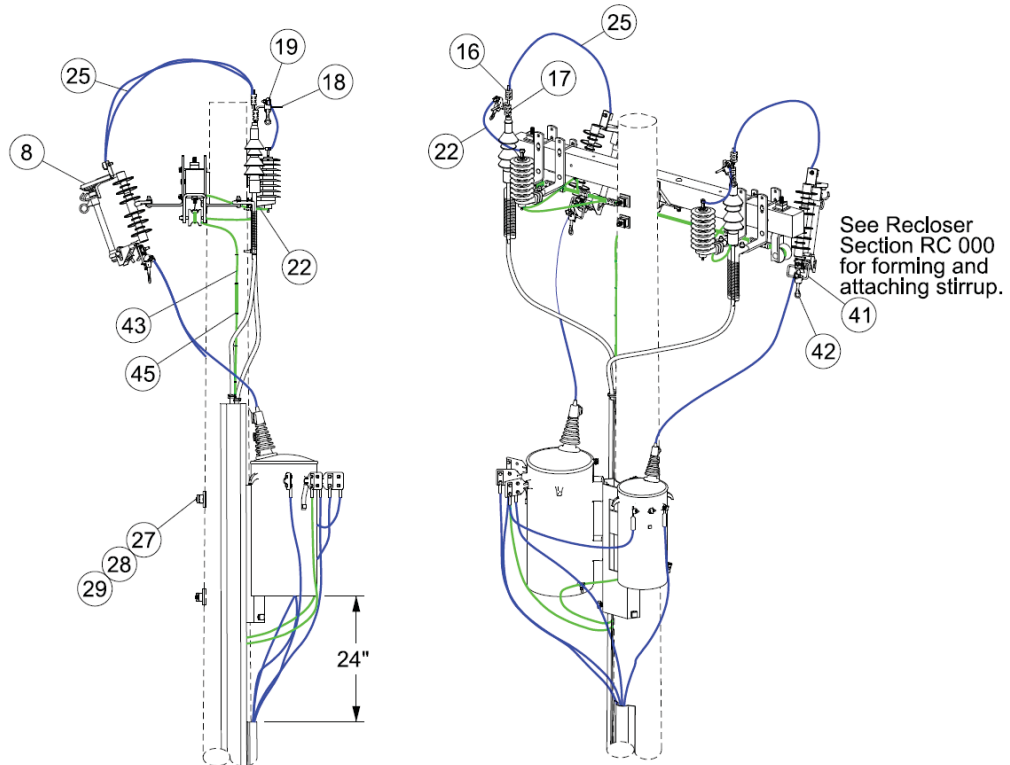
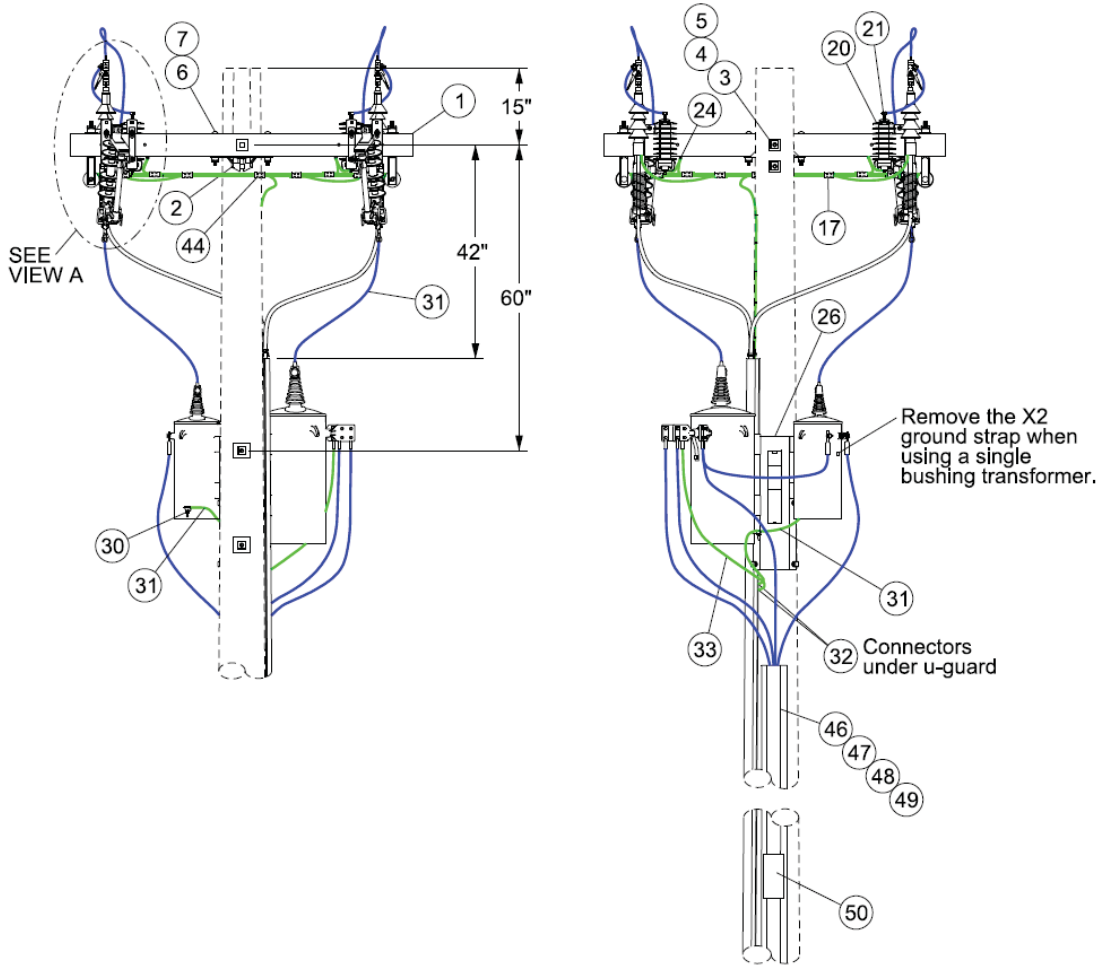
ITEM	MATERIAL	NO.REQ.	ITEM	MATERIAL	NO.REQ.
1	TRANSFORMER	-	15	LUG (SEE STDS CON SECTION)	3
2	CUTOUT	134-2906	16	5/8 X 5" LAG SCREW	2
3	ARRESTER	134-0375	17	1/2" WASHER	4
4	BACKSTRAP	134-7412	18	5/8" X " MACHINE BOLT	3
5	TANK GROUNDING CONNECTOR	135-3100	19	5/8" LOCKNUT	3
6	STIRRUP	134-73	20	PLATED NUT	AS REQ
7	4 PIN CROSSARM	134-0116	21	2-1/4" X 2-1/4" FLAT WASHER	4
8	INSULATED BUSHING COVER	135-3210	22	PLATED LOCK WASHER	AS REQ
9	HOT LINE CLAMP	134-1700	23	3/8" X 5" CARRIAGE BOLT	2
10	CONNECTOR	134-	24	PLATED BOLT	AS REQ
11	GROUND	-	25	1/2" X 7" MACHINE BOLT	2
12	CONNECTOR	135-2085	26	#4 POLY COVERED COPPER	AS REQ
13	MODIFIED NEMA BRACKET	134-1423	27	#6 BARE STRANDED COPPER	AS REQ
14	CROSSARM GAIN	134-4382	28	1/2" CARLON	40"

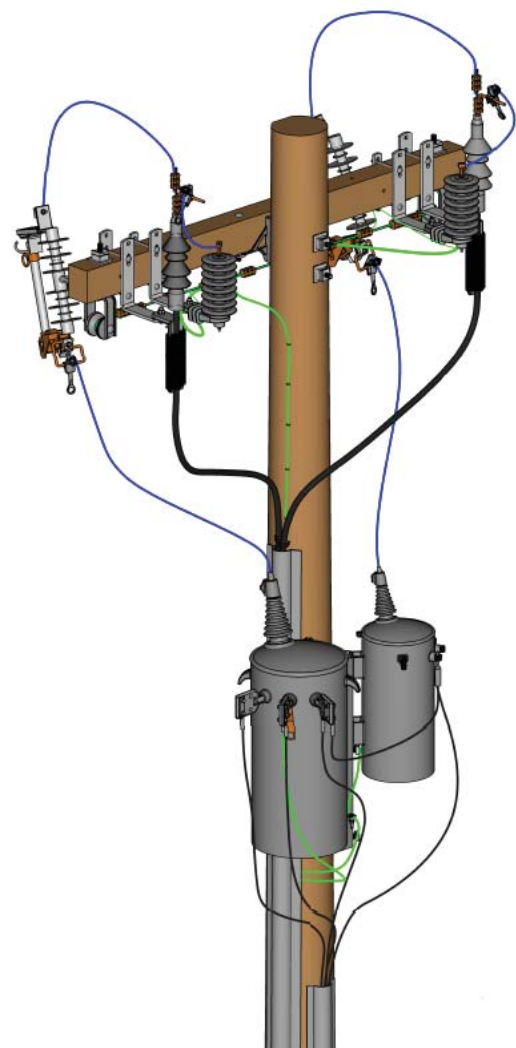
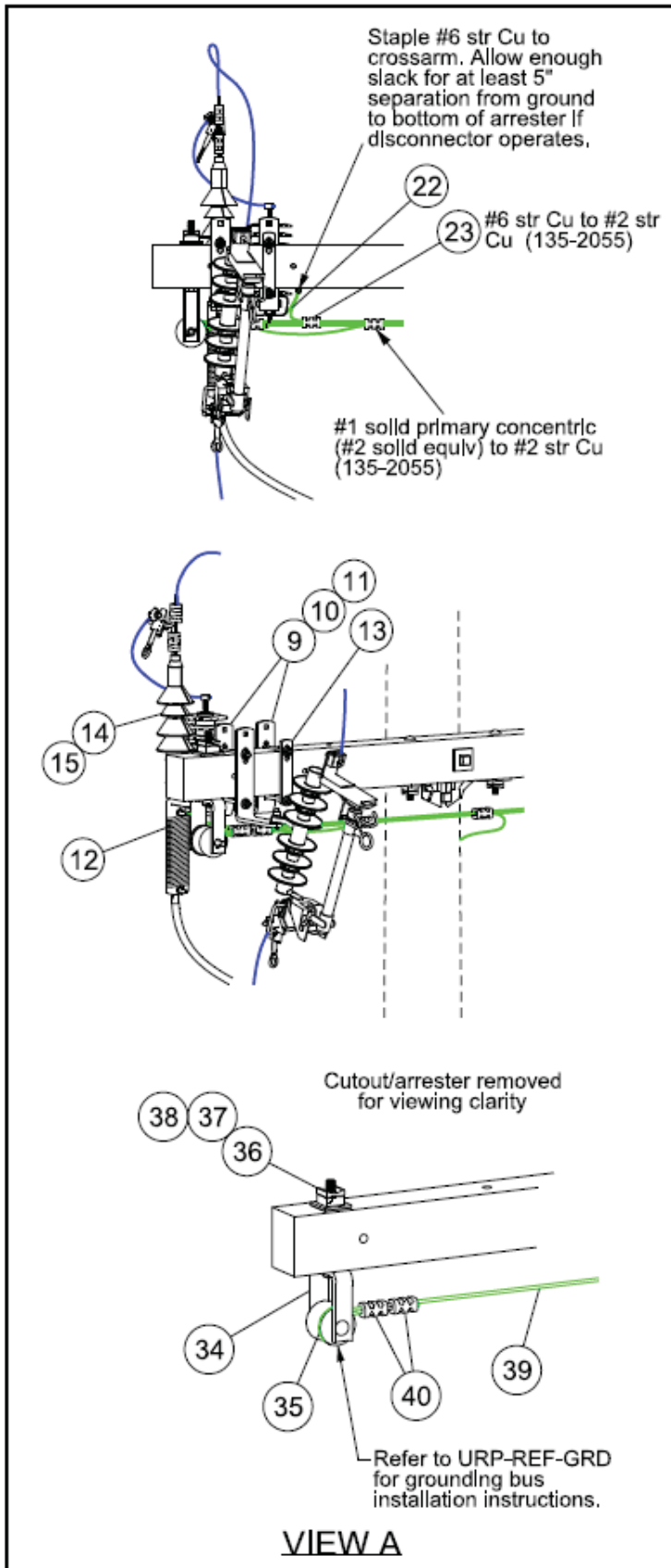


