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SEE STANDARD 01-00-03-01 FOR LIST OF ALL "MAINTENANCE ONLY STANDARDS"

1.GENERAL

Three general types of distribution transformers are used on the Ameren System. These differ from each other principally in the type and hookup of lightning arresters and switches used to protect the transformers. For purposes of uniformity the three transformer types will be referred to as:

- Conventional Transformers (C)
- Protected Transformers (P)
- Completely Self Protected Transformers (CSP)

2.CONVENTIONAL TRANSFORMERS (C)

These transformers require separately mounted lightning arresters and fused switches for their protection. Some Conventional transformers are still purchased new. A considerable number installed in past years are still in service. As non-standard Conventional transformers are removed from service they will be converted to Protected transformers by mounting lightning arresters on the transformers before they are placed in our transformer stock.

3.PROTECTED TRANSFORMERS (P)

Transformers of this type have lightning arresters mounted on the transformer. Since the discharge path of the lightning arrester is by way of the transformer tank, good tank grounds are imperative.

Protected transformers are standard for most new purchases of single phase and three phase transformers.

Protected transformers shall have separately mounted fused switches installed. Transformers whose primary winding are connected phase-to-ground are provided with only one lightning arrester. This arrester is normally connected to the H₁ bushing, but may be shifted to the side of the tank giving the best clearances. The arrester shall be connected to the phase lead which is connected to the fused switch. Transformers whose primary winding are connected phase-to-phase will have two arresters mounted on the transformer.

4.COMpletely SELF PROTECTED TRANSFORMERS (CSP)

Completely Self Protected transformers have built into the unit internal primary fuse links (designed to open only on internal transformer faults) and a secondary breaker for protection against external overloads. These devices are all under oil. In addition, integrally mounted lightning arresters are provided. The discharge path of the lightning arresters is by way of the transformer tank, therefore, good tank grounds are imperative.

Single phase Completely Self Protected transformers are no longer purchased new. Three phase units in sizes 30 kVA to 150 kVA inclusive for 4.16kV and in sizes 30 kVA and 45 kVA for 12.47 kV units are still purchased new.

Completely Self Protected transformers shall have separately mounted fused switches installed unless pole spare does not allow and the number of customers affected by transformer failure is deemed acceptable. Only in such cases may the transformer be directly connected to the line wires.

Non-standard Completely Self Protected transformers removed from service (both single and three phase) will be refurbished provided they are in good condition and meet Ameren's refurbishing criteria. These transformers should be used first to defer purchase of new transformers.

5.CAUTION:

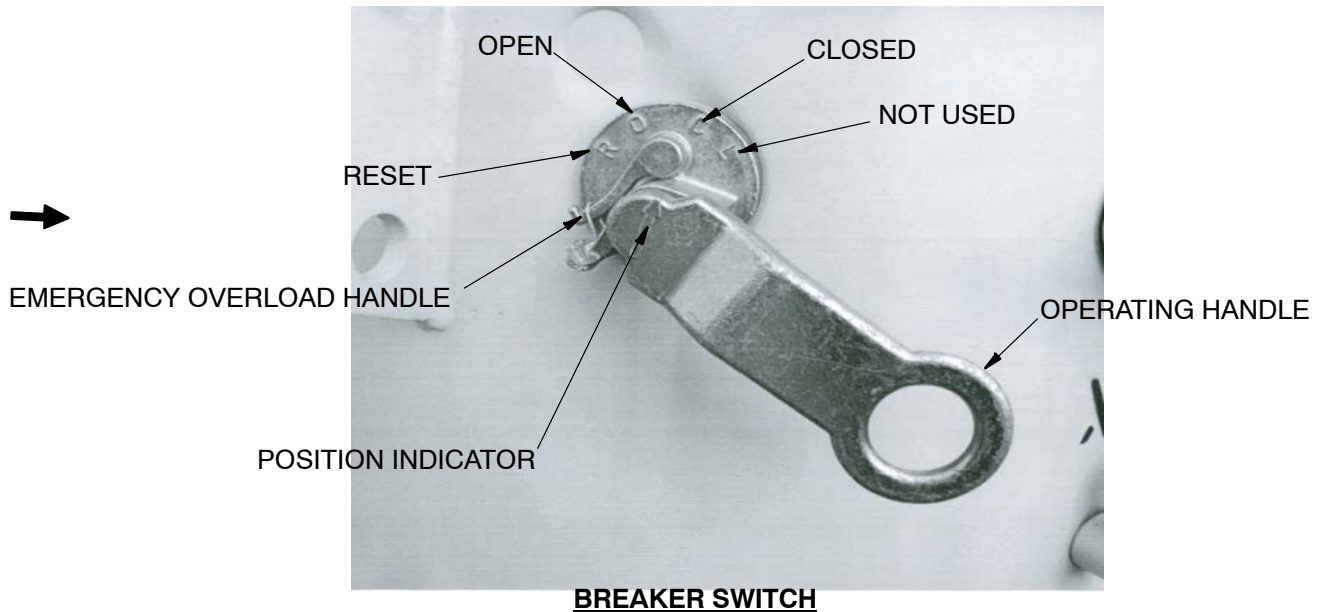
Care should be exercised in connecting primary leads to transformers.

On single phase transformers connected phase-to-neutral the neutral connection shall be made before the primary lead is connected.

On single phase transformers connected phase-to-phase both primary terminals will be hot after the first primary lead is connected.

On three phase transformers all primary terminals will be hot after the first primary lead is connected.

6.BREAKER OPERATION ON CSP TRANSFORMERS



To Reset the breaker after it has opened due to overload move the handle to the "Reset" position and then move it to the "Close" position.

To Open the breaker raise handle until pointer coincides with the word "Open."

To Close breaker (when it has not opened due to overload) lower handle until pointer coincides with the word "Close". On some units, this will be sufficient to close the breaker. On other units, it is necessary to move the handle to the Reset "R" position before it can be closed. This is true even though the transformer has not tripped on overload.

The breaker will trip free of the handle permitting the closing on a short circuit with safety.

CSP transformers may also be equipped with an emergency overload control. Adjustment of this device will increase the capacity of the transformer for emergency loading. The emergency control is operated by a handle located so as to be partially concealed by the larger breaker operating handle.

In case the breaker has tripped because of excessive overload, an attempt should first be made to reset the breaker in the usual manner without moving the emergency control handle. Usually this will be possible, and no other action will be necessary. If the tripping is the result of overload, then the transformer should be replaced with a larger unit. However, if this replacement cannot be made immediately and if the breaker cannot be reclosed, then it may be possible to reclose the breaker by use of the emergency overload device. First rotate the emergency handle clockwise, then the breaker handle can be moved to the reset position and the breaker reclosed in the usual manner.

The transformer should be allowed to carry this loading only until the transformer can be replaced, preferably not more than a day.

Some Completely Protected transformers have two secondary breakers connected in parallel. Both breakers must be closed to secure full capacity on these transformers.

7.480 VOLT THREE WIRE SERVICE FROM 480Y/277 VOLT FOUR WIRE TRANSFORMERS

CAUTION: Do not make these conversions on three-phase transformers that have the primary and secondary neutrals internally connected together.

A. Three-wire 480 volt service is non-standard for new installations.

B. Corner-Grounded Three-Wire Service

1. Remove the secondary neutral ground strap(s) from all transformers.
2. Tape the secondary neutral terminal to prevent accidental contact and any misunderstanding as to which terminals are being used and the type service being provided.
3. Run a #2 copper lead from the "A" phase secondary terminal to the tank ground connector. Ground the transformer tank(s) to a driven ground rod and to the common system neutral (if present).

CAUTION: After the "A" phase secondary terminal is energized, the taped neutral terminal is energized.

4. Before connecting the customer's cable, determine which cable the customer has grounded (if any) and connect that cable to the now grounded "A" phase secondary terminal.

C. Un-Grounded Three-Wire Service

1. Remove the secondary neutral ground strap(s) from all transformers.
2. Ground the transformer tank(s) to a driven ground rod and to the common system neutral (if present).

8.UN-GROUNDED Y PRIMARY TO Δ SECONDARY

A. This connection is non-standard for new installations.

B. For un-grounded Y primary to Δ secondary connected transformers, when primary voltage is lost to one of the bank phases or one of the cutouts is opened, a high temporary over-voltage can be impressed across tank mounted arresters. Therefore, for 2.4 and 4.16kV transformers 6kV rated arrester stock# 10-01-184 is used. For 7.2 through 14.4 kV transformers 15 kV rated arrester stock # 10-01-188 is used.

9.OPEN Y OR OPEN Δ PRIMARY TO OPEN Δ SECONDARY

A. Open Y primary to open Δ secondary connections should only be used where the three phase load is small and three primary phases are not available. 120/240 V, 3-phase, 4-wire open Δ service is provided with this connection. This connection can also be used for temporary situations where one transformer in a closed Y to closed Δ bank of three transformers has failed. The capacity of this connection is 86.6% of the two remaining transformers or 57.7% of the initial three transformers (based on three equal size transformers).

B. Open Δ primary to open Δ secondary connections should only be used for temporary situations where one transformer in a closed Δ to closed Δ bank of three transformers has failed. The capacity of this connection is 86.6% of the two remaining transformers or 57.7% of the initial three transformers (based on three equal size transformers).

TRANSFORMER VOLTAGE CODE EXPLANATION

VOLTAGES	
CODES	PRIMARY & SECONDARY
AA	2400/4160Y X 7200/12470Y X 7620/13200Y - 120/240
AD	2400/4160Y X 7200/12470Y X 7620/13200Y - 240/480
AN	2400 CURRENT TRANSFORMER
AP	2400 CURRENT TRANSFORMER
AU	2400/4160Y X 7200/12470Y X 7620/13200Y - 277
BA	2400/4160Y - 120/240
BD	2400/4160Y - 240/480
BJ	2400/4160Y - 2400
BM	2400/4160Y - 7200/12470Y
BR	2400/4160Y - 240/120
BT	2400/4160Y - 480
BU	2400/4160Y - 277
BW	2400/4160Y - 240
CA	4160/7200Y - 120/240
CD	4160/7200Y - 240/480
CM	4160/7200Y - 7200/12470Y
CU	4160/7200Y - 277
DE	4160Y - 240 X 480
DF	4160Y - 480Y/277
DG	4160Y - 240
DH	4160Y - 480
DQ	4160Y - 240 W/120 MIDTAP
EC	4160 - 208Y/120
EF	4160 - 480Y/277
EH	4160 - 480
EQ	4160 - 240 W/120 MIDTAP
FA	4160GRDY/2400 - 120/240
FC	4160GRDY/2400 - 208Y/120
FF	4160GRDY/2400 - 480Y/277
FR	4160GRDY/2400 - 240/120
GA	24940GRDY/14400 - 120/240
HA	BLANK
HB	13200 - 216Y/125
HF	BLANK
HN	7200 CONSTANT CURRENT
HP	7200 CONSTANT CURRENT
HQ	13200Y - 240 W/120 MIDTAP
HR	BLANK
IA	12000 - 120/240
IJ	12470 - 2400/4160Y
IU	12000 - 277
JA	7200/12470Y - 120/240
JD	7200/12470Y - 240/480
JJ	7200/12470Y - 2400/4160Y
JR	7200/12470Y - 240/120
JT	7200/12470Y - 480
JU	7200/12470Y - 277
JW	7200/12470Y - 240
KC	12470Y - 208Y/120
KE	12470Y - 240 X 480
KF	12470Y - 480Y/277
KG	12470Y - 240
KH	12470Y - 480
KQ	12470Y - 240 W/120 MIDTAP
KU	12470Y - 277
LC	12470 - 208Y/120
LF	12470 - 480Y/277
LG	12470 - 240
LJ	12470 - 2400/4160Y
LQ	12470 - 240 W/120 MIDTAP
LX	12470 - 4160Y/2400
MA	12470GRDY/7200 - 120/240
MC	12470GRDY/7200 - 208Y/120
MF	12470GRDY/7200 - 480Y/277

VOLTAGES	
CODES	PRIMARY & SECONDARY
MK	12470GRDY/7200 - 120
MQ	12470GRDY/7200 - 240 W/MIDTAP
MR	12470GRDY/7200 - 240/120
MU	12470GRDY/7200 - 277
MX	12470GRDY/7200 - 4160Y/2400
MZ	12470GRDY/7200 - 480/240
NC	13200 - 208Y/120
NF	13200 - 480Y/277
NU	13200 - 277
OA	19920/34500Y - 120/240
OD	19920/34500Y - 240/480
OM	19920/34500Y - 7200/12470Y
OU	19920/34500Y - 277
PB	13800 - 216Y/125
PC	13800 - 208Y/120
PF	13800 - 480Y/277
PM	13800 - 7200/12470Y
PU	13800 - 277
QA	34500 - 120/240
QB	34500 - 2400/4160Y X 7200/12470Y
QD	34500 - 240/480
QF	34500 - 480Y/277
QJ	34500 - 2400/4160Y
QK	34500 - 120
QM	34500 - 7200/12470Y
QT	34500 - 480
QU	34500 - 277
RA	14400/24940Y - 120/240
RD	14400/24940Y - 240/480
RJ	14400/24940Y - 2400/4160Y
RM	14400/24940Y - 7200/12470Y
RO	14400/24940Y - 7620/13200Y
RR	14400/24940Y - 240/120
RU	14400/24940Y - 277
RX	13200GRDY/7620 X 12470GRDY/7200 - 240/120
SA	13200GRDY/7620 - 120/240
SB	13200GRDY - 216Y/125
SC	13200GRDY/7620 - 208Y/120
SD	13200GRDY/7620 - 240/480
SF	13200GRDY/7620 - 480Y/277
SK	13200GRDY/7620 - 120
SR	13200GRDY/7620 - 240/120
SU	2400/4160Y X 7620/13200Y - 277
SW	2400/4160Y X 7620/13200Y - 120/240
SX	13200GRDY/7620 - 4160Y/2400
SZ	13200GRDY/7620 - 480/240
TA	13800GRDY/7970 - 120/240
TC	BLANK
TF	4160GRDY/2400 X 12470GRDY/7200 X 13200GRDY/7620 - 480Y/277
TR	13800GRDY/7970 - 240/120
TX	4160GRDY/2400 X 13200GRDY/7620 - 120/240
UA	7970/13800Y - 120/240
UB	14400 - 216Y/125
UC	14400 - 120/240
UD	7970/13800Y - 240/480
UE	14400 - 240/480
UF	14400 - 480Y/277
UJ	14400 - 2400/4160Y
UR	4160GRDY/2400 X 13200GRDY/7620 - 240/120
UU	14400 - 277
VA	34500GRDY/19920 - 120/240 (1 BUSHING - 150KV BIL)
VC	34500GRDY/19920 - 208Y/120
VD	34500GRDY/19920 - 240/480

VOLTAGES	
CODES	PRIMARY & SECONDARY
VF	34500GRDY/19920 – 480Y/277
VM	34500GRDY/19920 – 7200/12470Y
VR	34500GRDY/19920 – 240/120
VU	34500GRDY/19920 – 277
WA	4160GRDY/2400 X 12470GRDY/7200 – 120/240
WC	4160GRDY/2400 X 12470GRDY/7200 – 208Y/120
WF	4160GRDY/2400 X 12470GRDY/7200 – 480Y/277
WR	4160GRDY/2400 X 12470GRDY/7200 – 240/120
WX	4160GRDY/2400 X 12470GRDY/7200 X 13200GRDYY/7620 – 120/240
XA	2400/4160Y X 7200/12470Y – 120/240
XC	4160 X 12470 – 208Y/120
XD	2400/4160Y X 7200/12470Y – 240/480
XF	4160 X 12470 – 480Y/277
XG	4160 X 12470 – 240
XH	4160 X 12470 – 480
XQ	4160 X 12470 – 240 W/120 MIDTAP
XU	2400/4160Y X 7200/12470Y – 277

VOLTAGES	
CODES	PRIMARY & SECONDARY
YA	7620/13200Y – 120/240
YD	7620/13200Y – 240/480
YJ	7620/13200Y – 2400/4160Y
YO	13800Y – 7620/13200Y
YQ	13800Y – 240
YU	7620/13200Y – 277
ZA	13200GRDY/7620 X 12470GRDY/7200 – 120/240
ZC	4160GRDY/2400 X 13200GRDY/7620 – 208Y/120
ZD	2400/4160Y X 7620/13200Y – 240/480
ZF	4160GRDY/2400 X 13200GRDY/7620 – 480Y/277
ZQ	4160Y X 13200Y – 240 W/120 MIDTAP
ZR	4160GRDY/2400 X 12470GRDY/7200 X 13200GRDY/7620 – 240/120
ZZ	4160GRDY/2400 X 12470GRDY/7200 X 13200GRDY/7620 – 480/240

TRANSFORMER TYPE/STYLE CODE EXPLANATION

CODES	TYPES/STYLES
A	CILCO padmount, 3Ø, radial feed, dead-front, w/bayonets
B	CILCO padmount, 3Ø, loopfeed, dead-front, w/4-way switch or IP w/600A Bushing
C	Crossarm mount or IP 2400V 1Ø w/LA
D	Direct polemount, CSP, w/LA
E	Direct polemount, CSP, w/2 LA's
F	Direct polemount, conventional, w/LA
G	Direct polemount, conventional, no LA
H	Platform type, conventional, no LA
I	Direct polemount, w/breaker, w/LA
J	CIPS direct polemount, conventional, no LA
K	UE dry type or CILCO minipad, 1Ø, w/bayonet
L	Padmount, 3Ø, loopfeed, dead-front
M	Padmount, 3Ø, radial feed, dead-front
N	CIPS platform type, 1Ø, conventional
O	CILCO padmount, 3Ø, selective primary, w/external fuses
P	Platform type, conventional, w/LA
Q	Vault type, 1Ø
R	CIPS padmount, 3Ø, radial feed, live-front
S	Subway type
T	CIPS direct polemount, 3Ø
U	CIPS platform type, 3Ø
V	Vault type, 3Ø
W	Padmount, 1Ø, no bayonet
X	Padmount, 1Ø, 32" high
Y	Padmount, 1Ø, low profile, w/bayonet
Z	Padmount, live-front

Note: The Style Codes are used by all companies unless marked for a specific legacy company (UE, CIPS, CILCO, IP).

Transformer Stock Number Format = AANNNA

A = Alpha

N = Numeral

AA = Primary and Secondary Voltages

NNNN = Transformer Size w/Leading Zeros

(Ex. 25 kVA = 0025, 150 kVA = 0150)

A = Style Code Letter

Example: JA0025F

JA=7200/12470Y-120/240 Transformer Voltage

0025=25kVA Transformer

F=Pole Type, Conventional, w/Lightning Arrester

TRANSFORMERS

Stock Numbers

13 00 01 02
Sheet 1 of 5

Single-Phase Transformers - Pole and Platform Mount

Stock Number by kVA													
Voltage Primary-Secondary	Primary Bushings	Voltage Code	1	10	15	25	50	75	100	167	250	333	500
2400/4160Y-120/240	2	BA		0010C 0010F	0015C 0015F	0025C 0025F	0050C 0050F	0075C 0075F	0100C 0100F	0167C 0167F	0250C 0250P	0333C	
2400/4160Y-240/480	2	BD				0025F	0050C 0050F	0075C 0075F	0100C 0100F	0167C 0167F 0167P	0250C 0250P	0333P	0500P
2400/4160Y-277	2	BU							0100C	0167C	0250C	0333C	0500P
2400/4160Y-7200/12470Y	2	BM					0050G		0100G 0100P	0167G 0167P	0250G 0250P	0333G	
2400/4160Y x 7200/12470Y-120/240	2	XA		0010F		0025F	0050F	0075F	0100F	0167F	0250F	0333F	0500F
2400/4160Y x 7200/12470Y-240/480	2	XD		0010F		0025F	0050F		0100F	0167F	0250F	0333F	0500P
2400/4160Y x 7200/12470Y x 7620/13200Y-120/240	2	AA		0010F		0025F	0050F	0075F	0100F	0167F	0250F		
2400/4160Y x 7200/12470Y x 7620/13200Y-240/480	2	AD				0025F	0050F	0075F	0100F	0167F	0250F		
2400/4160Y x 7200/12470Y x 7620/13200Y-277	2	AU				0025F	0050F	0075F	0100F	0167F	0250F	0333F	0500P
4160/7200Y-120/240	2	CA				0025G	0050G	0075G	0100G	0167G			
4160/7200Y-277	2	CU								0167G			
7200/12470Y-120/240	2	JA		0010F	0015F	0025F	0050F	0075F	0100F	0167F	0250F	0333F	0500P
7200/12470Y-240/480	2	JD				0025F	0050F	0075F	0100F	0167F	0250F	0333F	0500P
7200/12470Y-277	2	JU					0050F		0100F	0167F	0250F	0333F	0500P
7620/13200Y-120/240	2	YA		0010F		0025F	0050F			0167F			
7620/13200Y-240/480	2	YD									0250F		
7620/13200Y-277	2	YU									0250F		
7620/13200Y-2400/4160Y	2	YJ							0100F	0167F	0250F		
7970/13800Y-120/240	2	UA			0015F	0025F	0050F	0075F	0100F	0167F			
7970/13800Y-240/480	2	UD				0025F	0050F		0100F	0167F			
12470 GrdY/7200-120	1	MK	0001F										
13200 GrdY/7620-120	1	SK	0001F										
14400/24940Y-120/240	2	RA			0015G	0025G	0050G	0075G	0100G	0167G	0250G	0333G	0500G
14400/24940Y-240/480	2	RD				0025G	0050G	0075G	0100G	0167G		0333G	0500G
14400/24940Y-2400/4160Y	2	RJ				0025G	0050G	0075G	0100G	0167G		0333G	
14400/24940Y-7200/12470Y	2	RM					0050G	0075G	0100G	0167G		0333G	0500G
14400/24940Y-277	2	RU				0025G	0050G		0100G	0167G	0250G	0333G	0500H
19920/34500Y-120/240	2	OA				0025G	0050G		0100G				
19920/34500Y-240/480	2	OD				0025G	0050G	0075G	0100G	0167G			
34500 GrdY/19920-120/240	1	VA	0010F	0015F		0025F	0050F	0075F	0100F	0167F			
34500-120	2	QK	0010G										
34500-120/240	2	QA				0025F	0050F		0100F	0167F	0250F		
34500-277	2	QU					0050F		0100F	0167F	0250F	0333F	0500P

NOTES:

- Transformers with voltage codes starting with B have side-wall mounted 4 kV primary bushings except for those with type code C and those 250 kVA and larger.
- Type code C, F, and P transformers have tank mounted arresters. Type code G and H transformers do not have arresters.
- Type code H and P transformers are platform mount transformers.

Three-Phase Transformers - Pole Mount

Stock Number by kVA								
Voltage Primary-Secondary	Primary Bushings	Voltage Code	30	45	75	150	300	500
4160Δ-208Y/120	3	EC	0030D	0045D	0075D	0150D	0300F	0500F
4160Y-240	3	DG	0030D	0045D	0075D	0150D	0300F	0500F
4160Δ-480Y/277	3	EF	0030F	0045F	0075F	0150F	0300F	0500F
12470Δ-208Y/120	3	LC	0030I	0045I	0075F	0150F	0300F	0500F
12470Y-240	3	KG	0030I	0045I	0075F	0150F	0300F	0500F
12470Δ-480Y/277	3	LF	0030F	0045F	0075F	0150F	0300F	0500F
13200Δ-208Y/120	3	NC					0300F	0500F
13200Δ-480Y/277	3	NF			0075F	0150F	0300F	0500F

NOTES:

1. Transformers with 4160 primary voltage have side-wall mounted 4 kV primary bushings.
2. All three-phase transformers have tank mounted arresters.
3. Type code D and I are CSP transformers.

Three-Phase Transformers - Platform Mount

Stock Number by kVA										
Voltage Primary-Secondary	Primary Bushings	Voltage Code	225	300	500	750	1000	1500	2000	2500
4160Δ-208Y/120	3	EC	0225P	0300P	0500P	0750P	1000P			
4160Y-240	3	DG	0225P	0300P	0500P	0750P	1000P			
4160Δ-480Y/277	3	EF	0225P	0300P	0500P	0750P	1000P	1500P	2000P	2500P
12470Δ-208Y/120	3	LC	0225P	0300P	0500P	0750P	1000P			
12470Y-240	3	KG	0225P	0300P	0500P	0750P	1000P			
12470Δ-480Y/277	3	LF	0225P	0300P	0500P	0750P	1000P	1500P	2000P	2500P
13200Δ-208Y/120	3	NC	0225P	0300P	0500P	0750P	1000P			
13200Δ-480Y/277	3	NF		0300P	0500P	0750P	1000P	1500P	2000P	2500P
34500Δ-480Y/277	3	QF			0500P	0750P	1000P	1500P	2000P	2500P

NOTES:

1. All platform mounted transformers have cover mounted primary bushings.
2. All platform mounted transformers have tank mounted arresters except those with 34500 volt primary.

Single-Phase Transformers - Pad Mount

Stock Number by kVA							
Voltage Primary-Secondary	Voltage Code	25	50	75	100	167	250
4160 GrdY/2400-240/120	FR	0025X 0025Y	0050X 0050Y	0075X 0075Y	0100X 0100Y	0167X 0167Y	
4160 GrdY/2400 x 12470 GrdY/7200-240/120	WR	0025X 0025Y	0050X 0050Y	0075X 0075Y	0100X 0100Y	0167W 0167X 0167Y	0250W
4160 GrdY/2400 x 12470 GrdY/7200 x 13200 GrdY/7620-240/120	ZR	0025Y	0050Y	0075Y	0100Y	0167X	0250X
4160 GrdY/2400 x 12470 GrdY/7200 x 13200 GrdY/7620-480/240	ZZ	0025Y		0075Y			
12470 GrdY/7200-240/120	MR	0025X 0025Y	0050X 0050Y	0075X 0075Y	0100X 0100Y	0167W 0167X 0167Y	
12470 GrdY/7200-480/240	MZ	0025Y		0075Y			
13200 GrdY/7620-240/120	SR	0025Y	0050Y	0075Y	0100Y		
13200 GrdY/7620-480/240	SZ			0075Y			
13800 GrdY/7970-240/120	TR	0025X 0025Y	0050X 0050Y	0075X 0075Y	0100X 0100Y	0167X 0167Y	
34500 GrdY/19920-240/120	VR	0025Y	0050Y		0100Y	0167Y	

NOTES:

1. All single-phase padmount transformers have a non-field replaceable weak-link fuse or isolation link to clear the transformer from the circuit in the event of a winding failure.
2. Type code X are high-profile transformers used in all of Missouri, and Alton and E. St. Louis Illinois. They are equipped with a secondary breaker in series with a weak-link fuse. Exception: ZRxxxxX transformers are equipped with a Bay-O-Net fuse in series with an isolation link.
3. Type code Y are low-profile transformers used primarily in Illinois. They are equipped with a Bay-O-Net fuse in series with an isolation link. Exception: VRxxxxY transformers are equipped with a Bay-O-Net fuse in series with a current-limiting fuse.
4. Type code W are high-profile transformers used in Illinois. They are equipped with only a non-field replaceable weak-link fuse.

TRANSFORMERS

Stock Numbers

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Three-Phase Transformers - Pad Mount

Stock Number by kVA											
Voltage Primary-Secondary	Voltage Code	75	150	300	500	750	1000	1500	2000	2500	3000
4160Δ-208Y/120	EC	0075L 0075M	0150L 0150M	0300L 0300M	0500M	0750M	1000M				
4160Δ-480Y/277	EF		0150L 0150M	0300L 0300M	0500M	0750M	1000M	1500M 1500Z	2000M 2000Z	2500M 2500Z	
4160Δ x 12470Δ-240Δ/120 Midtap	XQ	0075R	0150R	0300R	0500R						
4160 GrdY/2400 x 12470 GrdY/7200-208Y/120	WC	0075L 0075M	0150L 0150M	0300L 0300M	0500M	0750M	1000M				
4160 GrdY/2400 x 12470 GrdY/7200-480Y/277	WF		0150L 0150M	0300L 0300M	0500M	0750M	1000M	1500M 1500Z	2000M 2000Z		
4160 GrdY/2400 x 13200 GrdY/7620-208Y/120	ZC	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L						
4160 GrdY/2400 x 13200 GrdY/7620-480Y/277	ZF	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L						
4160Y x 13200Y-240Δ/120 Midtap	ZQ	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L						
12470Δ-208Y/120	LC	0075L 0075M	0150L 0150M	0300L 0300M	0500L 0500M	0750L 0750M	1000L 1000M				
12470Δ-480Y/277	LF		0150L 0150M	0300L 0300M	0500L 0500M	0750L 0750M	1000L 1000M	1500M	2000M	2500M	
12470 GrdY/7200-208Y/120	MC	0075L 0075M	0150L 0150M	0300L 0300M	0500L 0500M	0750L 0750M	1000L 1000M				
12470 GrdY/7200-480Y/277	MF		0150L 0150M	0300L 0300M	0500L 0500M	0750L 0750M	1000L 1000M	1500M	2000M	2500M	
12470Y-240Δ/120 Midtap	KQ		0150L	0300L	0500L	0750L	1000L				
13200Δ-208Y/120	NC		0150M	0300M	0500M	0750M	1000M				
13200Δ-480Y/277	NF		0150M	0300M	0500M	0750M	1000M	1500M	2000M	2500M	
13200 GrdY/7620-208Y/120	SC	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L	0750A					
13200 GrdY/7620-480Y/277	SF	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L	0750A 0750L	1000A 1000L	1500M	2000M	2500M	
13200Y-240Δ/120 Midtap	HQ	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L						
13200 GrdY/7620-4160 GrdY/2400	SX			0300A 0300L	0500A 0500L	0750A 0750L	1000A 1000L	1500M	2000M	2500M	
34500Δ-208Y/120	QC				0500L	0750L					
34500Δ-480Y/277	QF				0500L	0750L	1000L	1500L 1500M	2000M	2500L 2500M	3000M
34500 GrdY/19920-208Y/120	VC			0300L	0500L	0750L					
34500 GrdY/19920-480Y/277	VF				0500L	0750L	1000L	1500L		2500L	

NOTES:

1. Type code A transformers are radial feed. They are equipped with Bay-O-Net fuses.
2. Type code M transformers are radial feed. They do not have fuses.
3. Type code L transformers are loop feed. They are equipped with Bay-O-Net fuses. Exception: See Note 7.
4. Type code R and Z transformers are live-front radial feed. They do not have fuses. **THESE TRANSFORMERS ARE NOT TO BE INSTALLED NEW. THEY ARE ONLY AVAILABLE FOR LIKE-KIND REPLACEMENT.**
5. Voltage code EF and WF transformers 1500 kVA and larger are equipped with 15 kV, 600 Amp non-loadbreak bushings.
6. All QFxxxxM transformers are equipped with 35 kV, 600 Amp non-loadbreak bushings.
7. All VCxxxxL, VFxxxxL, QCxxxxL, and QFxxxxL transformers are equipped with 35 kV, 200 Amp loadbreak bushings (large interface). These transformers are also equipped with current limiting fuses instead of Bay-O-Net fuses.

Three-Phase Transformers - Network

Stock Number by kVA						
Voltage Primary-Secondary	Voltage Code	500	750	1000	1500	2000
13200Δ-216Y/125	HB	0500S	0750S	1000S		
13200Δ-480Y/277	NF	0500S	0750S	1000S		
13800Δ-216Y/125	PB	0500S	0750S			
13800Δ-480Y/277	PF			1000S	1500S	
14400Δ-216Y/125	UB	0500S		1000S		
14400Δ-480Y/277	UF			1000S	1500S	2000S

NOTES:

1. Voltage code HB and NF transformers are used in Bloomington and Decatur, IL.
2. Voltage code PB and PF transformers are used in St. Louis, MO.
3. Voltage code UB and UF transformers are used in Peoria, IL.

Three-Phase Transformers - Commercial Subsurface

Stock Number by kVA						
Voltage Primary-Secondary	Voltage Code	150	225	300	500	750
12470Y/7200-208Y/120	MC	0150V	0225V	0300V	0500V	0750V
12470Y/7200-480Y/277	MF				0500V	0750V
4160Y/2400 x 12470Y/7200-208Y/120	WC	0150V		0300V	0500V	0750V
4160Y/2400 x 12470Y/7200-480Y/277	WF				0500V	0750V

NOTES:

1. Commercial Subsurface Transformers are only used in Champaign, Galesburg, and Ottawa, IL.

1. Transformer Installations

Details of transformer installations will vary based on the number of phases, voltage, whether delta or wye connected, kVA rating, whether common or isolated neutral, and grounding requirements. Some special considerations are detailed below and should be used in conjunction with the other transformer construction standards.

2. Transformer Removals

Transformers removed from service shall be either retained at the district for future use or returned to the shop.

2.1 GUIDELINES FOR RETAINING A TRANSFORMER FOR RE-USE

- a. The transformer was known to be working when removed and is less than 35 years old.
- b. The transformer is a current design (for example, not iron tanks).
- c. The transformer is in good condition if:
 1. There are no broken bushings.
 2. It is not leaking oil.
 3. The paint is okay, very little rust present.
 4. Tanks are not badly dented and hanger brackets are not broken.
 5. If a padmount, it has a penta head bolt and the integrity of the cabinet security has not been compromised.

Transformers that meet these requirements do not need to be returned to the shop.

2.2 OPERATIONS TO BE PERFORMED PRIOR TO RE-USE:

- a. Replace porcelain arrester with polymer arrester on overhead transformers.
- b. On CSP transformers, remove all leads and check the low voltage breaker operation and continuity.
- c. On overhead transformers 7200 volts and above, install a wildlife guard. Refer to Dist. Std. 05-12-10-01.
- d. On CSP transformers, reset the emergency overload lever to the normal position and install a meter seal, Stock No. 49-05-860.

3. Grounding of Transformer Tanks

On all transformer installations, tanks shall be grounded by connecting the transformer grounding wire to the tank grounding lug provided for this purpose. On older style steel and cast iron tanked transformers the Transformer Shop will install the grounding lug, usually located on or near the lower right hanger bracket (facing secondary of transformer).

All single-phase transformers with two primary bushings, which are intended for phase to neutral connection, shall be equipped with an external ground connecting the primary neutral to the transformer tank (See Dist. Std. 13 00 06 02). Also all single-phase transformers having 120/240 volt secondaries with solderless connector type secondary bushings shall have a grounding strap between the secondary neutral bushing and the transformer tank. Note that where grounding rules require the interconnection of the secondary and arrester ground leads through a spark gap the grounding strap shall be removed (See Dist. Std. 13 00 06 06).

All transformer tanks shall be regarded as being "hot" when not positively known to be effectively grounded.

4. Single-Phase Delta Primary Systems

When a transformer is used on a delta primary system, lightning arresters must be attached to each primary bushing (See Dist. Std. 13 00 06 06).

5. Three-Phase Service

Three-phase service where the secondary voltage is 480Y/277 or 480 volts may be provided using three-phase transformers or by banking three single-phase transformers.

Three single-phase conventional transformers shall be banked for 120/208Y or 240 volt service.

CSP transformers should not be banked.

CAUTION:

If single-phase transformers having 120/240 volt secondaries are banked for three-phase service the grounding strap between the secondary neutral bushing and the tank must be removed on all transformers otherwise circulating currents may, under some conditions, be set up through one half the secondary coil of adjacent transformers, transformer tanks, and ground. See Dist. Stds. 13 00 07 04, 13 00 07 05, 13 00 07 08, and 13 00 07 09.

6. "Open" Transformer Banks

The open wye-open delta and open delta-open delta type transformer banks are used to supply power to small three-phase customers in addition to taking care of their lighting requirements. These customers require a four-wire service and only two transformers. When connecting two transformers together to form a transformer bank, the bank will be referred to as an "open bank".

The open wye-open delta bank may be used where three-phase service is required but only two primary phases are present. The "open bank" may also be used in emergencies where one transformer in a bank of three fails and service must be restored immediately.

When an "open bank" is used, the capacity is only 57% of the three-phase rating of a closed bank of three transformers. If an "open bank" is used in an emergency situation, measures must be taken to reduce load. Additionally, the failed transformer should be replaced as soon as possible.

7. PARALLELING TRANSFORMERS

No attempt should be made to parallel a three-phase transformer with a bank of three single-phase transformers. Differences in phase shifts (angular displacements) will not permit paralleling.

8. 480 VOLT THREE WIRE SERVICE FROM 480Y/277 VOLT FOUR WIRE TRANSFORMER

See Dist. Stds. 13 00 01 01, 51 12 00 **, 51 12 01 **, and 51 12 02 **.

9. ELIMINATION OF STRAY VOLTAGES

Relatively low levels of neutral-to-earth (stray) voltage may produce adverse effects in especially sensitive installations, such as dairy farms. If the neutral-to-earth voltage on the customer's premise cannot be reduced by conventional methods such as tightening connectors, replacing connectors, or adding ground rods, a neutral isolation device may be utilized. See Dist. Std. 13 00 06 08.

1. Secondary Leads

The following copper lead sizes shall be used for connections from overhead transformer secondary terminals to a secondary, a secondary bus, or an individual secondary service. Aluminum leads shall not be used. Exception: If a transformer installation serves only one customer, aluminum service conductor can be extended to the transformer secondary terminals provided pin terminal connectors with copper studs are used.

Where a three-phase installation consists of a bank of three single-phase transformers the lead sizes between the transformers secondary terminals shall be determined by the size of the individual transformers, their single-phase voltage, and the change-out overload rating. The lead size from the transformers to the secondary/service bus shall be determined by the size of the bank, the three-phase voltage, and the change-out overload rating.

For 208Y/120 Volt and 480Y/277 Volt banks, the size of both the transformer-to-transformer and transformer-to-secondary/service bus leads are the same. For 240 Volt and 480 Volt delta banks, the size of the transformer-to-transformer leads can be smaller than the transformer-to-secondary/service bus leads. The three-phase tables in this standard reflect the preceding sizing criteria. For paralleled transformers, the transformer-to-transformer lead size is based on the kVA of the largest single transformer. The transformer-to-secondary lead size is based on the total kVA of the paralleled transformers. Tables of lead sizes for paralleling transformers are not provided since it is a non-standard application to be used only in emergency situations.

Where customer's circuit is over 50 Amps and involves more than one metallic duct, connections should not be made unless each of the phase wires and neutral are in each duct. This is an NEC requirement to avoid heating the metallic ducts by induced currents.

167 kVA and larger transformers with 120/240 and 240/480 Volt secondary have four (4) secondary bushings so that the secondary windings can be externally connected in series or parallel depending on the application. If the windings are to be connected in series, the external connection wire size must match the phase wire size (if single-phase) or transformer-to-transformer wire size (if banked three-phase delta). If the windings are to be connected in parallel, the external connection wire size can be one-half (1/2) the phase wire size (if single-phase or banked three-phase wye).

TABLE 1.1

Single-Phase 120/240 Volt 3-Wire and 240 Volt 2-Wire

Transformer kVA	Cross-Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		Stock Number
	Phase	Neutral	
15 & Smaller	#6	#6	18 51 021
25	#2	#2	18 51 019
37-1/2	1/0	1/0	18 51 024
50	4/0	4/0	18 51 023
75	350	350	18 51 052
100	500	500	18 51 022
167	2-350	2-350	18 51 052
200	2-500	2-500	18 51 022
250	2-500	-	18 51 022
333	2-750	-	18 51 020

TABLE 1.2

Single-Phase 120 Volt 2-Wire and 120/240 Volt With Paralleled Windings

For Use In 208Y/120 Volt Three-Phase Banks

Transformer kVA		Cross-Linked Polyethylene Covered Copper Wire	
Single-Phase	Three-Phase Bank ⁽¹⁾	Size (AWG or KCMIL)	Stock Number
15 & Smaller	45	#2	18 51 019
25	75	1/0	18 51 024
37-1/2	112-1/2	4/0	18 51 023
50	150	350	18 51 052
75	225	500	18 51 022
100	300	2-350	18 51 052
167	500	2-750	18 51 020

Notes:

1. See Table 1.5

TABLE 1.3

Single-Phase 480 Volt 2-Wire

Transformer kVA	Cross-Linked Polyethylene Covered Copper Wire	
	Size (AWG or KCMIL)	Stock Number
37-1/2 & Smaller	#6	18 51 021
50	#2	18 51 019
75	1/0	18 51 024
100	1/0	18 51 024
167	350	18 51 052
200	500	18 51 022
250	500	18 51 022
333	750	18 51 020

TABLE 1.4
Three-Phase 240 Volt

Transformer or Bank kVA	Cross-Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		Stock Number
	Transformer to Transformer ⁽¹⁾	Transformer to Secondary/Service	
30 & Smaller	#6	#6	18 51 021
45	#2	#2	18 51 019
75	1/0	1/0	18 51 024
112-1/2	4/0	4/0	18 51 023
150	4/0	4/0	18 51 023
225	500	500	18 51 022
300	1-350	2-350	18 51 052
500	1-500	2-500	18 51 022
750	2-750	2-750	18 51 020
1000	2-750	3-750	18 51 020

Notes:

1. Applicable only to a bank of single-phase transformers.

TABLE 1.5
Three-Phase 208Y/120 Volt 4-Wire

Transformer or Bank kVA	Cross-Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		Stock Number
	Phase ⁽¹⁾	Neutral ⁽²⁾	
30 & Smaller	#6	#6	18 51 021
45	#2	#2	18 51 019
75	1/0	1/0	18 51 024
150	350	350	18 51 052
225	500	500	18 51 022
300	2-350	2-350	18 51 052
500	2-750	2-750	18 51 020
750	3-750	3-750	18 51 020
1000	3-750	3-750	18 51 020

Notes:

1. Wire size is the same for the Transformer-to-Transformer (banked single-phase transformers) and Transformer-to-Secondary/Service leads.
2. Full-size neutrals are required to accommodate the harmonic currents associated with increased usage of electronic office equipment.