□ Notes:

1. See Std T125 for transformer lead wire size.
2. See Std T150 for proper 3 position bracket if future load will require transformers. If two transformers are mounted on a 3 position bracket, mount them in proper position and connect to appropriate phase conductor to accommodate future addition of transformer. Lighting transformers should be put on the center phase if the center exists.
3. On a 3-wire 480V setting, a 650V arrester shall be installed in the metering cabinet.
4. To change phase rotation, exchange connections to these two wires only.
5. Service attachment hardware may be a rack, cable deadend, or suspension insulators, depending on service size.
6. For transformers with two primary bushings, the H2 bushing connection shall be to the system primary neutral, using a #4 CU poly-covered conductor. The #4 CU poly-covered conductor may be stapled to the pole alongside of the pole ground.

ITEM	MATERIAL	NO.REQ.	ITEM	MATERIAL	NO.REQ.
1	TRANSFORMER	-	12	650V ARRESTER [3]	134-0447 1 IF REQ
2	CUTOUT	134-2906 2	13	CONNECTOR	135-2085 AS REQ
3	CLUSTER MOUNTING [2]	134-1331 1	14	#4 POLY COVERED COPPER	133-6641 AS REQ
4	CUTOUT-ARRESTER BRACKET	134-1422 2	15	#6 BARE STRANDED COPPER	133-0917 AS REQ
5	ARRESTER	134-0375 2	16	3/4" X " MACHINE BOLT	143-080 2
6	INSULATED BUSHING COVER	135-3210 2 IF REQ	17	3/4" LOCKNUT	143-6255 2
7	GROUND	AS REQ	18	5/8" X " MACHINE BOLT	135-03 1
8	MODIFIED NEMA BRACKET	134-1423 2 IF REQ	19	5/8" LOCKNUT	135-4480 1
9	HOT LINE CLAMP	134-1700 2	20	2-1/4" X 2-1/4" FLAT WASHER	135-9400 2
10	STIRRUP	134-73 2	21	1/2" CARLON	135-3835 80"
11	TANK GROUNDING CONNECTOR	135-3100 2			



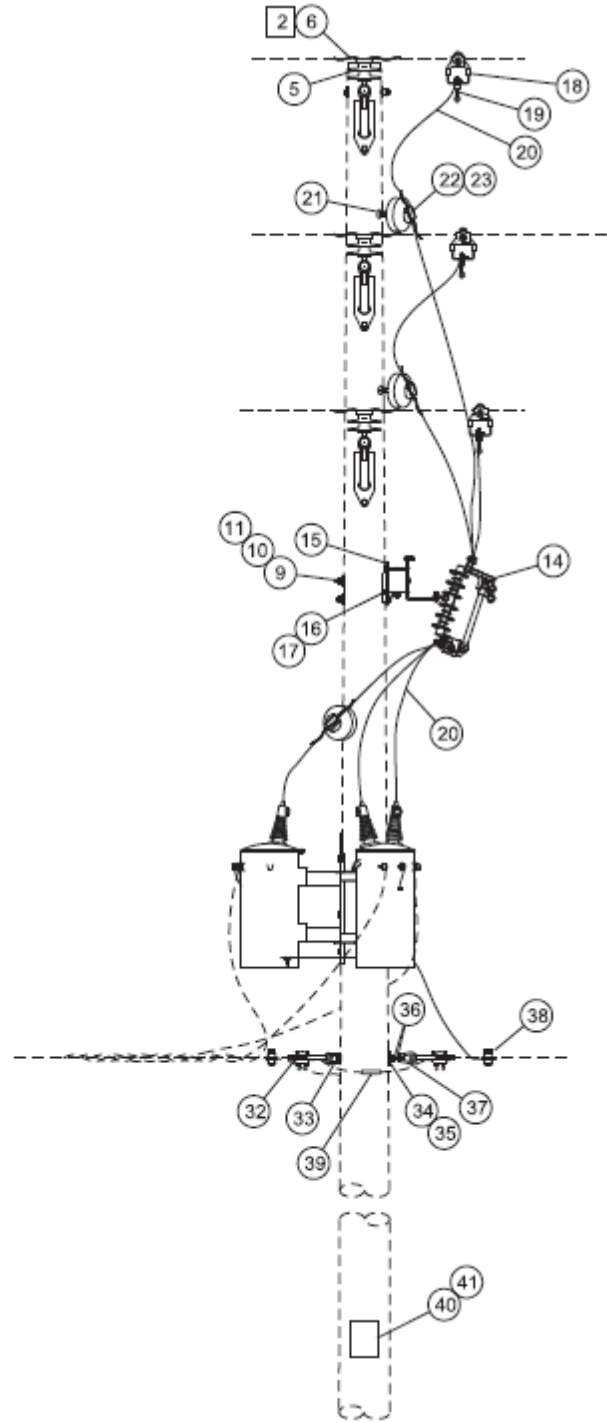
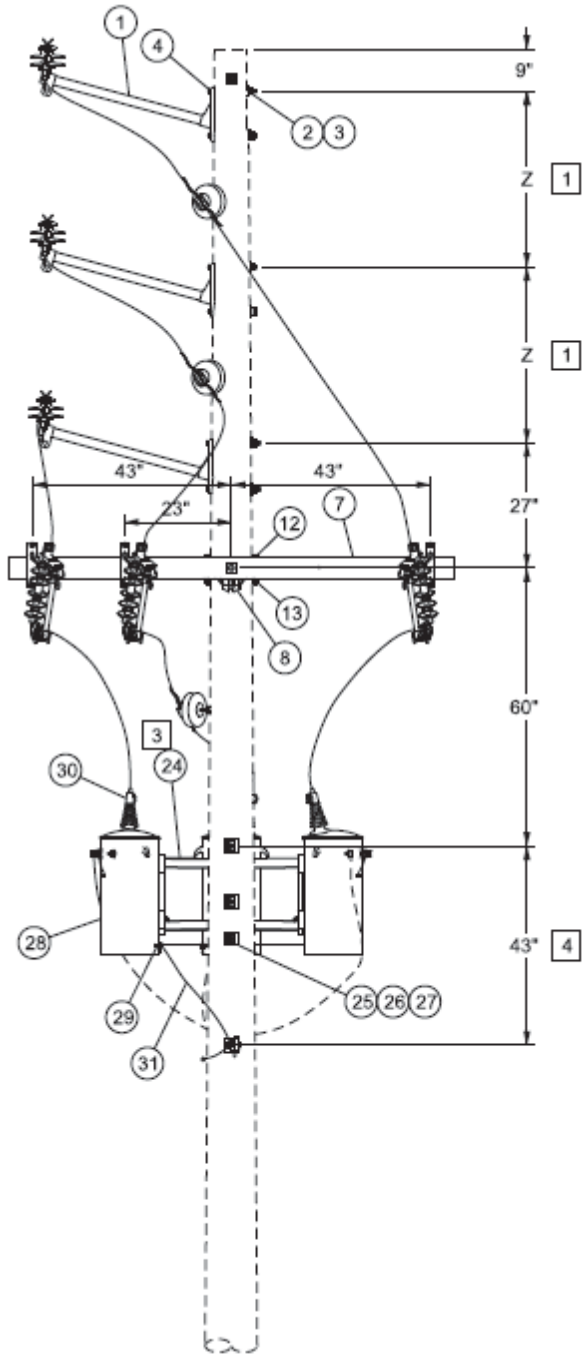


Click [here](#) to see and rotate this drawing in 3D.

□ Notes:

1. See [Std CA10](#) for installation of cutouts.
2. See Std T125 for transformer lead wire size.
3. See Line Work Method ([LWM](#)) [4008](#) for overhead transformer work methods.
4. On 480 V-3 wire settings, a 650V arrester shall be installed either at the transformer riser - service point or on the metering cabinet.
5. When connecting or disconnecting line jumpers, center phase shall be connected first and disconnected last to assist in maintaining safe working clearances from energized parts.

ITEM	MATERIAL	NO.REQ.	ITEM	MATERIAL	NO.REQ.
	ASSM: XARM-4PINNB	1		ASSM: BKT-MNT-2-TRANST	1
1	CROSSARM, 4-PIN WOOD	134-0116	26	BRACKET,MOUNTING,TRANS	134-1331
2	GAIN,CROSSARM-BRACELESS	134-4382	27	BOLT, MACHINE, 3/4"	MCH423X
3	BOLT, MACHINE, 5/8"	MCH421X	28	WASHER,SQUARE,3/4" NOM,13/16" ID	135-9400
4	WASHER,SQUARE,3/4" NOM,13/16" ID	135-9400	29	NUT,LOCK,3/4" DIA	143-6255
5	NUT,LOCK,5/8" DIA	135-4480	30	CONNECTOR, ELEC,TANK GND	135-3100
6	BOLT,CARR,GALVANIZED,1/2"X6" LG	135-0121	31	WIRE, ELEC, CU #4-7STR POLY	133-6980
7	NUT,LOCK,1/2" MF	135-4470	32	CONNECTOR, CU COMPRESSION	135-2055
	ASSM: CO-100/200A-XX	2	33	WIRE, ELEC, CU #6-7STR BARE	133-0917
8	CUTOUT, 100A	134-2906		ASSM: CLEVIS-GND-BUS-2CU	1
	ASSM: MOUNT-TRM/ARR-XA	2	34	CLEVIS, SPOOL INSULATOR	135-1815
9	BRACKET, CUT/ARR, MODIFIED NEMA	134-1423	35	INSULATOR, SPOOL	135-4240
10	BOLT, CARRIAGE 3/8" X 6"	135-0110	36	BOLT, MACHINE 5/8" X 8"	135-0350
11	NUT, LOCK	135-4460	37	WASHER,SQUARE,3/4" NOM,13/16" ID	135-9400
12	BRACKET,MOUNT,POLE TERMINATOR	134-1450	38	NUT,LOCK,5/8" DIA	135-4480
	ASSM: BACKSTRAP-ONLY	2	39	WIRE, #2-7STR CU MHD BARE	133-1035
13	BACKSTRAP	134-7412	40	CONNECTOR, CU COMPRESSION	135-2050
	ASSM: POLE_TERM-1-XX-RRISER	2		ASSM: STIRRUP-STR,18	2
14	TERMINATOR,CABLE,POLE	STS100X	41	STIRRUP,CU,1/0 SOL, 18"	134-7388
15	"SEAL, COLD SHRINK (ONLY NEEDED WHEN FCI ON JCKTD CABLE)	134-6600	42	CONNECTOR,ELEC,LIVE LINE	134-1700
16	CONN,CU COMPRESSION	135-2080		ASSM: DELTA-POLE-GND-RRISER(new)	1
17	CONN,CU COMPRESSION	135-2055	43	WIRE, #2-7STR CU MHD BARE	133-1035
	ASSM: CLMP-HOT/STRP-RRISER	2	44	CONNECTOR, CU COMPRESSION	135-2050
18	STIRRUP,CU,1/0 SOL,HD, L-SHAPE	134-7389	45	STAPLE, 2" X 1/2" COPPER	135-7980
19	CONNECTOR,ELEC,LIVE LINE	134-1700		ASSM: GUARD-U-XX	2
	ASSM: ARRESTER-18KV-RISER	2	46	GUARD,U-GUARD	134-45XX
20	ARRESTER,ELEC,18 KV,LIGHTNING	134-0375	47	TIE,CABLE	135-XXXX
21	CONNECTOR, ARRESTER	135-3110	48	SCREW,LAG,1/4" DIA,2" LG	135-5280
22	WIRE, #6 STR CU MHD BARE	133-0917	49	STAPLE, 1-1/4" X 1/4"	135-7966
23	CONNECTOR, CU COMPRESSION	135-2055	50	SIGN, ELEC SAFETY, WARNING	135-5480
24	STAPLE, 1-1/4" X 1/4"	135-7966			
	ASSM: WIRE-CU-#4-7S-P	3			
25	WIRE, #4 STR CU POLY	133-6980	20 ft		



04/01/15

T61 / We#

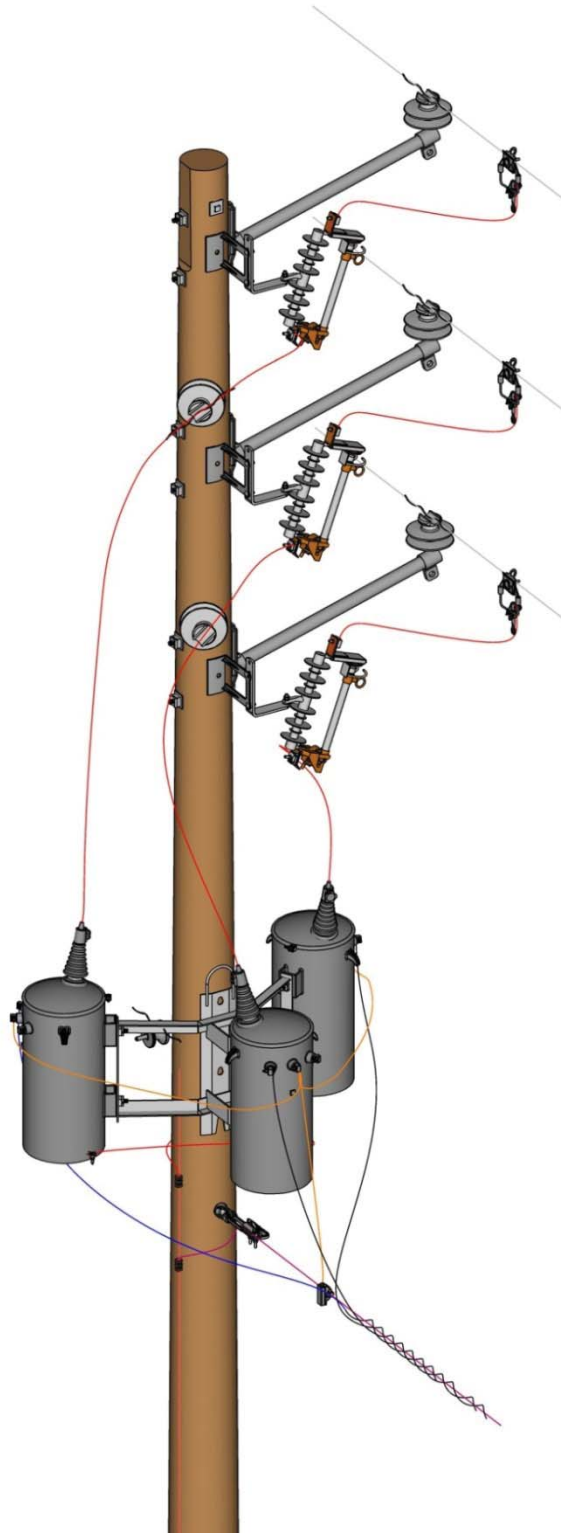
VERTICAL CONSTRUCTION – THREE PHASE – THREE TRANSFORMERS

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□ Notes:

1. For long span construction “Z” = 48”; for short span “Z” = 36”. If either circuit is long span the other circuit shall also be constructed long span.
2. See [Std OHC50](#) for proper use of preformed ties.
3. See Std T150 for proper transformer bracket.
4. Use 43” for transformer bracket 134-1328 and 53” for 134-1330.

ITEM	MATERIAL	NO.REQ.	ITEM	MATERIAL	NO.REQ.
	ASSEMBLY: ARMLESS	3		ASSEMBLY: BRACKET-XFER	1
1	BRACKET, ARMLESS, SIN	1	24	BRACKET, 3PH CLUSTER	1
2	NUT, LOCK, 5/8" DIAMETER	2	25	BOLT, MACHINE 3/4"	3
3	WASHER, SQUARE, 3/4"	2	26	WASHER, CURVED 3/4"	3
4	BOLT, MACHINE, 5/8"	2	27	NUT, LOCK 3/4"	3
	ASSEMBLY: INS-PIN	3		ASSEMBLY: TRANSFORMER	1
5	INSULATOR, PIN	1	28	TRANSFORMER	3
6	TIE, DISTRIBUTION	1	29	CONNECTOR, TANK GROUNDING	3
	ASSEMBLY: CUTOOT-CROSSARM	1	30	COVER, INSULATED BUSHING	3-IF NEEDED
7	CROSSARM, 6-PIN	1	31	WIRE, #4 STR POLY CU	1 LB
8	GAIN, BRACELESS	1		ASSEMBLY: SEC-NEU-DEADEND	1
9	BOLT, MACHINE, 5/8"	2	32	CLAMP, DEADEND	2
10	WASHER, SQUARE 3/4"	3	33	EYELET, 5/8"	1
11	NUT, LOCK 5/8"	2	34	BOLT, MACHINE, 5/8"	1
12	BOLT, CARRIAGE, 1/2" X 6"	2	35	WASHER, CURVED 3"	1
13	NUT, LOCK 1/2"	2	36	NUT, LOCK, 5/8" DIAMETER	2
	ASSEMBLY: CUTOOT	3	37	NUT, EYE 5/8"	1
14	CUTOOT, NEMA BRKT INCLUDED	1	38	CONNECTOR, VISE TYPE	1
15	BACKSTRAP	1	39	SPLICE, LOOP	1
16	BOLT, CARRIAGE, 3/8" X 5"	2		ASSEMBLY: SIGN HV	1
17	NUT, LOCK, 3/8" DIAMETER	2	40	NAIL, ROOFING, 1-1/2"	0.001
	ASSEMBLY: JUMPER-CUTOOT	3	41	SIGN, ELEC SAFETY	1
18	STIRRUP	1			
19	CONNECTOR, LIVE LINE	1			
20	CONDUCTOR, #2 STR POLY CU	11 LBS			
21	PIN, INSULATOR LAG SCREW	1			
22	INSULATOR, PIN	1			
23	TIE, INSULATOR #8 CU	1			



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For more information on using the drawing toolbar, see Std REF50.

04/01/13

T100 / We#

OVERHEAD TRANSFORMER INFORMATION

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SINGLE PHASE TRANSFORMERS

<u>Size KVA</u>	<u>Primary Voltage KV</u>	<u>Secondary Voltage</u>	<u>With Arresters Under Oil (Single Bushing) Code 137-</u>	<u>Without Arresters Under Oil (Double Bushing) Code 137-</u>
10	7.2 x 14.4	120/240	7155	7160
10	14.4	120/240	7170	7165
15	14.4	120/240	7185	7230
15	7.2 x 14.4	120/240	7187	7228
25	7.2 x 14.4	120/240	7284	7260
25	14.4	120/240	7240	7274
50	14.4	120/240	7290	7318
50	7.2 x 14.4	120/240	7292	7308
100	14.4	120/240	7388	7386
100	7.2 x 14.4	120/240	7368	7364
167	14.4	120/240		7455
167	7.2 x 14.4	120/240		7438
250	14.4	120/240		7520
250	7.2 x 14.4	120/240		7500
333	7.2 x 14.4	120/240		7555
333	14.4	120/240		7570
25	7.2 x 14.4	277/480	7282	7270
25	14.4	277/480	7280	7278
50	7.2 x 14.4	277/480	7314	7311
50	14.4	277/480	7324	7322
100	7.2 x 14.4	277/480	7376	7372
100	14.4	277/480	7400	7396
167	7.2 x 14.4	277/480	7448	7444
167	14.4	277/480	7470	7464
250	7.2 x 14.4	277/480		7510
250	14.4	277/480		7530
333	14.4	277/480		7575
333	7.2 x 14.4	277/480		7560
25	7.2 x 14.4	240/480		7265
25	14.4	240/480		7276
50	7.2 x 14.4	240/480		7310
50	14.4	240/480		7320
100	7.2 x 14.4	240/480		7369
100	14.4	240/480		7392
167	7.2 x 14.4	240/480		7442
167	7.2 x 14.4	240/480		7462

PRIMARY STEP-DOWN OVERHEAD TRANSFORMERS**Stock may or may not be immediately available.**