TABLE 1.6

Three-Phase 480 Volt

Transformer or Bank kVA	Cross-Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		Stock Number
	Transformer to Transformer ⁽¹⁾	Transformer to Secondary/Service	
75 & Smaller	#2	#2	18 51 019
112-1/2	#2	#2	18 51 019
150	1/0	1/0	18 51 024
225	4/0	4/0	18 51 023
300	4/0	4/0	18 51 023
500	500	500	18 51 022
750	750	750	18 51 020
1000	1-500	2-500	18 51 022
1500	2-750	2-750	18 51 020
2000	2-750	3-750	18 51 020
2500	2-750	3-750	18 51 020

Notes:

1. Applicable only to a bank of single-phase transformers.

TABLE 1.7

Three-Phase 480Y/277 Volt 4-Wire

Transformer or Bank kVA	Cross-Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		Stock Number
	Phase ⁽¹⁾	Neutral ⁽²⁾	
75 & Smaller	#2	#2	18 51 019
112-1/2	#2	#2	18 51 019
150	1/0	1/0	18 51 024
225	4/0	4/0	18 51 023
300	4/0	4/0	18 51 023
500	500	500	18 51 022
750	750	750	18 51 020
1000	2-500	2-500	18 51 022
1500	2-750	2-750	18 51 020
2000	3-750	3-750	18 51 020
2500	3-750	3-750	18 51 020

Notes:

1. Wire size is the same for the Transformer-to-Transformer (banked single-phase transformers) and Transformer-to-Secondary/Service leads.
2. Full-size neutrals are required to accommodate the harmonic currents associated with increased usage of electronic office equipment.

TABLE 1.8

Three-Phase 240 Delta/120 Volt Grounded Center Tap⁽¹⁾

Transformer Bank kVA	Cross-Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		Stock Number
	Transformer to Transformer	Transformer to Secondary/Service ⁽²⁾	
3-10	#6	#6	18 51 021
3-15	#2	#2	18 51 019
3-25	1/0	1/0	18 51 024
3-50	4/0	4/0	18 51 023
3-100	1-350	2-350	18 51 052
2-10 & 1-25	#2	#2	18 51 019
2-25 & 1-50	1/0	1/0	18 51 024
2-50 & 1-100	350	350	18 51 052
2-100 & 1-167	1-350	2-350	18 51 052
2-167 & 1-250	1-500	2-500	18 51 022
3-167	1-500	2-500	18 51 022
3-250	2-750	2-750	18 51 020
3-333	2-750	3-750	18 51 020

Notes:

1. Bank of three single-phase transformers. This table is provided for maintenance of existing installations.
2. Center tap neutral is the same size as the Transformer-to-Secondary/Service phase conductors.

TABLE 1.9

Three-Phase 120/240 Volt Open Wye-Open Delta, Grounded Center Tap⁽¹⁾

Transformer Bank kVA	Cross-Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		Stock Number
	Transformer to Transformer ⁽²⁾	Transformer to Secondary/Service ⁽³⁾	
2-10	#6	#6	18 51 021
1-25 & 1-10	#2	#2	18 51 019
1-50 & 1-10	1/0	1/0	18 51 024
2-25	#2	#2	18 51 019
1-50 & 1-25	1/0	1/0	18 51 024
1-100 & 1-25	350	350	18 51 052
2-50	1/0	1/0	18 51 024
1-100 & 1-50	350	350	18 51 052
1-167 & 1-50	350	2-350	18 51 052

Notes:

1. This transformer connection has one 208 V phase-to-neutral "wild" phase, and two 120 V phase-to-neutral "lighter" phases. All phase-to-phase voltages are 240 V.
2. Transformer-to-transformer and "wild" phase transformer-to-secondary/service leads are the same size.
3. Transformer-to-Secondary/Service "lighter" phase and center tap neutral leads are the same size.

2. Primary Phase Leads

TABLE 2.1

Single-Phase and Three-Phase 2400-4160 Volt Transformers With Cover Mounted Bushings

Maximum KVA		Cross-Linked Polyethylene Covered Copper Wire Size ⁽¹⁾	Stock Number
Single-Phase 2400V	Three-Phase 4160V		
333	1000	#4 CU, Solid	18 51 025
500	1500	#2 CU, 7 Strand	18 51 019
1000	2500	4/0 CU, 19 Strand	18 51 023

Notes:

1. Where long primary leads are required, a #2 or larger conductor shall be used for mechanical strength.

TABLE 2.2

Single-Phase and Three-Phase 2400–4160 Volt Transformers With Side-Wall Mounted Bushings

Maximum KVA		EPR Covered Copper Wire Size ⁽¹⁾	Stock Number
Single-Phase 2400V	Three-Phase 4160V		
167	500	#6 CU, 7 Strand – 5KV	18 53 011
250	750	#2 CU, 7 Strand – 5KV	18 53 018
333	1000	1/0 CU, 19 Strand – 5KV	18 53 022

Notes:

- Where long primary leads are required, a #2 or larger conductor shall be used for mechanical strength.

TABLE 2.3

Single-Phase and Three-Phase 5000–15000 Volt Transformers With Cover Mounted Bushings

Maximum KVA		Cross-Linked Polyethylene Covered Copper Wire Size ⁽¹⁾	Stock Number
Single-Phase	Three-Phase		
500	2500	#4 CU, Solid	18 51 025

Notes:

- Where long primary leads are required, a #2 or larger conductor shall be used for mechanical strength.

3. Primary Neutral Leads

3.1 Two Bushing Transformers

All single-phase, two bushing transformers, connected phase-to-neutral shall have the neutral bushing grounded twice. One of the grounding connections is from the neutral bushing to the grounded transformer tank. The second grounding connection is from the neutral bushing to the common neutral and is to be clearly separated from all other common neutral connections.

For all kVA sizes of 7.2 thru 19.9 kV transformers and 2.4 kV transformers thru 333 kVA, the grounding connections are made using a single piece of #4 soft-drawn solid covered copper wire (Stock Number 18 51 025) by extending the lead from the grounding boss on the transformer tank through the primary neutral bushing to the common neutral. Use a gradual sweep when taking the lead through the primary neutral bushing to the common neutral. See DCS 13 00 06 02. For 500 kVA 2.4 kV transformers, use #2 CU (Stock Number 18 51 019) from the primary neutral bushing to the common neutral.

3.2 Single Bushing Transformers

All single-phase, single bushing transformers, connected phase to neutral shall have two separate grounding connections to the tank. One connection shall be made from the tank to the earth ground. The second connection shall be made from the tank to the common neutral and is to be clearly separated from all other common neutral connections. In all instances, this connection shall be made with #4 soft-drawn solid covered copper wire (Stock Number 18 51 025).

**SINGLE PHASE – POLE OR PLATFORM MOUNTED (1)
5kV AND BELOW (TYPICAL VALUES)
SINGLE – VOLTAGE**

KVA SIZE	HEIGHT (INCHES)		WIDTH (INCHES)(3)	WEIGHT (POUNDS)	OIL (GAL)
	Side Bushings	Cover Bushings (2)			
10	30	34	23	235	10
15	30	34	27	310	13
25	30	40	28	475	17
50	36	42	32	800	28
75	40	50	32	900	38
100	46	50	36	1100	50
167	50	54	38	1805	79
250	50	58	41	2360	95
333	58	66	41	2860	104
500	–	66	41	3215	104

NOTES:

1. This table does not include step-up/step-down transformers.
2. Distance from upper support lug to HV terminal for cover mounted bushings is 15" ± 3".
3. Width includes cooling fins and tank mounted arresters in their extended positions.

**THREE PHASE – POLE MOUNTED (1)
5kV AND BELOW (TYPICAL VALUES)**

KVA SIZE	HEIGHT (INCHES)	WIDTH (INCHES)(2)	WEIGHT (POUNDS)	OIL (GAL)
30	61	40	1450	71
45	61	40	1480	71
75	61	40	1830	81
150	61	40	1900	85
225	70	56	2500	90
300	70	56	3200	115
500	74	56	3800	150

NOTES:

1. This table does not include step-up/step-down transformers.
2. Width includes cooling fins and tank mounted arresters in their extended positions.

SINGLE PHASE – POLE OR PLATFORM MOUNTED(1) 7.2 THRU 14.4 kV (TYPICAL VALUES) SINGLE – VOLTAGE

KVA SIZE	HEIGHT (INCHES)(2)	WIDTH (INCHES)(3)	WEIGHT (POUNDS)	OIL (GAL)
1	26	15	110	4
10	36	25	285	14
15	39	26	365	16
25	40	28	510	18
50	48	31	800	33
75	52	31	900	38
100	60	32	1120	66
167	60	39	1805	83
250	60	41	2360	95
333	75	52	2720	85
500	75	52	3060	98

NOTES:

1. This table does not includes step-up/step-down transformers.
2. Thru 13.8 kV, distance from upper support lug to HV terminal is 15" \pm 3".
For 14.4 kV, distance from upper support lug to HV terminal is 16.5" \pm 3" thru 167 kVA, and 19.5" \pm 3" for 250 thru 500 kVA.
3. Width includes cooling fins and tank mounted arresters in their extended positions.

THREE PHASE – POLE MOUNTED (1) 12.47 THRU 13.8 kV (TYPICAL VALUES)

KVA SIZE	HEIGHT (INCHES)(2)	WIDTH (INCHES)(#3)	WEIGHT (POUNDS)	OIL (GAL)
30	65	40	1435	72
45	65	40	1500	72
75	65	40	1815	83
150	66	40	2275	91
225	70	56	2600	120
300	72	56	3125	125
500	81	56	4105	150

NOTES:

1. This table does not include step-up/step-down transformers.
2. Distance from upper support lug to HV terminal is 15" \pm 3".
3. Width includes cooling fins and tank mounted arresters in their extended positions.

SINGLE PHASE – POLE OR PLATFORM MOUNTED(1)
19.9 and 34.5kV (TYPICAL VALUES)
SINGLE – VOLTAGE

KVA SIZE	HEIGHT (INCHES)(2)		WIDTH (INCHES)(3)		WEIGHT (POUNDS)		OIL (GAL)	
	19.9kV	34.5kV	19.9kV	34.5kV	19.9kV	34.5kV	19.9kV	34.5kV
10	44	48	29	32	380	685	17	32
15	44	–	32	–	435	–	18	–
25	44	49	32	32	500	685	18	36
50	50	58	34	42	815	1090	32	62
75	52	–	34	–	1255	–	42	–
100	55	62	34	42	1430	1890	56	85
167	55	70	36	47	1710	2200	58	94
250	–	66	–	48	–	2610	–	95
333	–	74	–	48	–	2770	–	105
500	–	82	–	48	–	5650	–	125

NOTES:

1. This table does not include step-up/step-down transformers.
2. Distance from upper support lug to HV terminal is 16.5" ± 3" thru 167 kVA and 19.5" ± 3" for 250 thru 500 kVA.
3. Width includes cooling fins and tank mounted arresters in their extended positions.

SINGLE PHASE – POLE MOUNTED (1)
DOUBLE AND TRIPLE VOLTAGE (TYPICAL VALUES)

KVA SIZE	HEIGHT (INCHES)(2)	WIDTH (INCHES)(3)	WEIGHT (POUNDS)	OIL (GAL)
10	36	27	485	20
25	42	27	500	23
50	46	31	955	42
75	54	32	1425	42
100	54	34	1430	64
167	58	39	1970	86
250	62	39	2415	93
333	66	41	2960	105
500	66	41	3505	105

NOTES:

1. This table does not include step-up/step-down transformers.
2. Distance from upper support lug to HV terminal is 15" ± 3".
3. Width includes cooling fins and tank mounted arresters in their extended positions.

THREE PHASE – PLATFORM MOUNTED (1) 5 THRU 13.2kV (TYPICAL VALUES)

KVA SIZE	HEIGHT (INCHES)	WIDTH (INCHES) (2)	DEPTH (INCHES) (2)	OIL (GALS)	WEIGHT (POUNDS)
225	67	61	30	241	4040
300	67	61	32	241	4385
500	67	61	41	241	5500
750	75	75	49	413	8200
1000	75	77	49	437	9900
1500	78	81	49	441	10300
2000	89	81	49	565	13800
2500	89	86	49	602	17400

NOTES:

1. This table does not include step-up/step-down transformers.
2. Width and depth dimensions include cooling fins and tank mounted arresters in their extended positions.

THREE PHASE – PAD MOUNTED (1) 5 THRU 13.2kV (TYPICAL VALUES)

KVA SIZE	HEIGHT (INCHES)	WIDTH (INCHES) (2)	DEPTH (INCHES) (2)	OIL (GALS)	WEIGHT (POUNDS)
75	62	74	50	175	3200
150	62	74	53	175	4000
300	64	74	59	259	6500
500	69	74	66	316	8000
750	74	76	68	394	8700
1000	74	76	70	416	12400
1500	74	80	80	521	13200
2000	80	92	86	561	17000
2500	80	96	92	557	17300

NOTES:

1. This table does not include step-up/step-down transformers.
2. Width and depth dimensions include cooling fins. Refer to DCS 34 21 05 ** for pad requirements for these transformers.

SINGLE PHASE – PAD MOUNTED
2.4 THRU 7.97kV (TYPICAL VALUES)

KVA SIZE	TYPE (1)	HEIGHT (INCHES)	WIDTH (INCHES) (2)	DEPTH (INCHES) (2)	OIL (GALS)	WEIGHT (POUNDS) (3)
25	I	32	36	35	56	1070
50	I	32	40	38	75	1330
75	I	32	40	42	87	2035
100	I	36	40	44	104	2035
167	I	42	40	45	116	2855
250	I	42	40	51	120	2855
25	II	24	34	34	36	680
50	II	24	34	36	40	840
75	II	24	34	38	69	1005
100	II	32	36	38	69	1300
167	II	32	36	44	91	1840

NOTES:

1. Type I are also referred to as high-profile transformers. Type II are also referred to as low-profile transformers.
2. Width and depth dimensions include cooling fins where applicable. Refer to DCS 34 21 05 ** for pad requirements for these transformers.
3. Weights for Type I padmount transformers are based on WR (dual voltage transformers) or ZR (triple voltage transformers). Single voltage transformers will typically weigh less.

SINGLE PHASE – PAD MOUNTED
19.9kV (TYPICAL VALUES)

KVA SIZE	TYPE	HEIGHT (INCHES)	WIDTH (INCHES) (1)	DEPTH (INCHES) (1)	OIL (GALS)	WEIGHT (POUNDS)
25	I	36	38	38	81	1295
50	I	36	38	39	82	1415
100	I	36	38	43	97	1815
167	I	42	38	45	120	2500

NOTES:

1. Width and depth dimensions include cooling fins where applicable. Use pad stock #12-06-163 for these transformers per DCS 34 21 04 **.

THREE PHASE – PLATFORM MOUNTED (1)
35kV (TYPICAL VALUES)

KVA SIZE	HEIGHT (INCHES)	WIDTH (INCHES)(2)	DEPTH (INCHES) (2)	OIL (GALS)	WEIGHT (POUNDS)
500	84	77	48	385	6635
750	88	81	52	451	8900
1000	88	81	54	456	9200
1500	88	84	77	456	10785
2000	96	100	62	585	14500
2500	105	110	70	605	16500

NOTES:

1. This table does not include step-up/step-down transformers.
2. Width and depth dimensions include cooling fins and tank mounted arresters in their extended positions.

THREE PHASE – PAD MOUNTED (1)
35kV (TYPICAL VALUES)

KVA SIZE	HEIGHT (INCHES)	WIDTH (INCHES)(2)	DEPTH (INCHES)(2)	OIL (GALS)	WEIGHT (POUNDS)
300 (3)	67	84	62	590	9300
500 (3)	77	87	66	685	11700
750 (3)	77	87	68	685	13400
1000 (3)	77	87	73	700	13300
1500 (4)	77	89	86	960	17600
2000 (5)	77	92	86	755	13065
2500 (4)	77	96	96	970	21100
3000 (5)	77	100	96	835	17900

NOTES:

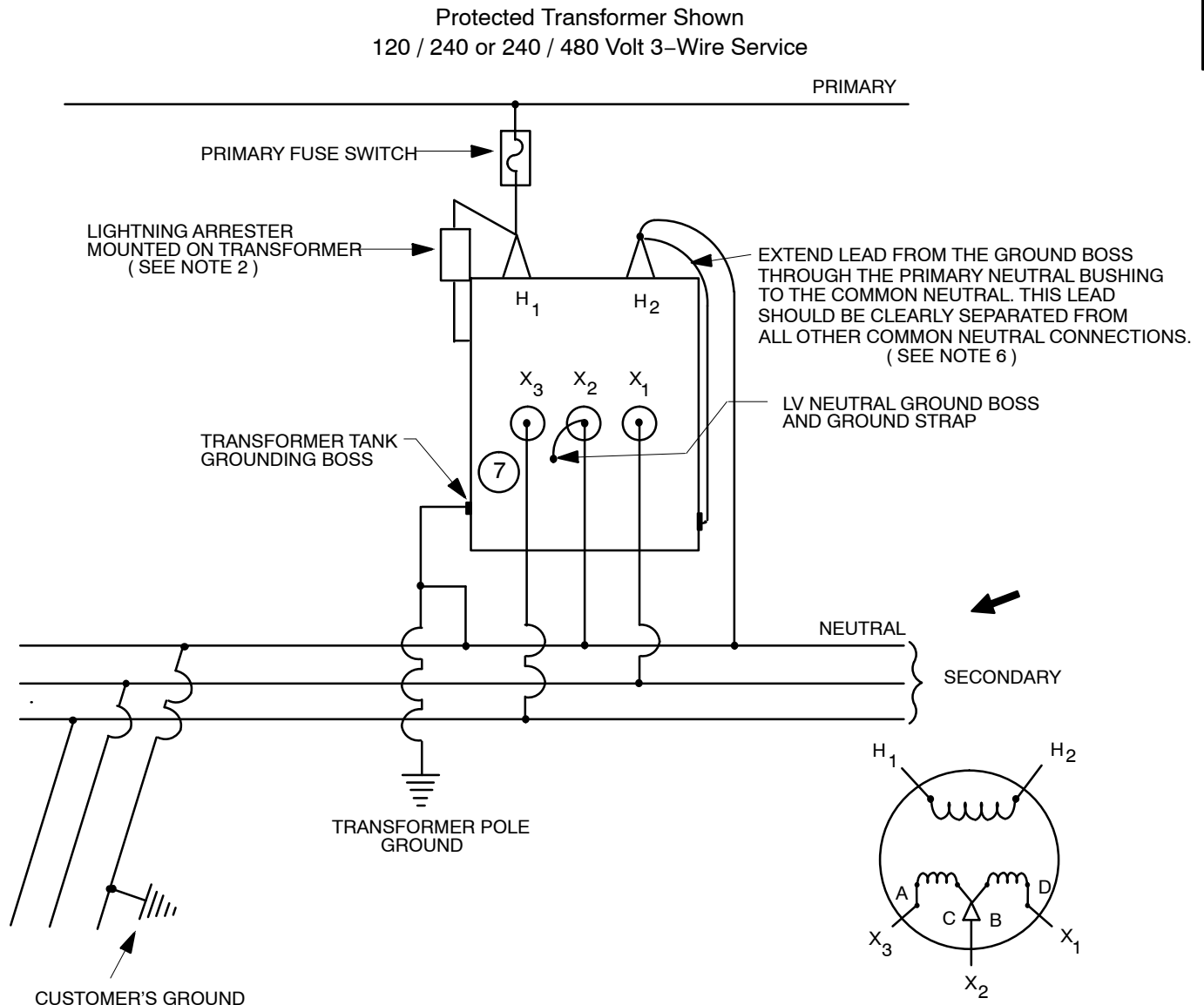
1. This table does not include step-up/step-down transformers.
2. Width and depth dimensions include cooling fins, but do not include the fuse cabinet provided on loop-feed transformers. With the fuse cabinet, the width of a loop-feed transformer can be up to 117". Refer to DCS 34 11 00 00 for pad requirements for those transformers.
3. 300 kVA thru 1000 kVA are only purchased as loop-feed.
4. 1500 kVA and 2500 kVA are purchased in both radial-feed and loop-feed styles with these dimensions and weights based on the loop-feed style.
5. 2000 kVA and 3000 kVA transformers are only purchased as radial-feed.

TRANSFORMERS

Single Phase Three Wire Secondary Connection Diagram 15 kV and Below – Grounded Wye Primary Systems

13 00 06 02

Sheet 1 of 1



NOTES:

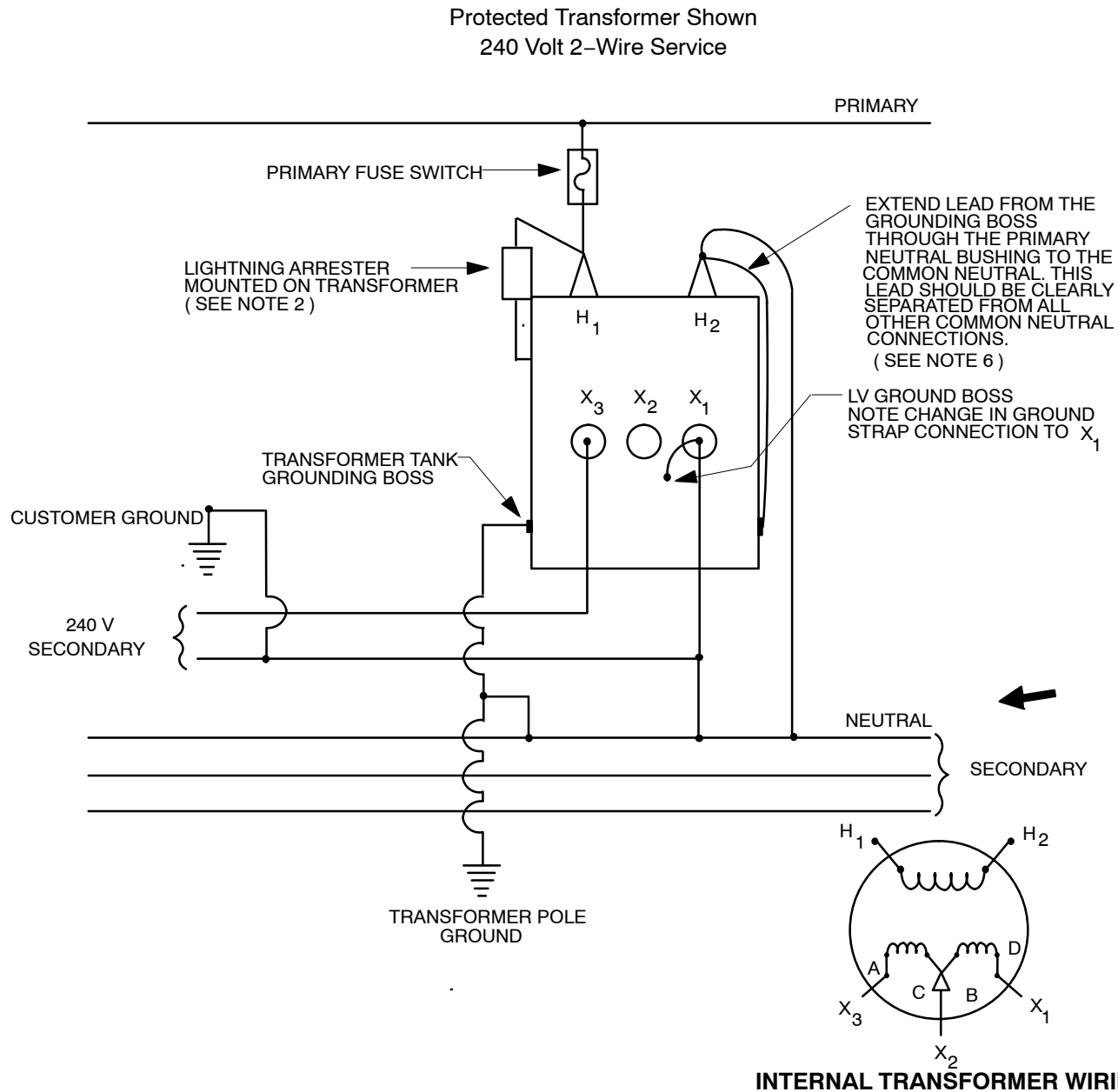
1. Some 2400/4160 Y transformers have sidewall mounted HV bushings.
2. Primary phase connection may be on either the H₁ or H₂ bushing, with the lightning arrester connected to the same bushing. The ground lead is then connected to the other "H" bushing.
3. See 13 00 01 01 for information about conventional and completely self protected transformers (CSP). See 13 00 03 01 for primary and secondary leads.
4. Transformers with a single HV bushing have one end of the winding grounded to the tank.
5. Transformer shown is additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of the x₁ and x₃ bushings are reversed.
6. Do not bend the primary neutral lead too severely. Use a gradual sweep when taking the lead to the common neutral.
7. "Power Leg" to be connected to the bottom wire of an open wire secondary. Note: "Power Leg" is the secondary leg closest to the energized primary bushing, H₁ above. If open wire secondary is not utilized there is no "Power Leg" connotation.

TRANSFORMERS

Single Phase Two Wire Secondary Connection Diagram 15 kV and Below – Grounded Wye Primary Systems

13 00 06 03

Sheet 1 of 2



NOTES:

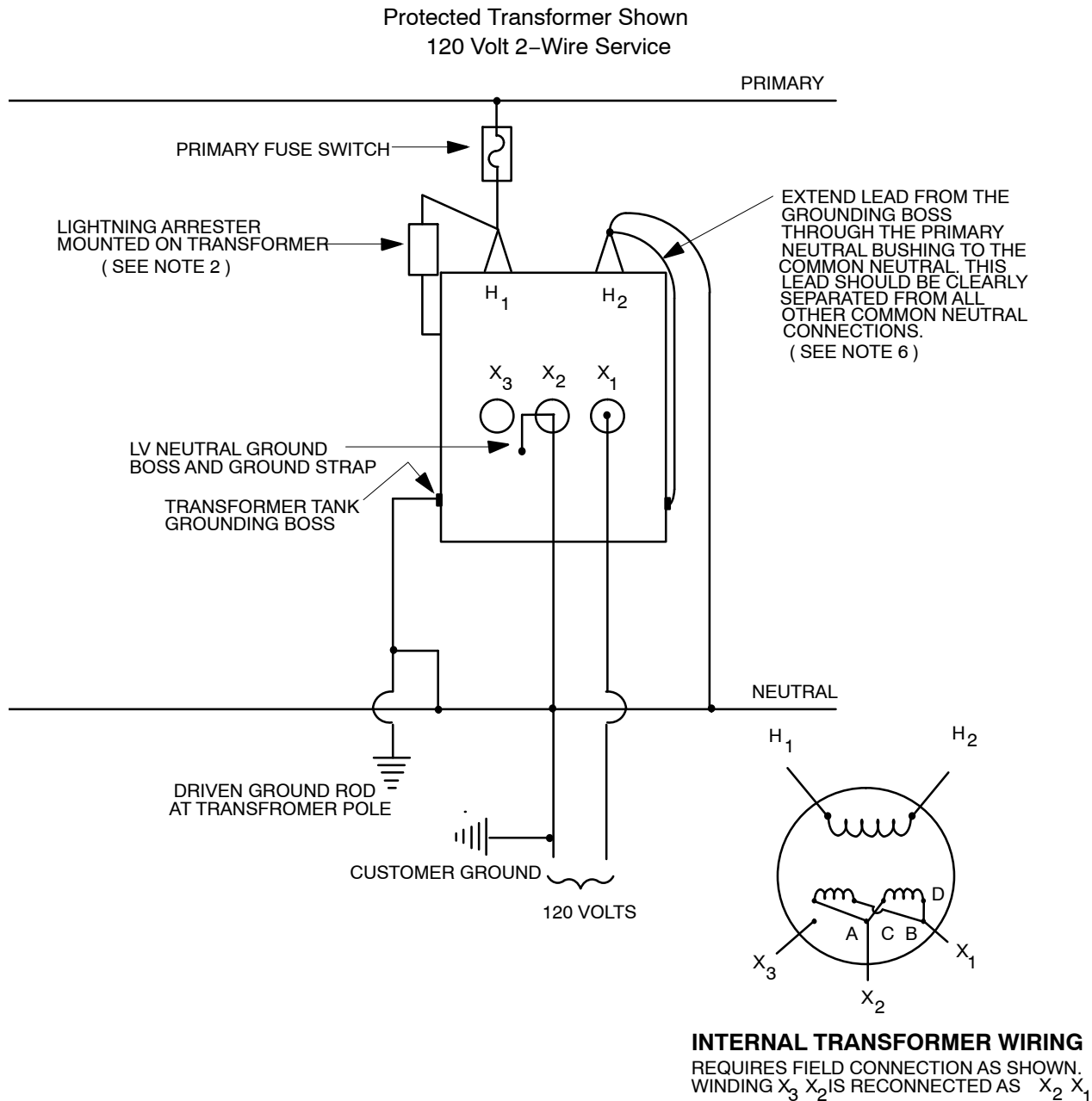
1. 2400/4160 Y transformers may have sidewall mounted HV bushings.
2. Primary phase connection may be on either the H_1 or H_2 bushing, with the lightning arrester connected to the same bushing. The ground lead is then connected to the other "H" bushing.
3. See 13 00 01 01 for information about conventional and completely self protected transformers (CSP). See 13 00 03 01 for primary and secondary leads.
4. Transformers with a single HV bushing have one end of the winding grounded to the tank.
5. Transformer shown is a additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of x_1 and x_3 bushings are reversed.
6. Do not bend the primary neutral lead too severely. Use a gradual sweep when taking the lead to the common neutral.

TRANSFORMERS

Single Phase Two Wire Secondary Connection Diagram 15 kV and Below – Grounded Wye Primary Systems

13 00 06 03

Sheet 2 of 2



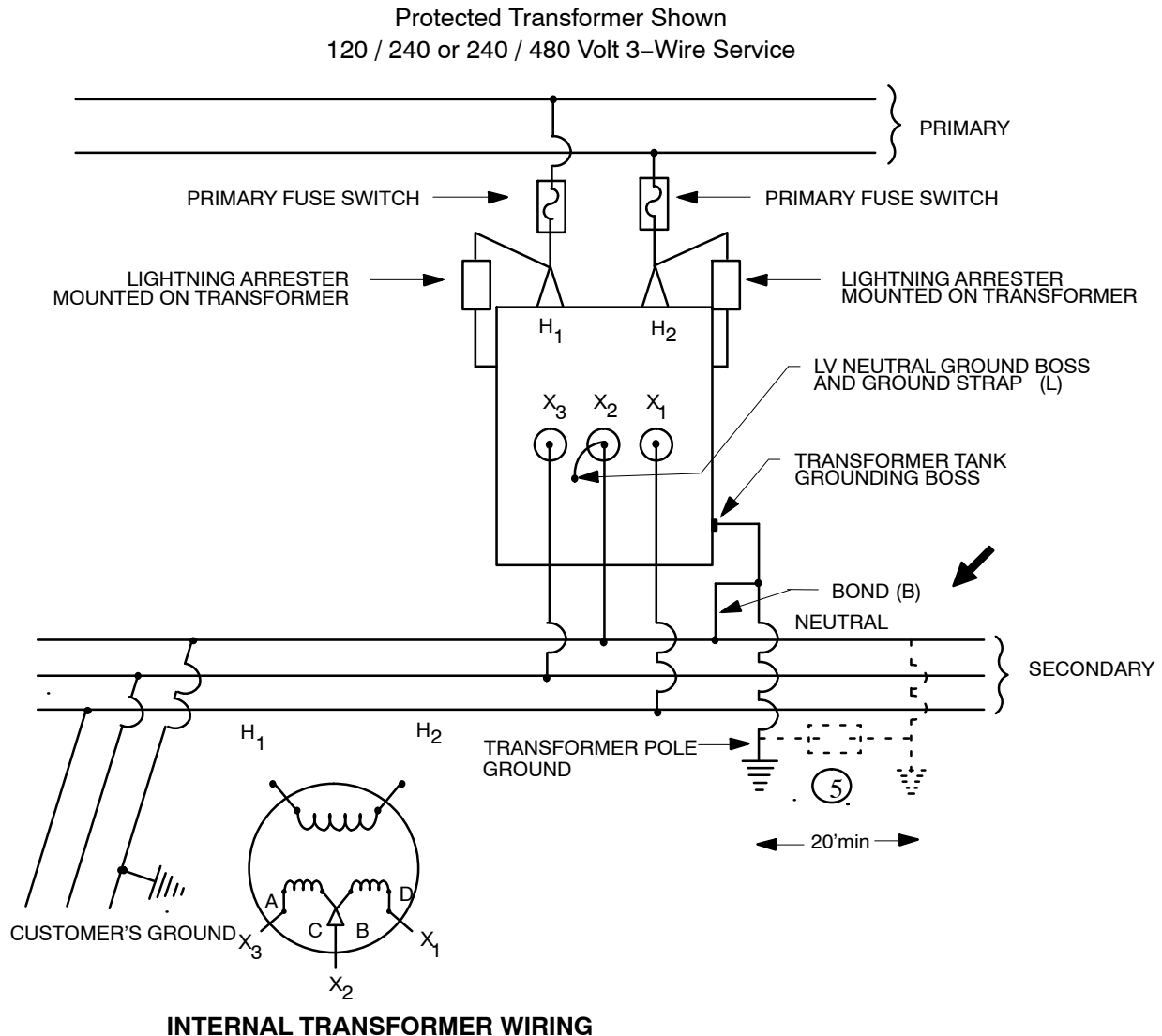
NOTES:

1. 2400/4160 Y transformers may have sidewall mounted HV bushings.
2. Primary phase connection may be on either the H₁ or H₂ bushing, with the lightning arrester connected to the same bushing. The ground lead is then connected to the other "H" bushing.
3. See 13 00 01 01 for information about conventional and completely self protected transformers (CSP). See 13 00 03 01 for primary and secondary leads.
4. Transformers with a single HV bushing have one end of the winding grounded to the tank.
5. Transformer shown is additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of x₁ and x₃ bushings are reversed.
6. Do not bend the primary neutral lead too severely. Use a gradual sweep when taking the lead to the common neutral.

TRANSFORMERS
Single Phase Three Wire Secondary Connection Diagram
15 kV and Below-Delta Primary Systems

13 00 06 06

Sheet 1 of 2



NOTES:

1. 2400/4160Y or 4160 two wire transformers may have sidewall mounted HV bushings.
2. Lightning arresters must be connected to the H₁ and H₂ bushings.
3. See 13 00 01 01 for information about conventional and completely self protected transformers (CSP). See 13 00 03 01 for primary and secondary leads.
4. Transformer shown is additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of x₁ and x₃ bushings are reversed.

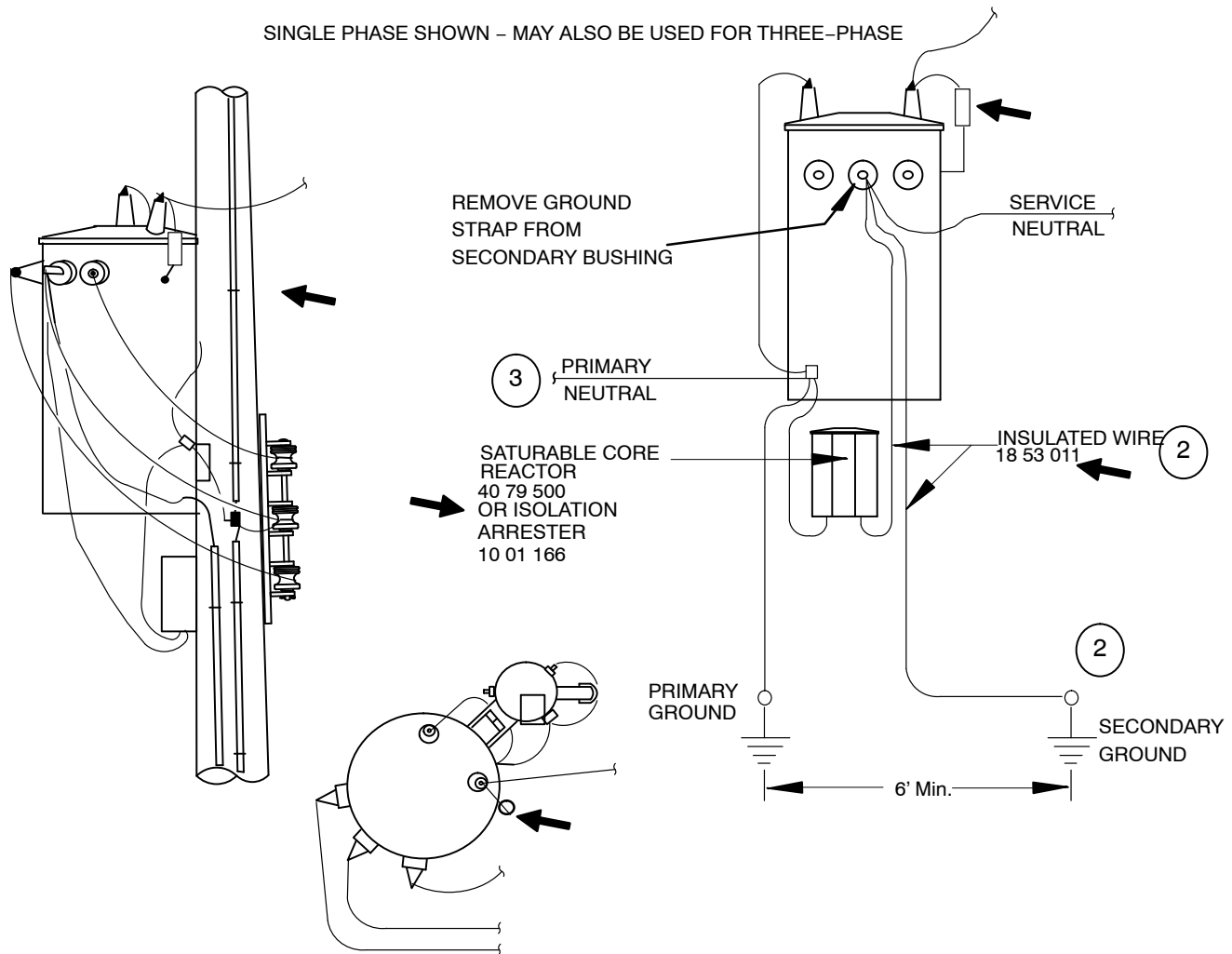
TRANSFORMERS
Single Phase Three Wire Secondary Connection Diagram
15 kV and Below-Delta Primary Systems

13 00 06 06

Sheet 2 of 2

5. The lightning arrester ground and secondary neutral can only be tied solidly together as shown, if one or the other or both of the following requirements are met:
- a) The secondary neutral shall have at least one connection to a continuous metallic underground water pipe system.
 - b) The secondary neutral shall be connected to a primary neutral or shield wire having not less than four ground connections in each mile of continuous line in addition to a ground connection at each individual service.

If the above requirements cannot be met, proceed as follows: Remove ground strap (L) and omit bond (B). Drive an additional ground rod for the secondary neutral not less than 20 ft. from the arrester ground rod and connect the ground lead through an isolation arrester (Stock #10-01-019) to the lightning arrester/transformer tank ground lead (shown dotted in figure). The secondary grounding conductor shall be insulated for 600V (use riser wire Stock #18-53-011). Both ground leads must be covered with plastic moulding for a distance of 8 ft. from the ground. The resistance of both grounds should not exceed 25 ohms.



NOTES:

1. Relatively low levels of neutral-to-earth (stray) voltage may produce adverse effects in especially sensitive installations, such as dairy farms. Usually stray voltages result from factors such as earth currents, ground electrode resistance, earth resistivity, or impedance of current-carrying neutral conductors. If neutral-to-earth voltage on the customer's premise (as measured by Ameren personnel with customer's main disconnect in the open position, or with only 240V loads connected) cannot be reduced to 1.0 volt AC or less across a 470 OHM 5% resistor by conventional methods such as tightening connectors, replacing connectors, or adding ground rods, a neutral isolation device may be utilized. **All options to eliminate stray voltages should be explored prior to installing either a saturable core reactor or an isolation arrester.**
2. Rule 97D2 of the National Electrical Safety Code allows the primary and secondary neutrals of a multi-grounded system to be separated but interconnected through a spark gap or similar isolation device. The gap or device shall have a 60Hz. breakdown voltage not exceeding 3 kV. Additionally, at least one other grounding connection on the secondary neutral shall be provided. This secondary grounding electrode shall be installed at least six feet from the primary grounding electrode. The secondary grounding conductor shall be insulated for 600V and must be covered with plastic moulding for a distance of 8 ft. from the ground. Resistance of the secondary ground should not exceed 25 ohms.
3. The system neutral must be connected to the grounded primary neutral bushing and the pole ground that connects the lightning arrester and transformer tank ground.
4. The reactor or isolation arrester ground must be completely isolated from other grounds.