<u>Distribution</u>	<u>KVA</u>	<u>Primary Voltages</u>	<u>Secondary Voltages</u>
137-7251	25	7200/12470Y	2400/4160Y
137-7304	50	7200/12470	2400/4160
137-7316	50	7200 x 14400/24900	2400/4160
137-7317	50	13800	12400 x 7200/12470Y
137-7328	50	14400/24900	2400/4160
137-7330	50	14400/24900	2400 x 7200/12470Y
137-7332	50	14400/24900	7200/12470
137-7342	75	7200/12470	2400/4160
137-7362	100	7200/12470	2400/4160
137-7380	100	7200 x 14400/24900	2400/4160
137-7405	100	14400/24940Y	2400/4160Y
137-7408	100	14400/24900	2400 x 7200/12470
137-7410	100	14400/24900	7200/12470
137-7412	100	14400/24900	7200 x 14400/24900
137-7436	167	7200/12470	2400/4160
137-7450	167	7200 x 14400/24900	2400/4160
137-7451	167	13800	2400/4160
137-7464	167	14400/24900	2400/4160
137-7476	167	14400/24940Y	7200 x 14400/24900Y
137-7478	167	14400/24900	2400 x 7200/12470
137-7480	167	14400/24940Y	7200/12470Y
137-7482	167	14400/24900Y	7200 x 14400/24900Y
137-7484	200	14400/24900 – 7200/12470	7200/12470
137-7494	250	7200/12470	2400/4160
137-7495	250	7200 x 14400/24900	2400/4160
137-7538	250	14400/24900	2400/4160
137-7540	250	14400/24900	2400 x 7200/12470
137-7541	250	14400/24900	7200/12470
137-7542	250	14400/24900	7200 x 14400/24900
137-7565	333	7200/12470Y x 14400/24940Y	2400/4160Y
137-7579	333	14400/24940Y	2400/4160Y
137-7580	333	14400/24900	2400 x 7200/12470Y
137-7582	333	14400/24940Y	7200/12470Y
137-7584	333	14400/24900Y	7200 x 14400/24900Y
137-7592	500	7200/12470	2400/4160
137-7595	500	7200/12470Y x 14400/24940Y	2400/4160Y
137-7610	500	14400/24940Y	2400/4160Y
137-7612	500	14400/12470	7200/12470Y
137-7614	500	14400/24900	7200 x 14400/24900
137-7653	1667	14400/24940Y	2400/4160Y
137-7654	1667	7200/12470Y x 14400/24740Y	2400/4160Y

01/01/13

T105 / We#

**OVERHEAD TRANSFORMER FUSE SCHEDULE – WYE
PRIMARY**

Page 1 of 2

Primary Voltages:		2.4 – 4.16 KV		7.2 – 12.47 KV		14.4 – 24.94 KV	
Transformer Size (KVA)		1-1-Phase Trans 2-1-Phase Trans Open Wye 3-1-Phase Trans or 1-3-Phase Trans 3-Phase Wye		1-1-Phase Trans 2-1-Phase Trans Open Wye 3-1-Phase Trans or 1-3-Phase Trans 3-Phase Wye		1-1-Phase Trans 2-1-Phase Trans Open Wye 3-1-Phase Trans or 1-3-Phase Trans 3-Phase Wye	
1-Phase	3-Phase	Full Load Amps	Fuse Size	Full Load Amps	Fuse Size	Full Load Amps	Fuse Size
1.5		0.61	10	0.21	5		
2.5						0.17	5
3		1.3	10	0.41	5	0.21	5
5		2.1	10	0.69	5	0.35	5
7.5		3.1	10	1.1	5		
10	30	4.2	10	1.4	5	0.69	5
15		6.3	15	2.1	5	1.1	5
25	75	10.4	20	3.5	10	1.7	5
37.5		15.6	30	5.2	10		
50	150	20.8	40	6.9	10	3.5	10
75		31.3	65	10.4	15	5.2	10
100	300	41.7	80	13.9	25	6.9	15
125						8.7	20
150		62.5	100	20.8	40	10.4	20
167	500	69.6	150	23.2	40	11.6	20
200		83.3	150	27.8	65	13.9	25
250	750	104.2	200	34.7	65	17.4	30
333	1000	138.8	300	46.3	80	23.1	40
500	1500	208.3	400	69.4	125	34.7	65
667	2000	--	--	92.6	200	46.3	100
833	2500	--	--	115.7	200	57.8	100

Notes:

1. When installing a new transformer, a voltage check shall be taken before connecting the secondary or service to verify appropriate voltage prior to energizing a customer's service.
2. Column headings indicate the transformer primary connections.
3. Transformer fuses are used to protect the primary line from trouble in the transformer. Fuses may not always blow for trouble on the secondary. Trouble on the secondary that does not blow the transformer fuse may cause the transformer to burn out, which in turn would blow the transformer fuse.
4. CAUTION: If the transformer fuse has blown and oil has vented from the pressure relief device or cover of the transformer, replace the transformer before refusing.
5. When changing dual wound transformers from one voltage class to another, always check the fuse size to see that it is correct.

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**OVERHEAD TRANSFORMER FUSE SCHEDULE – WYE
PRIMARY**

Page 2 of 2

Primary Voltage:	2.4 KV Delta				14.4 KV Delta			
Transformer Size (KVA)	1-1-Phase Trans		2-1-Phase Trans Open Delta 3-1-Phase Trans Closed Delta		1-1-Phase Trans		2-1-Phase Trans Open Delta 3-1-Phase Trans Closed Delta	
1 Phase	Full Load Amps	Fuse Size	Full Load Amps	Fuse Size	Full Load Amps	Fuse Size	Full Load Amps	Fuse Size
1.5	0.61	10	1.1	10				
2.5					0.17	5	0.30	5
3	1.3	10	2.2	10	0.21	5	0.36	5
5	2.1	10	3.6	10	0.35	5	0.60	5
7.5	3.1	10	5.4	15				
10	4.2	10	7.2	15	0.69	5	1.2	5
15	6.3	15	10.8	20	1.1	5	1.8	5
25	10.4	20	18.0	40	1.7	5	3.0	10
37.5	15.6	30	27.1	65				
50	20.8	40	36.1	80	3.5	10	6.0	15
75	31.3	65	54.1	100	5.2	10	9.0	20
100	41.7	80	72.2	150	6.9	15	12.1	25
125					8.7	20	15.0	30
150	62.5	100	108.2	200	10.4	20	18.0	40
167	69.6	150	120.5	250	11.6	25	20.6	40
200					13.9	25	24.1	50
250					17.4	40	30.4	65
333					23.1	50	40.1	80
500					34.7	80	60.2	125

Notes:

- When installing a new transformer, a voltage check shall be taken before connecting the secondary or service to verify appropriate voltage prior to energizing a customer's service.
- Column headings indicate the transformer primary connections.
- Transformer fuses are used to protect the primary line from trouble in the transformer. Fuses may not always blow for trouble on the secondary. Trouble on the secondary that does not blow the transformer fuse may cause the transformer to burn out, which in turn would blow the transformer fuse.
- CAUTION:** If the transformer fuse has blown and oil has vented from the pressure relief device or cover of the transformer, replace the transformer before refusing.
- When changing dual wound transformers from one voltage class to another, always check the fuse size to see that it is correct.

I. GENERAL

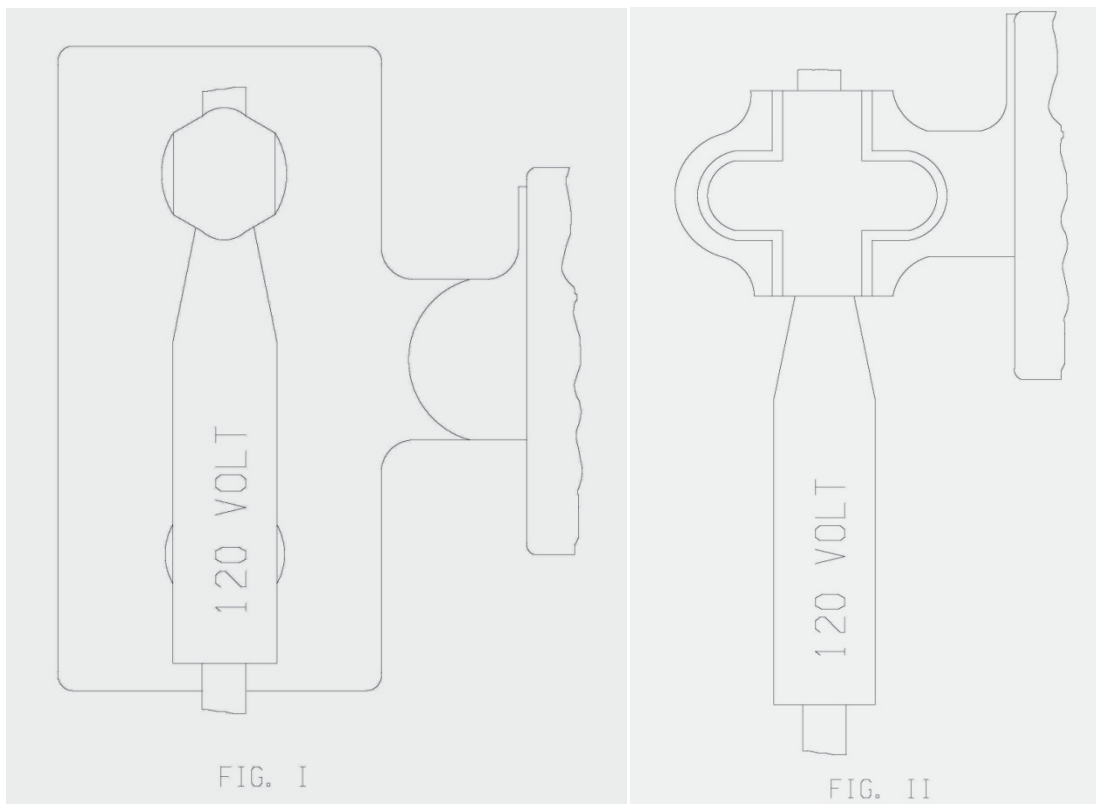
Due to the increase in the number of transformers used in 120/208 Volt overhead transformer banks and to avoid unnecessary reconnecting, transformers removed from 120/208 Volt bank and connected for 120 Volt operation may be stored so connected. Each district shall make the determination whether to store transformers removed from 120/208 Volt overhead bank as connected or reconnect them for 120/240 Volt operation. The determination shall be based on the district's need for such transformers. If the transformer is to be left connected for 120 Volt operation, it shall be tagged with a metal tag, Code #135-8485, with the information "120 Volt."

II. TAGGING OF PARALLELED TRANSFORMERS**A. Spade Type Secondary Terminals**

Use a piece of #4 solid copper wire to tie the "120 VOLT" tag to the X3 secondary spade of the transformer. (See Figure I.)

B. Eye Bolt Type Secondary Terminals

Use a piece of #4 solid wire approximately four inches long; strip back the insulation approximately two inches. Lay the marking tag lengthwise on the wire and form the end of the tag around the wire. Slip the wire and marking tag into the eye bolt of the vacant (X3) secondary terminal. Tighten the eye bolt terminal with a wrench, securing the tag in place. (See Figure II.)



I. GENERAL

For both two-bushing and single-bushing transformers in the field, the transformer tank ground serves two distinct purposes. For two-bushing transformers, tank grounds provide an effective equipment ground to protect the transformer from being energized accidentally. For single-bushing transformers, the tank ground serves as the primary neutral, which is connected to the primary winding of the transformer.