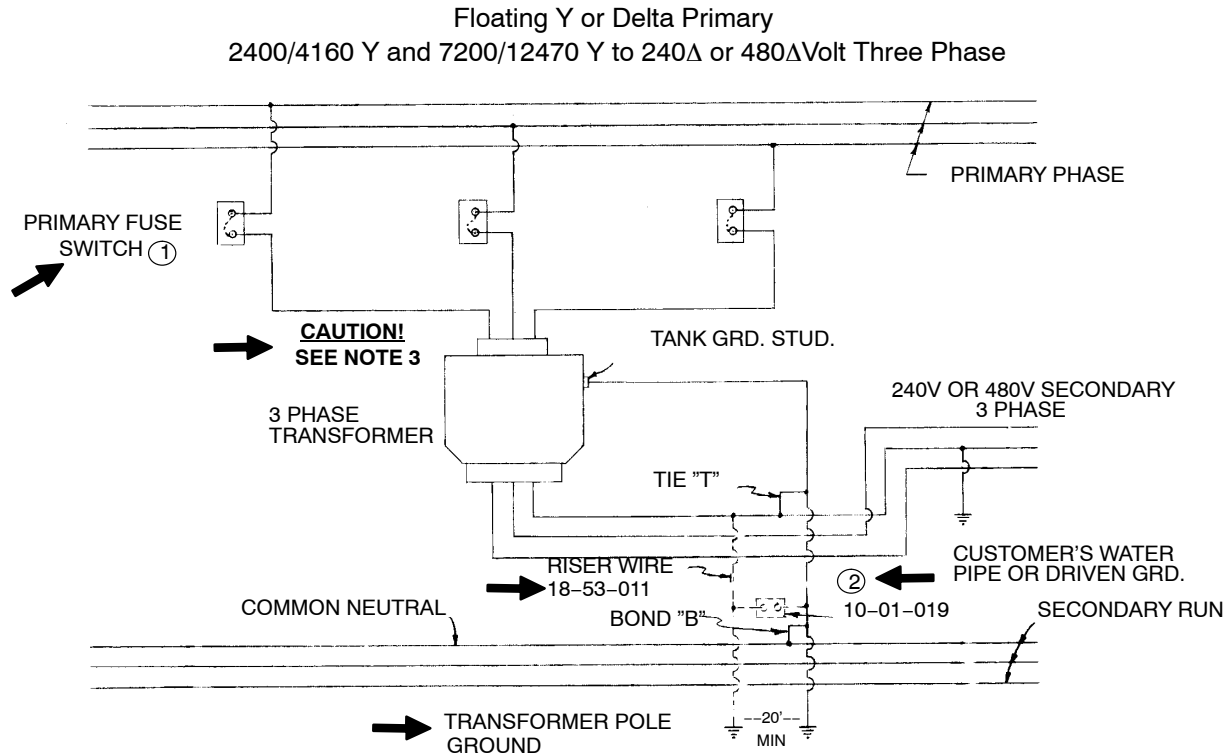
TRANSFORMERS

Connection Diagram

Three Phase

13 00 07 02

Sheet 1 of 1



NOTES:

1. If installing CSP transformer, install fused switches as shown unless pole space does not allow and number of customers affected by transformer failure is deemed acceptable.
2. If a common neutral is not present omit bond "B" and tie "T" and install a second ground rod a minimum distance of 20 feet from the ground at the pole. Connect the lightning arrester/transformer tank ground and secondary ground together through an isolation arrester (stock # 10-01-019). The ground lead to the secondary ground rod shall be insulated for 600V (use stock # 18-53-011). Both ground leads must be covered with plastic moulding for a distance of 8 feet from the ground. The resistance of both grounds should not exceed 25 ohms.
3. For 4.16kV Y transformers use 6kV arrester stock # 10-01-184. For 12.47kV Y transformers use 15kV arrester stock # 10-01-188.

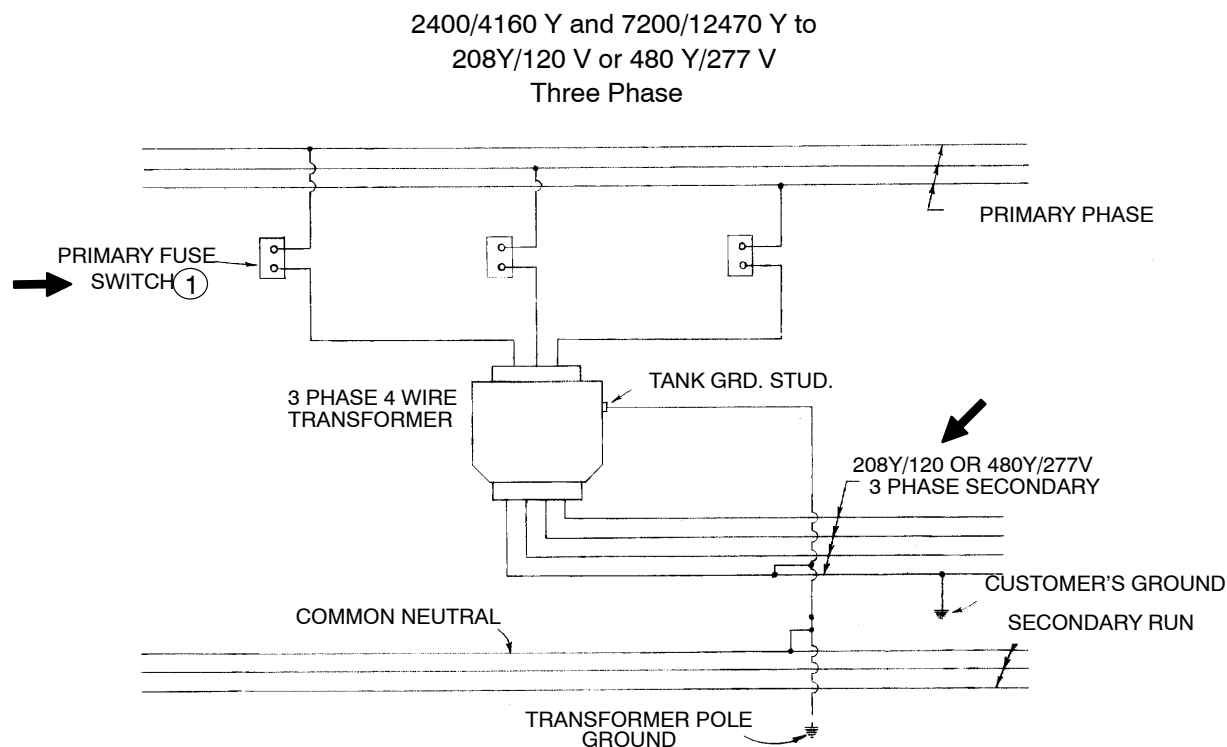
TRANSFORMERS

Connection Diagram

Three Phase

13 00 07 03

Sheet 1 of 1



NOTES:

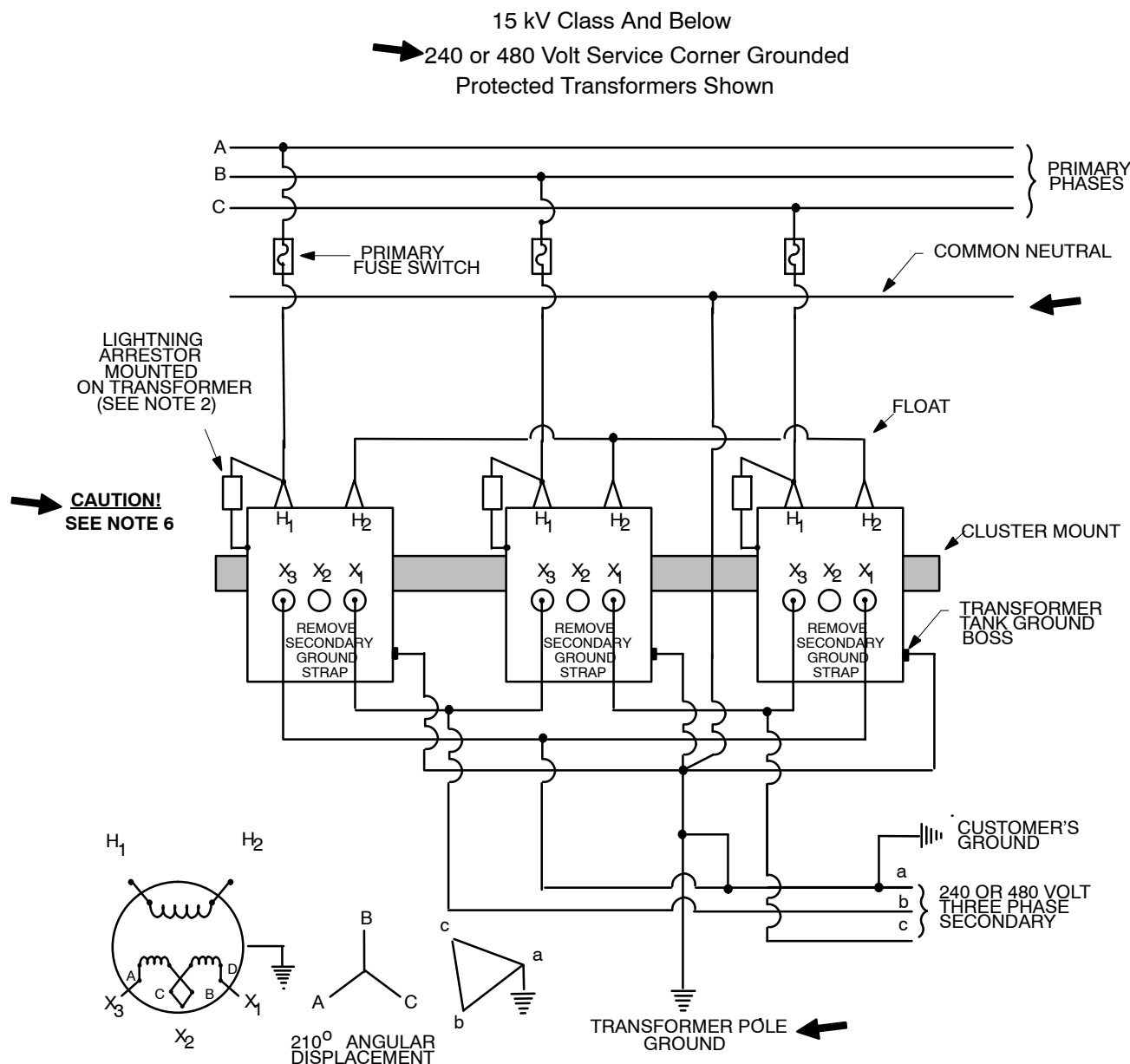
1. If installing CSP transformer, install fused switches as shown unless pole space does not allow and number of customers affected by transformer failure is deemed acceptable.

TRANSFORMERS

Single Phase Transformer Cluster Mount Connection Diagram 3 ϕ Floating-Wye Primary w/Grd. Delta Secondary

13 00 07 04

Sheet 1 of 1



NOTES:

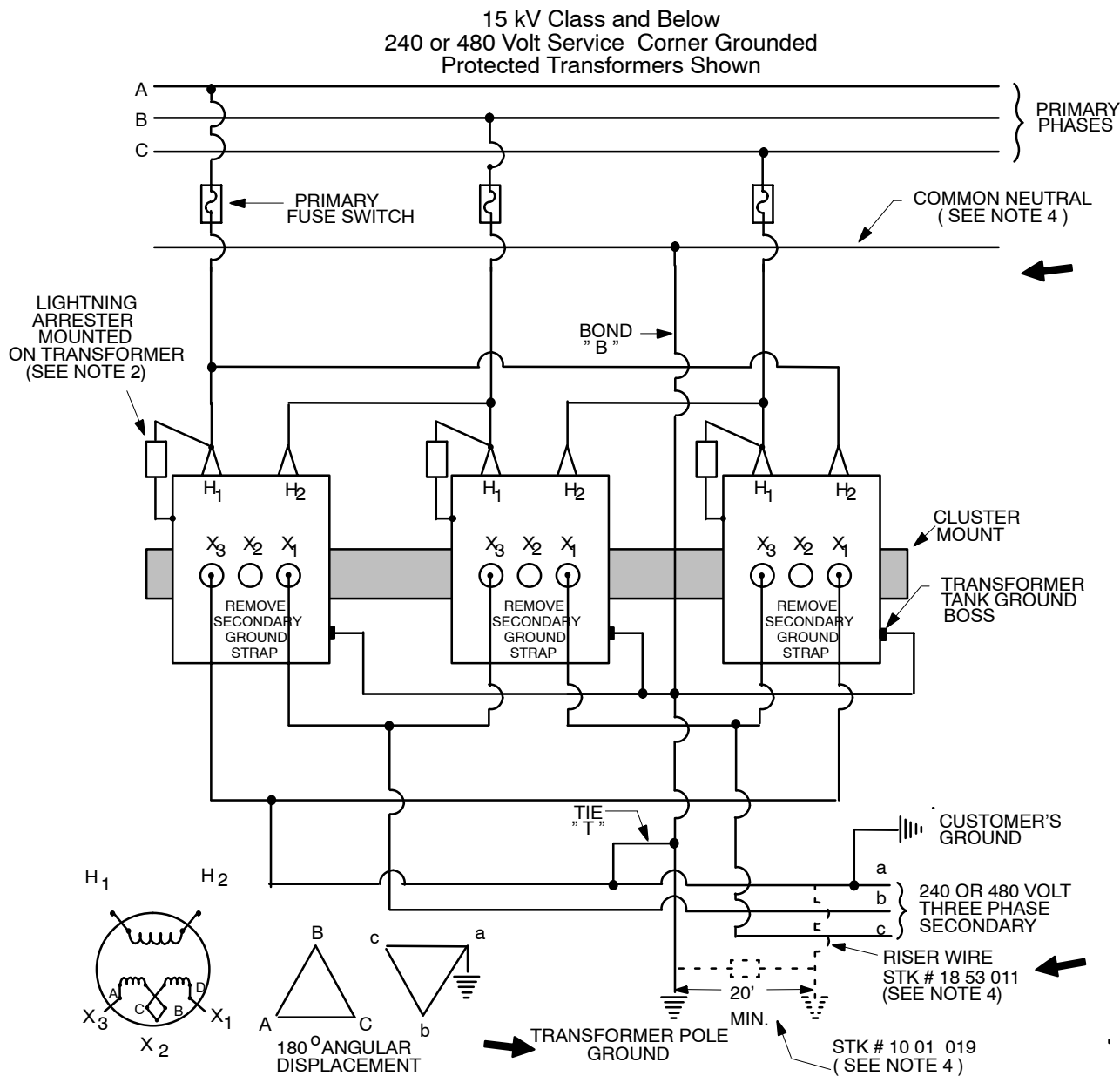
1. 2400/4160 Y transformers may have sidewall mounted HV bushings.
2. Primary phase connections may be on either H₁ or H₂ bushings, with the lightning arresters connected to the same bushings. The floating neutral is then connected to the other "H" bushings.
3. Transformers with three secondary bushings shown. Some transformers may have four secondary bushings.
4. Transformer impedances do not need to match.
5. Transformers shown are additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of x₁ and x₃ bushings are reversed.
6. For 7.2, 7.62, and 7.97 kV transformers use 15 kV arrester stock # 10-01-188. For 2.4 kV transformers use 6 kV arrester stock # 10-01-184.

TRANSFORMERS

13 00 07 05

Single Phase Transformer Cluster Mount Connection Diagram 3Ø 2.4/7.2/14.4kV Delta Prim.Sys.w/Grounded Delta Secondary

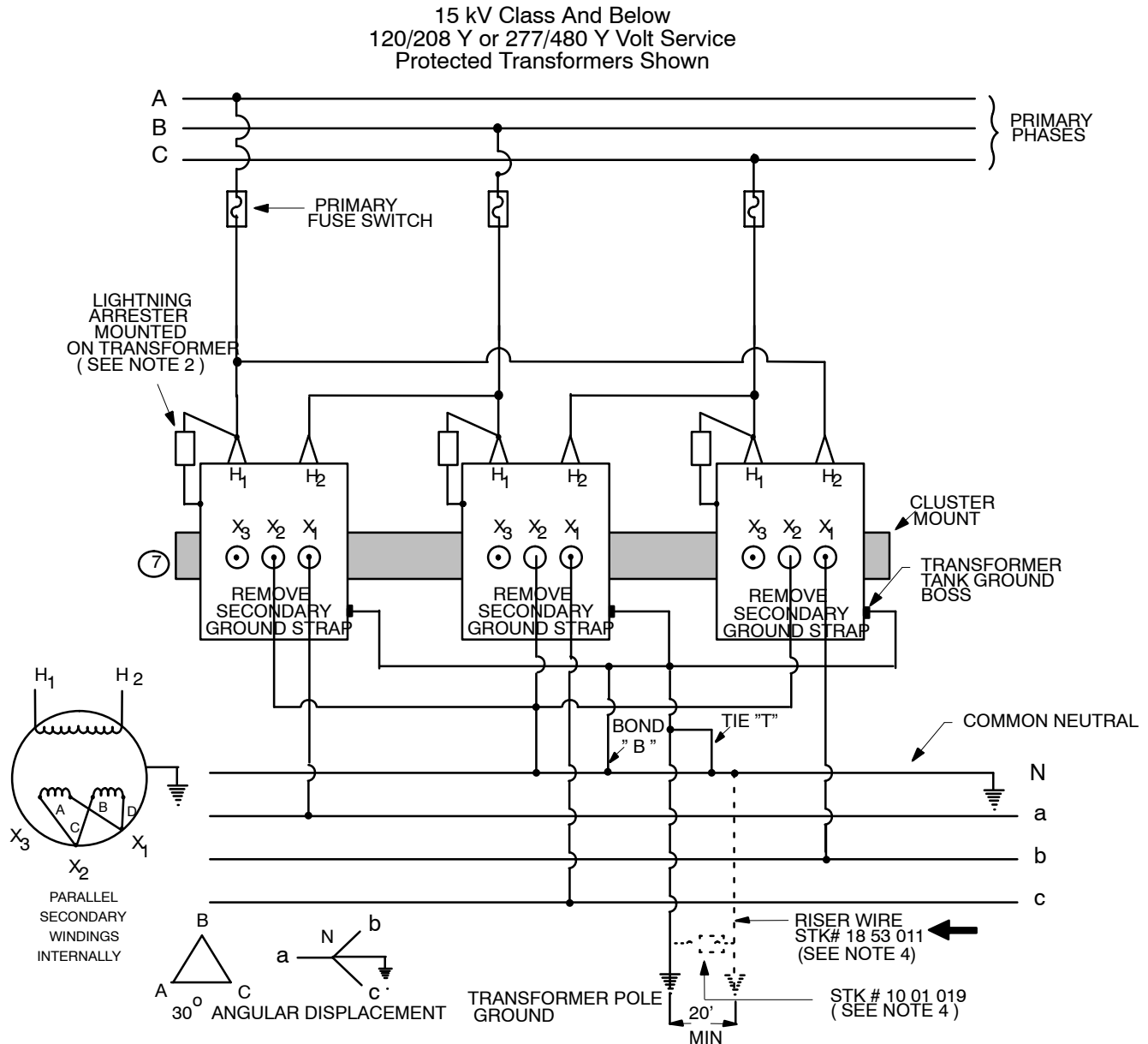
Sheet 1 of 1



NOTES:

- 2400 / 4160 Transformers may have sidewall mounted HV bushings.
- Lightning arrester may be on either H₁ or H₂ bushing.
- Transformers with three secondary bushings shown. Some transformers may have four secondary bushings.
- If a common neutral is not present omit bond "B" and tie "T" and install a second ground rod a minimum distance of 20 feet from the ground rod at the pole. Connect the lightning arrester/transformer tank ground and secondary ground together through an isolation arrester (Stock # 10-01-019). The ground lead to the secondary ground rod shall be insulated for 600V (use Stock # 18-53-011). Both ground leads must be covered with plastic moulding for a distance of 8 ft. from the ground. The resistance of both grounds should not exceed 25 ohms. These requirements are to meet NESC 097.D.1.
- Transformers shown are additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers positions of x₁ and x₃ bushings are reversed.
- Transformer impedances must be closely matched (+/-10%).

Single Phase Transformer Cluster Mount Connection Diagram 3 \emptyset 2.4kV/7.2kV/14.4kV Delta Prim. Systems With Grd.Wye Sec.



NOTES:

1. 2400/4160 Y transformers may have sidewall mounted HV bushings.
2. Lightning arrester may be on either H₁ or H₂ bushing.
3. Transformers with three secondary bushings shown. Some (120/240V) transformers may have four secondary bushings. Units with three secondary bushings must be reconnected internally to parallel the secondary windings. Units with four secondary bushings can have the secondaries paralleled externally. If 277V transformers are used, they have only two secondary bushings.
4. If a common neutral is not present omit bond "B" and tie "T" and install a second ground rod a minimum distance of 20 feet from the ground rod at the pole. Connect the lightning arrester/transformer tank ground and secondary ground together through an isolation arrester (Stock #10-01-019). The ground lead to the secondary ground rod shall be insulated for 600V (use Stock #18-53-011). Both ground leads must be covered with plastic moulding for a distance of 8 ft. from the ground. The resistance of both grounds should not exceed 25 ohms. These requirements are to meet NESC 097.D.1.
5. Transformers shown are additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers position of x₁ and x₃ bushings are reversed.

TRANSFORMERS

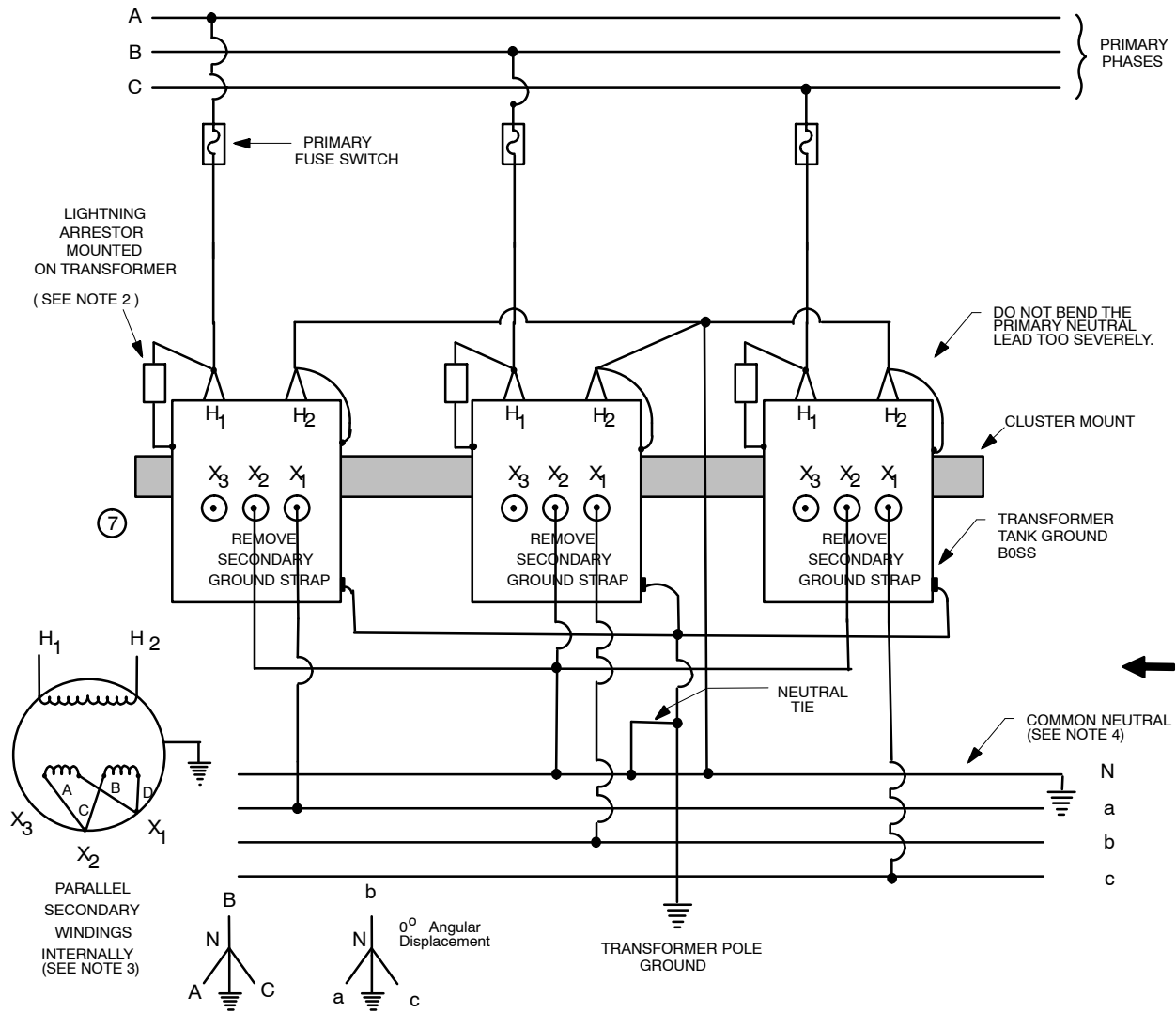
13 00 07 08

Single Phase Transformer Cluster Mount Connection Diagram
3 Ø 2.4kV/7.2kV/14.4kV Delta Prim. Systems With Grd.Wye Sec.

Sheet 2 of 2

6. Transformer impedances do not need to match.
7. Use tag, Stock Number 16-01-301 to identify transformers that have been wired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally.

15 kV Class And Below
120/208Y or 277/480Y Volt Service
Protected Transformers Shown



NOTES:

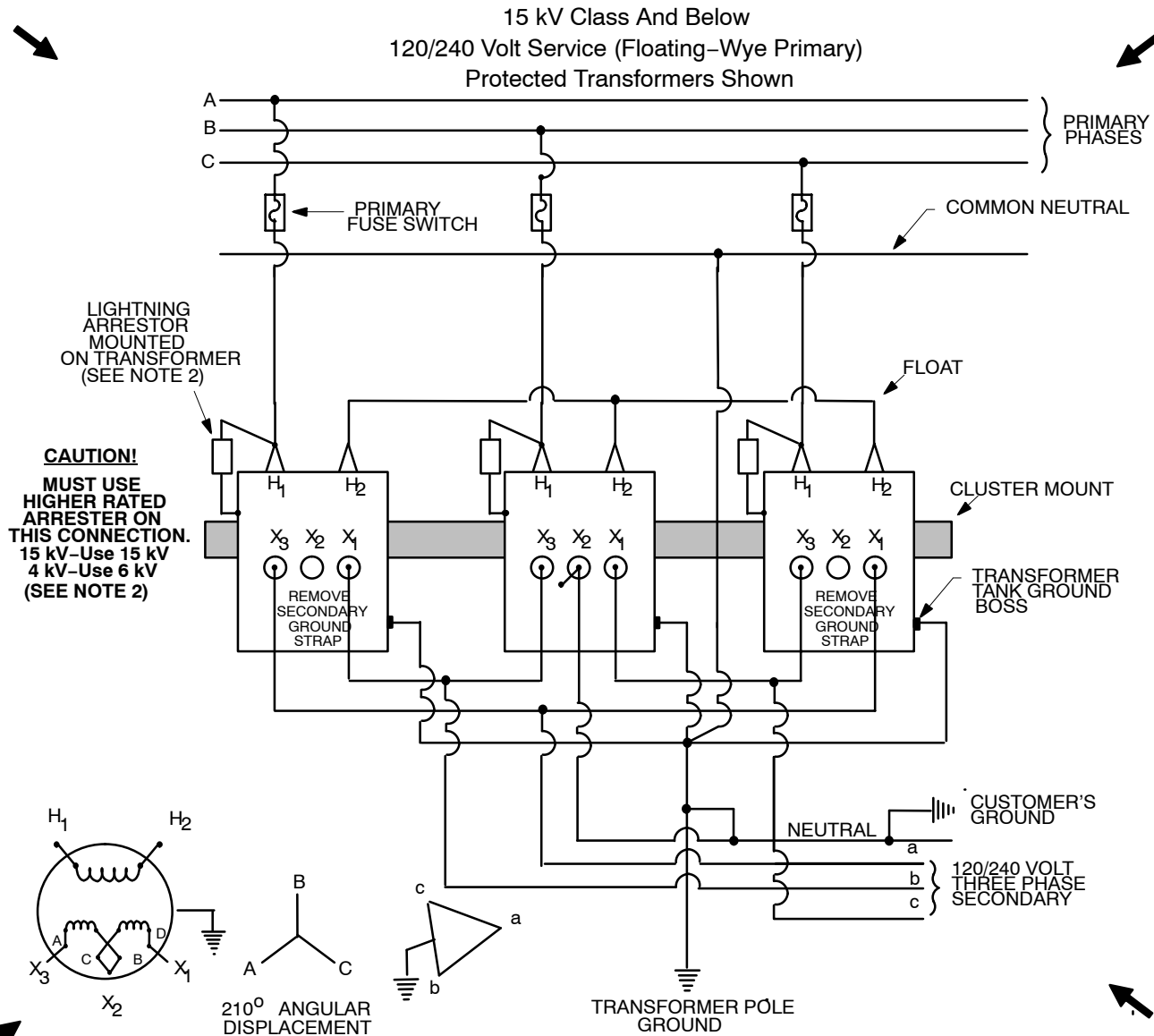
1. 2400/4160 Y transformers may have sidewall mounted HV bushings.
2. Primary phase connections may be on either H₁ or H₂ bushings, with the lightning arresters connected to the same bushings. The grounded neutral is then connected to the other "H" bushings.
3. Transformers with three secondary bushings shown. Some transformers may have four secondary bushings. Units with three secondary bushings must be reconnected internally to parallel the secondary windings. Units with four secondary bushings can have the secondaries paralleled externally. If 277V transformers are used, they have only two secondary bushings.
4. The transformer primary neutral bus must be solidly connected to the system neutral.
5. Transformers shown are additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers position of x₁ and x₃ bushings are reversed.
6. Transformer impedances do not need to match.
7. Use tag, Stock Number 16-01-301 to identify transformers that have been wired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally.

TRANSFORMERS

13 00 07 10

Single Phase Transformer Cluster Mount Connection Diagram 3 ϕ Floating-Wye Primary w/4-Wire Delta Secondary

Sheet 1 of 1



NOTES:

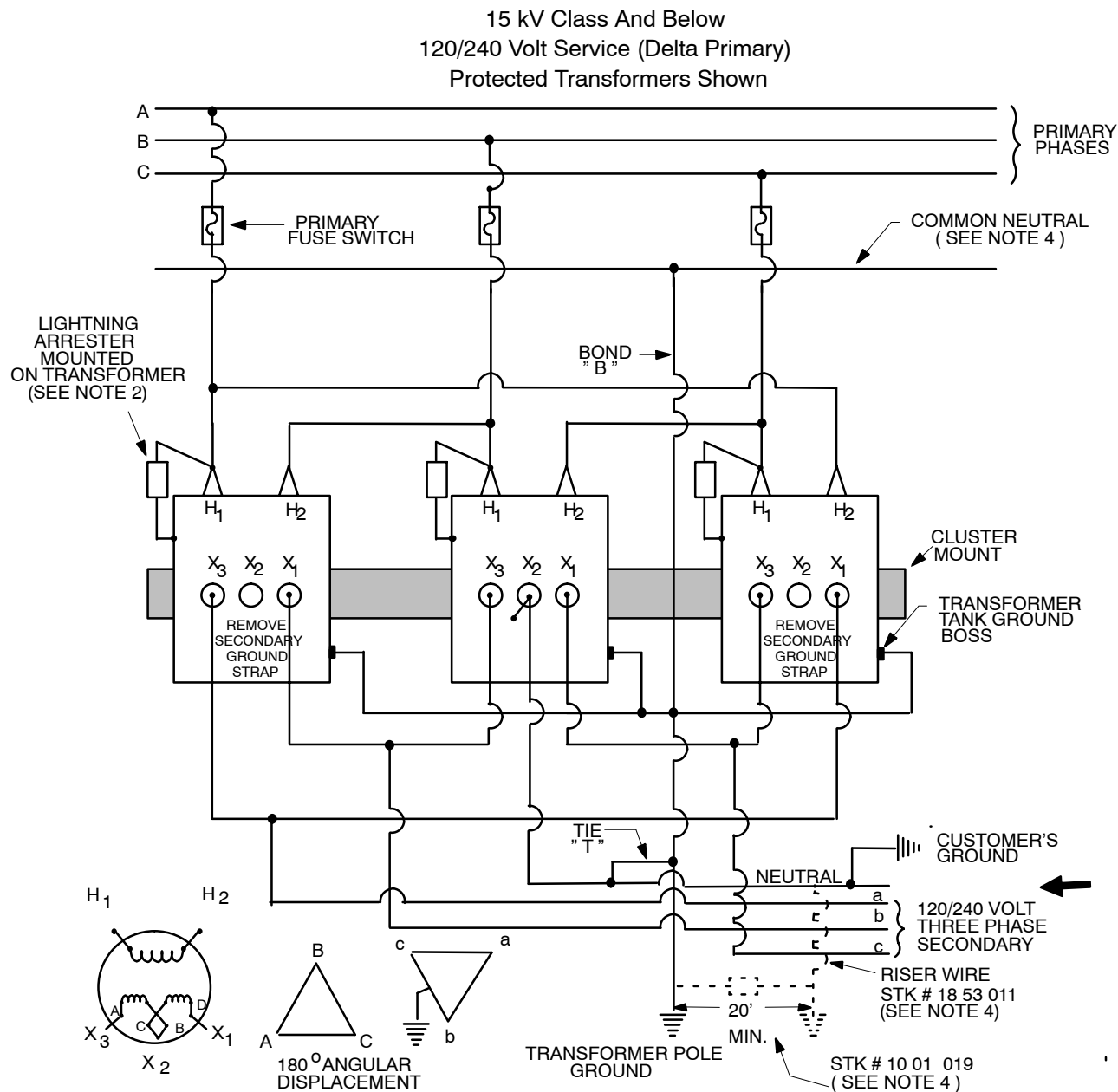
- 2400/4160 Y transformers may have sidewall mounted HV bushings.
- a. For 7.2, 7.62, and 7.97 kV transformers use 15 kV arrester stock number 10-01-188. For 2.4 kV transformers use 6 kV arrester stock number 10-01-184.
b. Primary phase connections may be on either H₁ or H₂ bushings with the lightning arresters connected to the same bushings. The floating neutral is then connected to the other "H" bushings.
- Transformers with three secondary bushings shown. Some transformers may have four secondary bushings.
- Transformer impedances do not need to match.
- Transformers shown are additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of x₁ and x₃ bushings are reversed.
- The transformer with the mid-tap carries 2/3 of the single-phase load and 1/3 of the three-phase load. The other two transformers each carry 1/3 of the three-phase load and 1/6 of the single-phase load.
- Phase rotation can be changed by reversing the secondary leads on the mid-tapped transformer (preferably on the secondary).

TRANSFORMERS

Single Phase Transformer Cluster Mount Connection Diagram 3 ϕ Delta Primary w/4-Wire Delta Secondary

13 00 07 11

Sheet 1 of 2



NOTES:

1. 2400/4160 transformers may have sidewall mounted HV bushings.
2. Lightning arrester may be on either H₁ or H₂ bushing.
3. Transformers with three secondary bushings shown. Some transformers may have four secondary bushings.
4. If a common neutral is not present omit bond "B" and tie "T" and install a second ground rod a minimum distance of 20 feet from the ground rod at the pole. Connect the lightning arrester/transformer tank ground and secondary ground together through an isolation arrester (stock # 10-01-019). The ground lead to the secondary ground rod shall be insulated for 600V (use stock # 18-53-011). Both ground leads must be covered with plastic moulding for a distance of 8 ft. from the ground. The resistance of both grounds should not exceed 25 ohms. These requirements are to meet NESC 097.D.1.
5. Transformers shown are additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of x₁ and x₃ bushings are reversed.

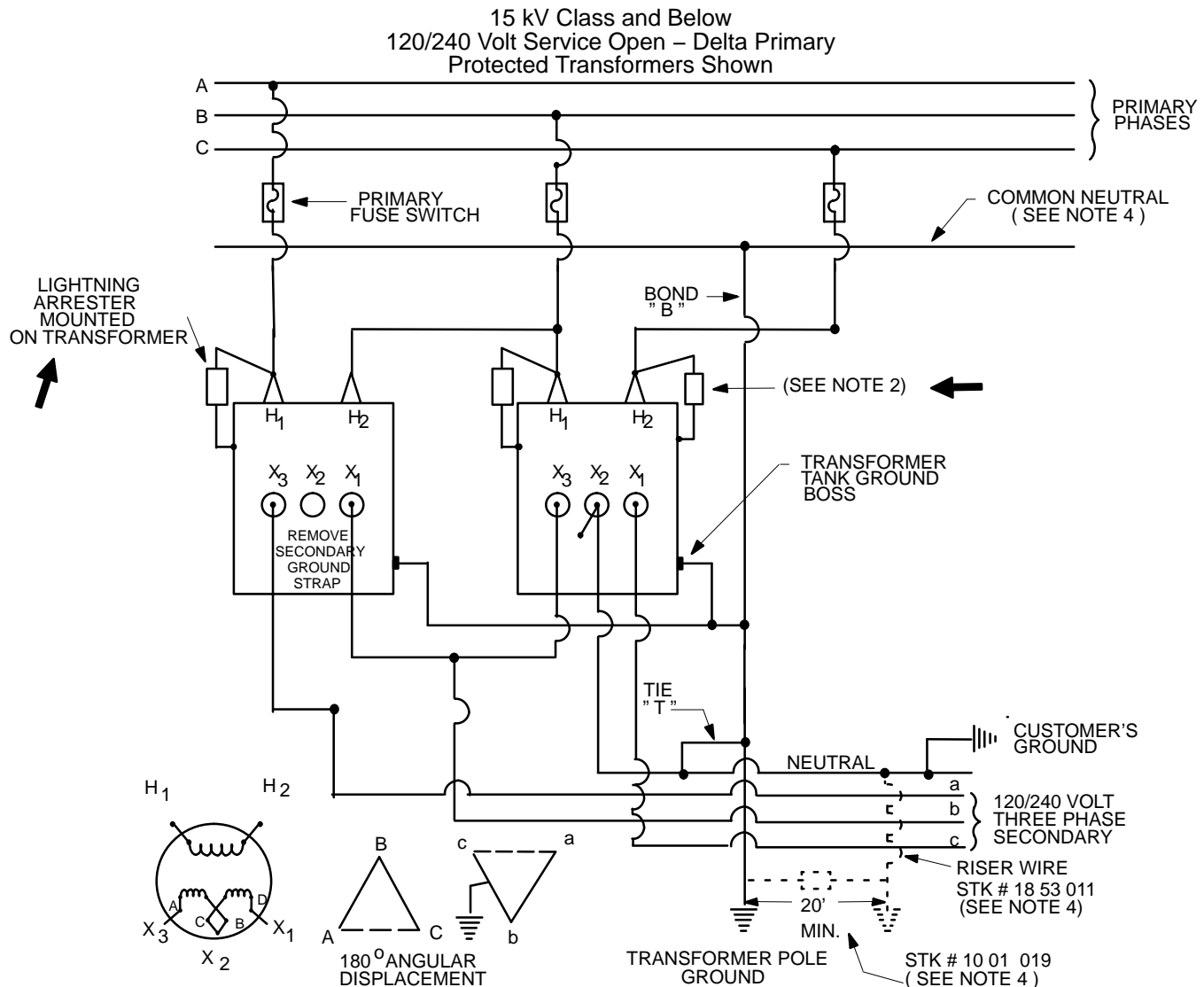
TRANSFORMERS
Single Phase Transformer Cluster Mount Connection Diagram
3 \emptyset Delta Primary w/4-Wire Delta Secondary

13 00 07 11

Sheet 2 of 2

6. Transformer impedances must be closely matched (+/-10%).
7. The transformer with the midtap carries 2/3 of the single-phase load and 1/3 of the three-phase load. The other two transformers each carry 1/3 of the three-phase load and 1/6 of the single-phase load.
8. Phase rotation can be changed by reversing any pair of primary line leads or by reversing the two secondary leads on the mid-tapped transformer (preferably on the secondary).

Single Phase Transformer Connection Diagram Open – Delta Primary w/ 4–Wire Open–Delta Secondary



NOTES:

- 2400 / 4160 Transformers may have sidewall mounted HV bushings.
- Add arrester to H2 of this transformer if transformer does not already have arresters on both bushings.
- Transformers with three secondary bushings shown. Some transformers may have four secondary bushings.
- If a common neutral is not present omit bond "B" and tie "T" and install a second ground rod a minimum distance of 20 feet from the ground rod at the pole. Connect the lightning arrester/transformer tank ground and secondary ground together through an isolation arrester (stock # 10-01-019). The ground lead to the secondary ground rod shall be insulated for 600V (use stock # 18-53-011). Both ground leads must be covered with plastic moulding for a distance of 8ft from the ground. The resistance of both grounds should not exceed 25 ohms. These requirements are to meet NESC 097.D.1.
- Transformers shown are additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers positions of x₁ and x₃ bushings are reversed.
- Transformer impedances do not need to match.
- A 3–wire delta secondary can be provided by removing the lead and ground strap from X₂ on the mid–tapped transformer and bonding the "A" phase at the pole and customer service grounds.

TRANSFORMERS
Single Phase Transformer Connection Diagram
Open – Delta Primary w/ 4–Wire Open–Delta Secondary

13 00 07 12

Sheet 2 of 2

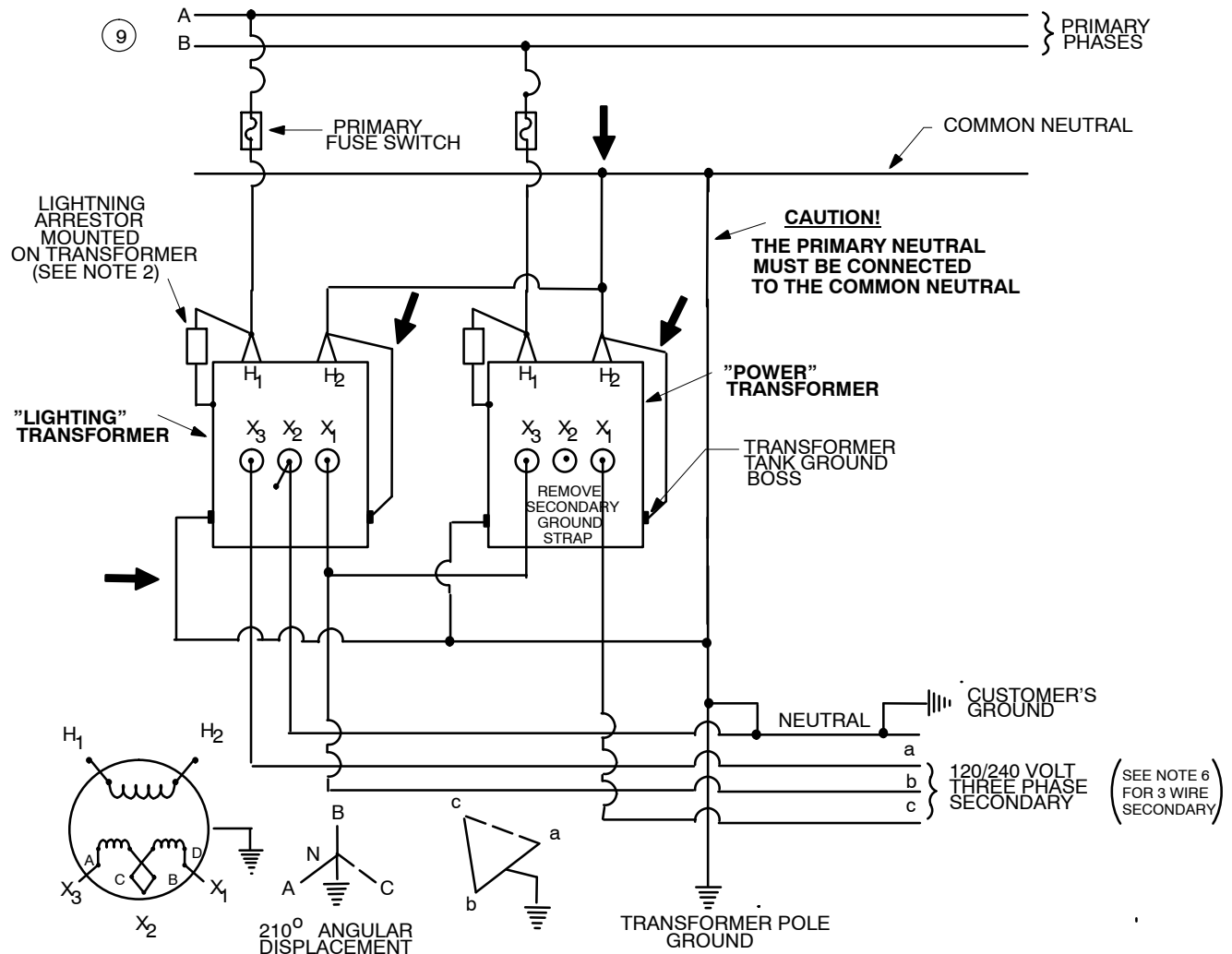
8. The mid–tapped transformer supplies all of the single–phase load and 1/2 of the three–phase load. The total three–phase load should not exceed 1.73 times the kVA of the smallest transformer.
9. Phase rotation can be changed by reversing any pair of primary line leads or by reversing the two secondary leads on the mid–tapped transformer (preferably on the secondary).

TRANSFORMERS
Single Phase Transformer Connection Diagram
Open – Wye Primary w/ 4–Wire Open–Delta Secondary

13 00 07 13

Sheet 1 of 2

15 kV Class And Below
120/240 Volt Service Open – Wye Primary
Protected Transformers Shown



NOTES:

1. 2400/4160 transformers may have sidewall mounted HV bushings.
2. Primary phase connections may be on either H₁ or H₂ bushings, with the lightning arresters connected to the same bushings. The neutral is then connected to the other "H" bushings.
3. Transformers with three secondary bushings shown. Some transformers may have four secondary bushings.
4. Transformer impedances do not need to match.
5. Transformers shown are additive polarity. Transformers 200 kVA and smaller with H.V. winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of x₁ and x₃ bushings are reversed.
6. A 3–wire delta secondary can be provided by removing the lead and ground strap from x₂ on the mid–tapped transformer and bonding the "a" phase at the pole and customer service grounds.
7. The mid–tapped transformer supplies all of the single–phase load and 1/2 of the three–phase load. The total three–phase load should not exceed 1.73 times the kVA of the smallest transformer.
8. Phase rotation can be changed by reversing the two secondary leads on the mid–tapped transformer (preferably on the secondary).

TRANSFORMERS
Single Phase Transformer Connection Diagram
Open – Wye Primary w/ 4–Wire Open–Delta Secondary

13 00 07 13

Sheet 2 of 2

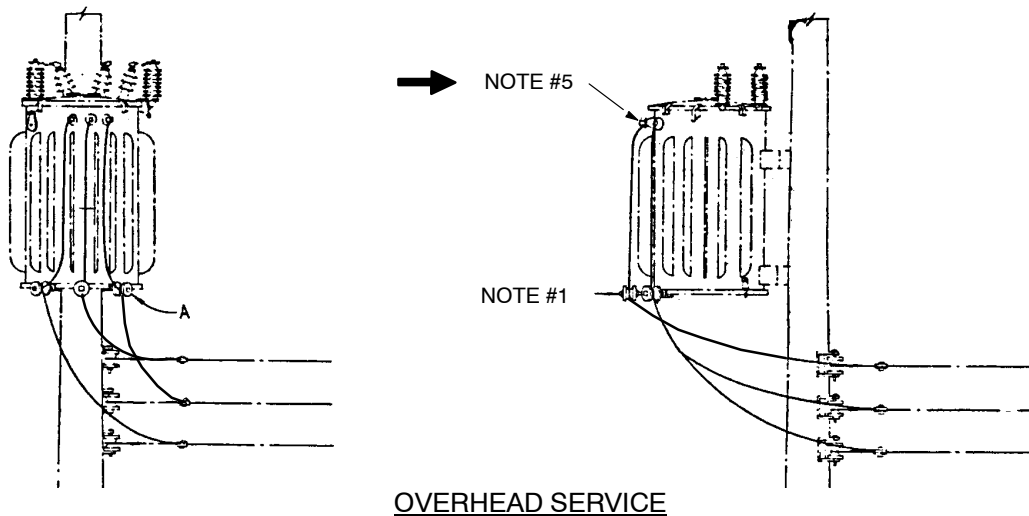
9. Primary connection shown is for AmerenIL (ABC rotation). Primary connection for AmerenMO (CBA rotation) should be reversed. Connecting the leading primary phase to the “Lighting” transformer gives better utilization of transformer capacity, less voltage dip, and less voltage unbalance.

TRANSFORMERS

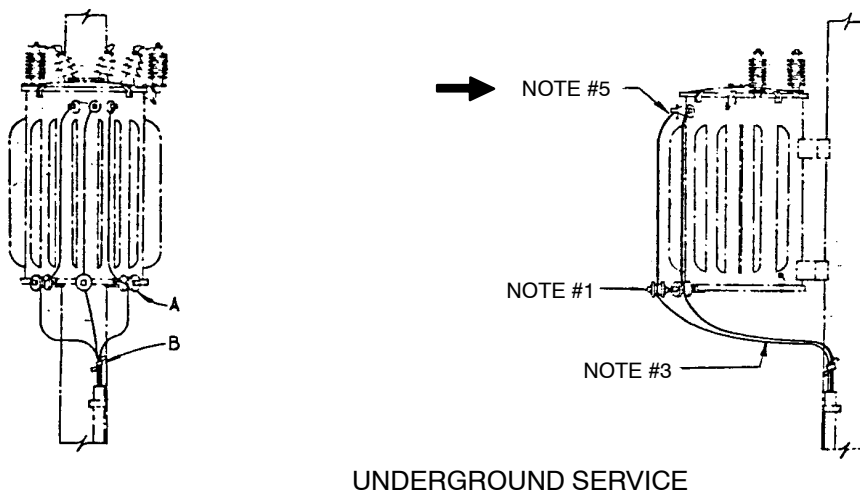
Secondary and Services Training and Supports For Single or Three Phase

13 01 01 **

Sheet 1 of 2



	Std. / Stk. No.	Description	13 01 01 **	01
A	69 08 249	Bracket – Transformer Secondary Lead		3

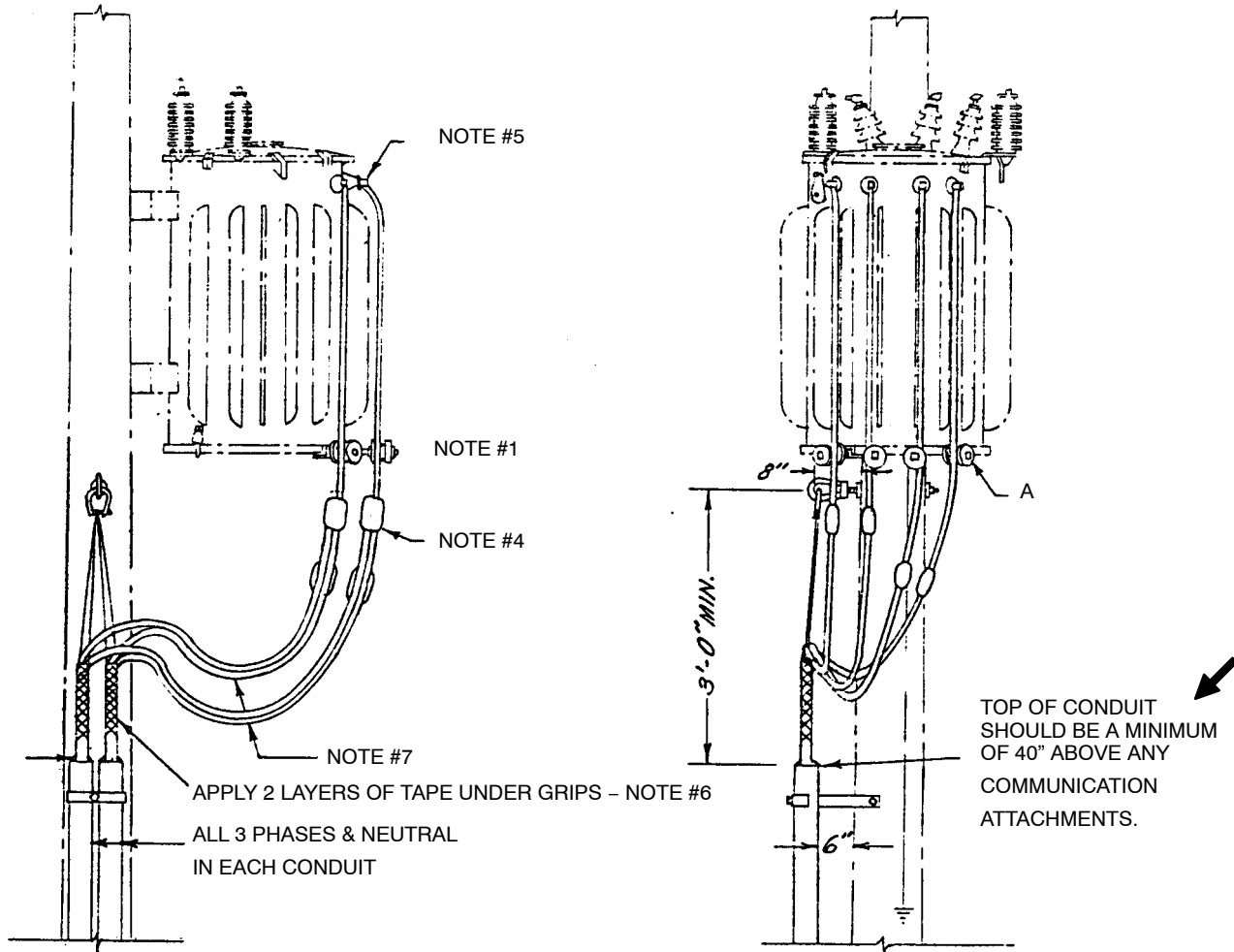


	Std. / Stk. No.	Description	13 01 01 **	02
A	69 08 249	Bracket – Transformer Secondary Lead		3
B	49 17 181	Strap – Poly.		1

TRANSFORMERS
Secondary and Services Training and Supports For
Single or Three Phase

13 01 01 **

Sheet 2 of 2

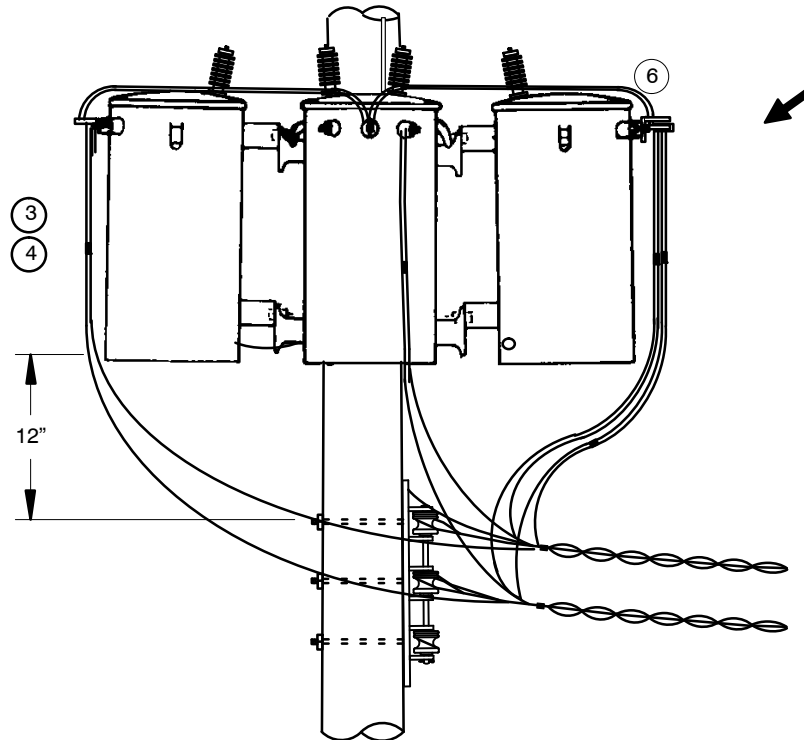


TWO UNDERGROUND CABLES

	Std. / Stk. No.	Description	13 01 01 **	03
A	69 08 249	Bracket - Transformer Secondary Lead		4

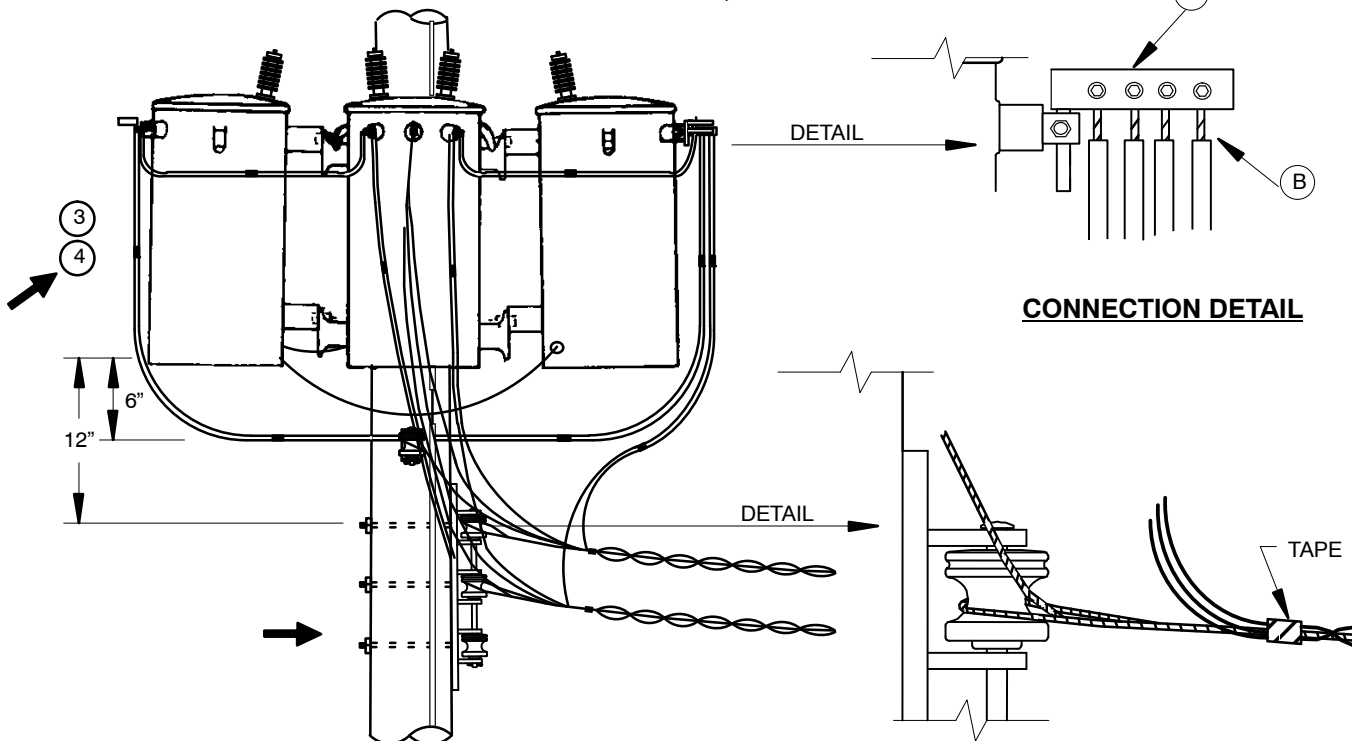
NOTES:

1. This standard shows the training of secondary leads, using a bracket, Stock No. 69-08-249, which attaches to the bottom of the transformer. The bracket may be used with either 1Ø or 3Ø secondary and with all primary distribution voltages.
2. For additional clearance from the transformer use 1/2" x 8" machine bolts, Stock No. 23-52-041. Use 5/8" nuts, Stock No. 23-65-011 as spacers.
3. If an underground service must be located on a transformer pole with overhead secondary, attach the underground service to the secondary, per Dist. Std. 14 02 01 ** NOT TO THE TRANSFORMER.
4. Cover with sealing compound (Stock No. 31-53-055) and tape so that water cannot enter strands.
5. Do not put aluminum conductors in transformer bushing connectors. Use copper secondary leads as per Dist. Std. 13 00 03 01, or pin terminal lug connectors with copper studs as per Dist. Std. 13 01 04 **. For transformers with secondary spade connections (1Ø > 100kVA and 3Ø > 300kVA) cable-to-flat lug connectors can be used (stock codes 17-55-289 or 17-55-344).
6. See Dist. Std. 14 02 02 for cable grips, conduits, and stand off bracket.
7. Pair cables, tape together and form drip loop.



Wye Secondary

13 01 04 03 - 1/0 thru 750 kCMIL
13 01 04 04 - 4/0 thru 500 kCMIL



Delta Secondary ⑦

➔ 13 01 04 01 - 1/0 thru 750 kCMIL
13 01 04 02 - 4/0 thru 500 kCMIL



		Std. / Stk. No.	Description	130104 **	01	02	03	04
2	A	17 54 245	Lug, 1/0 – 750 kcmil, 4 Position		7		6	
		17 54 214	Lug, 4/0 – 500 kcmil, 4 Position			7		6
	B	30 52 360	Compound, Sealing		1	1	1	1
			Multiple Service Lug Operation Code 399		7	7	6	6

NOTES:

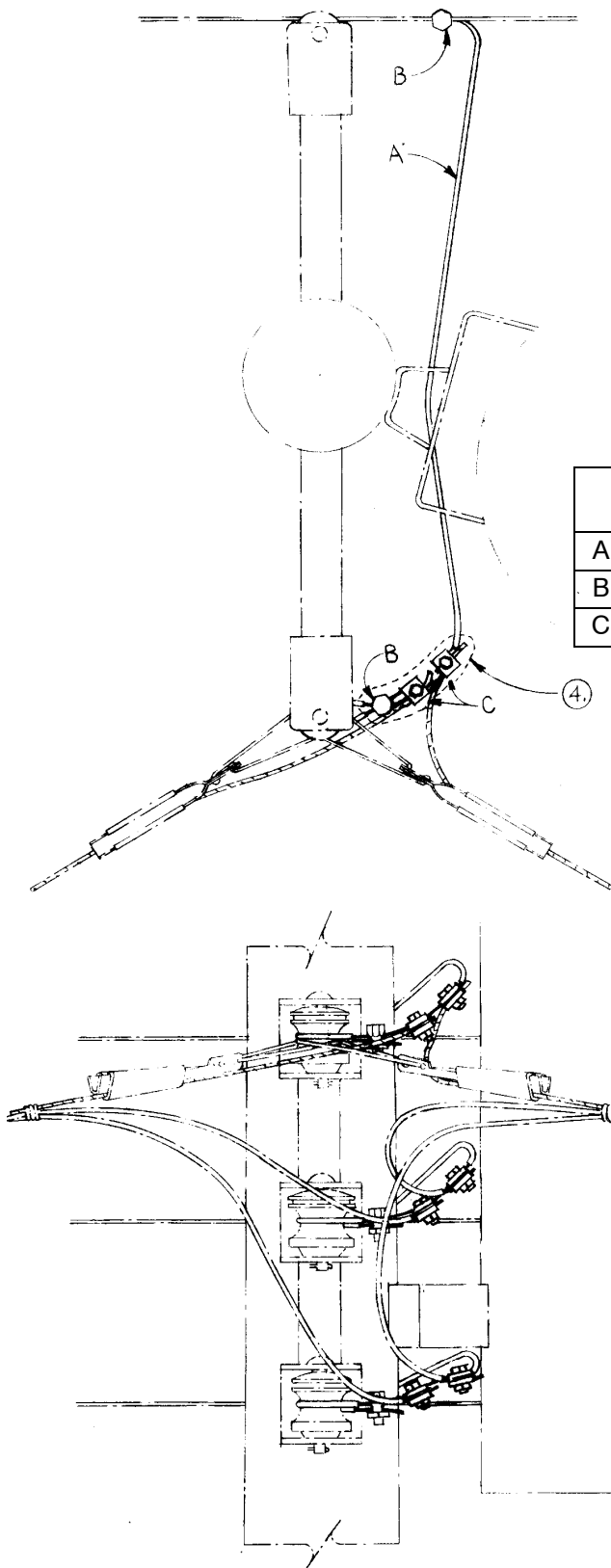
1. Clean cable surfaces and apply a liberal coating of corrosion inhibitor compound (stock # 31 59 058).
2. Use stock # 30 52 360 to weather seal lugs.
3. For buss sizing between the transformer secondary bushings see DCS 13 00 03 01.
4. For wye connected secondary see connection diagram on DCS 13 00 07 08 or 13 00 07 09. For delta connected secondary see connection diagram on DCS 13 00 07 04, 13 00 07 05, 13 00 07 10 or 13 00 07 11.
5. The messengers of the quadruplex cables shall be grounded at the pole by connecting to the secondary neutral, if available, or to a ground rod. Exception: For non-standard ungrounded three-wire services the messengers are not grounded.
6. For wye connected secondary, neutral will need to be connected to the X2 bushing of either the left or right transformer.
7. For ungrounded or corner-grounded delta, use DCS 13 01 04 03 or 13 01 04 04.

TRANSFORMERS

Secondary and Services – Secondary Service Bus for Triplex Cable – Single Phase

13 01 07 00

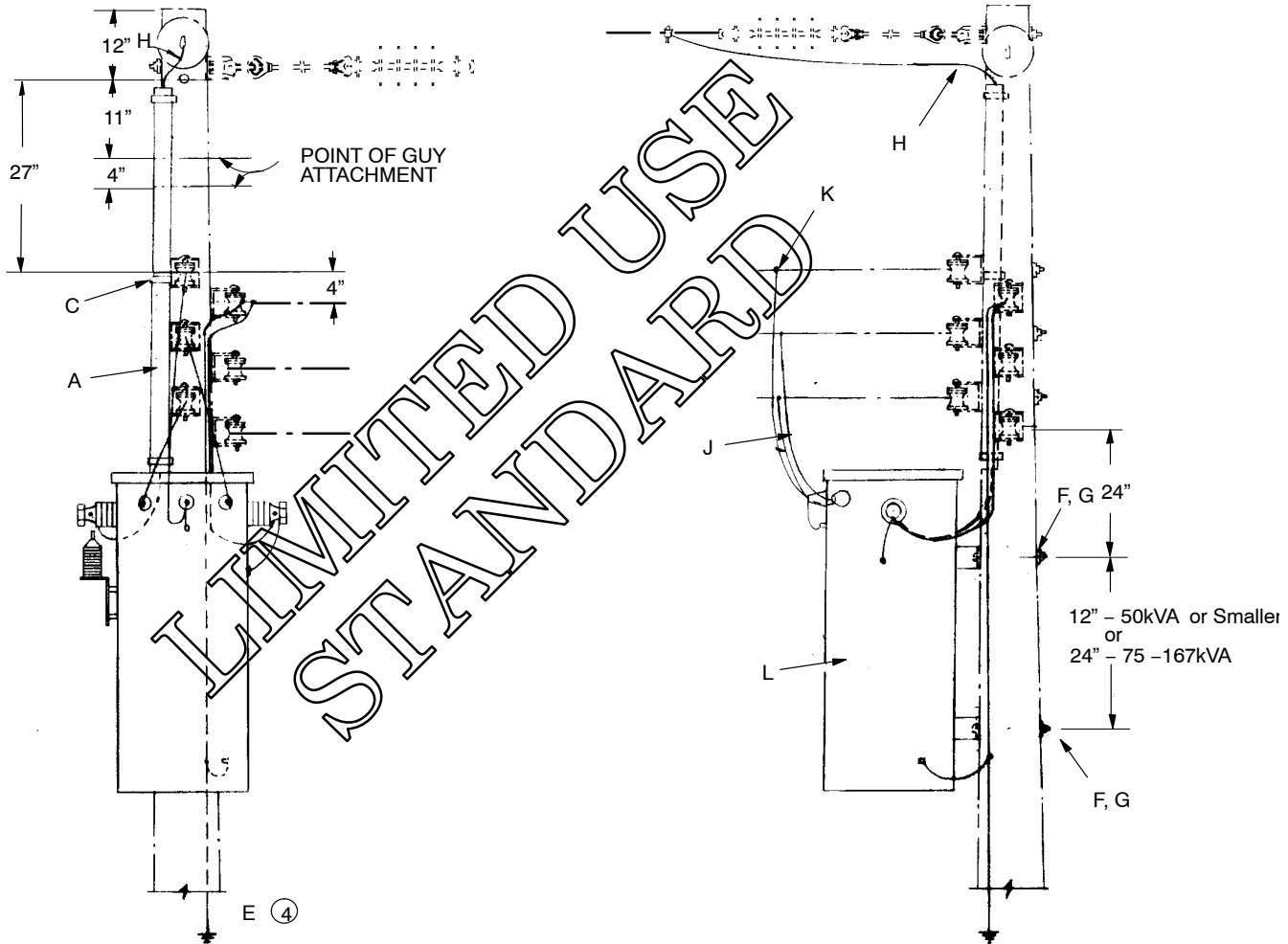
Sheet 1 of 1



1. Service buses shall be installed only where it is evident that two or more services will be required from each side of pole.
2. Normally a service bus should not be added to an existing installation when an additional service is installed.
3. In many cases it may be desirable to install the service bus for the neutral only and connect the covered wires of the triplex cable directly to the secondary.
4. Apply corrosion resisting lubricant and tape connectors in accordance with Dist. Std. 07 00 25 00 and 07 00 27 00.

	Std. / Stk. No.	Description	Req'd
A	18 01 020	Wire – #2 Copper – W.P.	10
B	17 54 005	Connector – #2 Copper	6
C	17 51 032	Clamp – P.G.	6

FOR NEW CONVENTIONAL TRANSFORMER USE DCS 13 12 10 02 or 13 12 14 02



		Std. / Stk. No.	Description	
@4 T T T T T @	A	12 51 197	Conduit, Plastic, 1" (ft.)	6
	C	23 64 033	Staple – 1-1/2" x 3"	3
	E	12 00 10 **	Grounding Unit	1
	F	23 52 063	Bolt, Mach., 5/8" x 10" (50kVA or smaller) OR	2
		23 52 095	Bolt, Mach., 3/4" x 10" (75 – 167kVA)	2
	G	23 66 027	Washer, Square, 5/8" (50kVA or smaller) OR	2
		23 66 031	Washer, Curved, 3/4" (75 – 167kVA)	2
	H		Wire, Ins., 5 kV (Ft.) (See 13 00 03 01)	10
	J		Secondary Leads (Ft.) (See 13 00 03 01)	9
	K	PG*	See 07 00 25 00	3
	L		Transformer	1

TRANSFORMERS

4kV – 120/240 V. – Single Phase 1 to 167 kVA "T" or "L" Corner
CSP Maintenance Construction

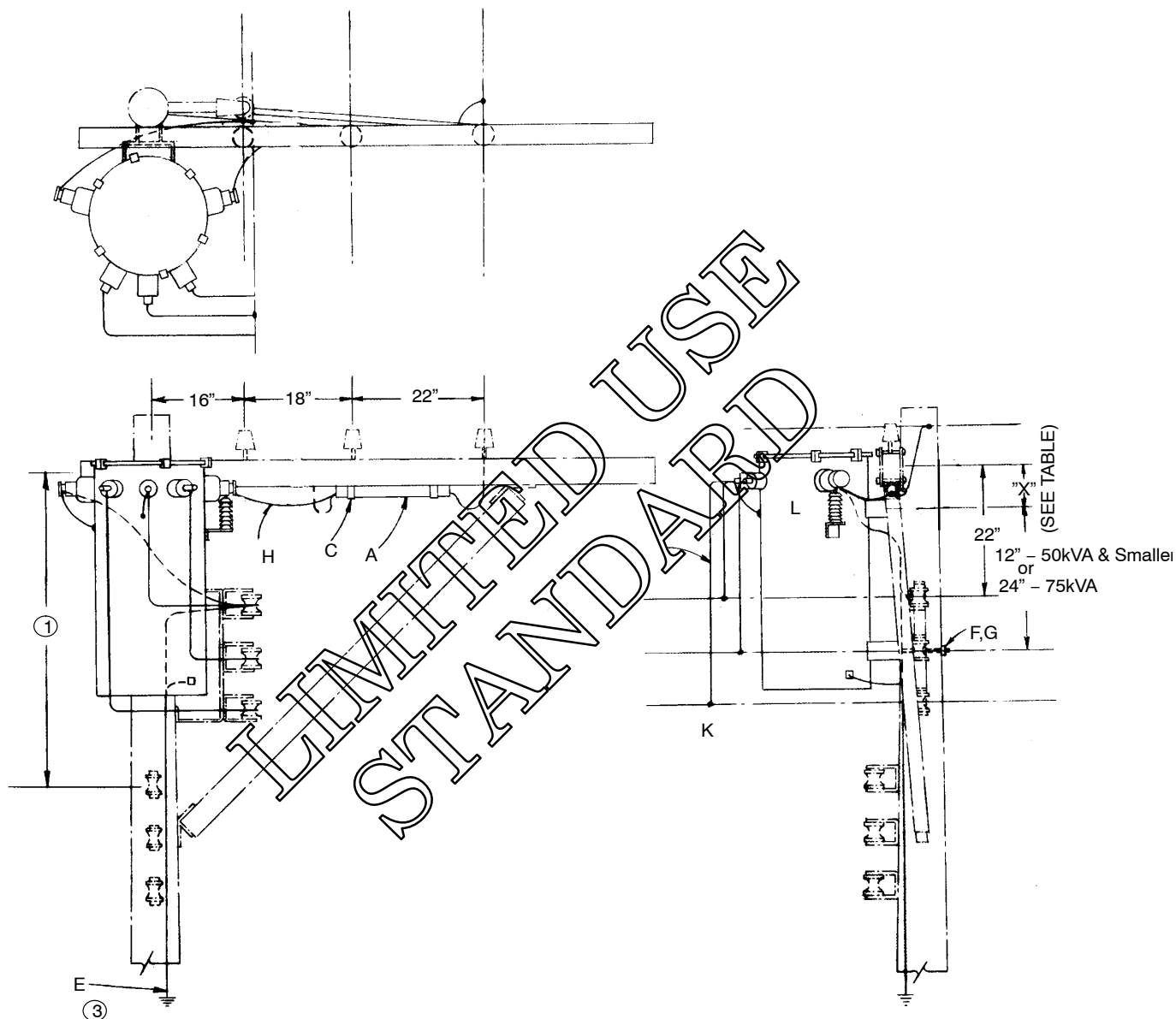
13 04 14 01

Sheet 2 of 2

NOTES:

1. The primary connection shall be made on the H₂ bushing on the side opposite the breaker operation handle.
2. Some 37-1/2 kVA and larger CSP transformers have two secondary breakers.
3. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
4. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.

FOR NEW CONVENTIONAL TRANSFORMER INSTALLATION USE DCS 13 12 21 02



	Dimension "X"
Transformers with 24" Spacing btwn. Mounting Lugs	8"
Transformers with 12" Spacing btwn. Mounting Lugs	12"

		Std. / Stk. No.	Description	
@3 T T T T T @	A	12 51 197	Conduit, Plastic, 1" (ft.)	2
	C	23 64 033	Staple – 1–1/2" x 3"	2
	E	12 00 10 **	Grounding Unit	1
	F	23 52 063	Bolt, Mach., 5/8" x 10" (50kVA & smaller) OR	2
		23 52 095	Bolt, Mach., 3/4" x 10" (75kVA)	2
	G	23 66 027	Washer, Square, 5/8" (50kVA & smaller) OR	2
		23 66 031	Washer, Curved, 3/4" (75kVA)	2
	H		Wire, Ins., 5 kV (Ft.) (See 13 00 03 01)	6
	J		Secondary Leads (Ft.) (See 13 00 03 01)	9
	K	PG*	See 07 00 25 00	3
	L		Transformer	1

NOTES:

1. When secondary is deadended on transformer pole, locate secondary clevises 44" below primary arm for transformers 15kVA and below, and 52" below primary arm for 25 and 37–1/2kVA transformers.
2. For 50 & 75kVA transformers, measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
3. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.

LIMITED USE
STANDARD

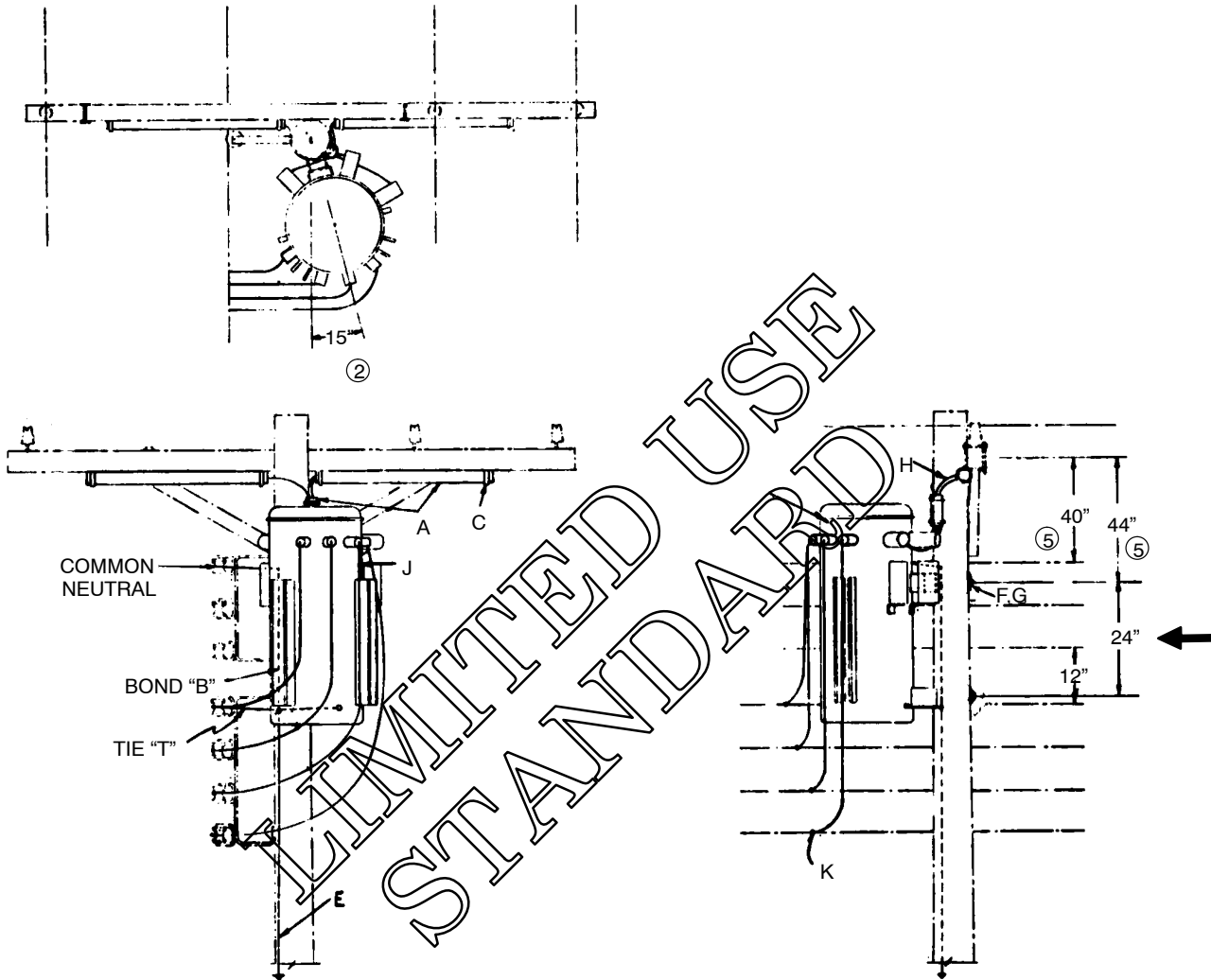
TRANSFORMERS

4kV – Three Phase – 3 or 4 Wire

→ 30-45 kVA – 1000# Maximum

13 04 50 01

Sheet 1 of 2



		Std. / Stk. No.	Description	
7 T T T T T @	A	12 01 280	Conduit, Plastic, 2" (ft.)	10
	C	27 60 035	Iron, Hanger (Ft.)	6
	E	12 00 10 01	Grounding Unit	1
	F	23 52 063	Bolt, Mach., 5/8" x 10" (30 kVA) OR	2
		23 52 095	Bolt, Mach., 3/4" x 10" (45 kVA)	2
	G	23 66 027	Washer, Curved, 5/8" (30 kVA) OR	2
		23 66 031	Washer, Curved, 3/4" (45 kVA)	2
	H		Wire, Ins., 5 kV (Ft.) (See 13 00 03 01)	12
	J		Secondary Leads (Ft.) (See 13 00 03 01)	15
	K	PG*	See 07 00 25 00	4
	L		Transformer	1

**DISTRIBUTION
CONSTRUCTION STANDARDS**



ENG: DG
REV. NO: 4
REV. DATE: 07/07/11

NOTES:

- 1. If common neutral is not present, refer to DCS 13 00 07 02 for installation of grounds.
- 2. 15° may be obtained by taking 1/24th of pole circumference.
- 3. A three phase service (no secondary) may be placed at any point on the pole that permits required clearances.
- 4. Switches are required for C transformers.
- 5. These dimensions are for new construction. On existing construction, spacing may be 26" from primary to through bolt and 22" from primary to secondary.
- 6. When transformer is installed directly under conductor deadends, provide set of switches on line arm.
- 7. Use DCS 12 00 10 02 for ground rod application on existing pole installation.