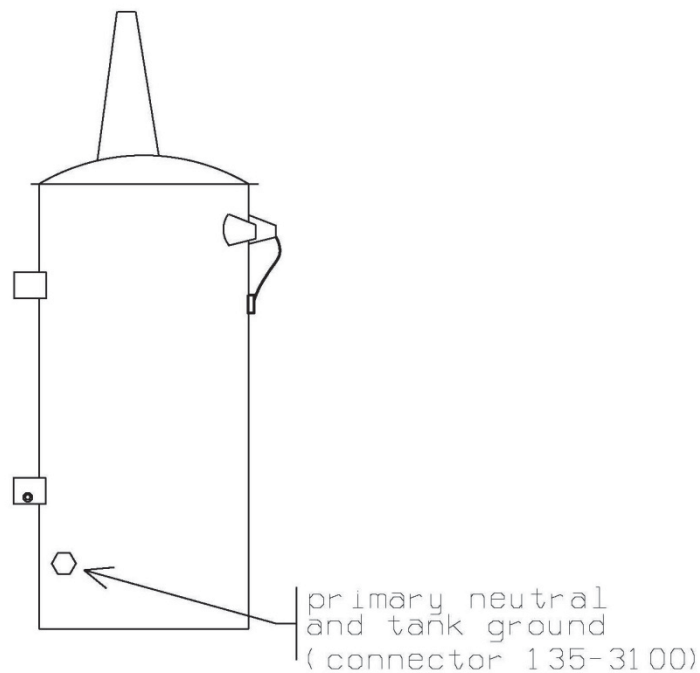
For all new overhead and padmounted transformers, replace the tank grounding connector with the connector in stock (135-3100).

II. TWO-BUSHING TRANSFORMERS

- A. Tank grounding on existing two-bushing transformers was done with #6 stranded copper. On two-bushing transformers, the ground only serves as an equipment ground; #6 stranded CU is adequate.
- B. On **NEW** installations of two-bushing transformers, the H₂ bushing and tank ground should be #4 stranded poly-covered copper (Stock Code 133-6641) to be consistent with new construction.
- C. If a ground must be added to an existing energized transformer, temporarily ground transformer by attaching a ground to the upper mounting bolt with a hot stick. If the upper mounting bolt is too short, the ground clamp can be installed on the transformer hanger. While installing the ground, the line electrician should avoid a position directly below the cutout in case an internal fault is present and the fuse blows.

III. SINGLE-BUSHING TRANSFORMERS

- A. To eliminate the possibility of opening the primary neutral, all single-bushing transformers shall be de-energized prior to connecting and disconnecting transformer tank ground.
- B. Transformers provided with a neutral strap connected to the secondary neutral bushing should not be considered the only neutral ground. In addition to this strap, either lug a piece of #6 stranded copper to the secondary neutral terminal of the transformer and connect to the ground wire interconnected to the system neutral at the pole, or the transformer will have a secondary lead connected directly to the primary neutral from the x₂ bushing.
- C. On all installations of single-bushing transformers, the tank ground should be #4 stranded poly covered copper (Stock Code 133-6641).
- D. The tank ground on single-bushing transformers is considered a primary neutral connection. Use an approved connector as shown in the [Standards Book CON section](#).



According to the latest industry standards, new distribution transformer terminals will accommodate the range of conductors given below. Older transformers may not have the same size terminals.

High-Voltage Terminals

KVA Range for High Voltage Rating of:	
<u>2.4 KV</u>	<u>7.2 – 14.4 KV</u>
5-167	5-500
250-500	

Size of Conductor Terminal Will Accept
#8 Sol. to #2 Str. Copper
#6 Sol. to 4/0 19 Str. Copper

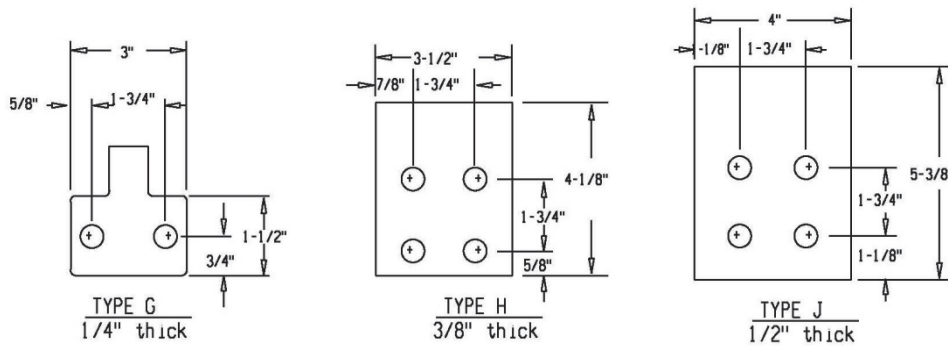
New transformers are provided with insulated bushing covers that should prevent outages caused by animals that sit on the cover and contact the primary terminal. When transformers are used that are not supplied with the insulated bushing covers, use the neoprene bushing cover 135-3210 on each bushing connected to an ungrounded conductor.

Low-Voltage Terminals

KVA Range for Low Voltage Rating of:		
<u>120/240</u>	<u>240/480</u>	<u>277</u>
10-50	10-50	10-50
100-250	100-250	100-250
333, 500	--	333, 500

Type of Terminal
Type G Spade
Type H Spade
Type J Spade

Spades are shown below:



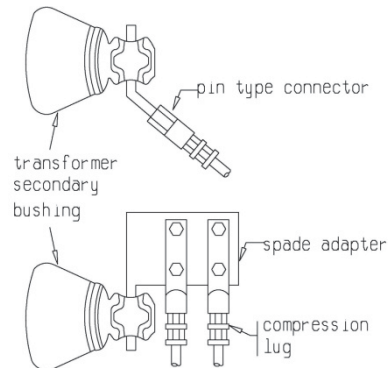
Transformer Secondary Connection Without Spades

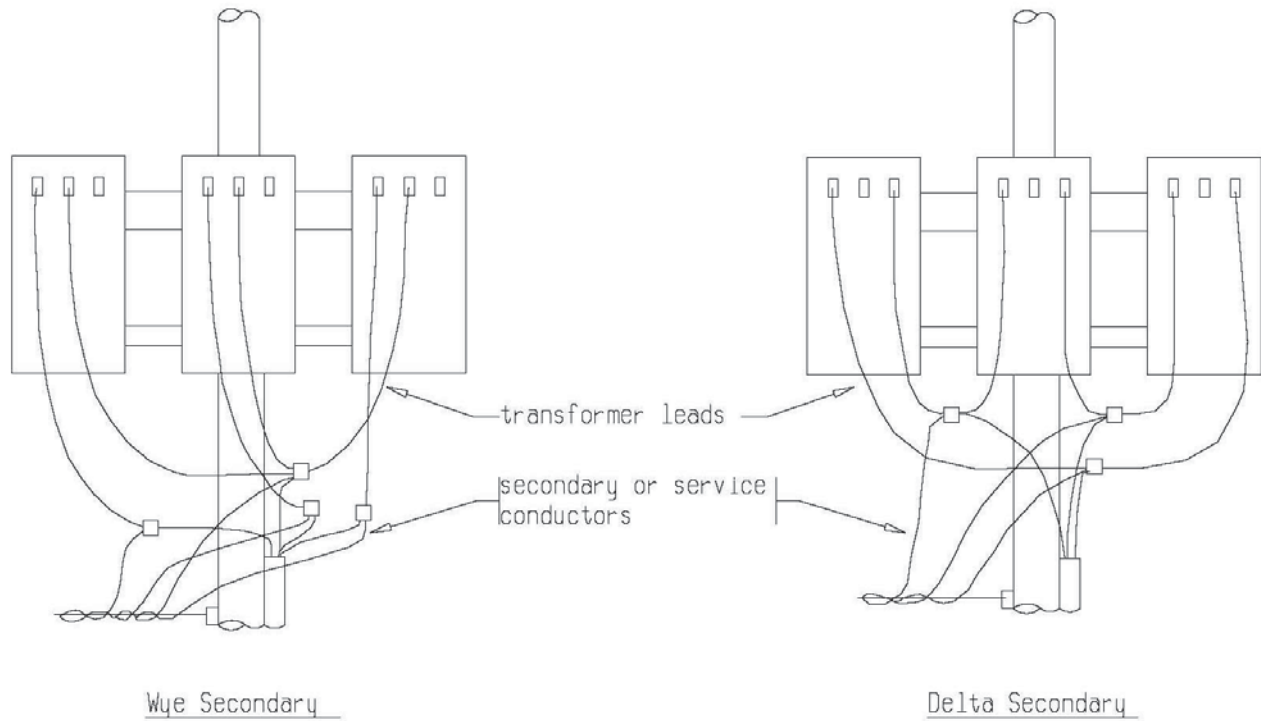
Many existing transformers have secondary terminals other than spades. These do not accommodate aluminum conductors.

When connecting one aluminum secondary or service to these transformers, use the appropriate sized pin type connector listed below:

When connecting two or more services to these transformers, 134-6950 spade adapters, along with compression lugs, may be used.

Aluminum Conductor	Code #	Die Index
#6 Str. & 4 Sol.	134-2600	BG, 243
#2 Str.	134-2601	BG, 243
#1/0 Str.	134-2602	BG, 243
#3/0 Str.	134-2603	249
#4/0 Str.	134-2639	249





ALUMINUM CONDUCTOR LEAD SIZE

Transformer Size (KVA)	120/240 V Single-Phase	Transformer Size (KVA)	120/208 V 3-Phase	277/480 V 3-Phase	240 Volt 3-Phase	480 Volt 3-Phase
10	1/0	3-10	1/0	1/0	1/0	1/0
15	1/0	3-15	1/0	1/0	1/0	1/0
25	1/0	3-25	1/0	1/0	1/0	1/0
50	3/0	3-50	350 KCM	1/0	3/0	1/0
100	350 KCM	3-100	2-700 KCM	350 KCM	350 KCM	1/0
167	700 KCM	3-167	3-700 KCM	700 KCM	700 KCM	350 KCM
250	2-700 KCM	3-250	4-700 KCM	2-700 KCM	2-700 KCM	700 KCM
		3-333	4-700 KCM	2-700 KCM	2-700 KCM	700 KCM
		3-500	NA	3-700 KCM	3-700 KCM	2-700 KCM

Notes:

- To substitute copper conductor leads for aluminum conductor leads, contact the Field Application Engineer.
- The neutral and phase transformer leads must be equal to or greater than the lead size indicated in the table above (do not use a smaller neutral conductor).
- When using multiple lead conductors, maintain at least 1.5" of spacing between conductors.
- Consult the [Standards CON section](#) for information on connectors to use on the leads.

01/01/13	T130 / We#	POLE-TYPE SINGLE PHASE TRANSFORMER LOW VOLTAGE CONNECTIONS AND BUSHING ARRANGEMENTS	Page 1 of 1
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Shown below are the various low-voltage connections and bushing arrangements for single-phase, pole-type transformers.

By industry standards, all single-phase distribution transformers 200 KVA and smaller, having high voltages 8660 Volts and below (delta-phase to phase, wye-phase to neutral) have additive polarity. All other single-phase transformers have subtractive polarity. If a transformer has dual voltage capability on the primary winding, the higher voltage is used to determine a transformer's polarity. Always check a transformer's nameplate for polarity information.