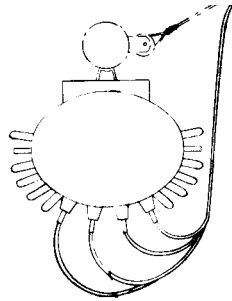
LIMITED USE
STANDARD

TRANSFORMERS

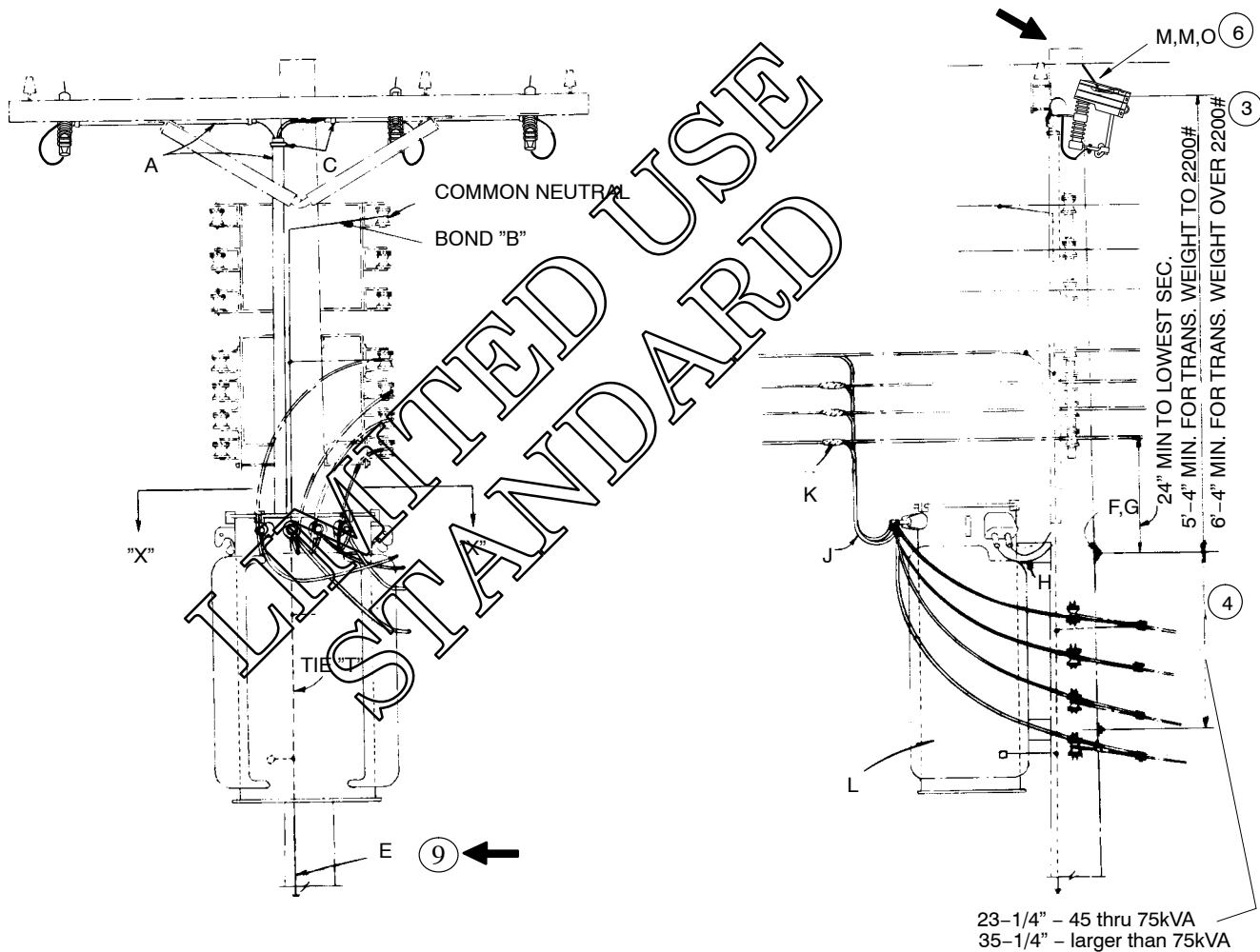
4kV – Three Phase – 3 or 4 Wire
45–500 kVA

13 04 54 01

Sheet 1 of 2



SECTION XX



TRANSFORMERS
4kV – Three Phase – 3 or 4 Wire
45–500 kVA

13 04 54 01

Sheet 2 of 2

		Std. / Stk. No.	Description	
@9 T T T T T @ @6 @6 @6	A	12 01 280	Conduit, Plastic, 2" (ft.)	15
	C	27 60 035	Strip, Hanger (Ft.)	10
	E	12 00 10 **	Grounding Unit	1
	F	23 52 095	Bolt, Mach., 3/4" x 10" (45 thru 300kVA) OR	2
		23 52 268	Bolt, Mach., 1" x 14" (500kVA)	2
	G	23 66 031	Washer, Curved, 3/4" (45 thru 300kVA) OR	2
		23 66 106	Washer, Curved, 1" (500kVA)	2
	H		Wire, Ins., 5 kV (Ft.) (See 13 00 03 01)	30
	J		Secondary Leads (Ft.) (See 13 00 03 01)	24
	K	PG*	See 07 00 25 00	4
	L		Transformer	1
	M	05 15 10 01	Cover, Cutout	3
	N	54 07 208	Switch, Fused, Open Type	3
	O	17 58 054	Bracket, Crossarm, Heavy Duty	3

NOTES:

1. A 3 phase service (no secondary) may be at any point on the pole that permits required clearances.
2. If common neutral is not present, refer to DCS 13 00 07 02 for installation of grounds.
3. For transformers above 3400#, this distance shall be determined by space necessary for hoisting equipment.
4. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
5. A 15" crescent wrench is required for 1" bolts.
6. For C transformers, switches are required.
7. Units weighing in excess of 3400#'s must be mounted using 1" bolts.
8. When transformer is installed directly under conductor deadends, provide set of switches on line arm.
9. Use DCS 12 00 10 02 for ground rod application on existing pole installation. Use DCS 12 00 10 01 for ground coil application on new pole installation.

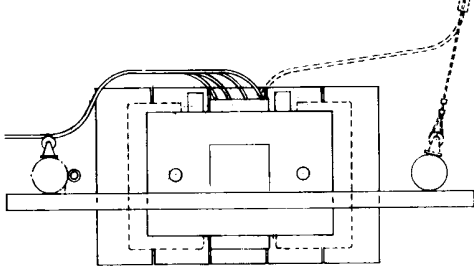
TRANSFORMERS

4kV – Three Phase – 3 or 4 Wire
750 kVA

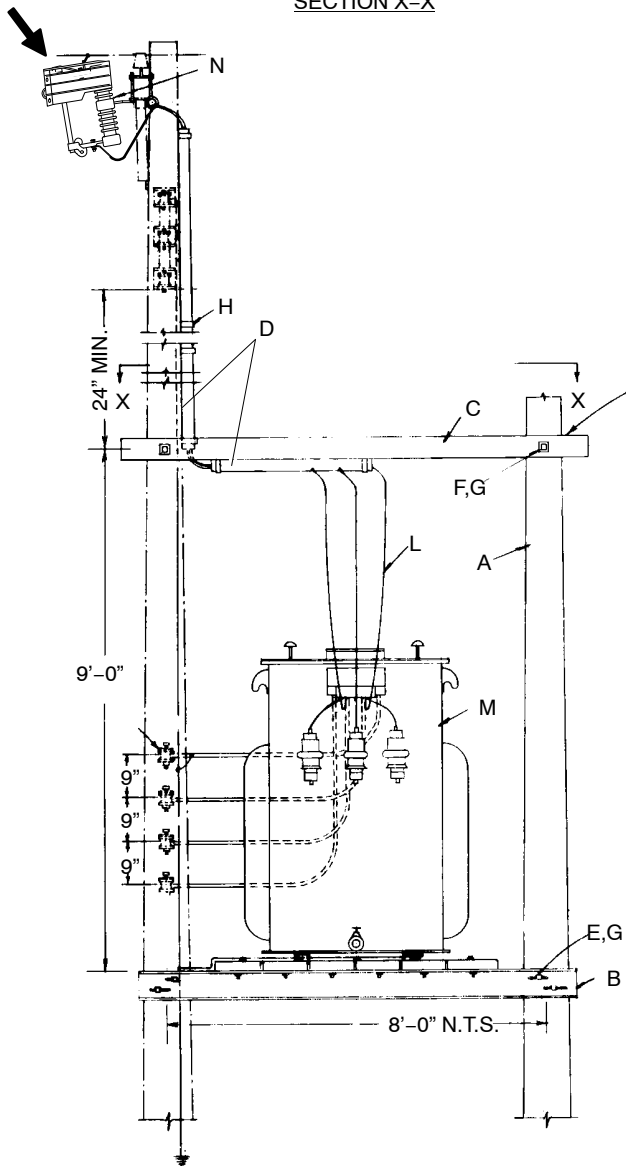
13 04 58 02

Sheet 1 of 2

OPTIONAL SERVICE TAKEOFF
SEE DCS 09 01 12 00

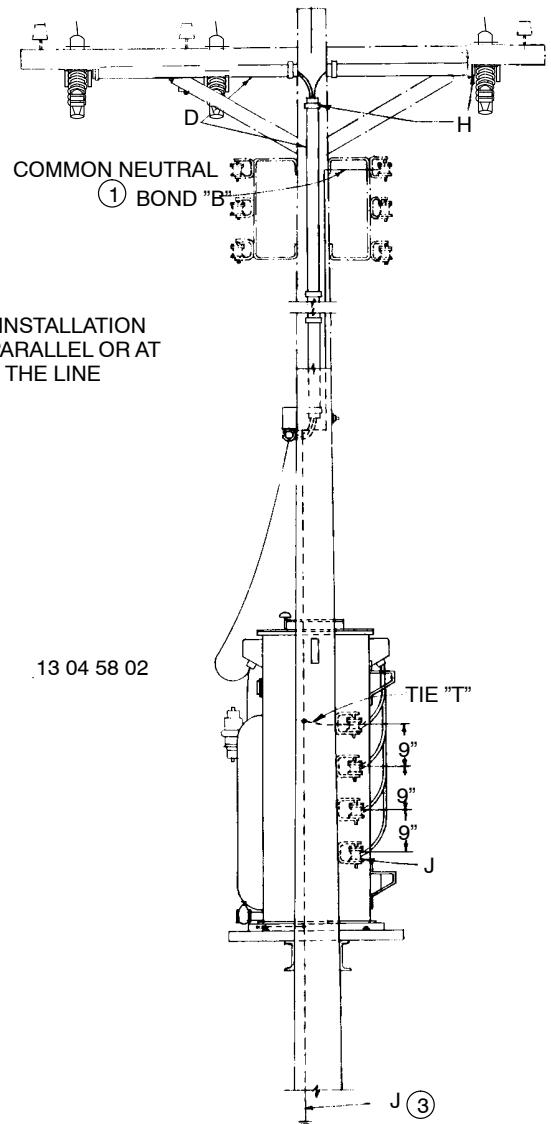


SECTION X-X



② MOUNTING UNIT INSTALLATION
MAY BE EITHER PARALLEL OR AT
RIGHT ANGLE TO THE LINE

15' CLEARANCE 13 04 58 02



TRANSFORMERS
4kV – Three Phase – 3 or 4 Wire
750 kVA

13 04 58 02

Sheet 2 of 2

		Std. / Stk. No.	Description	13 04 58 02	
T @ @	A	41 02 351	Pole, Stub, 35', Class 1		1
	B	23 17 174	Platform, Trans, 8'-0"		1
	C	41 01 008	Arm, Cross, 10'		1
	D	12 01 280	Conduit, Plastic, 2" (ft.)		15
	E	23 52 069	Bolt, Mach., 5/8" x 18"		4
	F	23 52 065	Bolt, Mach., 5/8" x 12"		2
	G	23 66 027	Washer, Square, 5/8"		20
	H	27 60 035	Strip, Hanger (Ft.)		6
	J	12 00 10 **	Grounding Unit		1
	K	06 01 01 01	Secondary Clevis		4
	L		Wire, Ins., 5 kV (Ft.) (See 13 00 03 01)		60
	M		Transformer		1
	N	10 12 ** **	Switch Assembly		1

NOTES:

1. If common neutral is not present, refer to DCS 13 00 07 02 for installation of grounds.
2. Transformer may be rotated 90° if necessary for more convenient service take-off.
3. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.

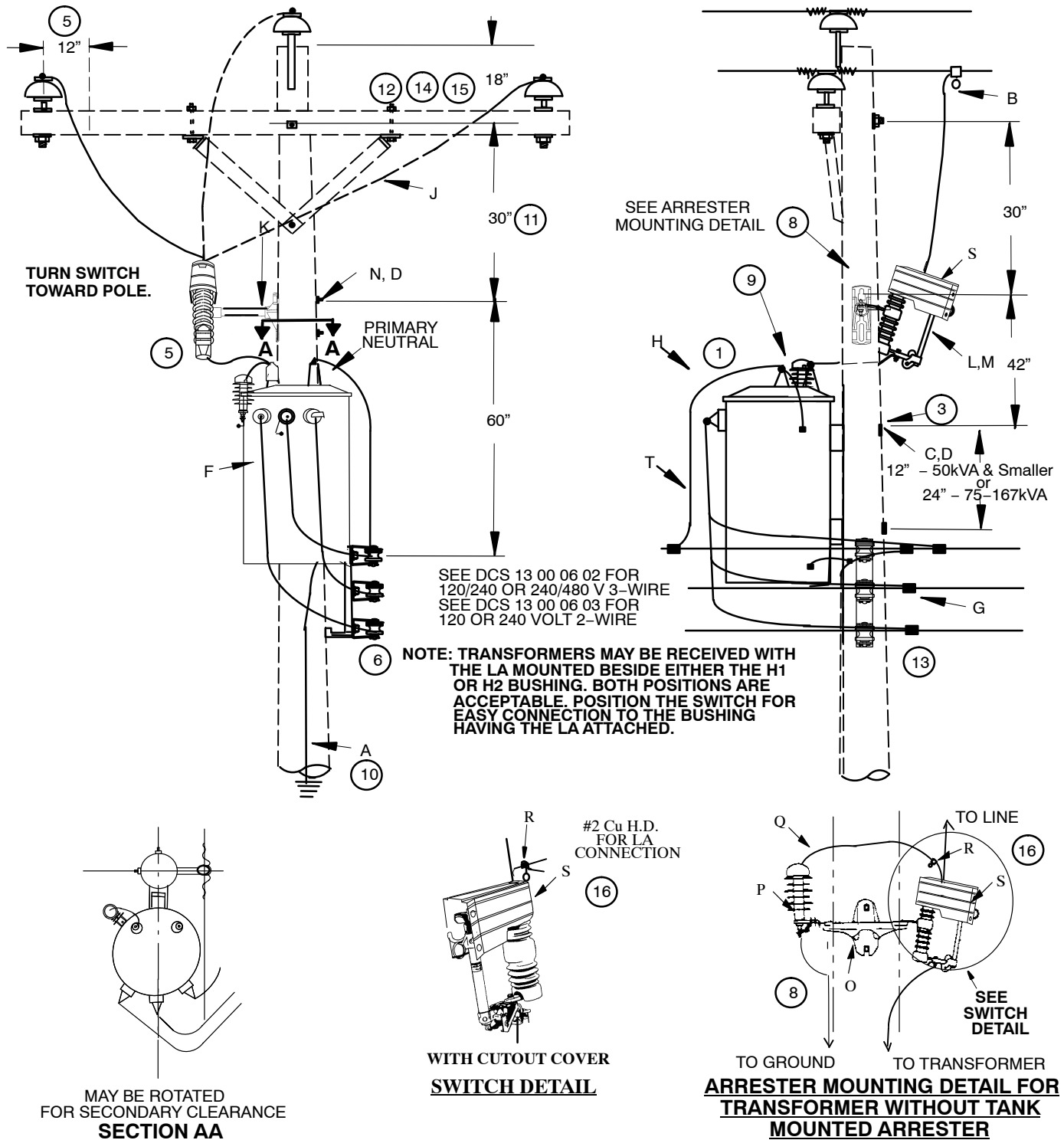
TRANSFORMERS

15 kV and Below – Grounded Wye Primary System
1–167 KVA – Single Phase – Protected

13 12 00 01

Sheet 1 of 3

FOR CSP TRANSFORMER INSTALLATION SEE NOTE 7
FOR TRANSFORMER WITHOUT TANK MOUNTED ARRESTER SEE NOTE 8



TRANSFORMERS
15 kV and Below – Grounded Wye Primary System
1–167 KVA – Single Phase – Protected

13 12 00 01

Sheet 2 of 3

		Std. / Stk. No.	Description	13 12 00 01
@10	A	12 00 10 **	Grounding Unit	1
@	B	HLC*W	Hot Line Clamp	1
T	C	23 52 065	Bolt, Mach., 5/8" x 12" (50 kVA & smaller) OR	2
		23 52 097	Bolt, Mach., 3/4" x 12" (75 – 167 kVA)	2
T	D	23 66 027	Washer, Square, 5/8" (50 kVA & smaller) OR	4
		23 66 031	Washer, Curved, 3/4" (75 – 167 kVA)	2
T	F		Secondary Leads (Ft.) (See 13 00 03 01)	12
T	G	PG*	See 07 00 25 00	3
@	H		Transformer (see 13 00 01 02)	1
T9	J	18 51 025	Wire, Trans. Riser, #4, S.D. Poly covered (FT.)	12
	K	23 06 127	Bracket, Cutout	1
5, 7	L	54 07 208	Switch, Fused, Open Type	1
@4	M		Link, Fuse	1
	N	23 52 065	Bolt,, Mach, 5/8" x 12"	2
@8	O	23 56 063	Bracket, 3 Position, Equipment Mount	1
@8	P		Arrester, Lightning (see 12 00 01 01)	1
@8	Q	18 51 021	Wire, #6Cu, S.D. Poly Covered	@
@8,16	R	23 78 394	Clamp, Hotline, #6 to 2/0	1
	S	23 17 411	Cover – Cutout	1
T	T	18 51 025	Wire, #4 Cu, S.D., Covered	10

NOTES:

- Arrester may be shifted to most convenient side of tank on two bushing transformers.
- Deadend construction – Deadend primary one span past transformer pole if there is another pole in the lead. If not, see DCS 13 12 10 02.
- Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
- See DCS 10 00 01 01 for fuse selections.
- Switch may be mounted on either side of pole or on the crossarm. If the switch is mounted on the crossarm, it should be positioned 12" from the pin insulator or from the pole. The transformer may be raised 12" to 24" when the switch is located on the crossarm. Omit items K and N.
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- If installing a CSP transformer, a fused switch shall be installed as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items K, L, M, N, and S may be omitted and connect the transformer primary lead to the overhead conductor.
- If installing a transformer that does not have a tank mounted lightning arrester use items O, P, Q, and R and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 16 for avian protection requirements.
- 2400/4160Y transformer may have side wall or cover mounted HV bushings. If side wall mounted bushings:
 - Build according to this DCS except use 2.5kV primary lead wire stock # 18 53 011, or
 - If pole is congested, 2.5kV primary lead wire stock # 18 53 011 in conduit similar to DCS 13 04 14 01 may be used.
- Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.

TRANSFORMERS
15 kV and Below – Grounded Wye Primary System
1–167 KVA – Single Phase – Protected

13 12 00 01

Sheet 3 of 3

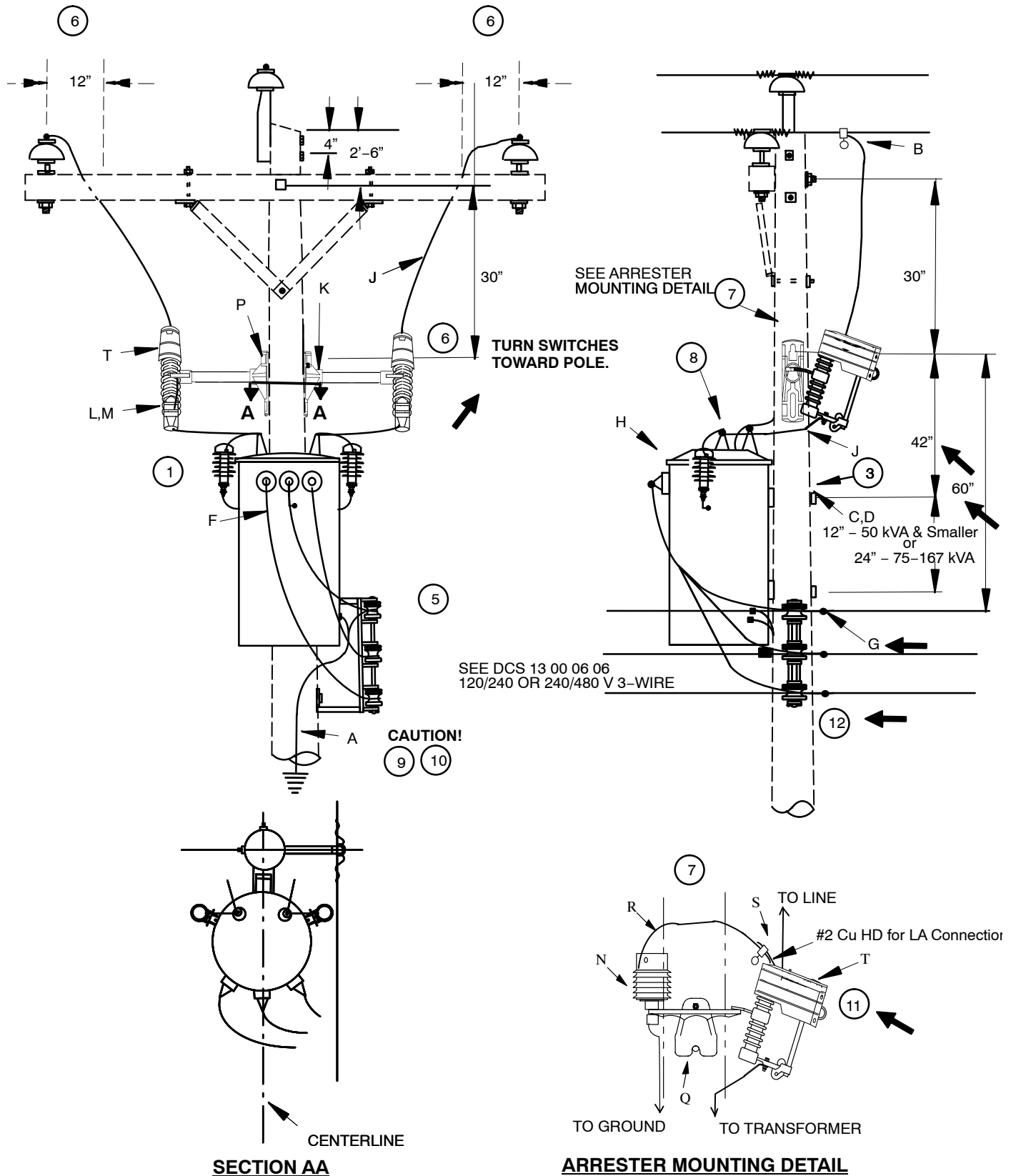
11. This dimension is to top bolt position if FG crossarm is used.
12. Use DCS 05 11 10 01 for existing structure modification or DCS 05 16 10 01 for pin cover in area with eagle population.
13. If pole is NOT truck accessible, make secondary connections on the climbing side of the pole.
14. Use DCS 03 12 05 ** for new pole installation.
15. On single-phase pole lines where future addition of crossarm for adding additional phases is not reasonably expected, this dimension can be reduced to 6" (i.e., total of 36" from the pole top to the top bolt of the cutout bracket).
16. For all of Illinois and locations in Missouri where additional avian protection is needed, omit the piece of #2 copper wire and hotline clamp R. Connect the #6 copper poly covered arrester wire Q directly to the fused switch connector.

TRANSFORMERS

15 kV and Below – Delta Primary System
1-167 KVA – Single Phase – Protected

13 12 00 10

Sheet 1 of 2



TRANSFORMERS
15 kV and Below – Delta Primary System
1–167 KVA – Single Phase – Protected

13 12 00 10

Sheet 2 of 2

		Std. / Stk. No.	Description	13 12 00 10
@9,10	A	12 00 10 **	Grounding Unit	1
@	B	HLC*W	Hot Line Clamp	2
T	C	23 52 065	Bolt, Mach., 5/8" x 12" (50 kVA or Smaller) or	2
		23 52 097	Bolt, Mach., 3/4" x 12" (75–167 kVA)	2
T	D	23 66 027	Washer, Square, 5/8" (50 kVA or Smaller) or	2
		23 66 031	Washer, Curved, 3/4" (75–167 kVA)	2
T	F		Secondary Leads (Ft.) (See 13 00 03 01)	12
T	G	PG*	See 07 00 25 00	3
@	H		Transformer (See 13 00 01 02)	1
	J	18 51 025	Wire, Trans. Riser (FT.)	12
	K	23 06 127	Bracket, Cutout	2
6	L	54 07 208	Switch, Fused, Open Type	2
@ 4	M		Link, Fuse	2
@1	N		Arrester, Lightning (See 12 00 01 01)	@
	P	23 52 065	Bolt, Mach., 5/8" x 12"	2
@7	Q	23 56 063	Bracket, 3 Position, Equipment Mount	@
@7,11	R	18 51 021	Wire, #6 Cu, S.D. Poly Covered	@
@7	S	23 78 394	Clamp, Hotline, #6 to 2/0	@
	T	23 17 411	Cover – Cutout	2

NOTES:

- Arresters must be connected to each HV bushing. Transformers coded BA, BD, JA, JD, XA, and XD have one arrester included, all others have no arrester. See Note #7 for additional information.
- Deadend construction – Deadend primary one span past transformer pole if there is another pole in the lead. If not, see DCS 13 12 10 02.
- Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
- See DCS 10 00 01 01 for fuse selections.
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- Switches may be mounted on the crossarm. If the switches are mounted on the crossarm, they should be positioned 12" from the pin insulators. The transformer may be raised 12" to 24" when the switches are located on the crossarm. Omit items K and P.
- If installing a transformer that does not have a tank mounted lightning arrester use items N, Q, R, and S and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 11 for avian protection requirements.
- 2400/4160 Y transformers may have sidewall or cover mounted HV bushings.
- Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
- Arrester ground and secondary ground may be required to be separate. See DCS 13 00 06 06 for details on this requirement.
- For all of Illinois and locations in Missouri where additional avian protection is needed, omit the #2 bare CU stud and hot line clamp S and connect the #6 poly covered arrester lead wire R directly to the fused switch connector.
- If pole is NOT truck accessible, make secondary connections on climbing of the pole.

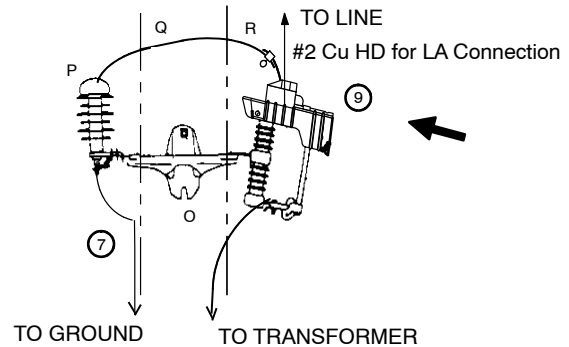
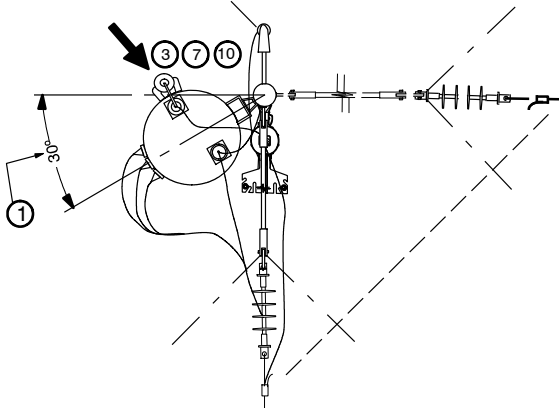
TRANSFORMERS

15kV and Below - 120/240 Volts - Single Phase
1 To 167 kVA Deadend or "L" Corner

13 12 10 **

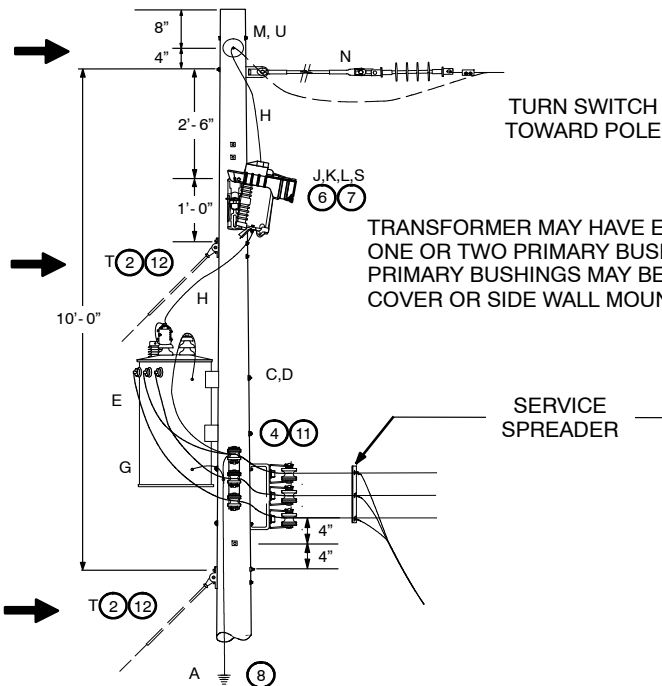
Sheet 1 of 2

FOR TRANSFORMER WITHOUT TANK MOUNTED ARRESTER SEE NOTES 7 & 10. ←

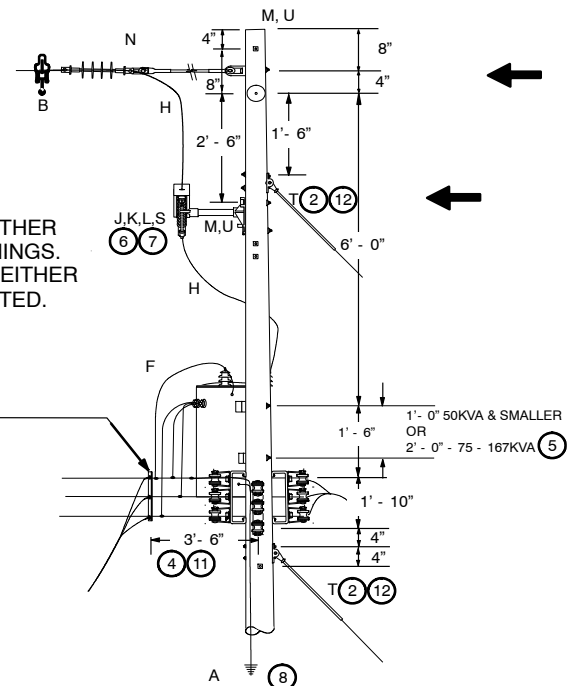


ARRESTER MOUNTING DETAIL

MISSOURI ONLY



SERVICE SPREADER



DEADEND - 13 12 10 01
"L" CORNER - 13 12 10 02

"L" CORNER - 13 12 10 02

NOTES:

1. Angle is shown as 30°; but may be varied depending on the size and shape of the transformer, to obtain proper clearance from the secondary.
2. On "L" corners, where guy must be installed below transformer, a Class 4 or heavier pole shall be used. A Class 4 pole will provide adequate strength for deadending 1-1/0 bare AAAC at 1,360 lbs. max. tension (non-standard intermediate span urban construction). For conductor tension greater than this, contact Distribution Standards for determination of pole class.
3. Arrester may be shifted to the most convenient side of tank on two bushing transformers.
4. Where primary deadends, and secondary runs through, construct as on DCS 13 12 00 01.
5. For 75 thru 167 kVA transformers, measure distance between mounting slots and drill so that transformer rests evenly on both bolts.

DISTRIBUTION
CONSTRUCTION STANDARDS



ENG: DG
REV. NO: 14
REV. DATE: 05/24/2018

TRANSFORMERS
15kV and Below - 120/240 Volts - Single Phase
1 To 167 kVA Deadend or "L" Corner

13 12 10 **

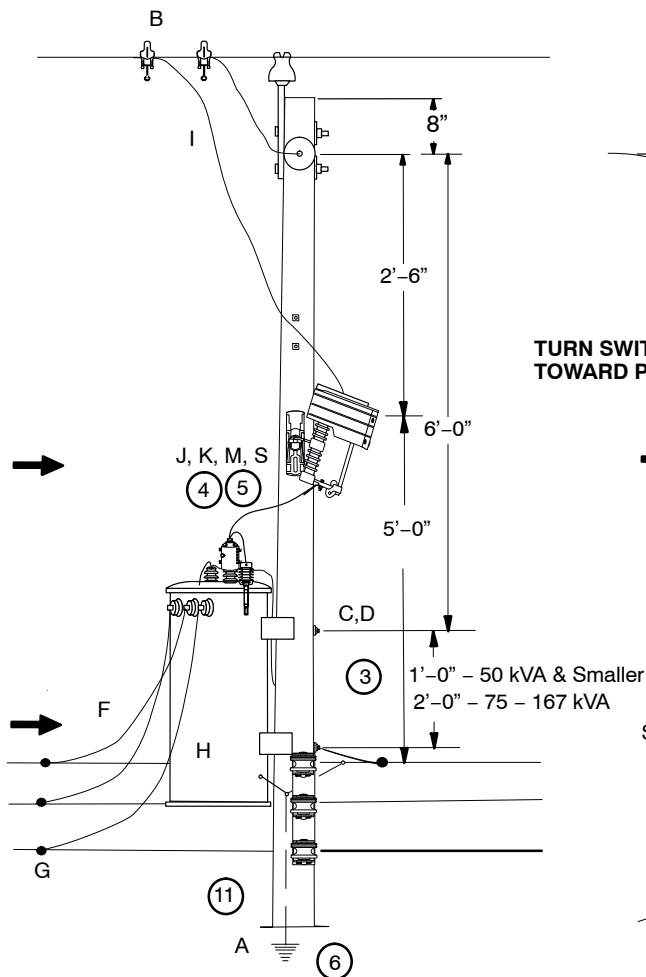
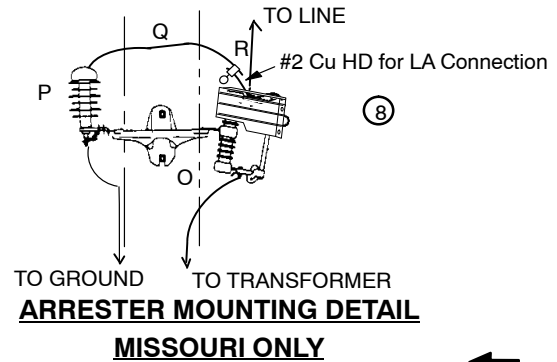
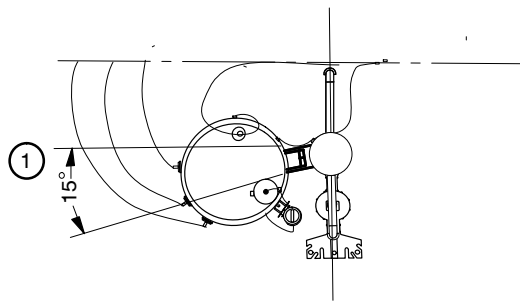
Sheet 2 of 2

6. If a CSP transformer is used, a fused switch shall be provided as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items J, K, L, M and S may be omitted and connect the transformer primary lead to the overhead conductor.
7. In Missouri, if installing a transformer that does not have a tank mounted lightning arrester use items O, P, Q, and R and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 9 for avian protection requirements.
8. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
9. For locations in Missouri where additional avian protection is needed, omit the #2 bare CU stud and hot line clamp R and connect the #6 CU poly covered arrester lead wire directly to the fused switch connector.
10. In Illinois, if the transformer does not have provision for tank mounting the arrester, install the arrester on the upper transformer mounting bracket per DCS 12 12 05 **.
11. See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
12. See DCS 11 00 02 02 for typical guy insulator placement.

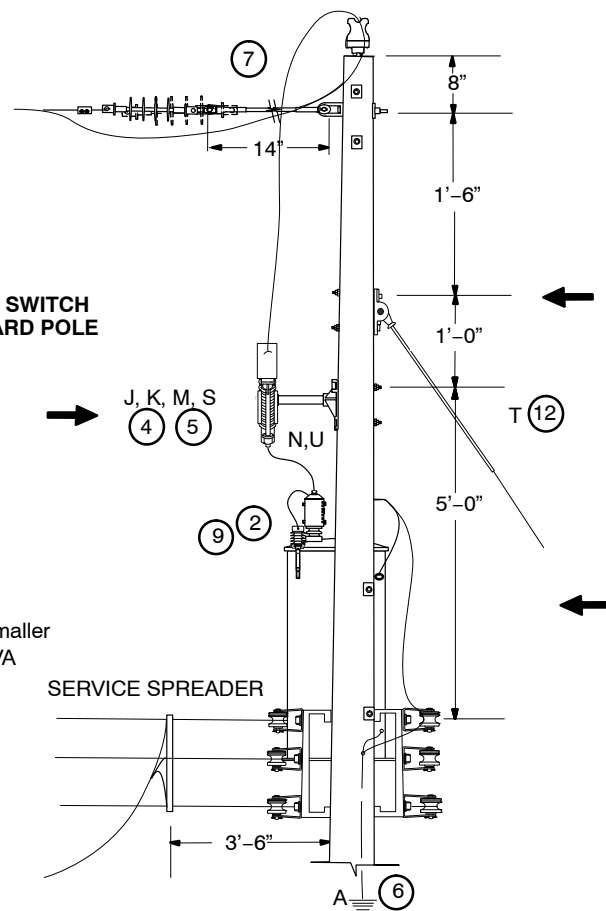


		Std. / Stk. No.	Description	13 12 10	01	02
@8	A	12 00 10 **	Grounding Unit		1	1
@	B	HLC*W	Hot Line Clamp (See 07 00 21 00)		1	1
T	C	23 52 066	Bolt, Mach., 5/8" x 14" (50 kVA & Smaller) or		2	2
		23 52 219	Bolt, Mach., 3/4" x 14" (75 kVA - 167 kVA)		2	2
T	D	23 66 027	Washer, Square, 5/8" (50 kVA & Smaller) or		2	2
		23 66 031	Washer, Curved, 3/4" (75 kVA - 167 kVA)		2	2
T	E		Secondary Leads (Ft.) (See 13 00 03 01)		9	9
T	F	PG*	See 07 00 25 00		4	4
@	G		Transformer (see 13 00 01 02)		1	1
	H	18 51 025	Wire, Trans. Riser (Ft.)		6	6
	J	23 06 127	Bracket, Cutout		1	1
	K	54 07 208	Switch, Fused, Open Type		1	1
@	L		Link, Fuse (sized for transformer) (See 10 00 01 01)		1	1
	M	23 52 065	Bolt, Mach., 5/8" x 12"		3	3
	N	06 12 30 01	Deadend W / EXT		1	2
@7	O	23 56 063	Bracket, 3 Position, Equipment Mount		1	1
@7	P		Arrester, Lightning (See 12 00 01 01)		1	1
@7	Q	18 51 021	Wire, #6 Cu, S.D. Poly Covered (Ft.)		2	2
@7,9	R	23 78 394	Clamp, Hotline, #6 to 2/0		1	1
	S	23 17 411	Cover - Cutout		1	1
@12	T	11 00 4* **	Guying Unit (Down, Span, or Sidewalk)		1	2
	U	23 66 027	Washer, Square, 2- 1/4" x 2- 1/4" x 3/16"		3	3

**FOR CSP TRANSFORMER INSTALLATION SEE NOTE 4.
 FOR TRANSFORMER WITHOUT TANK MOUNTED ARRESTER SEE NOTES 5 & 10**



**TURN SWITCH
TOWARD POLE**



TRANSFORMERS
15kV and Below – 120/240 Volts – Single Phase
1 to 167kVA "T" Corner

13 12 14 02

Sheet 2 of 3

		Std. / Stk. No.	Description	13 12 14 02
@6	A	12 00 10 **	Grounding Unit	1
@	B	HLC*W	Hot Line Clamp (See 07 00 21 00)	1
T	C	23 52 066	Bolt, Mach., 5/8" x 14" (50 kVA or Smaller) or	2
		23 52 219	Bolt, Mach., 3/4" x 14" (75–167 kVA)	2
T	D	23 66 027	Washer, Square, 5/8" (50 kVA or Smaller) or	2
		23 66 031	Washer, Curved, 3/4" (75–167 kVA)	2
T	F		Secondary Leads (Ft.) (See 13 00 03 01)	9
T	G	PG*	See 07 00 25 00	4
@	H		Transformer (See 13 00 01 02)	1
T	I	18 51 025	Wire, Trans. Riser (Ft.)	6
	J	54 07 208	Switch, Fused, Open Type	1
	K	23 06 127	Bracket, Cutout	1
@	M		Link, Fuse (sized for transformer) (See 10 00 01 01)	1
	N	23 52 065	Bolt, Mach., 5/8" x 12"	2
@5	O	23 56 063	Bracket, 3 Position, Equipment Mount	1
@5	P		Arrester, Lightning (See 12 00 01 01)	1
@5	Q	18 51 021	Wire, #6 CU, S.D. Poly Covered (Ft.)	@
@5,8	R	23 78 394	Clamp, Hotline, #6 to 2/0	1
	S	23 17 411	Cover, Cutout	1
@12	T	11 00 4* **	Guying Unit (Down, Span, or Sidewalk)	1
	U	23 66 027	Washer, Square, 2–1/4" x 2–1/4" x 3/16"	2

NOTES:

- Angle is shown as 15°, but may be varied depending on the size and shape of the transformer to obtain proper clearance from the secondary.
- Arrester may be shifted to the most convenient side of tank on two bushing transformers.
- For 75 thru 167 KVA transformers, measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
- If a CSP transformer is used, a fused switch shall be provided as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items J, K, M, N, & S may be omitted and connect the transformer primary lead to the overhead conductor.
- In Missouri, if installing a transformer that does not have a tank mounted lightning arrester use items O, P, Q, and R and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 8 for avian protection requirements.
- Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
- If there is space available on the pole, the fused switch for the primary tap can be installed on "T" corners. Refer to DCS 10 12 19 **.
- For locations in Missouri where additional avian protection is needed, omit the #2 bare CU stud and hotline clamp R and connect the #6 CU poly covered arrester lead wire Q directly to the fused switch connector.
- 2400/4160 Y transformer may have side wall or cover mounted HV bushings. If side wall mounted bushings:
 - Build according to this DCS except use 2.5kV primary lead wire stock #18 53 011, or
 - If pole is congested, 2.5kV primary lead wire stock #18 53 011 in conduit similar to DCS 13 04 14 01 may be used.

TRANSFORMERS
15kV and Below – 120/240 Volts – Single Phase
1 to 167kVA "T" Corner

13 12 14 02

Sheet 3 of 3

10. In Illinois, if the transformer does not have provision for tank mounting the arrester, install the arrester on the upper transformer mounting bracket per DCS 12 12 05 **.
11. See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
12. See DCS 11 00 02 02 for typical guy insulator placement.

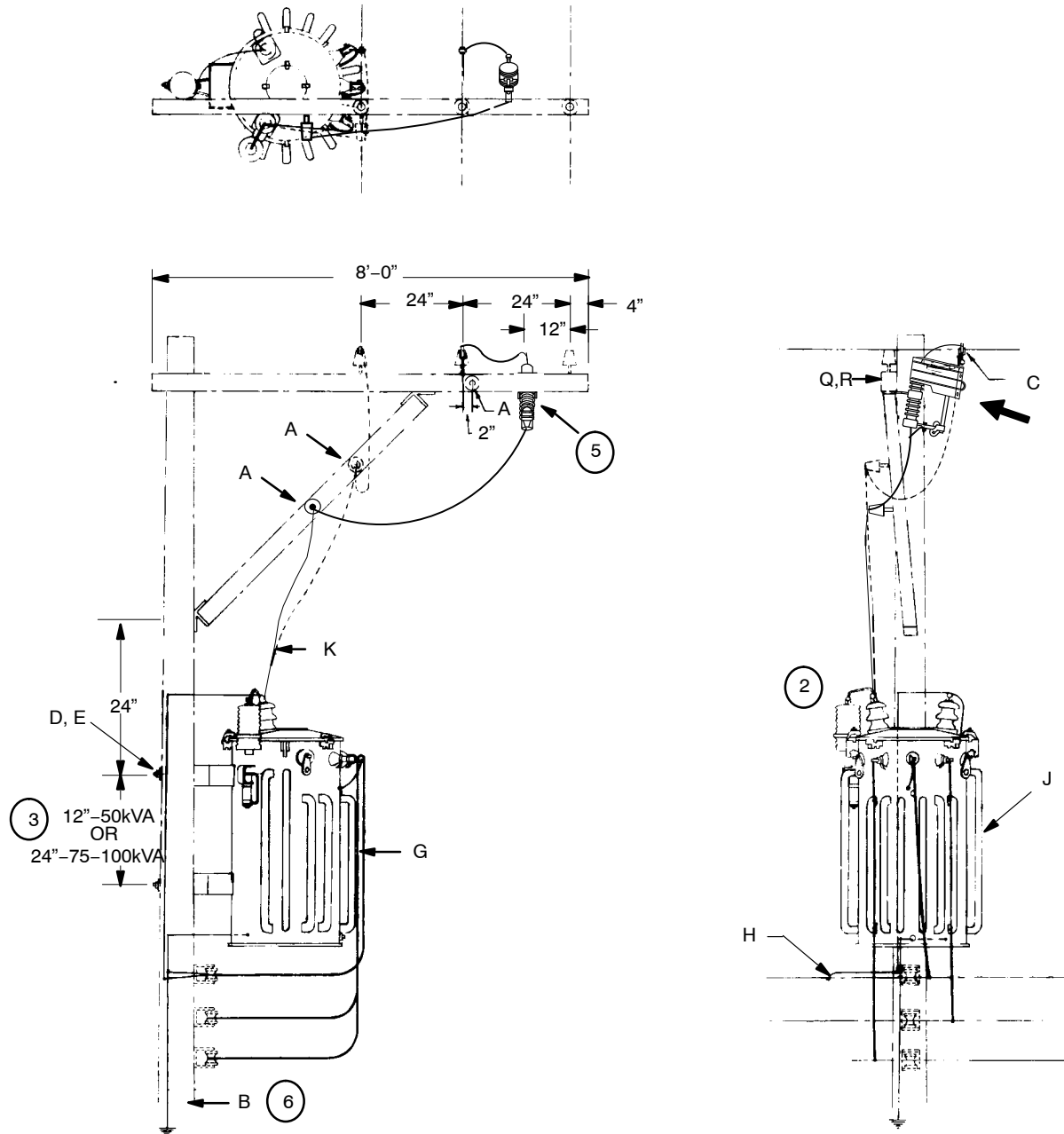
TRANSFORMERS
12kV – 120/240 Volts – Single Phase
1 To 100 kVA Side Arm Construction

13 12 21 02

Sheet 1 of 2

FOR CSP TRANSFORMER INSTALLATION SEE NOTE 1.

FOR TRANSFORMER WITHOUT TANK MOUNTED ARRESTER SEE NOTE 5.



TRANSFORMERS
12kV – 120/240 Volts – Single Phase
1 To 100 kVA Side Arm Construction

13 12 21 02

Sheet 2 of 2

		Std. / Stk. No.	Description	13 12 21 02	
@6 @ T T T T @ @4 @5 @5 @5	A	06 12 01 01	Pin and Insulator		1
	B	12 00 10 **	Grounding Unit		1
	C	HLC*W	Hot Line Clamp		1
	D	23 52 063	Bolt, Mach., 5/8" x 10" (50 kVA & smaller) OR		2
		23 52 095	Bolt, Mach., 3/4" x 10" (75–100 kVA)		2
	E	23 66 027	Washer, Square, 5/8" (50 kVA & smaller) OR		2
		23 66 031	Washer, Curved, 3/4" (75–100 kVA)		2
	G		Secondary Leads (Ft.) (See 13 00 03 01)		12
	H	PG*	See 07 00 25 00		4
	J		Transformer		1
	K	18 51 025	Wire – Trans. Riser (Ft.)		10
	L	54 07 208 & 17 58 054	Switch, Fused, Open Type & Bracket, Crossarm, Heavy Duty		1
	M		Link, Fuse		1
	N		Arrester, Lightning (See 12 00 01 01)		1
	O	18 51 021	Wire, #6 Cu. S.D. Poly Covered		@
	P	23 78 394	Clamp, Hotline, #6 to 2/0		1
	Q	17 58 054	Bracket, Crossarm, Heavy Duty		1
	R	05 15 10 01	Cover, Cutout		1

NOTES:

- For CSP transformers, a fused switch shall be installed as shown.
- Arrester may be shifted to the most convenient side of tank on two bushing transformers.
- Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
- See DCS 10 00 01 01 for fuse selections.
- If installing a transformer that does not have a tank mounted lightning arrester use items "N", "O", "P" and "Q" and install the appropriate lightning arrester on the crossarm beside the switch. Keep the arrester leads as short as possible. The wire on the line side of the switch may be changed to bare copper (Stk. #18 02 020) in order to make the arrester line side connection.
- Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.

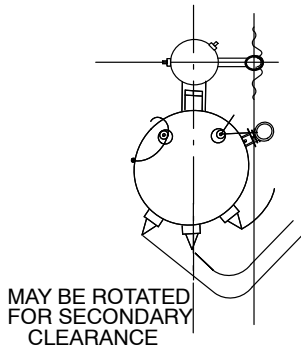
TRANSFORMERS

15kV and Below – 120/240 Volts – Single Phase
1-167 kVA – Armless Underbuild

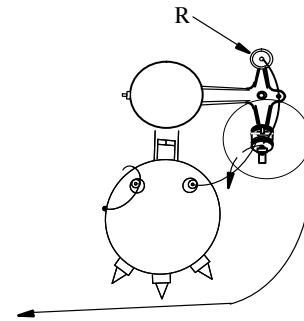
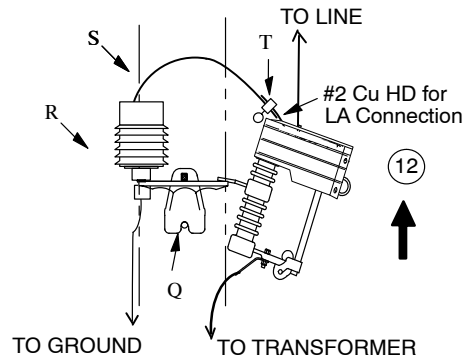
13 12 34 **

Sheet 1 of 2

FOR CSP TRANSFORMER INSTALLATION SEE NOTE 8.

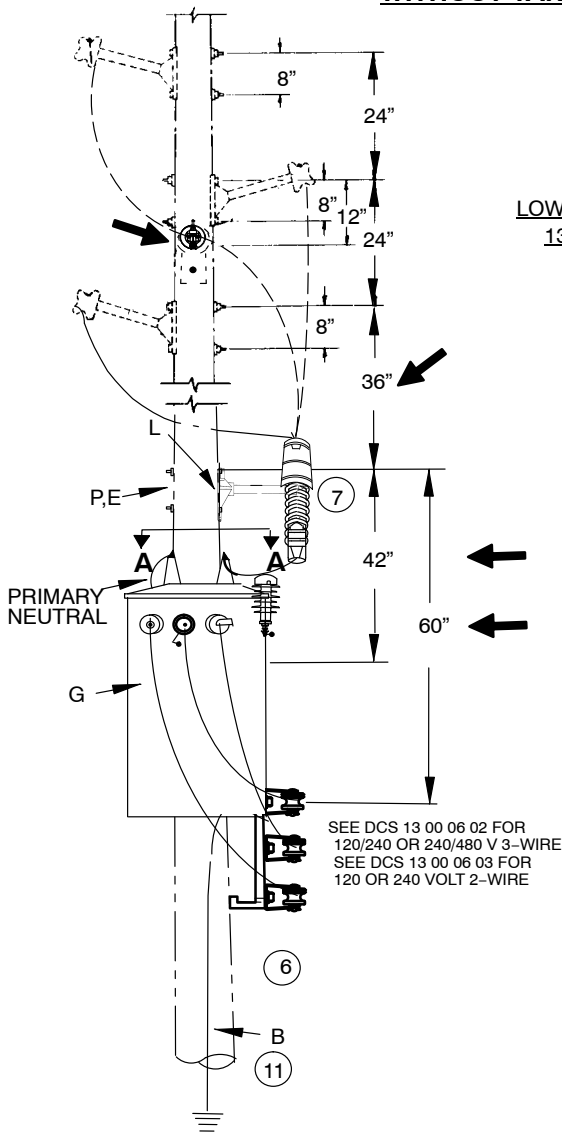


SECTION AA



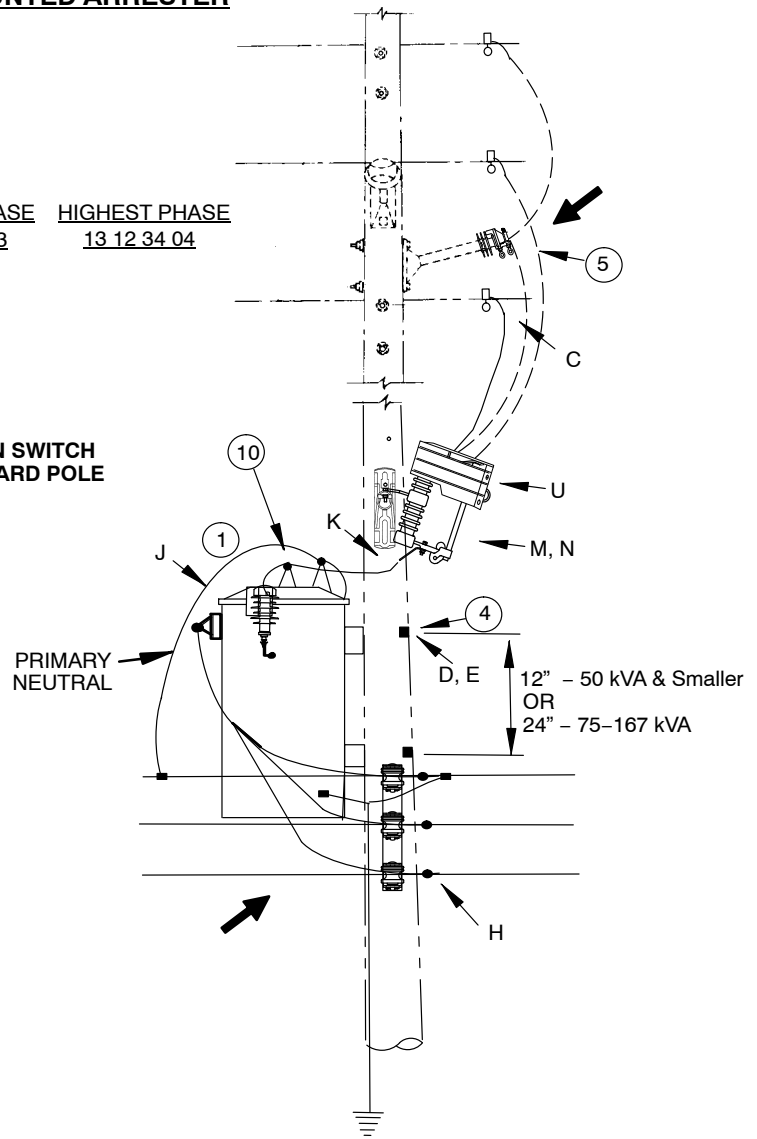
BRACKET DETAIL

9 ARRESTER MOUNTING DETAIL FOR TRANSFORMER WITHOUT TANK MOUNTED ARRESTER



LOWEST PHASE 13 12 34 03
HIGHEST PHASE 13 12 34 04

TURN SWITCH TOWARD POLE



TRANSFORMERS
15kV and Below – 120/240 Volts – Single Phase
1–167 kVA – Armless Underbuild

13 12 34 **
Sheet 2 of 2

		Std. / Stk. No.	Description	13 12 34 **	03	04
<div style="display: flex; flex-direction: column; align-items: center;"> <div>@11</div> <div>@</div> <div>T</div> <div>T</div> <div>T</div> <div>T</div> <div>@</div> <div></div> <div></div> <div>@3</div> <div>@9</div> <div>@9</div> <div>@9</div> <div>@9,12</div> </div>	A	06 12 20 04	Insulator, Standoff, L.D.			1
	B	12 00 10 **	Grounding Unit		1	1
	C	HLC*W	Hot Line Clamp		1	1
	D	23 52 065	Bolt, Mach., 5/8" x 12" (50 kVA & Smaller) or		2	2
		23 52 097	Bolt, Mach., 3/4" x 12" (75–167 kVA)		2	2
	E	23 66 027	Washer, Square, 5/8" (50 kVA & Smaller) or		4	4
		23 66 031	Washer, Curved, 3/4" (75–167 kVA)		2	2
	G		Secondary Leads (Ft.) (See 13 00 03 01)		12	12
	H	PG*	See 07 00 25 00		4	4
	J		Transformer (see 13 00 01 02)		1	1
	K	18 51 025	Wire, Trans. Riser (Ft.)		12	12
	L	23 06 127	Bracket, Cutout		1	1
	M	54 07 208	Switch, Fused		1	1
	N		Link, Fuse (sized for transformer)		1	1
	P	23 52 065	Bolt, Machine, 5/8" x 12"		2	2
	Q	23 56 063	Bracket, 3 Position, Equipment Mounting		1	1
	R		Arrester, Lightning (See 12 00 01 01)		1	1
	S	18 51 021	Wire, #6 Cu, S.D. Poly Covered	@	@	@
	T	23 78 394	Clamp, Hotline, #6 to 2/0		1	1
	U	23 17 411	Cover – Cutout		1	1

NOTES:

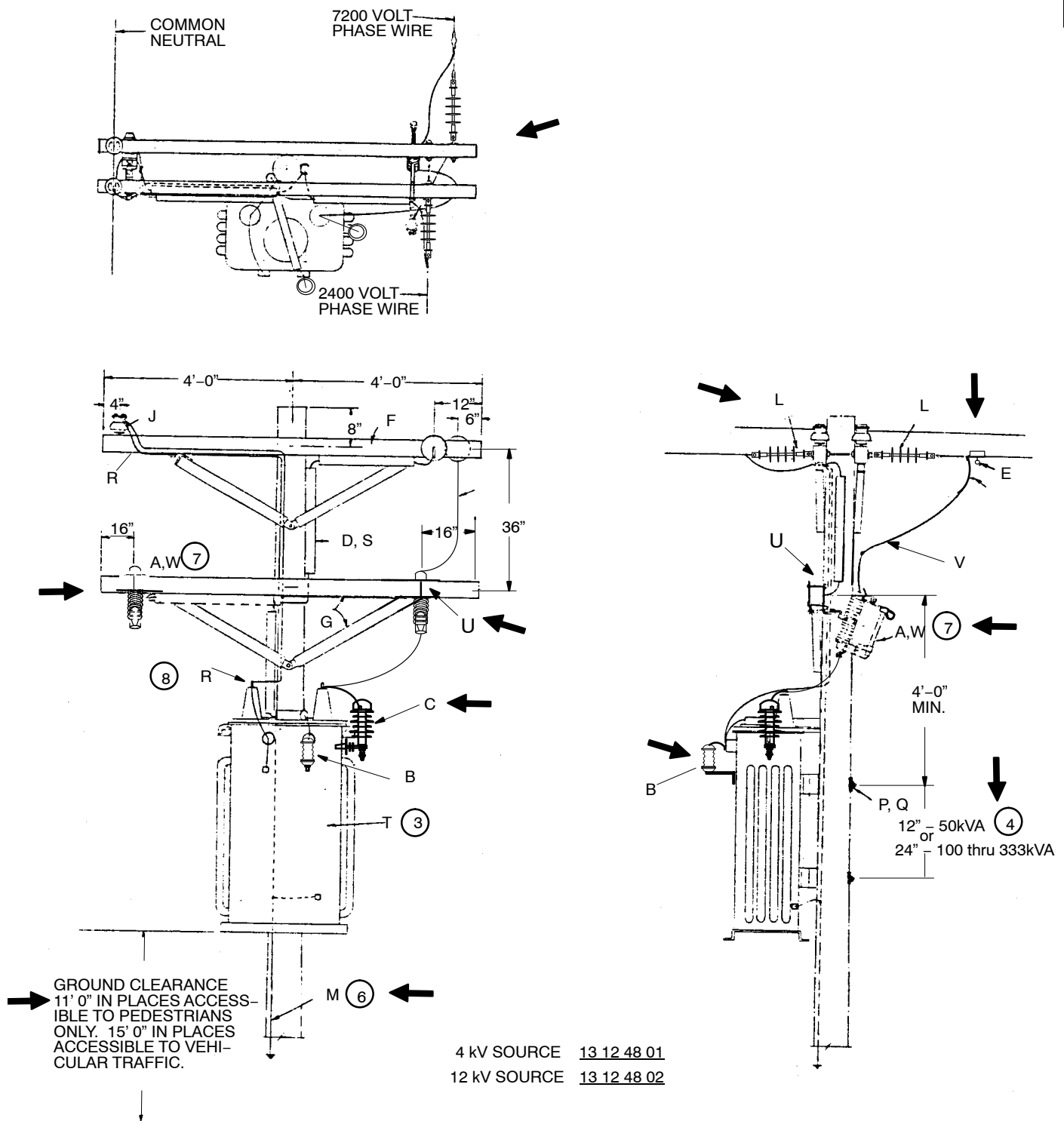
- Arrester may be shifted to most convenient side of tank on two bushing transformers.
- Deadend construction – deadend primary one span past transformer pole if there is another pole in the lead. If not, see DCS 13 12 10 02 for primary deadend on transformer pole.
- See DCS 10 00 01 01 for fuse information.
- Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
- When transformer must be connected to top phase, install 24" fiberglass standoff.
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- Switch may be mounted on either side of the pole.
- If installing a CSP Transformer, a fused switch shall be installed as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items L, M, N, P, and U may be omitted and connect the transformer primary lead to the overhead conductor.
- If installing a transformer that does not have a tank mounted lightning arrester use items Q, R, S, and T and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 12 for avian protection requirements.
- 2400/4160 Y transformer may have side wall or cover mounted HV bushings.
- Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
- For all of Illinois and locations in Missouri where additional avian protection is needed, omit the #2 bare CU stud and hotline clamp T and connect the #6 CU poly covered arrester lead wire S directly to the fused switch connector.

TRANSFORMERS

7200V. – 2400 V. Step-Up or Down

13 12 48 **

Sheet 1 of 2



TRANSFORMERS

7200V. – 2400 V. Step-Up or Down

13 12 48 **

Sheet 2 of 2

		Std. / Stk. No.	Description	13 12 48 **	
				01 4kV	02 12k
@	A	54 07 208	Switch, Fuse, 100A, 15kV	1	1
	B	10 01 122	Arrester, Lightning, 3kV, w/Transformer Bkt	1	1
	C	10 01 145	Arrester, Lightning, 10kV, w/Transformer Bkt	1	1
	D	12 51 197	Conduit, Plastic, 1" (Ft.)	16	16
	E	HLC*W	Clamp, Hot Line	1	1
	F	04 00 20 07	Crossarm, Double 8'	1	1
	G	04 00 20 02	Crossarm, Single, 8'	1	1
	J	06 12 01 01	Pin and Insulator	3	2
@6	L	06 12 34 01	Deadend	2	2
	M	12 00 10 **	Grounding Unit	1	1
@	O	STC*W	Hot Tap With/Stirrup	1	1
T	P	23 52 063	Bolt, Mach., 5/8" x 10" (50kVA) OR	2	2
		23 52 095	Bolt, Mach., 3/4" x 10" (100 – 333kVA)	2	2
T	Q	23 66 027	Washer, Square, 5/8" (50kVA) OR	2	2
		23 66 031	Washer, Curved, 3/4" (100 – 333kVA)	2	2
@8	R		Wire, Bare, S.D. (Ft.) (See 13 00 03 01)	30	30
@	S		Wire, Ins., 5kV (Ft.) (See 13 00 03 01)	35	25
@	T		Transformer	1	1
@5	U	17 58 054	Bracket, Crossarm, Arrester	1	1
	V	18 51 025	Wire, Cu., #4 S.D., Covered	10	10
	W		Link, Fuse	1	1

NOTES:

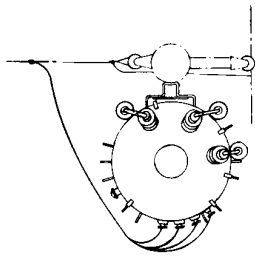
1. Install switch on source side only.
2. Install arresters on both source and load sides.
3. Connection shown is for subtractive polarity. On additive polarity transformers, secondary bushings are reversed.
4. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
5. See DCS 10 00 01 01 for fuse selection.
6. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
7. Drawing depicts 12kV source. If 4kV source, route 4kV lead to fused switch installed on left side of drop-arm and install pin and insulator J on right side of drop-arm for 12kV lead support.
8. For 50 thru 167kVA transformer use #6 Cu (stock # 18 52 019) from the neutral bushing to the common neutral. For 250 and 333kVA transformer use #4 Cu (stock # 18 52 020).

TRANSFORMERS

12kV – 3 Phase – 3 or 4 Wire
30 – 500 kVA

13 12 54 04

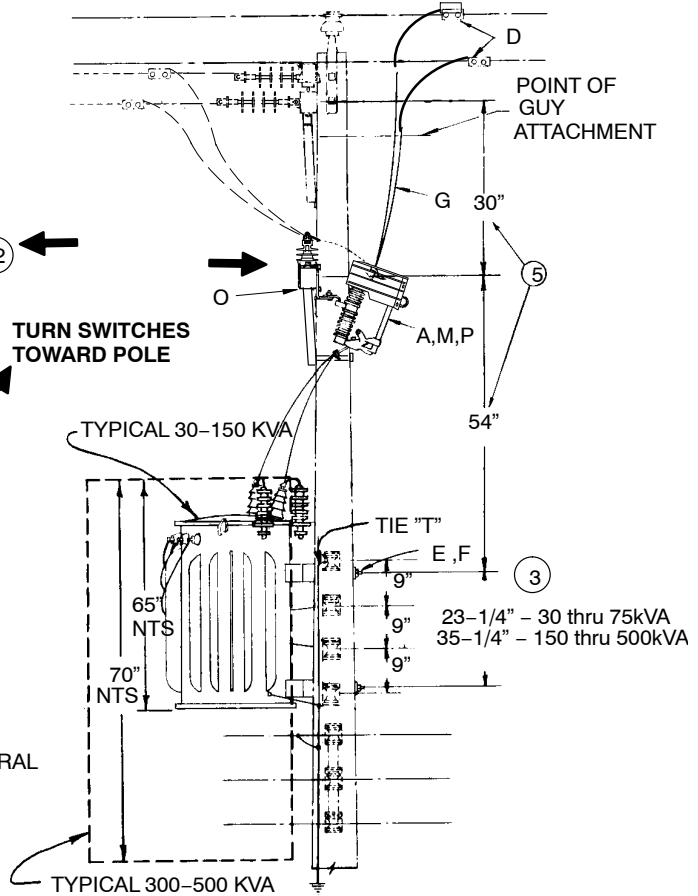
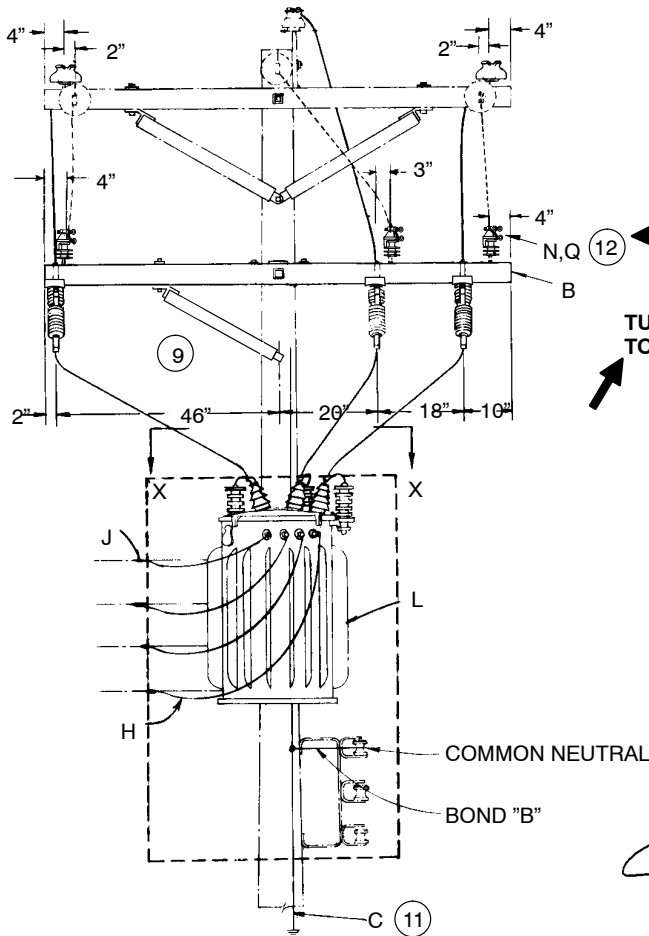
Sheet 1 of 2



SECTION X - X

CAUTION

ALL PRIMARY TERMINALS ARE HOT AFTER THE FIRST PHASE WIRE IS CONNECTED.



TRANSFORMERS

12kV – 3 Phase – 3 or 4 Wire

30 – 500 kVA

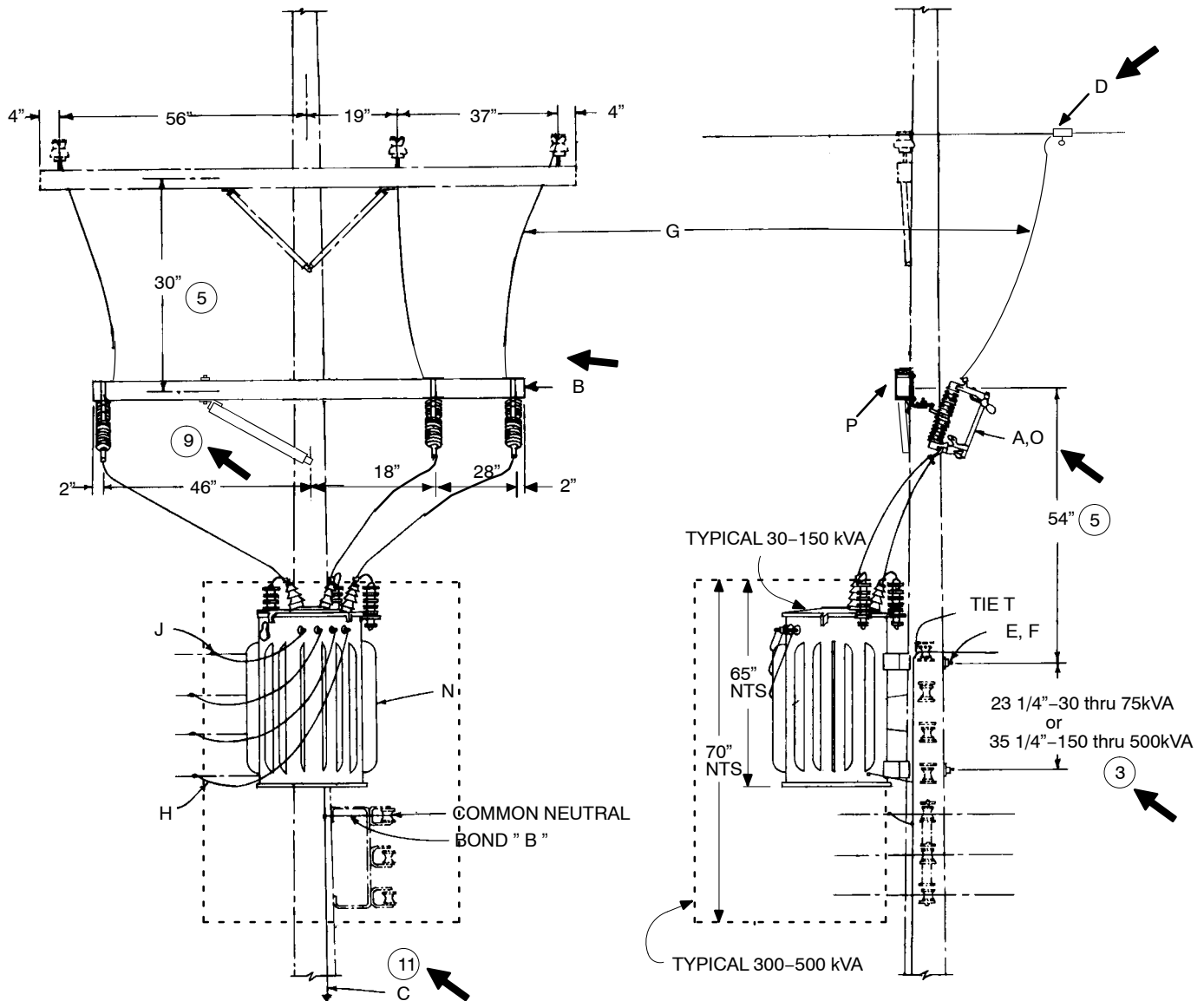
13 12 54 04

Sheet 2 of 2

		Std. / Stk. No.	Description	13 12 54 04
@9	A	54 07 208	Switch, Fused, Open Type	3
	B	04 00 20 02	Crossarm, 8' w/60" V Brace	1
		04 00 20 03	Crossarm, 10' w/60" V Brace	1
@11	C	12 00 10 **	Grounding Unit	1
@	D	HLC*W	Hot Line Clamp	3
T	E	23 52 065	Bolt, Mach., 5/8" x 12" (30kVA) or	2
		23 52 097	Bolt, Mach., 3/4" x 12" (45 thru 300kVA) or	2
		23 52 268	Bolt, Mach., 1" x 14" (500kVA)	2
T	F	23 66 027	Washer, Square, 5/8" (30kVA) or	2
		23 66 031	Washer, Curved, 3/4" (45 thru 300kVA) or	2
		23 66 106	Washer, Curved, 1" (500kVA)	2
T	G	18 51 025	Primary Leads, S.D. (ft.)	35
T	H		Secondary Leads (ft.) (see 13 00 03 01)	20
T	J	PG*	See 07 00 25 00	4
@	L		Transformer (See 13 00 01 02)	1
@10	M		Fuse, Link	3
@12	N	25 05 143	Insulator, Vice-Top, 15 kV	3
	O	17 58 054	Bracket, Crossarm, Heavy Duty	3
	P	23 17 411	Cover, Cutout, 100A	3
@12	Q	23 62 028	Pin, Insulater	3

NOTES:

1. If common neutral is not present refer to DCS 13 00 07 02 for installation of grounds.
2. Turn switches toward pole.
3. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
4. Units weighing in excess of 3400#'s must be mounted using 1" bolts.
5. These dimensions may be reduced for existing installation to 24" and 48".
6. See DCS 02 00 02 00 for pole class.
7. See DCS 13 00 04 01 for dimensions and weights of transformers.
8. Instructions for converting a 480Y/277 volt four wire transformer to 480 volt three wire service are shown on DCS 13 00 01 01.
9. Use only one V brace. Keep the extra brace for future use.
10. See DCS 10 00 01 01 for fuse selection.
11. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
12. Insulators are only required for installation on a dead-end structure.



TRANSFORMERS
12kV – 3 Phase – 3 or 4 Wire
→ 30 – 500 kVA Underbuild

13 12 56 02

Sheet 2 of 2

		Std. / Stk. No.	Description	13 12 56 02	
9 @11 @ T T T T @ @10	A	54 07 208	Switch, Fused, Open Type		3
	B	04 00 20 02	Crossarm 8' w/60" V Brace		1
	C	12 00 10 **	Grounding Unit		1
	D	HLC*W	Hot Line Clamp		3
	E	23 52 063	Bolt, Mach., 5/8" x 10" (30kVA) OR		2
		23 52 095	Bolt, Mach., 3/4" x 10" (45 thru 300kVA) OR		2
		23 52 268	Bolt, Mach., 1" x 14" (500kVA)		2
	F	23 66 027	Washer, Square, 5/8" (30kVA) OR		2
		23 66 031	Washer, Curved, 3/4" (45 thru 300kVA) OR		2
		23 66 106	Washer, Curved, 1" (500kVA)		2
	G	18 51 025	Primary Leads, (Ft.)		35
	H		Secondary Leads (Ft.) (See 13 00 03 01)		20
	J	PG*	See 07 00 25 00		4
	N		Transformer		1
	O		Fuse, Link		3
	P	17 58 054	Bracket, Crossarm, Heavy Duty		3

NOTES:

1. If common neutral is not present refer to DCS 13 00 07 02 for installation of grounds.
2. Turn switches toward pole.
3. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
4. Units weighing in excess of 3400#s must be mounted using 1" bolts.
5. These dimensions may be reduced for existing installations to 24" and 48".
6. Instructions for converting a 480Y/277 volt four wire transformer to 480 volt three wire service are shown on DCS 13 00 01 01.
7. See DCS 13 00 04 01 for dimensions and weights of transformers.
8. See DCS 02 00 02 00 for pole class.
9. Use only one V brace. Keep the extra brace for future use.
10. See DCS 10 00 01 01 for fuse selection.
11. Use DCS 12 00 10 02 for ground rod application on existing pole installation. Use DCS 12 00 10 09 for ground coil application on new pole installation.

Sheet 1 of 2

TRANSFORMERS
12kV – 3 Phase – 3 or 4 Wire
750 kVA

13 12 58 02
Sheet 2 of 2

		Std. / Stk. No.	Description	13 12 58 02	
	A	54 07 208	Switch, Fused, Open Type		3
	B	41 02 351	Pole, Stub, 35', Class 1		1
	C	23 17 174	Platform, Trans., 8'-0"		1
	D	41 01 008	Crossarm, 10'		1
	E	23 52 069	Bolt, Mach., 5/8" x 18"		4
	F	23 52 065	Bolt, Mach., 5/8" x 12"		2
	G	23 66 027	Washer, Square, 5/8"		20
6	H	04 00 20 02	Crossarm, 8' W/ 60" V Brace		1
6	I	23 62 028	Pin, Insulator		3
	J	25 05 143	Insulator, Vice – Top, 15KV		3
@8	K	12 00 10 **	Grounding Unit		1
@	L	HLC*W	Hot Line Clamp		3
T	M	18 51 025	Primary Leads (Ft.)		35
T	N		Secondary Leads (Ft.) (See 13 00 03 01)		20
T	O	PG*	See 07 00 25 00		4
@	P		Transformer		1
@7	Q		Link, Fuse		3
	R	17 58 054	Bracket, Crossarm, Heavy Duty		3

NOTES:

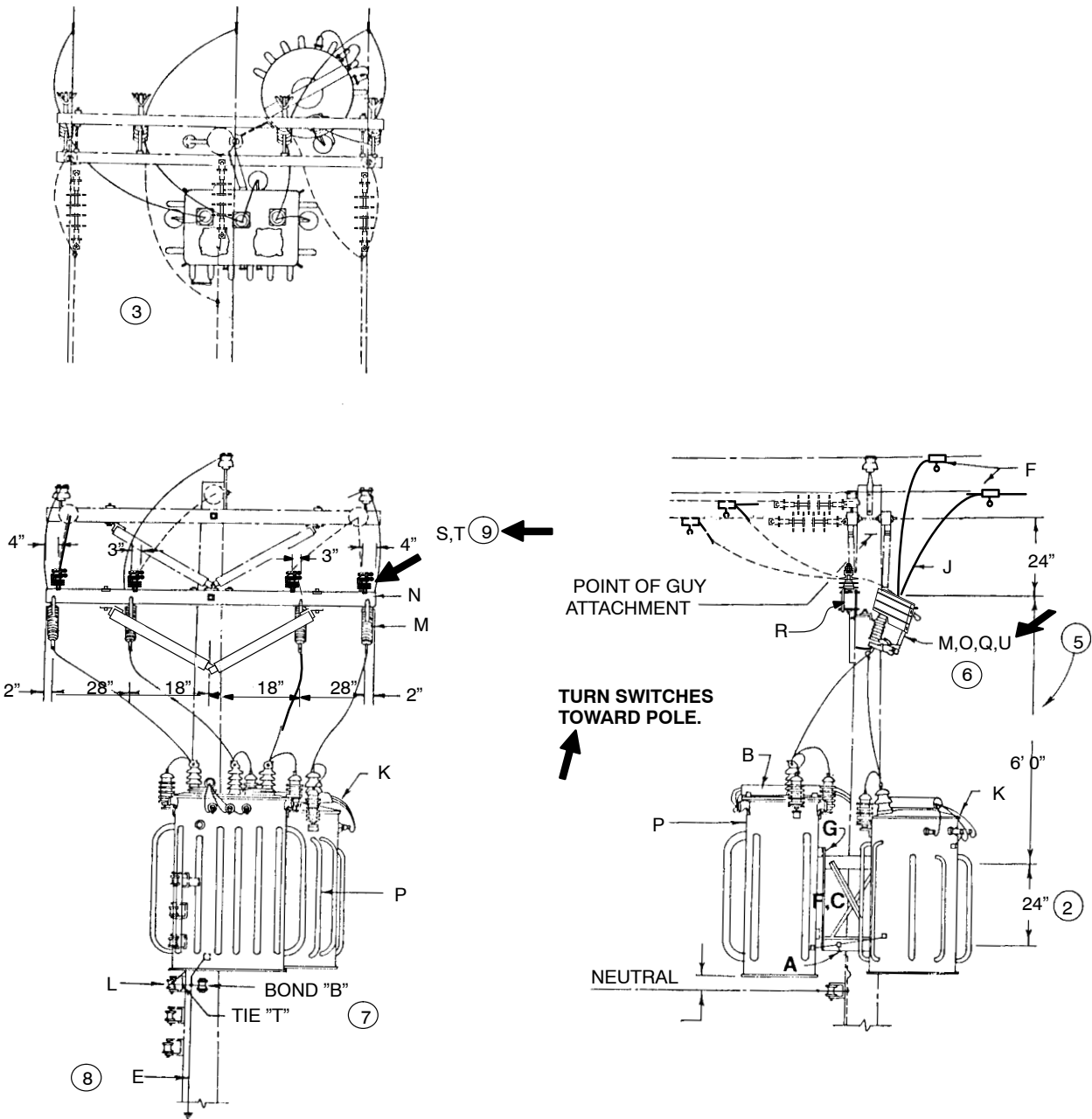
1. If common neutral is not present refer to DCS 13 00 07 02 for installation of grounds.
2. See DCS 13 01 01 ** for underground service arrangement.
3. Instructions for converting a 480/277 voly four wire transformer to 480 volt three wire service are shown on DCS 13 00 01 01.
4. See DCS 13 00 04 01 for dimensions and weights of transformers.
5. See dcs 02 00 02 00 for pole class.
6. Use only one V brace. Keep extra brace for future use.
7. See DCS 10 00 01 01 for fuse selection.
8. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.

TRANSFORMERS

12kV – 120/240 1-Phase and 12 kV 3-Phase Cluster
3400# Max. (One Unit) 5000# Max. Total Weight

13 12 75 02

Sheet 1 of 2



CAUTION-ALL PRIMARY TERMINALS ARE HOT AFTER FIRST PHASE WIRE IS CONNECTED.

TRANSFORMERS
 12kV – 120/240 1-Phase and 12 kV 3-Phase Cluster
 3400# Max. (One Unit) 5000# Max. Total Weight

13 12 75 02

Sheet 2 of 2

		Std. / Stk. No.	Description	13 12 75 02	
	A	23 17 202	Mounting Unit, Cluster		1
	B	12 01 279	Conduit, PVC, 3" (ft.)		5
	C	23 52 097	Bolt, Mach., 3/4" x 12"		2
@8	E	12 00 10 **	Grounding Unit		1
@	F	HLC*W	Hot Line Clamp		4
T	G	23 52 049	Bolt, Mach., 5/8" x 2" OR		2
		23 52 187	Bolt, Mach. 3/4" x 2-1/2"		2
T	H	23 66 031	Washer, Curved, 3/4"		2
T	J	18 51 025	Primary Leads, (ft.)		35
T	K		Secondary Leads (ft.) (See 13 00 03 01)		30
T	L	PG*	See 07 00 25 00		8
	M	54 07 208	Switch – Fused		4
	N	04 00 20 02	Crossarm – 8', w/60" V Brace		1
@6	O		Link, Fuse Single Phase Transformer		1
@	P		Transformer (see 13 00 01 02)		2
@6	Q		Link, Fuse Three Phase Transformer		3
	R	17 58 054	Bracket, Crossarm, Heavy Duty		4
@9	S	25 05 143	Insulator, Vice-Top, 15kv		4
@9	T	23 62 028	Pin, Insulator		4
	U	23 17 411	Cover, Cutout, 100A		4

NOTES:

1. Single phase transformer shall be connected to outside phase only.
2. The 3Ø transformer must have 24" spacing between mounting lugs, and must be equipped for direct pole mounting.
3. Mount cluster bracket on pole on angle such that mounting face for 3Ø transformer is parallel with crossarm.
4. Measure distance between mounting slots on cluster bracket and drill pole so that weight rests evenly on both bolts.
5. This dimension may be reduced for existing installations to 4'0".
6. See DCS 10 00 01 01 for fuse selection.
7. If common neutral is not present refer to DCS 13 00 07 02 for installation of grounds.
8. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
9. Insulators are only required for installation on a dead-end structure.