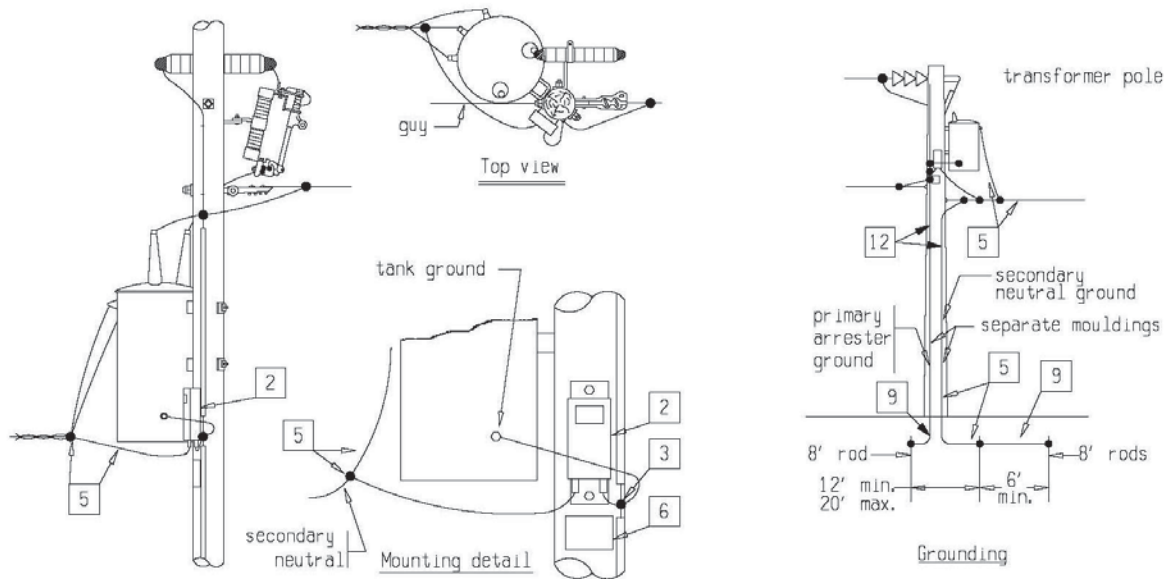
The illustrations below show how connections, internal and/or external, are to be made to obtain the desired voltage with transformers of either polarity. Some manufacturers build their transformers so that the internal connections can be made only as illustrated.

Low Voltage	120/240 V		240/480 V		277/480 V	2400 V	7200 V
High Voltage (Delta-phase to phase Wye-phase to neutral)	8660 V and Below	8661 V and Above	8660 V and Below	8661 V and Above	15000 V and Below	15000 V and Below	15000 V and Below
Transformer KVA	Low-voltage Connections & Bushing Arrangement (letters refer to illustrations below)						
100 KVA and less	A	B	D	E	G	H	K
167 KVA & larger	C		F		G	J	K



□ Notes:

- For additive polarity, the low voltage X1 terminal is on the right when facing the low-voltage side (see A), and for subtractive polarity, X1 is on left (see B).
- For additive and subtractive polarity, the high-voltage H1 terminal is always on the left when facing the low-voltage side.



□ Notes:

1. The neutral isolator, 134-5255 (old design - fixed threshold) or 134-5254 (new design – variable threshold) are designed to provide an open between the primary and secondary neutrals. If the voltage across the isolator reaches approximately 30V, it will close and act as a short circuit between the primary and secondary neutrals. When this voltage falls below 30V, the isolator will reopen, reestablishing isolation of the primary neutral from the secondary neutral.
2. Current-limiting fuses may be required on some settings. Contact EDE Planning for the fuse size.
3. The primary neutral, pole ground, and transformer tank ground shall be interconnected and then connected to either terminal of the isolator. The customer secondary neutral shall be connected to the other terminal.
4. The neutral isolator must be positioned so that all neutral conductors and jumpers maintain a minimum 40" clearance from any communication conductors.
5. Secondary neutral conductors and points of connection must be installed such that the secondary neutrals do not contact any part of the primary ground circuit, resulting in bypassing the isolator. This may require taping or installation of 600 volt insulated conductors. The jumper from the isolator to the secondary neutral must be a #6 copper wire (or larger), and is recommended to be 600 volt insulated wire. The conductor from the secondary neutral to the two ground rods must be a #6 copper 600 volt insulated wire (or larger). The secondary neutral must be a 600 volt cable of appropriate size for the phase conductors. To provide a secondary cable with a 600 volt insulated neutral, it is recommended to use either 3- 1/c #2/0 cu Cables (code 133-9000) or 1-4/c #336.4 alum Cable (code 133-0291).
6. A "CAUTION" sign (code #134-6664) shall be installed beneath the isolator.
7. Ground(s) shall be driven at adjacent primary pole(s). The ground resistance should be measured. Contact your Field Application Engineer for acceptable values.
8. If the ground rod at the transformer pole and the rod at the customer's service pole are connected together by a length of wire, this wire must be disconnected at both ground rods and removed.
9. The secondary neutral ground shall have a minimum of 2 ground rods. They shall be a minimum of 12 feet from the primary neutral arrester ground at the transformer pole.
10. Before installing the jumpers, test the isolator by connecting an ohmmeter across the terminals. The ohmmeter should read 50,000 ohms or higher. If the reading is lower, contact Field Application Engineer.
11. In the event of a blown transformer fuse at a pole carrying an isolator:
 - A. The primary and secondary neutrals shall be solidly jumpered together before refusing the cutout.
 - B. If the fuse holds or after the transformer has been replaced or other trouble has been cleared, the neutral jumper shall be removed and the isolator tested.
 - C. Test the isolator by removing the jumpers from both terminals and following the procedure given in note 10 above.

I. GENERAL

- A. The Company has standardized on transformers with internal arresters under oil because of lower installed cost, improved reliability and improved safety.
- B. Identification
All transformers with arresters under oil will have "INT L.A." stenciled on the tank and included on the nameplate. At present time, all Company transformers with arresters under oil will have only one primary bushing.
- C. Construction
1. The tank grounding connector is now the primary neutral.
 2. The X2 secondary bushing is externally connected directly to the transformer tank. A separate jumper is required from the X2 bushing to the system neutral.
 3. The transformers are equipped with an external arrester disconnect located near the hanger brackets. This disconnect is for shop testing only and should not be disturbed in the field.

II. NEW INSTALLATIONS

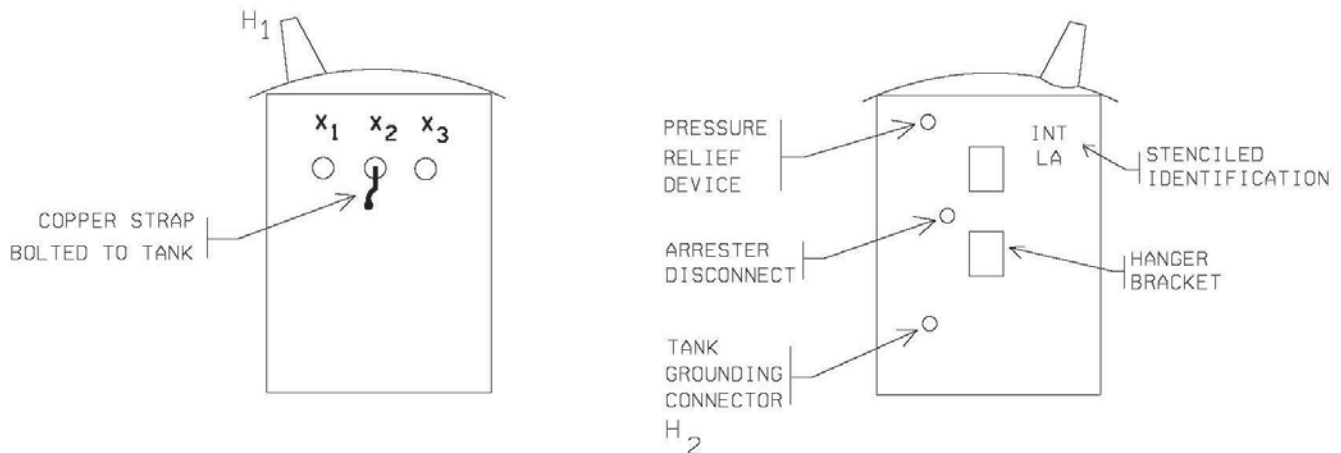
- A. See Stds T20 and T60.

III. REPLACEMENTS

- A. Replacing two bushing transformers with single bushing transformers
1. Single bushing transformers cannot be used in closed-delta transformer settings. Two bushing spares will be maintained in each district.
 2. Single bushing transformers can replace two bushing transformers in all single-phase, three-phase Wye-Wye and Wye-Open Delta settings.
 3. If the single primary bushing is less than 11 inches from the neutral conductor, offset the neutral using armless extension bracket 134-1326 or lower neutral.
 4. Remove existing arrester and ground wire down to neutral or tank ground on single-phase settings. Leave ground wire on three-phase settings unless all three transformers are changed to single bushings.
- B. Replacing single bushing transformer with two bushing transformer
1. Install arrester on transformer tank.
- C. Wye-Open Delta setting
1. Remove the ground strap from the power transformer (transformer with no connections to the X2 bushing).

IV. MAINTENANCE

- A. Transformer fuse blown
1. Check transformer fuse size per Std T105 and install fuse.
 2. If fuse holds and voltage is correct, no further action is required.
 3. If fuse blows, replace the transformer.



There was a period of time in the late 70's and early 80's, during which RTE supplied us transformers with possibly defective hanger brackets.

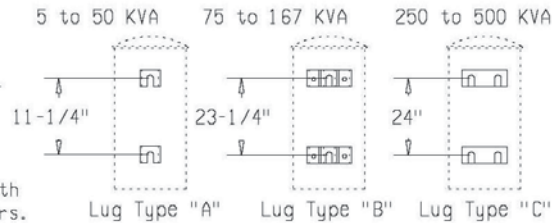
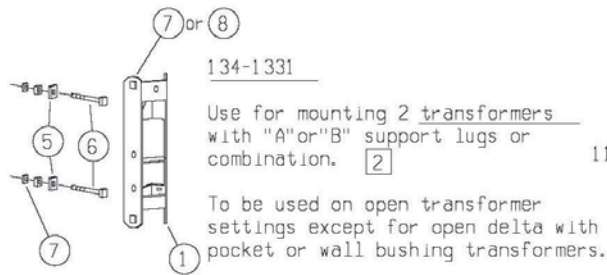
The brackets have the potential of cracking during high winds and cold temperatures on those units that are installed on cluster mounts. The cluster-mounted units are of concern because the back of the transformer mounting bracket is contoured to fit a pole's round surface. When it is mounted to a cluster mount's flat surface, the contour is flattened and stresses occur at the corners of the bracket. The stresses are much less when the hanger is bolted directly to the pole.

To remedy the problem, RTE furnished reinforcing brackets which were installed on any units that were on cluster mounts and on any transformers that could, in the future, be installed on cluster mounts.