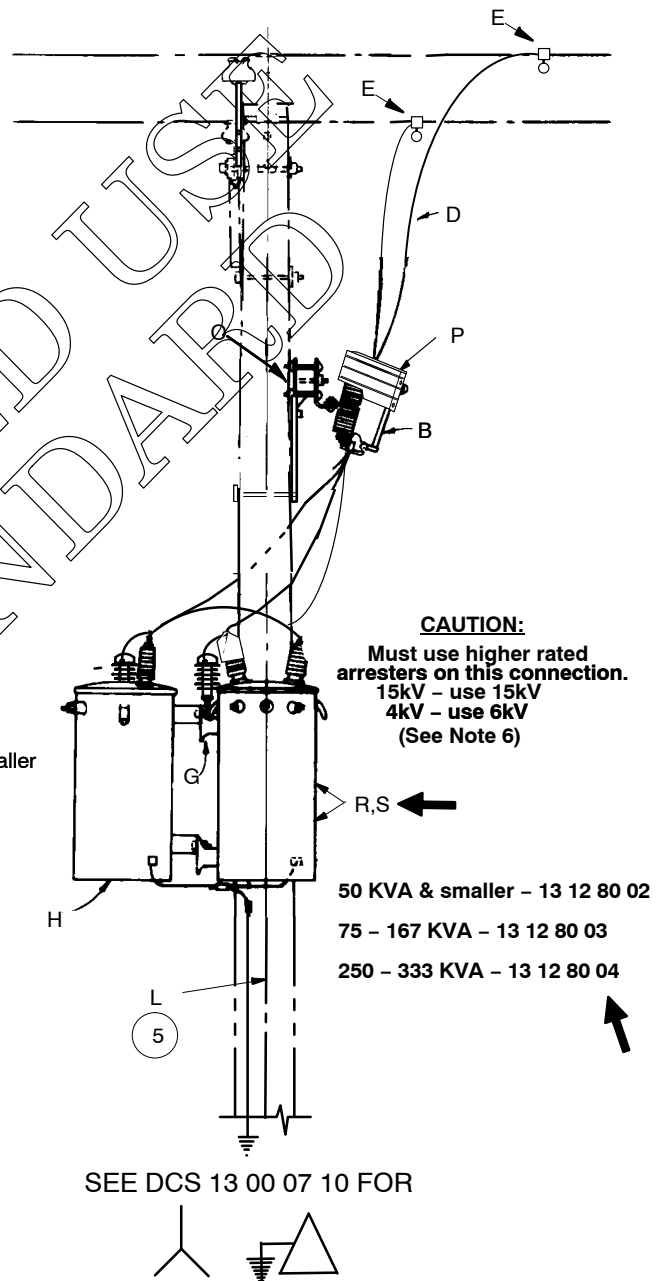
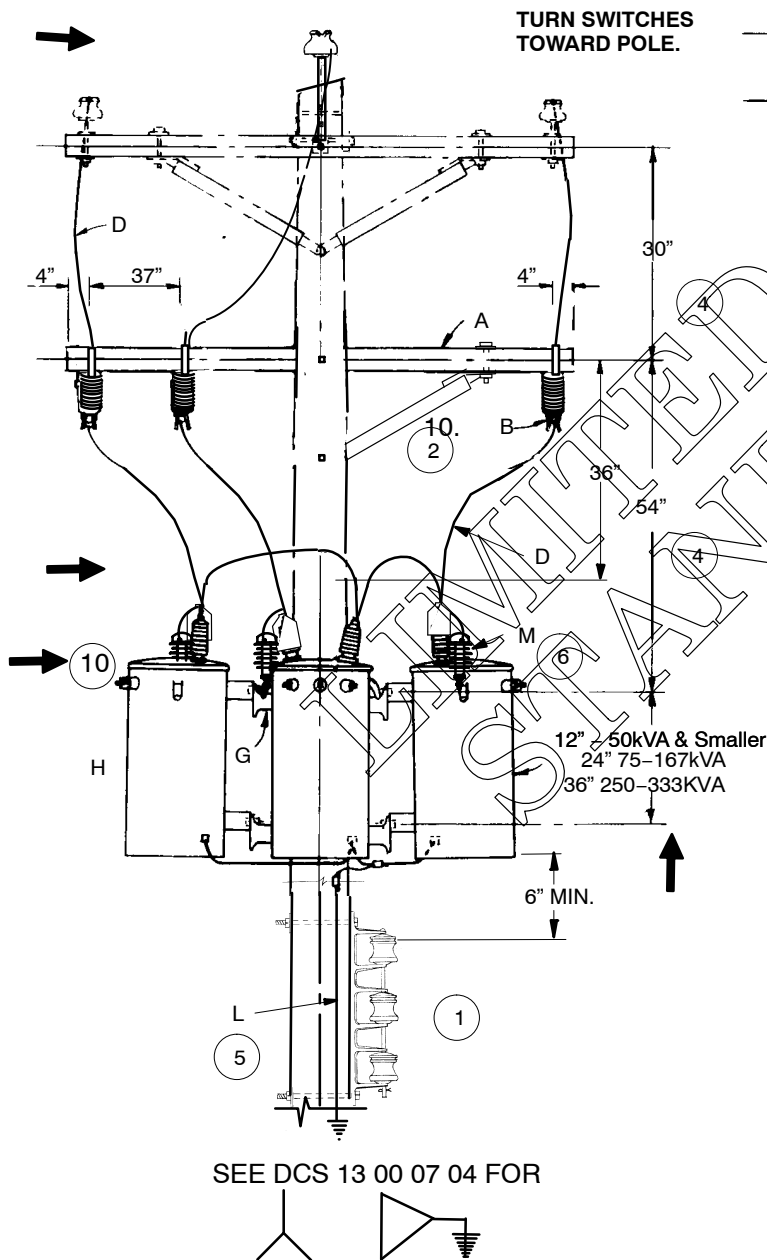
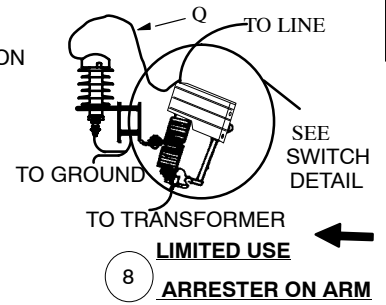
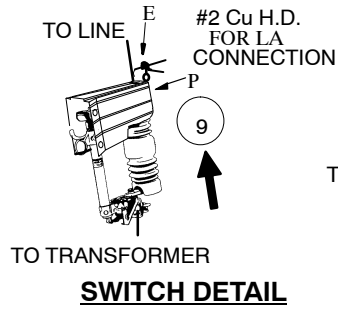
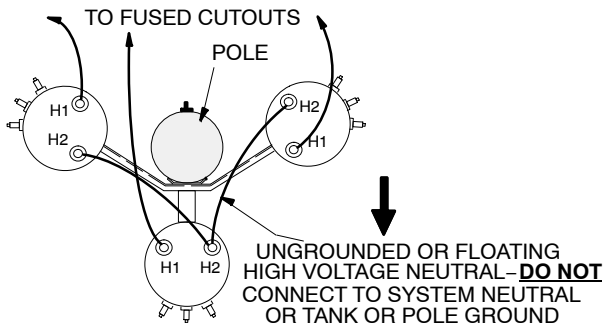
TRANSFORMERS

Three Single Phase Cluster Mounted 15kV and Below Grounded Wye Primary Systems

13 12 80 **

Sheet 1 of 2

FLOATING WYE PRIMARY CONNECTION



CAUTION:
Must use higher rated
arresters on this connection.
15kV - use 15kV
4kV - use 6kV
(See Note 6)

50 KVA & smaller - 13 12 80 02
75 - 167 KVA - 13 12 80 03
250 - 333 KVA - 13 12 80 04

TRANSFORMERS

Three Single Phase Cluster Mounted 15kV and Below Grounded Wye Primary Systems

13 12 80 **

Sheet 2 of 2



		Std. / Stk. No.	Description	13 12 80 **	02	03	04
2	A	04 00 20 03	Crossarm 10' w/ 60" V Brace		1	1	1
7	B	54 07 208	Switch Fused 100A 15kV		3	3	3
T	D		Primary Leads (ft.) (See 13 00 03 01)		40	40	40
@9	E	HLC*W	Hot Line Clamp		6	6	6
	G	23 17 209	Mounting Unit 3 Pos. Light (Up To Three 50 KVA Trans)		1		
		23 17 202	Mounting Unit 3 Pos. Heavy (Three 75-167 KVA Trans)			1	
		23 17 354	Mounting Unit 3 Pos. Xtra Heavy (Three 250- 333 KVA)				1
@	H		Transformer (see 13 00 01 02)		3	3	3
T	J		Secondary Leads (Ft.) (See 13 00 03 01)				
T	K	PG*	See 07 00 25 00		1	1	1
@5	L	12 00 10 **	Grounding Unit		1	1	1
@6	M	10 01 184	Arresters, 6kV		3	3	3
		10 01 188	Arresters, 15kV		3	3	3
@3	N		Link, Fuse		3	3	3
8	O	17 58 054	Bracket, Crossarm, Heavy Duty		3	3	3
	P	23 17 411	Cover - Cutout		3	3	3
@8	Q	18 51 021	Wire #6 CU, S.D. Poly Covered (ft.)		6	6	6
	R	23 52 219	Bolt, Mach., 3/4"x 14"		2	2	
	S	23 66 031	Washer, Curved, 3/4"		2	2	

NOTES:.

- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- Use only one V brace. Keep the extra brace for future use.
- See DCS 10 00 01 01 for fuse selection.
- These dimensions may be reduced to 24" and 48" for installation on existing pole.
- Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
- For 7.2, 7.62, and 7.97 kV transformers use 15 kV arrester stock code 10 01 188. For 2.4 kV transformers use 6kV arrester stock code 10 01 184.
- For transformer banks greater than 500 KVA on 4KV circuits, substitute 200A fused switches stock #54 07 209.
- Use only for installations where arresters cannot be mounted on the transformer tanks. Substitute cross arm bracket with stock #23 56 088 and mount arresters on cross arm back-to-back with the fused switches. See note 9 for avian protection requirements.
- For all of Illinois and locations in Missouri where additional avian protection is needed, omit the #2 bare CU stud and hotline clamp E and connect the #6 CU poly covered arrester lead wire Q directly to the fused switch connector.
- 2400/4160 Y Transformers may have sidewall or cover mounted HV bushings. If sidewall mounted bushings:
 - Build according to this DCS except use 2.5KV primary lead wire table 2.2 of DCS 13 00 03 01 or
 - If pole is congested, 2.5 KV primary lead wire in conduit similar to DCS 13 04 54 01.

**DISTRIBUTION
CONSTRUCTION STANDARDS**



ENG: DG
REV. NO: 9
REV. DATE: 06/10/15

TRANSFORMERS

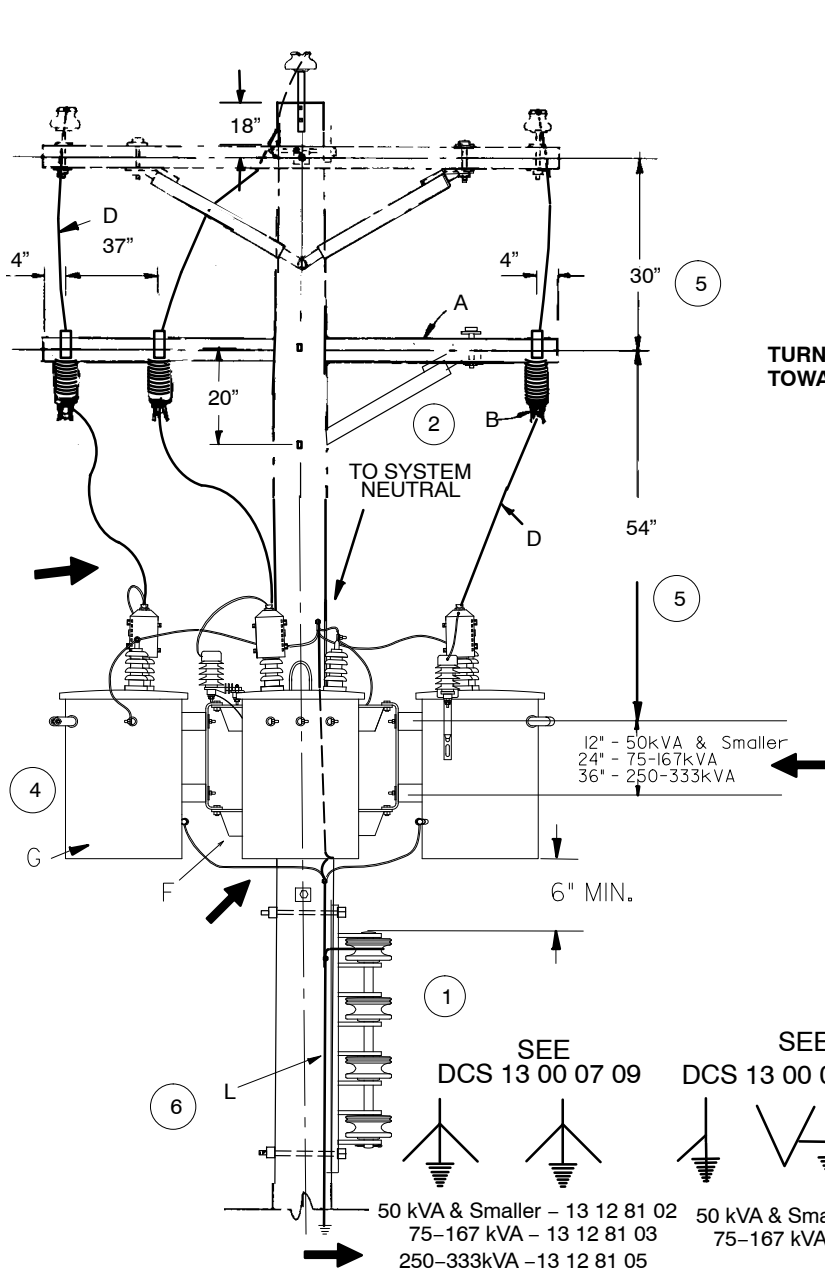
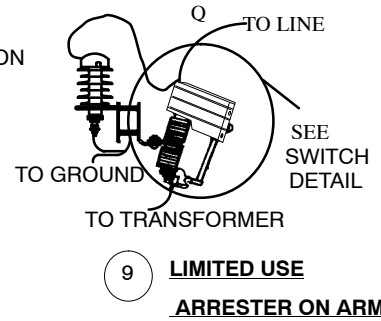
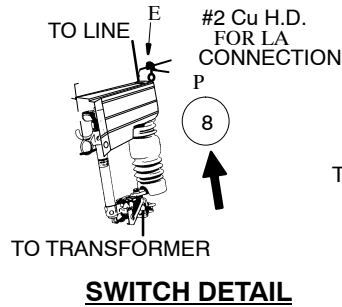
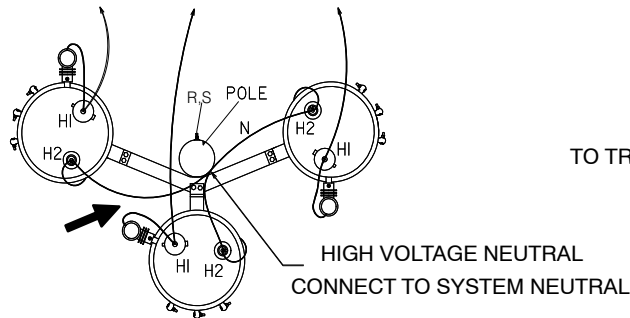
Three Single Phase Cluster Mounted

15 kV and Below Grounded Wye Primary Systems

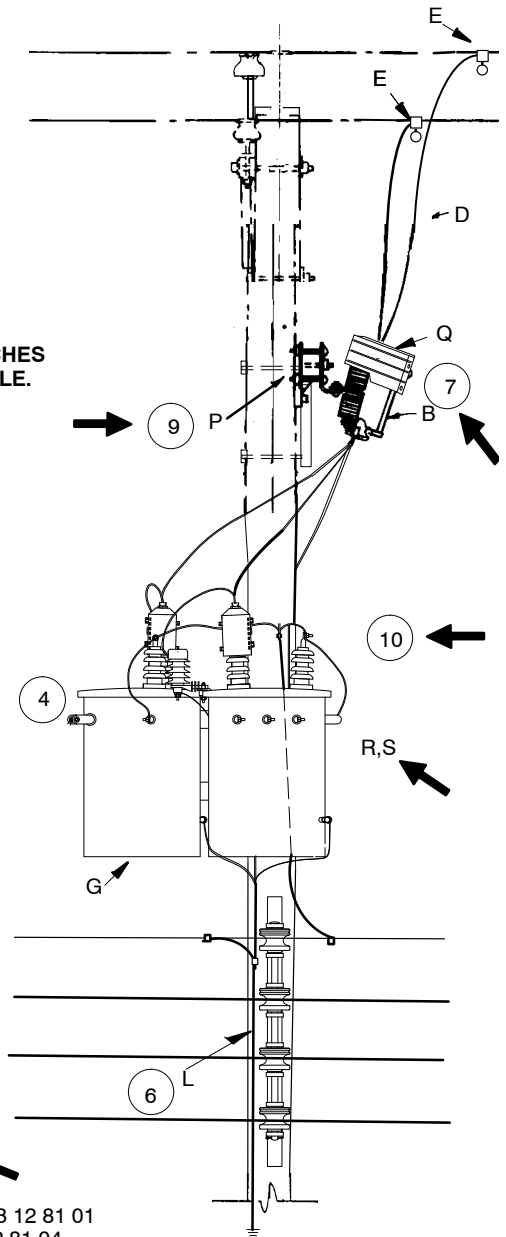
13 12 81 **

Sheet 1 of 2

GROUNDWYE PRIMARY CONNECTION TO FUSED CUTOUTS AND COMMON NEUTRAL



TURN SWITCHES
TOWARD POLE.



TRANSFORMERS
Three Single Phase Cluster Mounted
15 kV and Below Grounded Wye Primary Systems

13 12 81 **

Sheet 2 of 2



		Std. / Stk. No.	Description	13 12 81**	01	02	03	04	05
2	A	04 00 20 03	Crossarm 10' w/ 60" V Brace		1	1	1	1	1
7	B	54 07 208	Switch, Fused, 100A, 15kV		2	3	3	2	3
T10	D		Primary Leads (ft.) (See 13 00 03 01)		30	40	40	30	40
@8	E	HLC*W	Hot Line Clamp		4	6	6	4	6
	F	23 17 209	Mounting Unit 3 Pos. Light (Up To Three 50 KVA Trans.)		1	1			
		23 17 202	Mounting Unit 3 Pos. Heavy (Three 75–167 KVA Trans.)				1	1	
		23 17 354	Mounting Unit 3 Pos. Xtra Hvy (Three 250–333 KVA)						1
@	G		Transformer		2	3	3	2	3
@T	H		Secondary Leads (Ft.) (See 13 00 03 01)						
T	K	PG*	See 07 00 25 00		1	1	1	1	1
@6	L	12 00 10 **	Grounding Unit		1	1	1	1	1
@3	N		Link, Fuse		2	3	3	2	3
@4	O	16 01 301	Tag, Banked Transformer			3	3		3
9	P	17 58 054	Bracket, Crossarm, Heavy Duty		2	3	3	2	3
7	Q	23 17 411	Cover – Cutout		2	3	3	2	3
	R	23 52 219	Bolt, Mach., 3/4" x 14"		2	2	2	2	
	S	23 66 031	Washer, Curved, 3/4"		2	2	2	2	

NOTES:

1. See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
2. Use only one V Brace. Keep the extra brace for future use.
3. See DCS 10 00 01 01 for fuse selection.
4. Use tag, Stock #16 01 301 to identify transformers that have been rewired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally. See DCS 13 00 07 09.
5. These dimensions may be reduced to 24" and 48" for installation on existing pole.
6. Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
7. For transformer banks greater than 500 KVA on 4KV circuits, substitute 200A fused switches stock #54 07 209.
8. For all of Illinois and locations in Missouri where additional avian protection is required, omit #2 CU HD wire and hot line clamps and connect #6 CU poly covered arrester lead wire directly to the fused switch connector.
9. ONLY FOR INSTALLATION WHERE ARRESTERS CANNOT BE MOUNTED ON THE TRANSFORMER TANKS, substitute crossarm bracket with stock #23 56 088 and mount arresters on crossarm back-to-back with the fused switches. See note 8 for avian protection.
10. 2400/4160Y transformers may have side wall or cover mounted HV bushings. If side wall mounted bushings:
 - a. Build according to this DCS except use 2.5 KV primary lead wire per Table 2.2 of DCS 13 00 03 01, or
 - b. If pole is congested, 2.5KV primary lead wire in conduit similar to DCS 13 04 54 01.

TRANSFORMERS

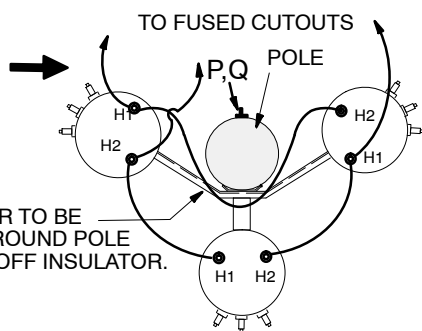
Three Single Phase Cluster Mounted

→ 15kV and Below Delta Primary Systems

13 12 82 **

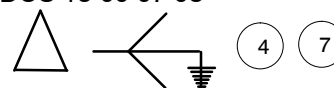
Sheet 1 of 2

DELTA PRIMARY CONNECTION

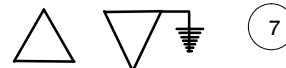


NOTE:
THIS JUMPER TO BE
CARRIED AROUND POLE
ON STAND-OFF INSULATOR.

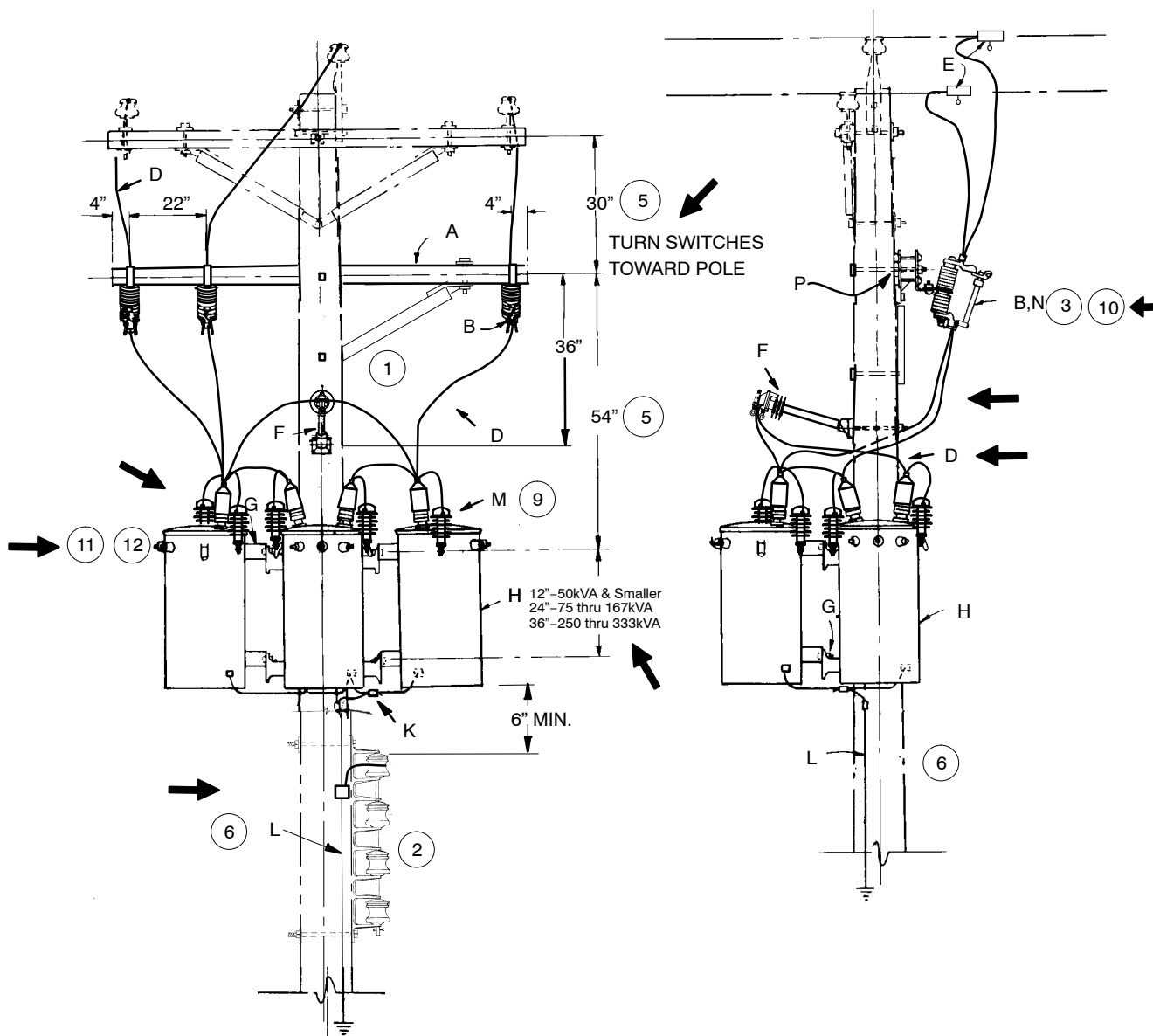
DCS 13 00 07 08



DCS 13 00 07 05



DCS 13 00 07 12



TRANSFORMERS
Three Single Phase Cluster Mounted
→ 15kV and Below Delta Primary Systems

13 12 82 **

Sheet 2 of 2



		Std. / Stk. No.	Description	13 12 82 **	01	02	03	04	05
1	A	04 00 20 03	Crossarm 10' w/ 60" V brace		1	1	1	1	1
10	B	54 07 208	Switch Fused 100A 15kV		2	3	3	2	3
T11	D	18 51 025	Primary Leads (Ft.)		30	40	40	30	40
@	E	HLC*W	Hot Line Clamp		2	3	3	2	3
	F	06 12 20 04	Insulator, Standoff 18" LD		1	1	1	1	1
	G	23 17 209	Mounting Unit 3 Pos. Light (Up To Three 50 KVA Trans.)		1	1			
		23 17 202	Mounting Unit 3 Pos. Heavy (Three 75–167 KVA Trans.)				1	1	
		23 17 354	Mounting Unit 3 Pos. Xtra Hvy. (Three 250–333 kVA)						1
@	H		Transformer		2	3	3	2	3
@T	J		Secondary Leads (Ft.) (See 13 00 03 01)						
T	K	PG*	See 07 00 25 00		1	1	1	1	1
@6	L	12 00 10 **	Grounding Unit		1	1	1	1	1
@9	M		Lightning Arresters (See 12 00 01 01)		2	3	3	2	3
@3	N		Link, Fuse		2	3	3	2	3
@4	O	16 01 301	Tag, Banked Transformer		2	3	3	2	3
	P	17 58 054	Bracket, Crossarm, Heavy Duty		2	3	3	2	3
	Q	23 52 219	Bolt, Mach, 3/4" X 14"		2	2	2	2	
	R	23 66 031	Washer, Curved 3/4"		2	2	2	2	

NOTES:

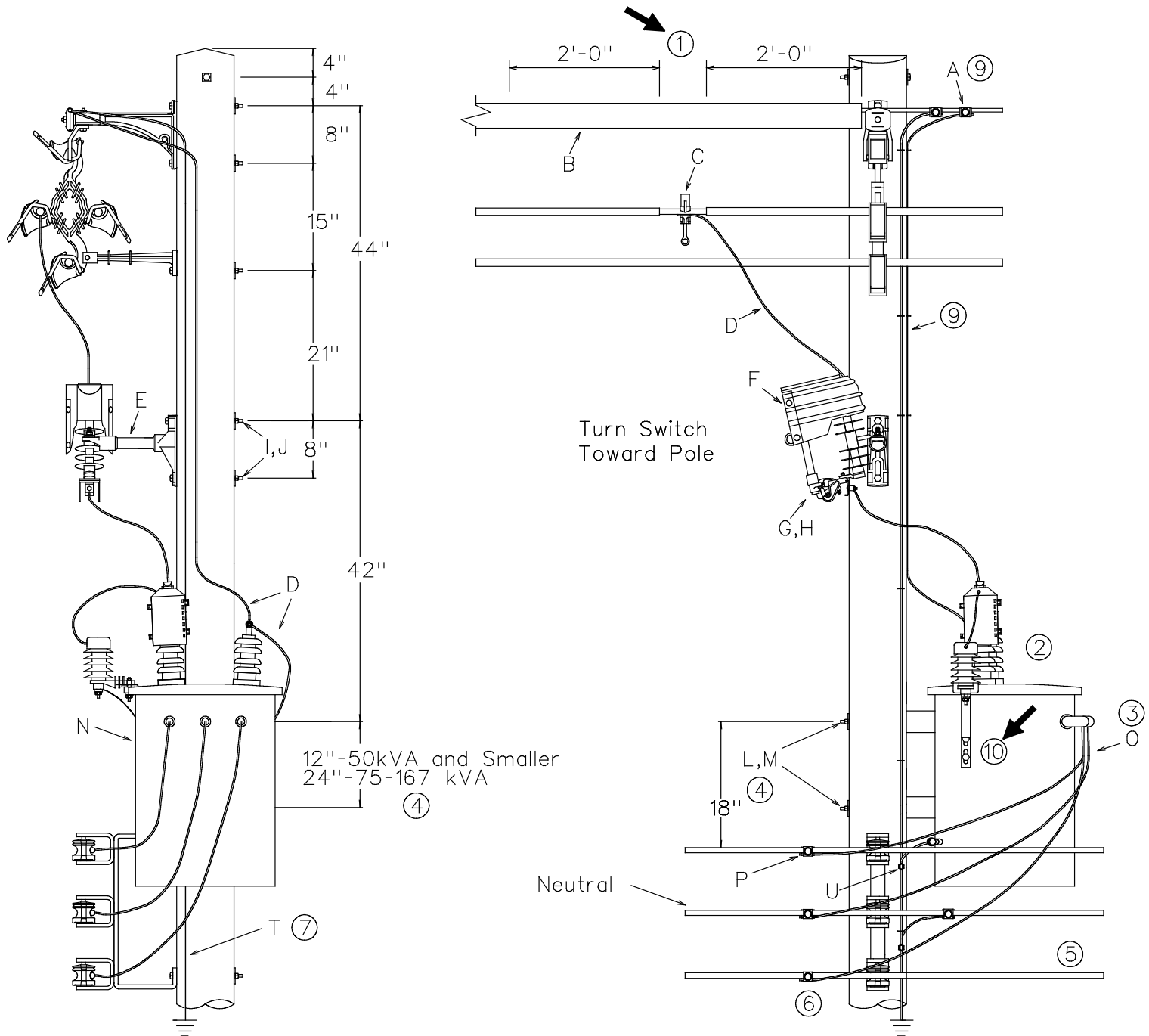
- Use only one V-brace. Keep the extra brace for future use.
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- See DCS 10 00 01 01 for fuse selection.
- Use tag, Stock #16–01–301 to identify transformers that have been rewired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally. See DCS 13 00 07 08.
- These dimensions may be reduced to 24" and 48" for installation on an existing pole.
- Use DCS 12 00 10 01 for ground coil application on new pole installation and DCS 12 00 10 02 for ground rod application on existing pole installation.
- For closed delta primary applications: 50 kVA and smaller – use 13 12 82 02
75 kVA thru 167 kVA – use 13 12 82 03
250 kVA thru 333 kVA – use 13 12 82 05
- For open delta primary applications: 50 kVA and smaller – use 13 12 82 01
75 kVA thru 167 kVA – use 13 12 82 04
- 14.4kV transformers must have arresters ordered separately and field installed. Use arrester Stock #10–01–143 with tank mounting bracket Stock #23–06–122.
- For transformer banks greater than 500 kVA on 4 kV circuits, substitute 200 A fused switches stock #54–07–209.
- 2400/4160Y transformers may have side wall or cover mounted HV bushings. If side wall mounted bushings:
 - Build according to this DCS except use 2.5 kV primary lead wire per Table 2.2 of DCS 13 00 03 01, or
 - If pole is congested, 2.5 kV primary lead wire in conduit similar to DCS 13 04 54 01.
- If arresters cannot be mounted on transformer tanks, refer to switch details and associated notes on DCS 13 12 81**.

TRANSFORMERS

15kV & Below - Spacer Cable - Grounded Wye Primary
1 to 167kVA - Single Phase - Protected

13 20 00 01

Sheet 1 of 2



TRANSFORMERS
15kV & Below – Spacer Cable – Grounded Wye Primary
1 to 167kVA – Single Phase – Protected

13 20 00 01

Sheet 2 of 2

		Std. /Stk. No.	Description	13 20 00 01	
9	A	17 51 137	Connector, PG		1
1	B	69 58 293	Line DUC (Messenger Cover), Black (Each)		1
@	C	17 62 088	Hot Line Clamp 1/0 through 477 Spacer Cable		1
		17 62 143	Hot Line Clamp 795 Spacer Cable		1
	D	18 51 025	Wire, Trans. Riser #4, S.D. Poly Covered (FT.)		20
	E	23 06 127	Bracket, Cutout, Single-Position		1
	F	23 17 411	Cover, Cutout, 100 Amp		1
8	G	54 07 208	Switch, Fused, 100 Amp		1
@	H		Link, Fuse – See Single-Phase Trans. Table in 10 00 01 01		1
	I	23 52 066	Bolt, Machine, 5/8" x 14" (w/nut)		2
	J	23 66 027	Washer, Square, 5/8", 2 1/4" x 2 1/4" x 3/16" Thick		2
T	L	23 52 066	Bolt, Machine, 5/8" x 14" (w/nut) (50kVA & Below)		2
		23 52 219	Bolt, Machine, 3/4" x 14" (w/nut) (75 & 167kVA)		2
T	M	23 66 027	Washer, Square, 5/8", 2 1/4" x 2 1/4" x 3/16" Thick (50kVA & Below)		2
		23 66 031	Washer, Square, 3/4", Curved (75 to 167kVA)		2
@	N		Transformer – See 13 00 01 02		1
T	O		Secondary Leads (FT.) (See 13 00 03 01)		12
T	P	PG*W	Connector, Lead Wire Connections (See 07 00 25 00)		3
@7	T	12 00 10 02	7#10 Grounding Unit With Ground Rod		1
	U	17 54 373	Connector, Split Bolt		1

NOTES:

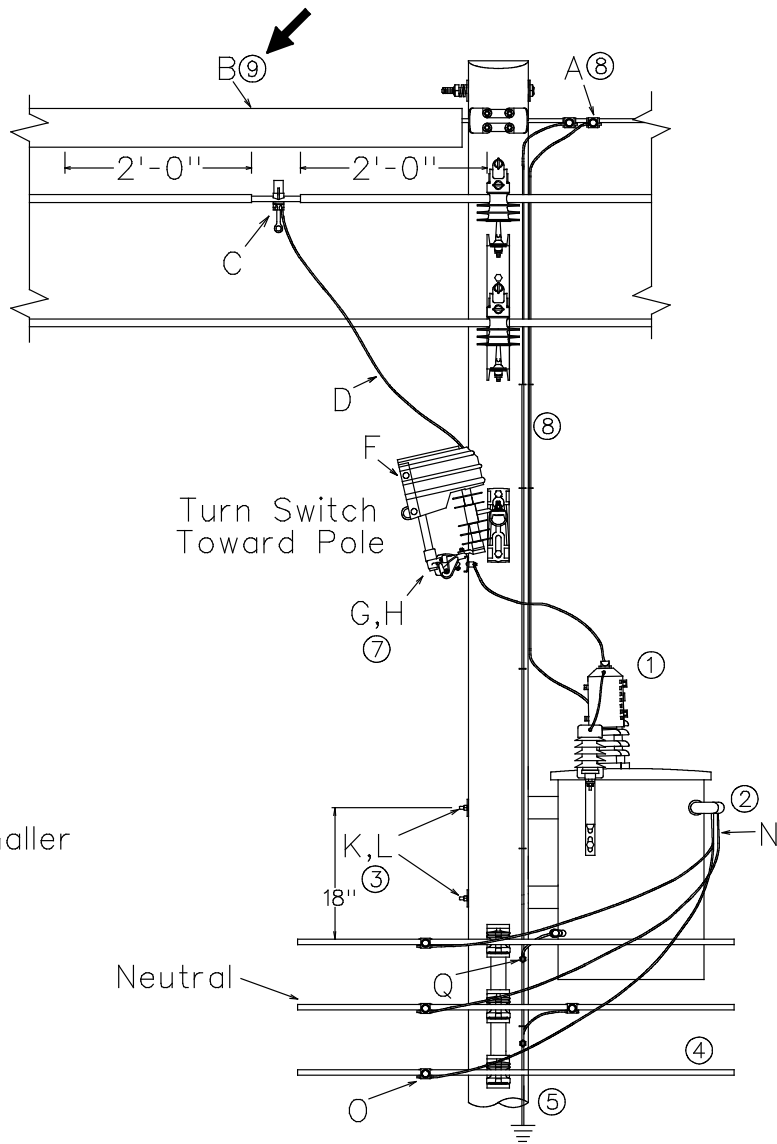
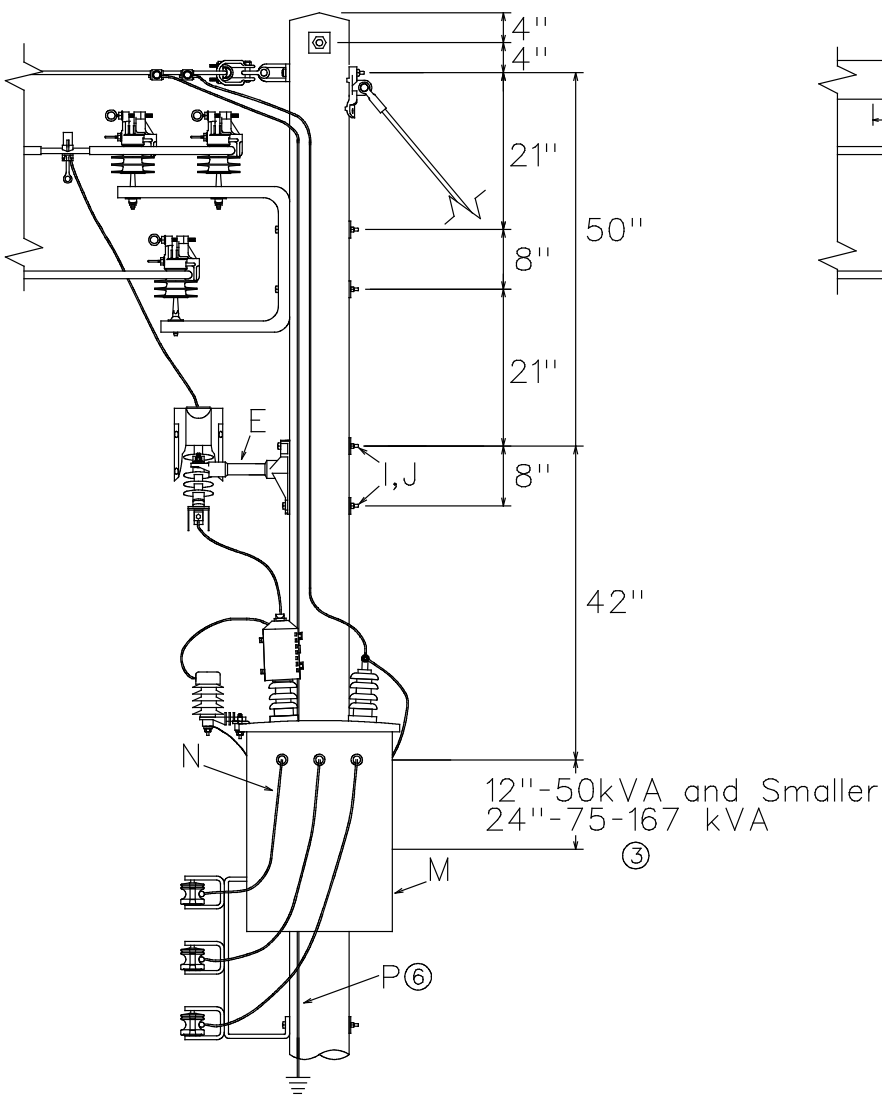
1. Stagger taps and other areas where the covering has been removed to provide a minimum 2'-0" horizontal separation between the opening and another opening or ground point. Install line duc over the messenger anywhere the cable covering is stripped to maintain the required 2'-0" of horizontal separation.
2. Transformer may be received with the LA mounted beside either the H1 or H2 bushing. Both positions are acceptable. The arrester may be shifted to the most convenient side of tank.
3. See DCS 13 00 06 02 for 120/240 or 240/480V 3-wire. See DCS 13 00 06 03 for 240 or 120V 2-wire.
4. Measure the distance between the mounting slots and drill so that the transformer rests evenly on both bolts. This distance is approximately 12 inches for transformers 50kVA and below, and 24 inches for 75kVA and above. The secondary rack position does not change.
5. See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
6. If pole is NOT truck accessible, make secondary connections on the climbing side of the pole.
7. Install a pole ground if not already installed on pole.
8. If installing a CSP transformer, a fused switch shall be installed.
9. Note that the messenger also serves as the system neutral, so the transformer high voltage neutral must extend from the neutral bushing up to the messenger separate from the pole ground. The transformer neutral connection to the messenger shall be the furthest from the pole and separated from the pole ground connection as far as practical.
10. If an existing transformer does not have the tapped lug holes for a tank mounted arrester, refer to DCS 12 12 05 **.