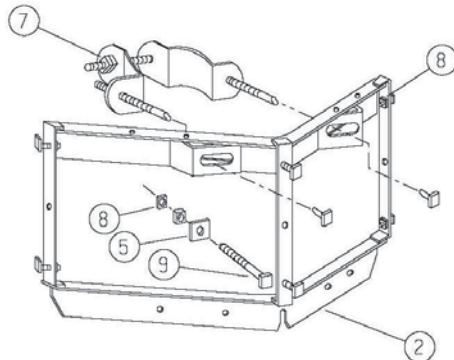
All poles that have a pole-mounted RTE transformer of the vintage with possible defective hanger brackets were identified and have a sign stating "REFER TO STANDARD 1422 BEFORE REMOVING THE TRANSFORMER FROM THIS POLE" installed on them.

Since these transformers could eventually be installed on cluster mounts, the following procedure should be followed if any of these single-phase units are removed from service:

1. Take any necessary precautions not to apply any unusual stresses on the transformer's hanger brackets when it is being removed from the pole.
2. Remove the sign that refers to this Standards page from the pole and wire it to one of the secondary bushings of the transformer.
3. The transformer shall be sent to the Transformer Repair Shop for hanger bracket replacement. The sign should remain on the secondary bushing until the hanger brackets are replaced.
4. Notify the Materials & Standards group of the company number of the transformer and the pole number that it was removed from by indicating "Defective Hanger Bracket" in the "Reason for Failure" portion of the transformer "Set and Remove" form.

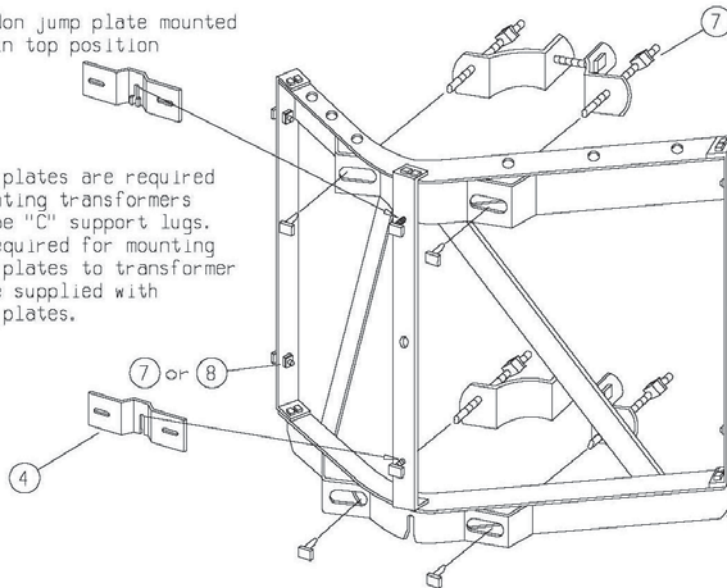


Use 5/8" bolt on type A lug, 3/4" bolt on type "B" and "C" lugs for mounting transformer to cluster mounting.



Non jump plate mounted in top position

Adapter plates are required for mounting transformers with type "C" support lugs. Bolts required for mounting adapter plates to transformer lugs are supplied with adapter plates.

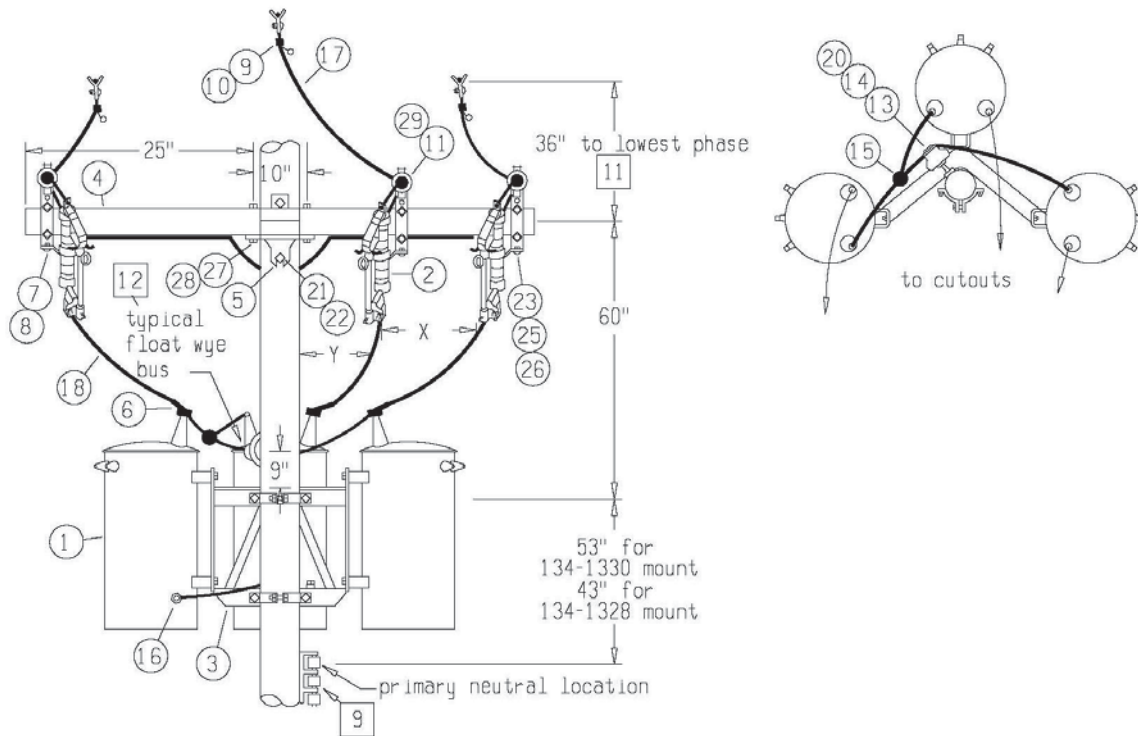


143-0797
2-1/2"x3/4" fully threaded bolt can be used here if not provided by the manufacturer.

Notes:

- Fasten 134-1331 with two 3/4" through bolts, 134-1328 with one band and one 5/8" through bolt, 134-1330 with two bands.
- Use 134-1330 for transformers through 333 KVA. Use 134-1331 for transformers through 100 KVA. Use 134-1328 with transformers through 50 KVA.
- The 16-foot transformer assembly 134-0486A can carry a maximum load 13,500 lbs uniformly distributed, with not more than 6,700 lbs concentrated in the center, or 4,500 lbs in each of three positions, or 3,375 lbs in each of four positions.

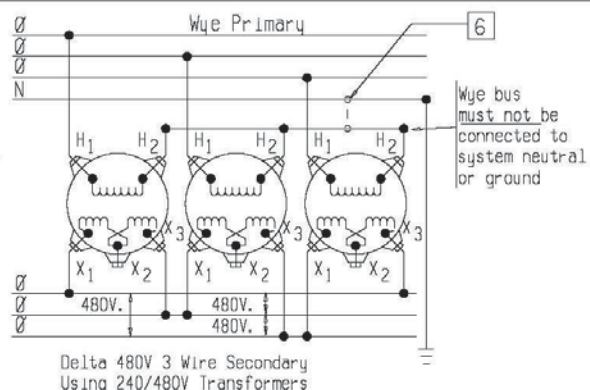
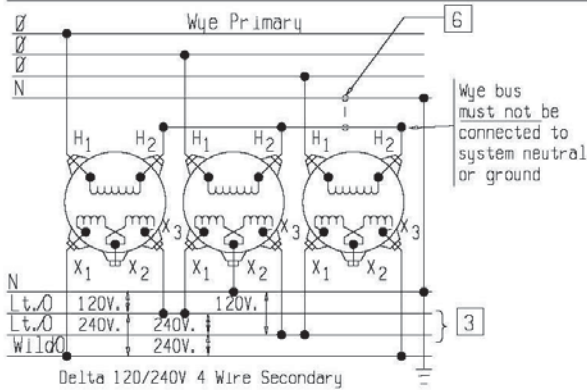
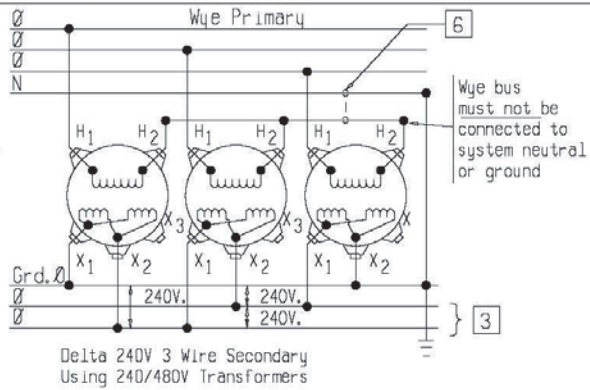
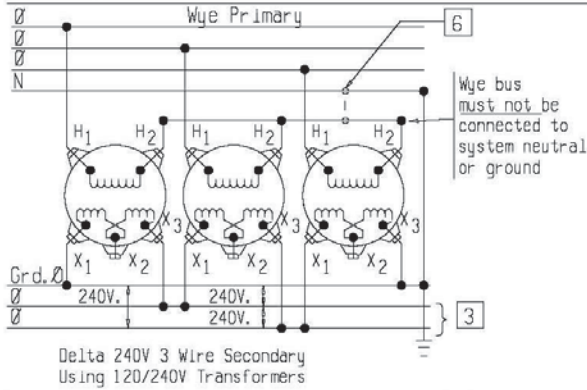
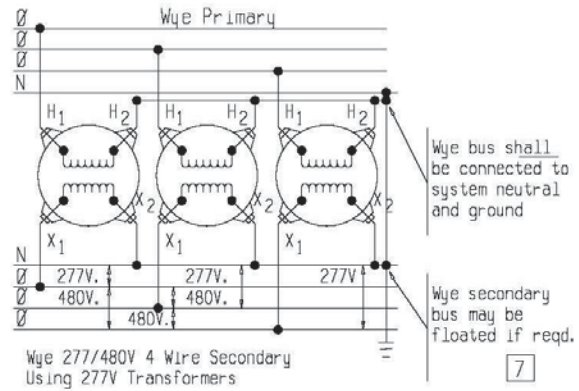
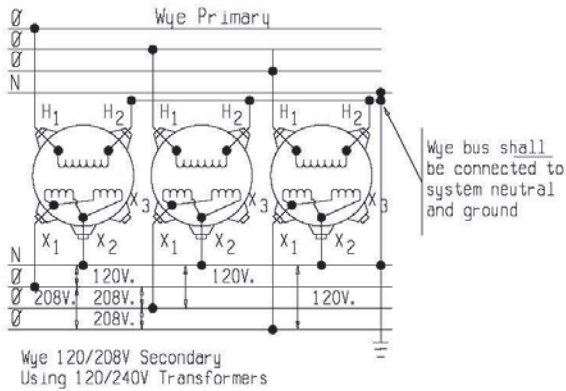
ITEM	MATERIAL	NO.REQ.	ITEM	MATERIAL	NO.REQ.
1	CLUSTER MOUNT BRACKET 134-1331	1	6	3/4" X " MACHINE BOLT 143-080	2 IF REQ
2	CLUSTER MOUNT BRACKET 134-1328	1	7	3/4" LOCKNUT 143-6255	AS REQ
3	CLUSTER MOUNT BRACKET 134-1330	1	8	5/8" LOCKNUT 135-4480	AS REQ
4	TYPE "C" ADAPTER PLATE 134-5955	AS REQ	9	5/8" X " MACHINE BOLT 135-03	1 IF REQ
5	2-1/4" X 2-1/4" FLAT WASHER 135-9400	AS REQ			



Notes:

1. See [Std CA10](#) for installation of cutouts and arresters.
2. See Std T125 for transformer lead wire size.
3. See Std CA15 for sizing and Line Work Method ([LWM](#)) 4008 for operation of cutouts.
4. Dimension "X" shall not be less than 15".
5. Dimension "Y" shall not be less than 11".
6. On 4-wire 120/208V and 4-wire 277/480V wye settings, the primary (H₂) and secondary neutral buses must be grounded.
7. On 3-wire 480V floated wye settings, the primary neutral bus must be grounded (H₂). The tank straps to the X₂ bushing of each transformer must be removed and no conductor connected to the X₂ bushings.
8. On 4-wire 120/240V, 3-wire 240V, and 3-wire 480V closed delta settings, the primary neutral (H₂) bus shall be floated and tied to a face pin insulator. See LWM 4008 for operation of the floated primary neutral H₂ bus.
9. Secondary service attachment method shown is for illustrative purposes only.
10. When connecting or disconnecting line jumpers, center phase shall be connected first and disconnected last to assist in maintaining safe working clearances from energized parts.
11. When using preassembled deadend arm, change this dimension to 48".
12. See LWM 4008 and [LWM 1003](#) for procedures on switching floating wye bus settings.
13. See Std T45 on how to mount arresters on the transformer if this is a new wye-wye setting and polymer arresters are used.
14. On 480V 3-wire setting, a 650V arrester shall be installed either at transformer riser, the service point or in the metering cabinet.

ITEM	MATERIAL	NO.REQ.	ITEM	MATERIAL	NO.REQ.
1	TRANSFORMER	3	16	TANK GROUNDING CONNECTOR	135-3100 3
2	CUTOUT (SIZE AS REQ)	134-29 3	17	#6 BARE STR CU	133-0917 AS REQ
3	CLUSTER MOUNTING (SEE STD T150)	134-13 1	18	#4 POLY COVERED CU	133-6641 25 FT
4	6 PIN CROSSARM	134-0151 1	19	GROUND	- 2
5	CROSSARM GAIN	134-4382 1	20	TIE WIRE	135-5 AS REQ
6	INSULATED BUSHING COVER	135-3210 3 IF REQ	21	5/8" X 2" MACHINE BOLT	135-03 2
7	MODIFIED NEMA BRACKET	134-1423 3	22	5/8" LOCKNUT	135-4480 2
8	BACKSTRAP	134-7412 3	23	3/8" X 5" CARRIAGE BOLT	135-0109 6
9	HOT LINE CLAMP	134-1700 3	24	2-1/4" X 2-1/4" FLAT WASHER	135-9400 2
10	STIRRUP	134-73 3	25	1/2" ROUND WASHER	135-9150 8
11	ARRESTER	134-0375 3	26	3/8" LOCKNUT	135-4460 6
12	650V ARRESTER [14]	134-0447 1 IF REQ	27	1/2" X 6" CARRIAGE BOLT	135-0121 2
13	LAG SCREW INSULATOR PIN	135-4686 1 IF REQ	28	1/2" LOCKNUT	135-4470 2
14	PIN INSULATOR	134-4955 1 IF REQ	29	1/2" CARLON	135-3835 120"



□ Notes:

1. Connections are for subtractive polarity transformers.
2. For connection diagrams (wye primary) not listed here (such as when one or more transformers are additive polarity), consult the Field Application Engineer.
3. To change phase rotation, exchange connections to these two wires only.
4. Before final connections are made, all secondary voltages shall be checked and found to be within reasonable limits of those shown on diagrams.
5. On new transformer installations and prior to changing out transformers, all service conductors shall be identified to assure proper electrical connection with customer-owned conductors. This is required on both overhead services and underground risers from overhead transformers. Refer to Line Work Method [\(LWM\) 1019](#) for overhead service phase identification and [Std 3012](#) underground service phase identification.
6. Install temporary jumper when required for switching. See [LWM 1003](#). Floated H₂ bus shall be tied to a face pin insulator.
7. Normally, the secondary bus of a 4-wire 277/480V setting is grounded; an exception is when using 277V transformers to supply 3-wire 480V service – consult with the Field Application Engineer. If the secondary of a 3-phase wye setting is grounded, code requires that the neutral be brought into and connected to the customer-owned switchgear.
8. The primary neutral shall be extended to 3-phase wye-delta settings.
9. If rebuilding an existing 3-wire 480V closed delta transformer setting, consult the Field Application Engineer about building the new setting as a 3-wire 480V floated wye setting.

TABLE 1 – Information on Three-Phase Overhead Transformer Settings

Number of Service Wires	Service Voltage	Service Type	Transformer Type (Secondary Voltage)	Transformer Windings (Series or Parallel)	Primary Neutral (H ₂) Bus	Secondary Neutral Bus	Number of Transformer Primary Bushings
4-wire	120/208V	Grounded Wye	120/240V	Parallel	Grounded	Grounded	1 or 2
4-wire	277/480V	Grounded Wye	277V	NA	Grounded	Grounded	1 or 2
3-wire	480V	Floated Wye ⁴	277V	NA	Grounded	Floated ¹	1 or 2
4-wire	120/240V	Closed Delta*	120/240V	Series	Floated	Grounded ²	2
3-wire	240V	Closed Delta*	240/480V	Parallel	Floated	Grounded ³	2
3-wire	240V	Closed Delta*	120/240V	Series	Floated	Grounded ³	2
3-wire	480V	Closed Delta*	240/480V	Series	Floated	Floated	2

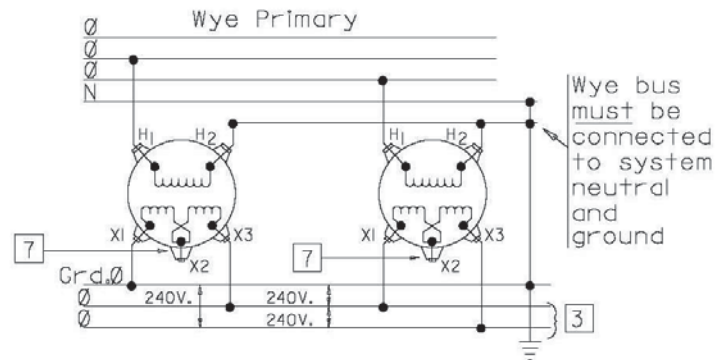
¹There shall be no connection to the X₂ secondary bushings on a 3-wire 480V floated wye service. The tank straps shall be disconnected from the X₂ bushings. See note 7.

²The X₂ bushing on the lighting transformer shall be grounded to system neutral.

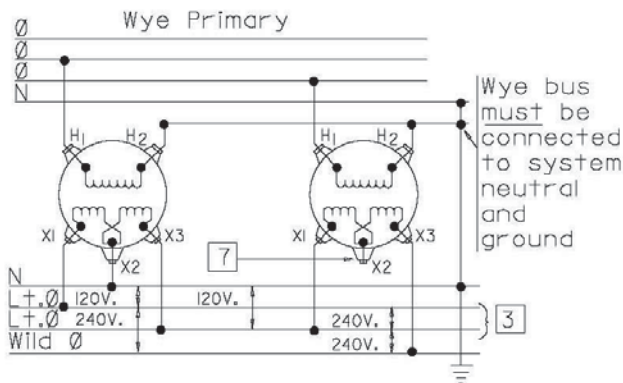
³One secondary phase on a 3-wire 240V closed delta service shall be grounded to the system neutral.

⁴3-wire 480V floated wye services are only allowed at the discretion of the Field Application Engineer.

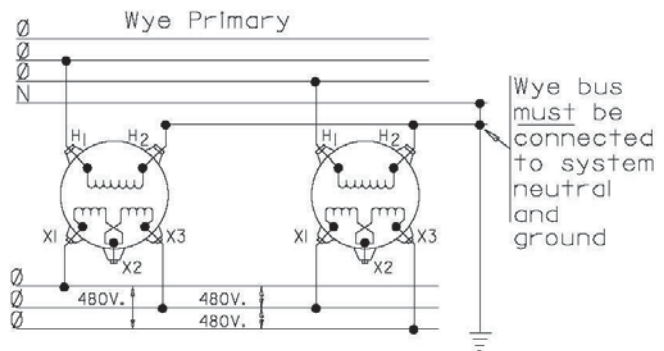
*Closed delta services are not available for new construction.



Open Delta 240V, 3 Wire Secondary
Using 120/240V Transformers



Open Delta 120/240V, 4 Wire Secondary



Open Delta 480V, 3 Wire Secondary
Using 240/480V Transformers

□ Notes:

1. Connections are for subtractive polarity transformers.
2. For open wye primary connection diagrams not listed here (such as when one or more transformers are additive polarity), consult Field Application Engineer.
3. To change phase rotation, exchange connections to these two wires only.
4. Before final connections are made, all secondary voltages shall be checked and found to be within reasonable limits of those shown on diagrams.
5. On new transformer installations and prior to changing out transformers, all service conductors shall be identified to assure proper electrical connection with customer-owned conductors. This is required on both overhead services and underground risers from overhead transformers. Refer to Line Work Method [\(LWM\) 1019](#) for overhead service phase identification and [Std 3012](#) underground service phase identification.
6. It is preferred to make primary connections to phases corresponding with transformer position. To obtain load balance, connections may be made to any of two of the three phases.
7. Remove the X_2 ground strap when using a single bushing transformer.
8. Open Delta services are generally no longer available for new customers. Consult the Field Application Engineer and the Material & Standards group for exceptions.
9. For 4-wire 120/240V open delta settings, it is common to size the lighting transformer larger than the power transformer. (The lighting transformer has the 120V component; the power transformer just serves the 240V portion of the service). Consult the Field Application Engineer for sizing information.
10. Transformer should not exceed 50 KVA for open delta settings. Consult the Field Application Engineer and the Material & Standards group for exceptions.

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**TRANSFORMER CONNECTION DIAGRAMS OPEN WYE
PRIMARY**

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TABLE 1 – Information on Three-Phase Overhead Open Delta Transformer Settings

Number of Service Wires	Service Voltage	Service Type	Transformer Type (Secondary Voltage)	Transformer Windings (Series or Parallel)	Primary Neutral (H₂) Bus	Secondary Neutral Bus	Number of Transformer Primary Bushings
4-wire	120/240V	Open Delta	120/240V	Series	Grounded	Grounded ¹	1 or 2
3-wire	240V	Open Delta	120/240V	Series	Grounded	Grounded ²	1 or 2
3-wire	480V	Open Delta	240/480V	Series	Grounded	Floated	1 or 2

¹The X₂ bushing on the lighting transformer shall be grounded to system neutral.

²One secondary phase on a 3-wire 240V open delta service shall be grounded to the system neutral.