CONFIGURATIONS

13 20 03 01

15kV & Below - Spacer Cable - Grounded Wye Primary
1 to 167kVA - Single Phase - Protected - Angle Structure 7° - 60°

Sheet 1 of 2



CONFIGURATIONS**13 20 03 01**

15kV & Below – Spacer Cable – Grounded Wye Primary
 1 to 167kVA – Single Phase – Protected – Angle Structure 7°– 60°

Sheet 2 of 2

		Std. / Stk. No.	Description	13 20 03 01	01
@	A	17 51 137	Connector, PG		1
	B	69 58 293	Line Duc (Messenger Cover), Black, 8' Long (Each)		1
	C	17 62 088	Hot Line Clamp 1/0 through 477 Spacer Cable		1
		17 62 143	Hot Line Clamp 795 Spacer Cable		1
@	D	18 51 025	Wire, Trans. Riser #4, S.D. Poly Covered (Ft.)		20
	E	23 06 127	Bracket, Cutout, Single-Position		1
	F	23 17 411	Cover, Cutout, 100 Amp		1
	G	54 07 208	Switch, Fused, 100 Amp		1
T	H		Link, Fuse (See 10 00 01 01)		1
	I	23 52 066	Bolt, Machine, 5/8" x 14" (w/ nut)		2
	J	23 66 027	Washer, Square, 5/8", 2 1/4" x 2 1/4" x 3/16" Thick		2
	K	23 52 066	Bolt, Machine, 5/8" x 14" (w/ nut) (50kVA & Below)		2
T		23 52 219	Bolt, Machine, 3/4" x 14" (w/ nut) (75 to 167kVA)		2
	L	23 66 027	Washer, Square, 5/8", 2 1/4" x 2 1/4" x 3/16" Thick (50kVA & Below)		2
		23 66 031	Washer, Square, 3/4", Curved (75 to 167kVA)		2
	M		Transformer – See 13 00 01 02		1
T	N		Secondary Leads (FT.) (See 13 00 03 01)		12
	O	PG*W	Connector, Lead Wire Connections (See 07 00 25 00)		3
	P	12 00 10 02	7#10 Grounding Unit With Ground Rod		1
	Q	17 54 373	Connector, Split Bolt		1

NOTES

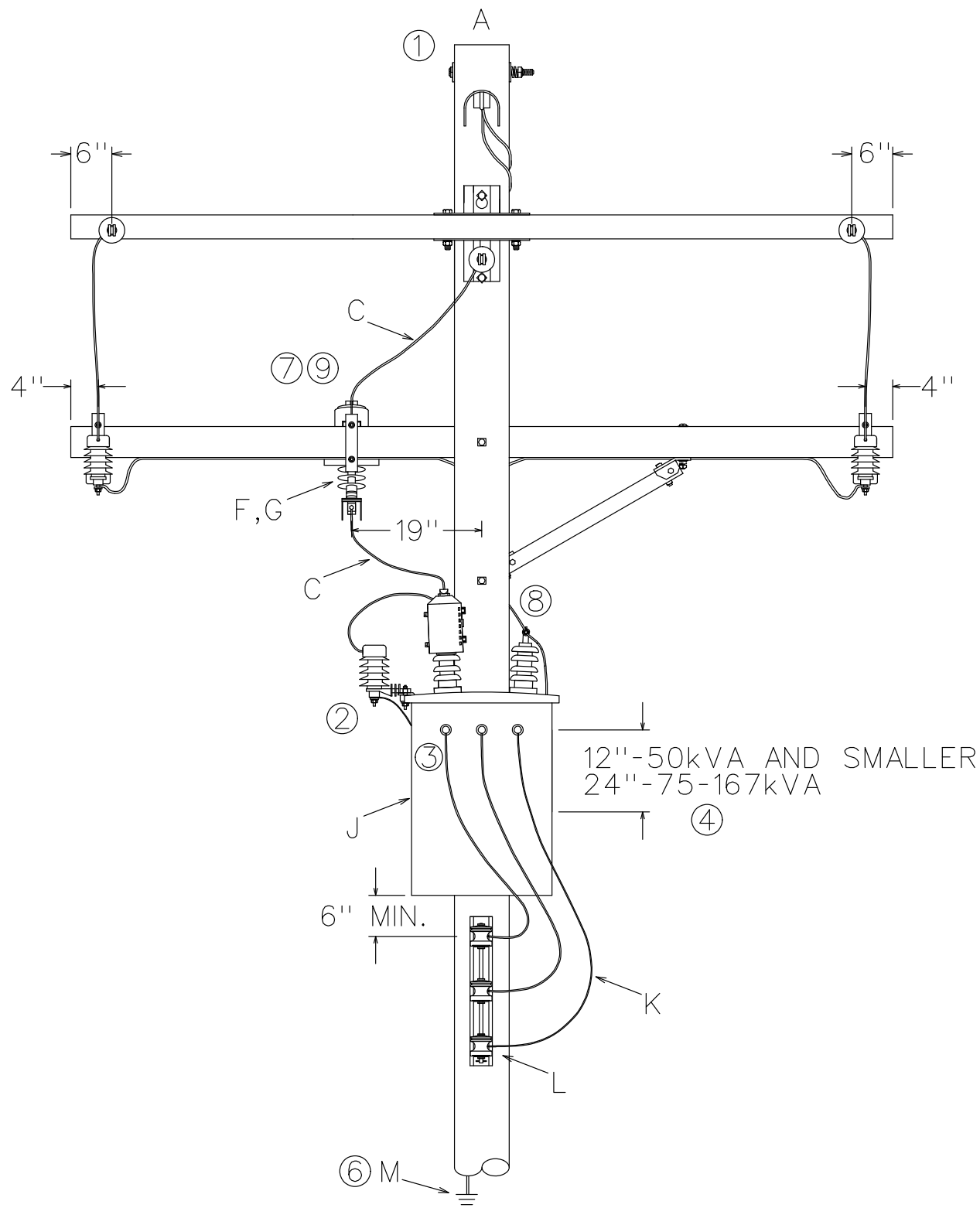
- Transformer may be received with the LA mounted beside either the H1 or H2 bushing. Both positions are acceptable. The arrester may be shifted to the most convenient side of tank.
- See DCS 13 00 06 02 for 120/240 or 240/480V 3-wire. See DCS 13 00 06 03 for 240 or 120V 2-wire.
- Measure the distance between the mounting slots and drill so that transformer rests evenly on both bolts. This distance is approximately 12 inches for transformers 50kVA and below, and 24 inches for 75kVA and above. The secondary rack position does not change.
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- If pole is NOT truck accessible, make secondary connections on the climbing side of the pole.
- Install a pole ground if not already installed on pole.
- If installing a CSP transformer, a fused switch shall be installed.
- Note that the messenger also serves as the system neutral, so the transformer high voltage neutral must extend from the neutral bushing up to the messenger separate from the pole ground. The transformer neutral connection to the messenger shall be the furthest from the pole and separated from the pole ground connection as far as practical.
- Stagger taps and other areas where the covering has been removed to provide a minimum 2'-0" horizontal separation between the opening and another opening or ground point. Install line duc over the messenger anywhere the cable covering is stripped to maintain the required 2'-0" of horizontal separation.

TRANSFORMERS

15kV & Below – Spacer Cable – 3 Phase Dead End Structure
1 to 167kVA – Single Phase – Protected

13 20 10 01

Sheet 1 of 3

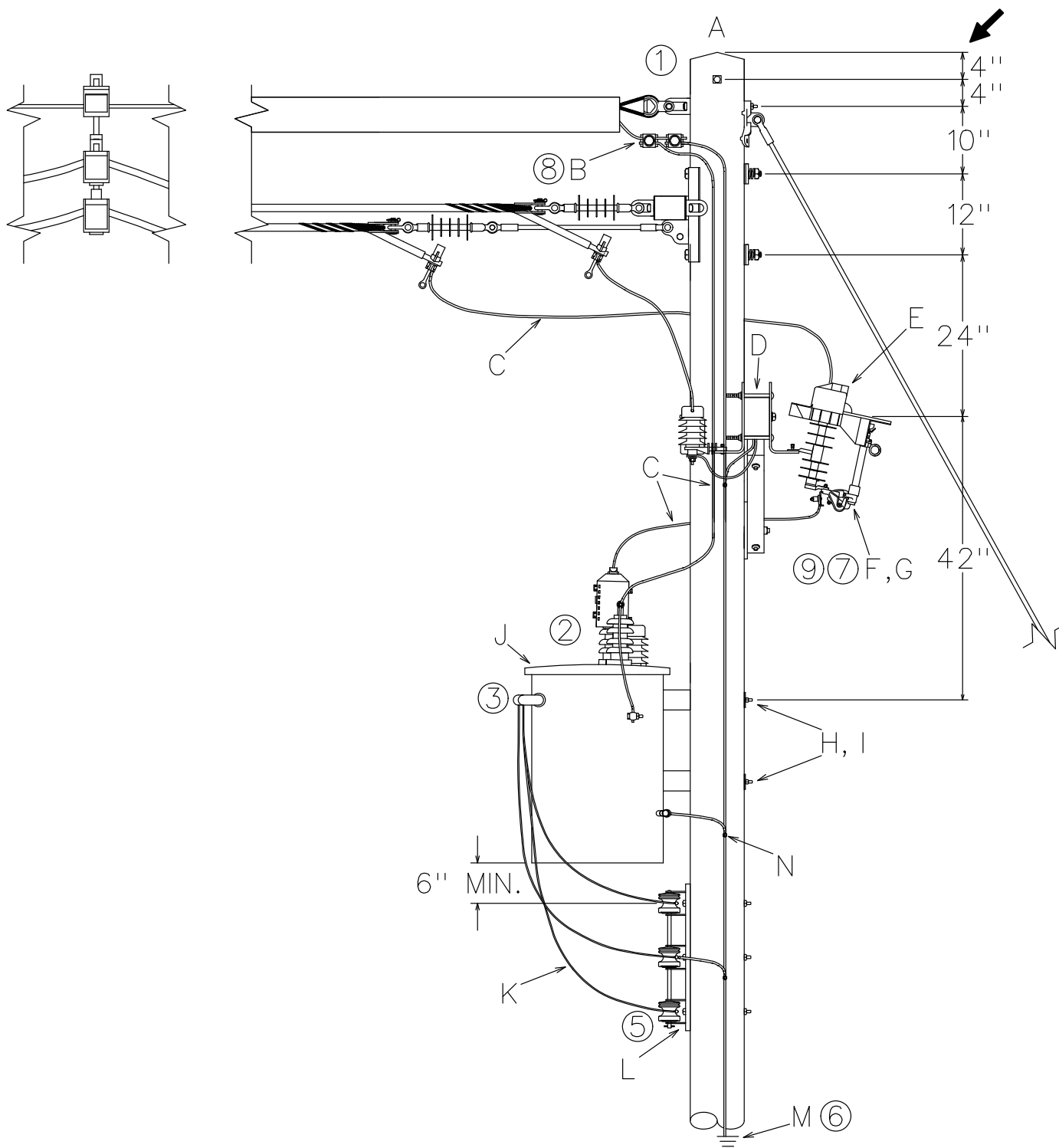


TRANSFORMERS

15kV & Below – Spacer Cable – 3 Phase Dead End Structure
1 to 167kVA – Single Phase – Protected

13 20 10 01

Sheet 2 of 3



TRANSFORMERS

15kV & Below – Spacer Cable – 3 Phase Dead End Structure
1 to 167kVA – Single Phase – Protected

13 20 10 01

Sheet 3 of 3

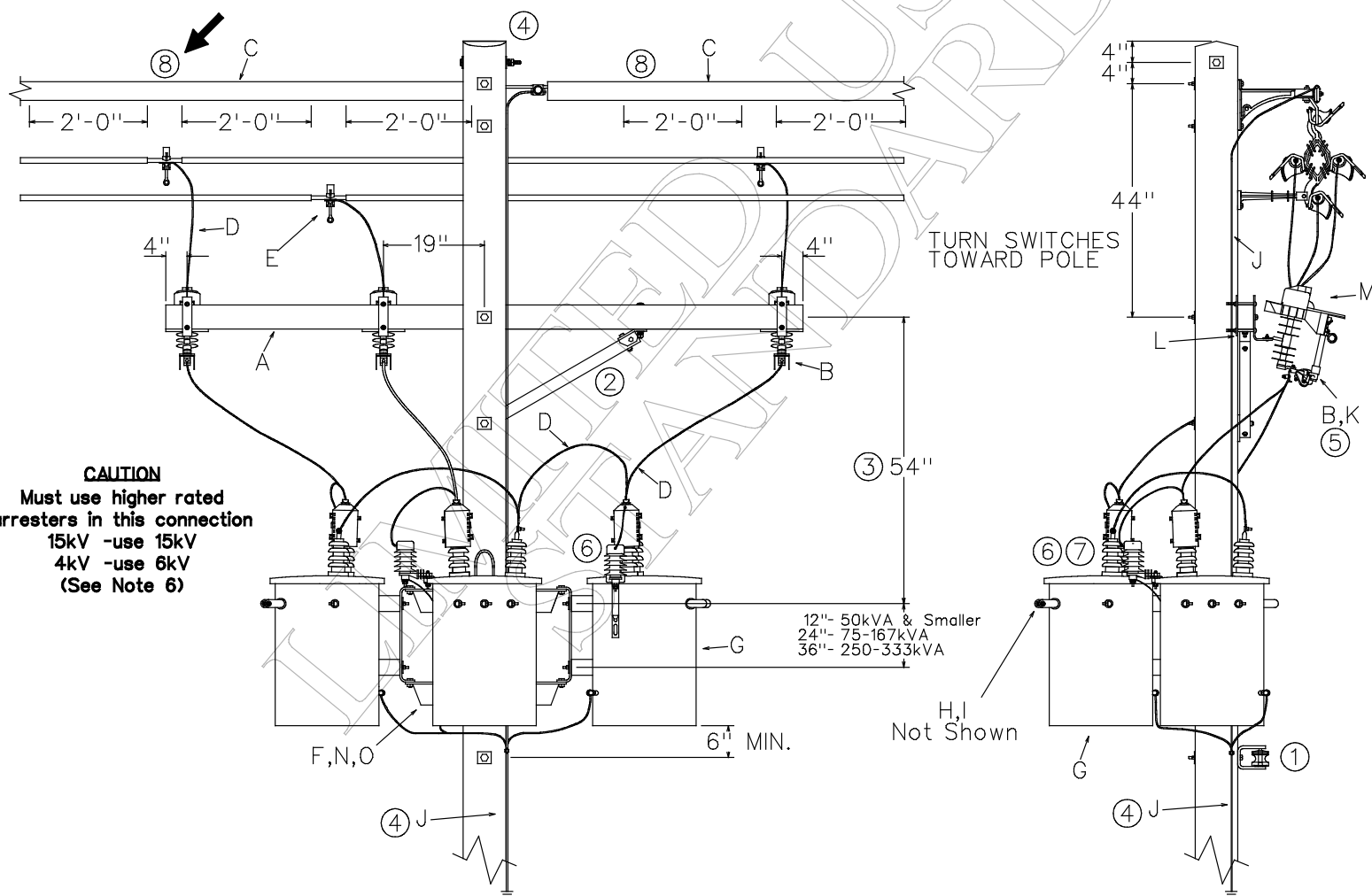
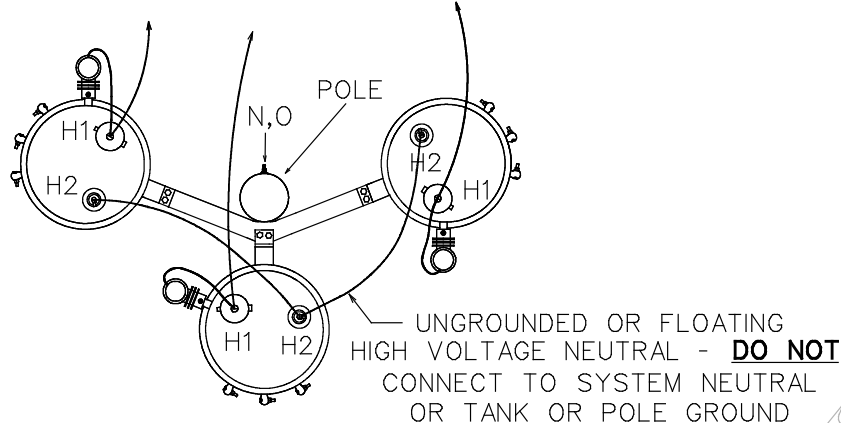
		Std./Stk. No.	Description	13 20 10 01
@1	A	03 20 10 01	15kV & Below – Spacer Cable Single Circuit – Dead End Structure	
8	B	17 51 137	Connector, PG	1
	C	18 51 025	Wire, Trans. Riser #4, S.D. Poly Covered (Ft.)	20
	D	17 58 054	Bracket, Crossarm, Cutout	1
	E	23 17 411	Cover, Cutout, 100 Amp	1
7, 9	F	54 07 208	Switch, Fused, 100 Amp	1
@	G		Link, Fuse – See Single Phase Transformer Table in 10 00 01 01	1
T	H	23 52 066	Bolt, Machine, 5/8" x 14" (w/ nut) (50kVA and Below)	2
		23 52 219	Bolt, Machine, 3/4" x 14" (w/ nut) (75 to 167kVA)	2
T	I	23 66 027	Washer, Square, 5/8", 2 1/4" x 2 1/4" x 3/16", Thick (50kVA and Below)	2
		23 66 031	Washer, Square, 3/4", Curved (75 to 167kVA)	2
@	J		Transformer – See 13 00 01 02	1
T	K		Secondary Leads (FT.) (See 13 00 03 01)	12
T	L	PG*W	Connector, Lead Wire Connections (See 07 00 25 00)	3
@6	M	12 00 10 **	7#10 Grounding Unit	1
	N	17 54 373	Connector, Split Bolt	1

NOTES:

- Construct pole using 03 20 10 01. Mount the equipment arm on the guyed side of the pole as shown and omit one lightning arrester and replace with a switch as specified in this standard. Only two lightning arresters are required on the crossarm for the unprotected phases. The tank mounted arrester will be used to protect the phase that is tapped for the transformer.
- Transformer may be received with the LA mounted beside either the bushing H1 or H2 bushing. Both positions are acceptable. The arrester may be shifted to the most convenient side of the tank.
- See DCS 13 00 06 02 for 120/240 or 240/480V 3-wire. See DCS 13 00 06 03 for 240 or 120V 2-wire.
- Measure the distance between the mounting slots and drill so that the transformer rests evenly on both bolts. This distance is approximately 12 inches for transformers 50kVA and below, and 24 inches for 75kVA and above. The secondary rack position does not change.
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- Use DCS 12 00 10 01 for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.
- If installing a CSP transformer, a fused switch shall be installed.
- Note that the messenger also serves as the system neutral, so the transformer high voltage neutral must extend from the neutral bushing up to the messenger separate from the pole ground. The transformer neutral connection to the messenger shall be the furthest from the pole and separated from the pole ground connection as far as practical.
- Switch may be mounted on any of the three positions on the LA arm depending on which phase is used.

15kV & Below - Spacer Cable - Three Single Phase
Transformers Ungrounded-Wye Primary - Delta Secondary

Sheet 1 of 2



The image shows two circuit symbols. The left symbol is a three-terminal node, represented by a central point with three lines extending outwards at approximately 120-degree angles. The right symbol is a dependent current source, represented by a triangle pointing to the right, with its base on the left and its vertex on the right. The vertex is connected to a ground symbol, which consists of three horizontal lines of decreasing width.

50kVA & Smaller - 13 20 80 01
75kVA - 167kVA - 13 20 80 02
250kVA- 333kVA- 13 20 80 03

DISTRIBUTION CONSTRUCTION STANDARDS



ENG: DG
REV. NO: 1
REV. DATE: 06/19/18

TRANSFORMERS
15kV & Below – Spacer Cable – Three Single Phase
Transformers Ungrounded-Wye Primary – Delta Secondary

13 20 80 **
Sheet 2 of 2

		Std. / Stk. No.	Description	13 20 80 **	01	02	03
2	A	04 00 20 03	Crossarm 10' w/ 60" V Brace		1	1	1
5	B	54 07 208	Switch Fused 100A 15kV		3	3	3
	C	69 58 293	Line DUC (Messenger Cover), Black (ea.)		2	2	2
T	D	18 51 025	Primary Leads (ft.) (See 13 00 03 01)		40	40	40
@	E	17 62 088	Hot Line Clamp 1/0 through 477 Spacer Cable		3	3	3
		17 62 143	Hot Line Clamp 795 Spacer Cable		3	3	3
	F	23 17 209	Mounting Unit, 3 Pos. Light (Up To Three 50 KVA Trans.)		1		
		23 17 202	Mounting Unit, 3 Pos. Heavy (Three 75kVA to 167kVA Trans.)			1	
		23 17 354	Mounting Unit, 3 Pos. Xtra Hvy (Three 250kVA to 333kVA Trans.)				1
@	G		Transformer (See 13 00 01 02)		3	3	3
T	H		Secondary Leads (ft.) (See 13 00 03 01)				
T	I	PG*	Connector, Lead Wire Connections (See 07 00 25 00)				
@4	J	12 00 10 02	Grounding Unit, 7#10 Copperweld With Ground Rod		1	1	1
@	K		Link, Fuse – See Three-Phase Trans. Table in 10 00 01 01		3	3	3
	L	17 58 054	Bracket, Crossarm, Heavy Duty		3	3	3
	M	23 17 411	Cover – Cutout, 100 Amp		3	3	3
	N	23 52 219	Bolt, Mach., 3/4" x 14"		2	2	
	O	23 66 031	Washer, Curved, 3/4"		2	2	

NOTES:

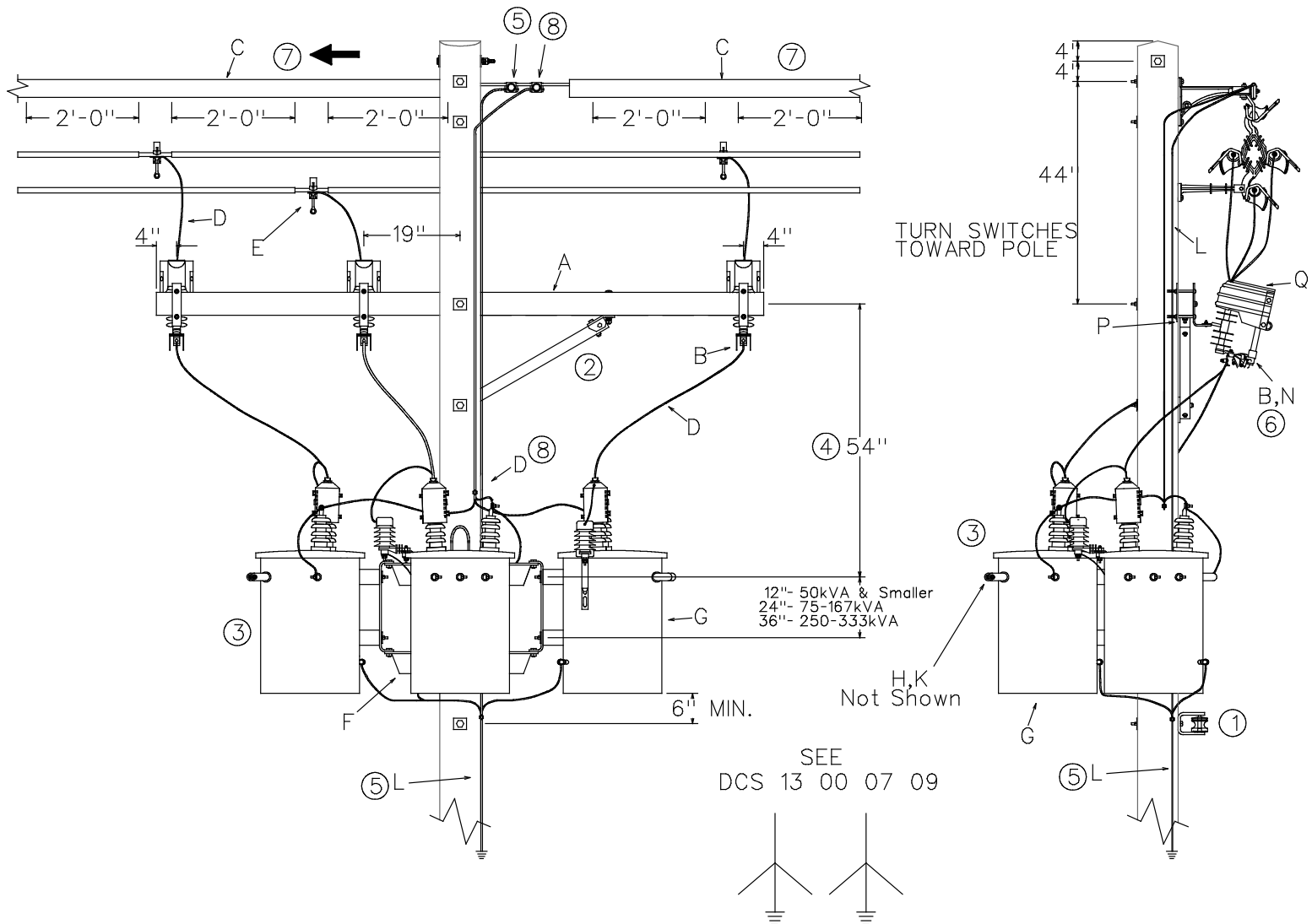
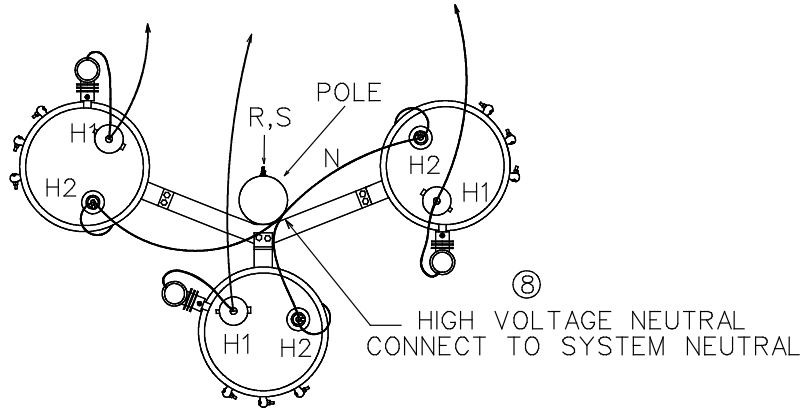
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- Use only one V Brace. Keep the extra brace for future use.
- This dimension may be reduced to 48" for installation on existing pole.
- All poles with spacer cable should be installed with a pole ground. Add a pole ground if not already installed. Pole ground shall extend up to the messenger which is the system neutral and attached on the single switch side of the pole.
- Substitute 200A fused switches stock #54 07 209 for transformer banks greater than 500kVA on 4kV circuits.
- For 7.2, 7.62, and 7.97kV transformers use 15kV arrester stock #10 01 188. For 2.4kV transformers use 6kV arrester stock #10 01 184.
- 2400/4160 Y Transformers may have sidewall or cover mounted HV bushings. If sidewall mounted bushings:
 - Build according to the DCS except use 2.5 kV primary lead wire per Table 2.2 of DCS 13 00 03 01 or
 - If pole is congested, 2.5 kV primary lead wire in conduit similar to DCS 13 04 54 01.
- Stagger taps and other areas where the covering has been removed to provide a minimum 2'-0" horizontal separation between the opening and another opening or ground point. Install line duc over the messenger anywhere the cable covering is stripped to maintain the required 2'-0" of horizontal separation.

TRANSFORMERS

15kV & Below - Spacer Cable - Three Single Phase Transformers
Grounded - Wye Primary/Grounded - Wye Secondary

13 20 81 **
Sheet 1 of 2

GROUND WYE PRIMARY CONNECTION
TO FUSED CUTOUTS AND COMMON NEUTRAL



50kVA & Smaller - 13 20 81 01
75kVA - 167kVA - 13 20 81 02
250kVA- 333kVA- 13 20 81 03

DISTRIBUTION
CONSTRUCTION STANDARDS



ENG: DG
REV. NO: 2
REV. DATE: 06/19/18

TRANSFORMERS

15kV & Below - Spacer Cable - Three Single Phase Transformers
Grounded - Wye Primary/Grounded - Wye Secondary

13 20 81 **
Sheet 2 of 2

		Std. / Stk. No.	Description	13 20 81**	01	02	03
2	A	04 00 20 03	Crossarm 10' w/ 60" V Brace		1	1	1
6	B	54 07 208	Switch Fused 100A 15kV		3	3	3
	C	69 58 293	Line DUC (Messenger Cover), Black (ea.)		2	2	2
T	D	18 51 025	Primary Leads (ft.) (See 13 00 03 01)		40	40	40
@	E	17 62 088	Hot Line Clamp 1/0 through 477 Spacer Cable		3	3	3
		17 62 143	Hot Line Clamp 795 Spacer Cable		3	3	3
	F	23 17 209	Mounting Unit, 3 Pos. Light (Up To Three 50 KVA Trans.)		1		
		23 17 202	Mounting Unit, 3 Pos. Heavy (Three 75kVA to 167kVA Trans.)			1	
		23 17 354	Mounting Unit, 3 Pos. Xtra Hvy (Three 250kVA to 333kVA Trans.)				1
@	G		Transformer (See 13 00 01 02)		3	3	3
T	H		Secondary Leads (ft.) (See 13 00 03 01)				
T	K	PG*	Connector, Lead Wire Connections (See 07 00 25 00)				
@5	L	12 00 10 02	Grounding Unit		1	1	1
@	N		Link, Fuse - See Three-Phase Trans. Table in 10 00 01 01		3	3	3
@3	O	16 01 301	Tag, Banked Transformer		3	3	3
	P	17 58 054	Bracket, Crossarm, Heavy Duty		3	3	3
	Q	23 17 411	Cover - Cutout, 100 Amp		3	3	3
	R	23 52 219	Bolt, Mach., 3/4" x 14"		2	2	
	S	23 66 031	Washer, Curved, 3/4"		2	2	

NOTES:

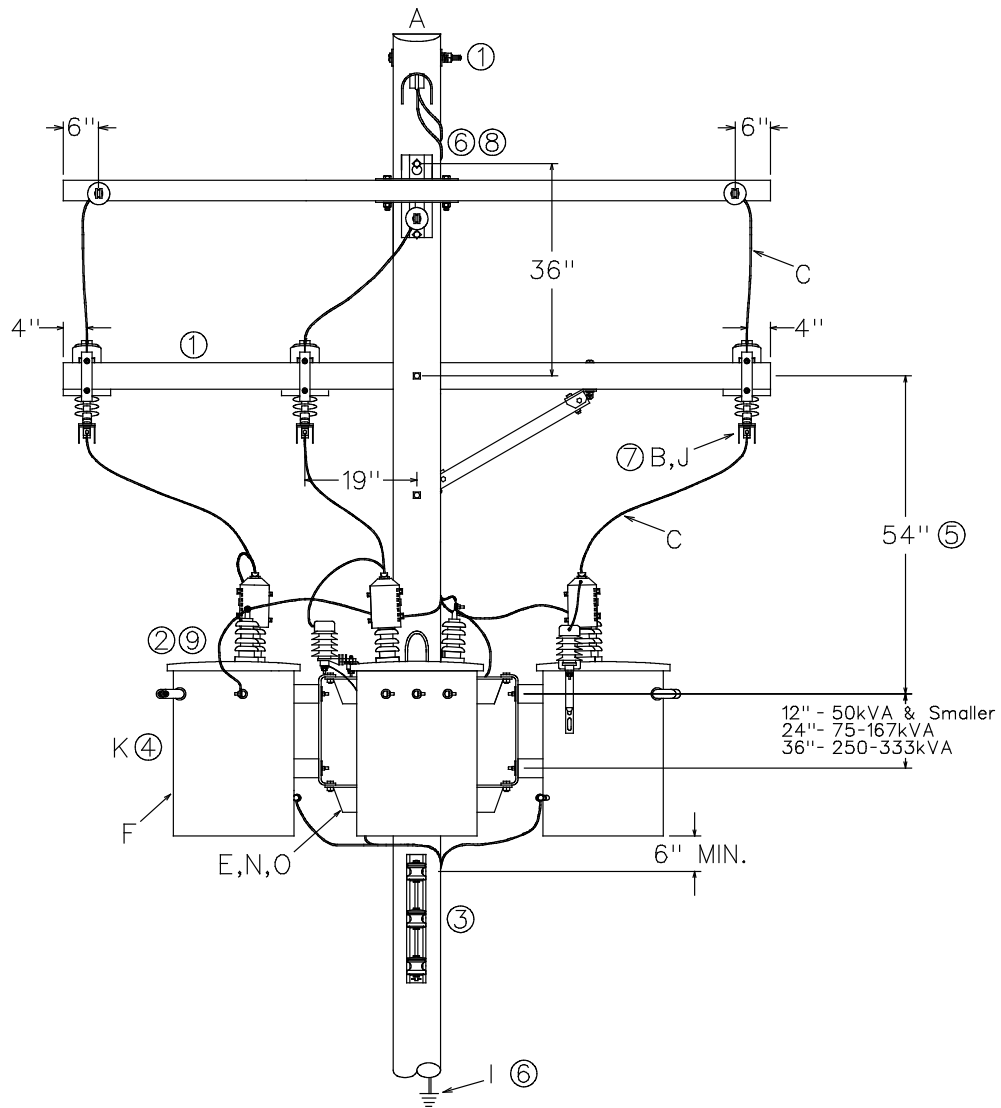
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- Use only one V Brace. Keep the extra brace for future use.
- Install tag "Banked Transformer, 120/208Y" stock #16 01 301 to identify transformers that have been rewired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally. See DCS 13 00 07 09.
- This dimension may be reduced to 48" for installation on existing pole.
- All poles with spacer cable should be installed with a pole ground. Add a pole ground if not already installed. Pole ground shall extend up to the messenger which is the system neutral and attached on the single switch side of the pole.
- Substitute 200A fused switches stock #54 07 209 for transformer banks greater than 500kVA on 4kV circuits.
- Stagger taps and other areas where the covering has been removed to provide a minimum 2'-0" horizontal separation between the opening and another opening or ground point. Install line duc over the messenger anywhere the cable covering is stripped to maintain the required 2'-0" of horizontal separation..
- Note that the messenger also serves as the system neutral, so the high voltage neutral must extend from the neutral bushings up to the messenger separate from the pole ground. The transformer neutral connection to the messenger shall be the furthest from the pole and separated from the pole ground connection as far as practical.

TRANSFORMERS

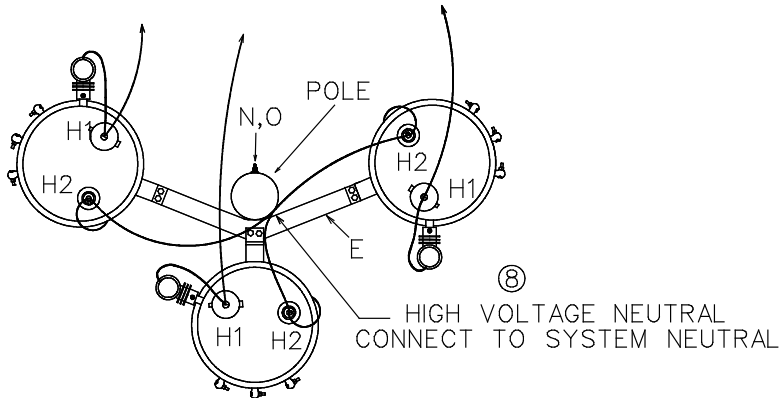
15 kV & Below - Spacer Cable - Dead End Structure
Three Single Phase Transformers - Grounded Wye Primary

13 20 85 **

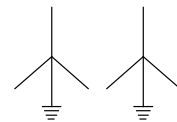
Sheet 1 of 3



GROUNDING WYE PRIMARY CONNECTION TO FUSED CUTOUTS AND COMMON NEUTRAL



SEE
DCS 13 00 07 09



50kVA & Smaller - 13 20 81 01
75kVA - 167kVA - 13 20 81 02
250kVA- 333kVA- 13 20 81 03

**DISTRIBUTION
CONSTRUCTION STANDARDS**



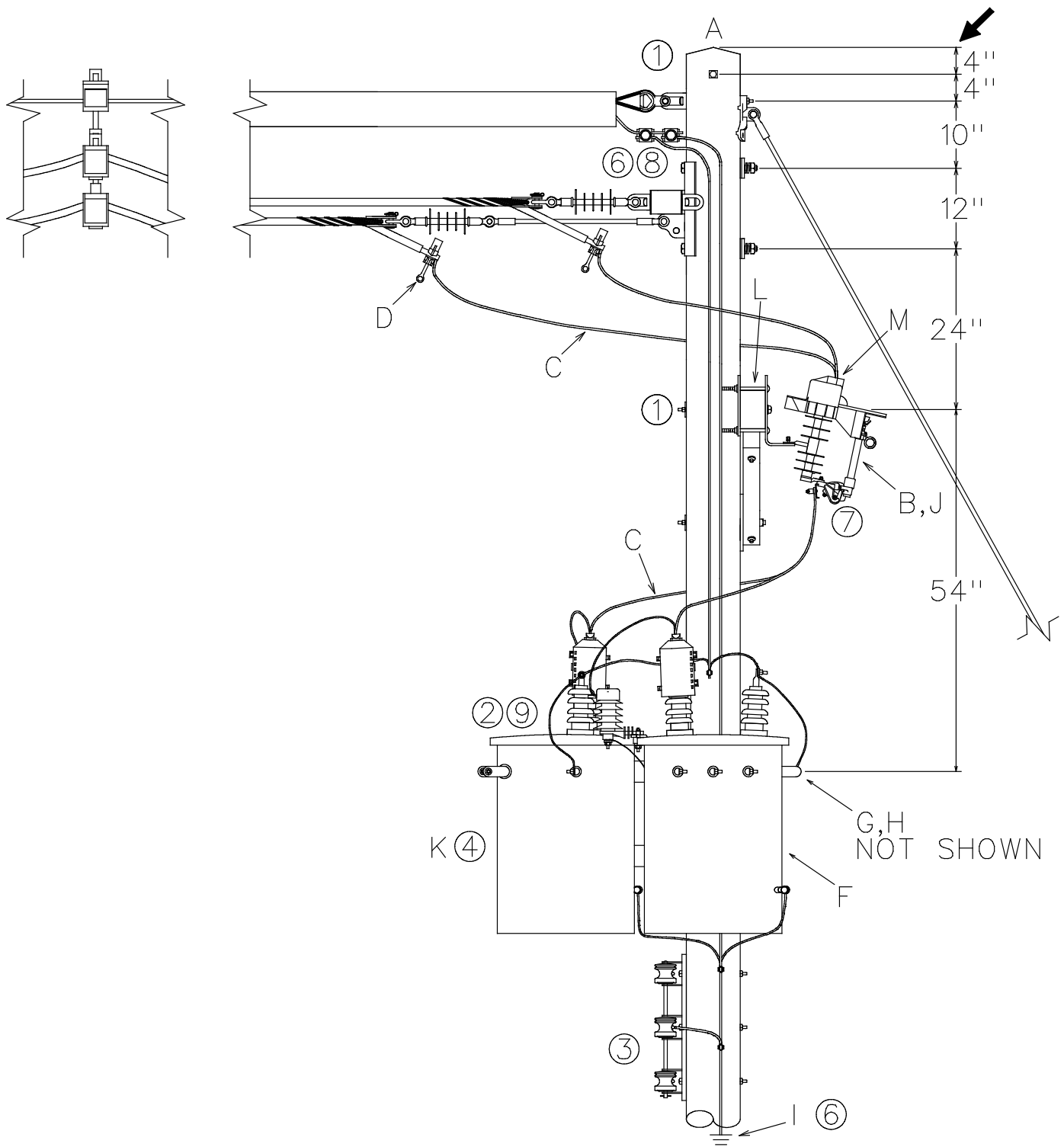
ENG: DG
REV. NO: 1
REV. DATE: 07/02/18

TRANSFORMERS

15 kV & Below - Spacer Cable - Dead End Structure
Three Single Phase Transformers - Grounded Wye Primary

13 20 85 **

Sheet 2 of 3



TRANSFORMERS
15 kV & Below – Spacer Cable – Dead End Structure
Three Single Phase Transformers – Grounded Wye Primary

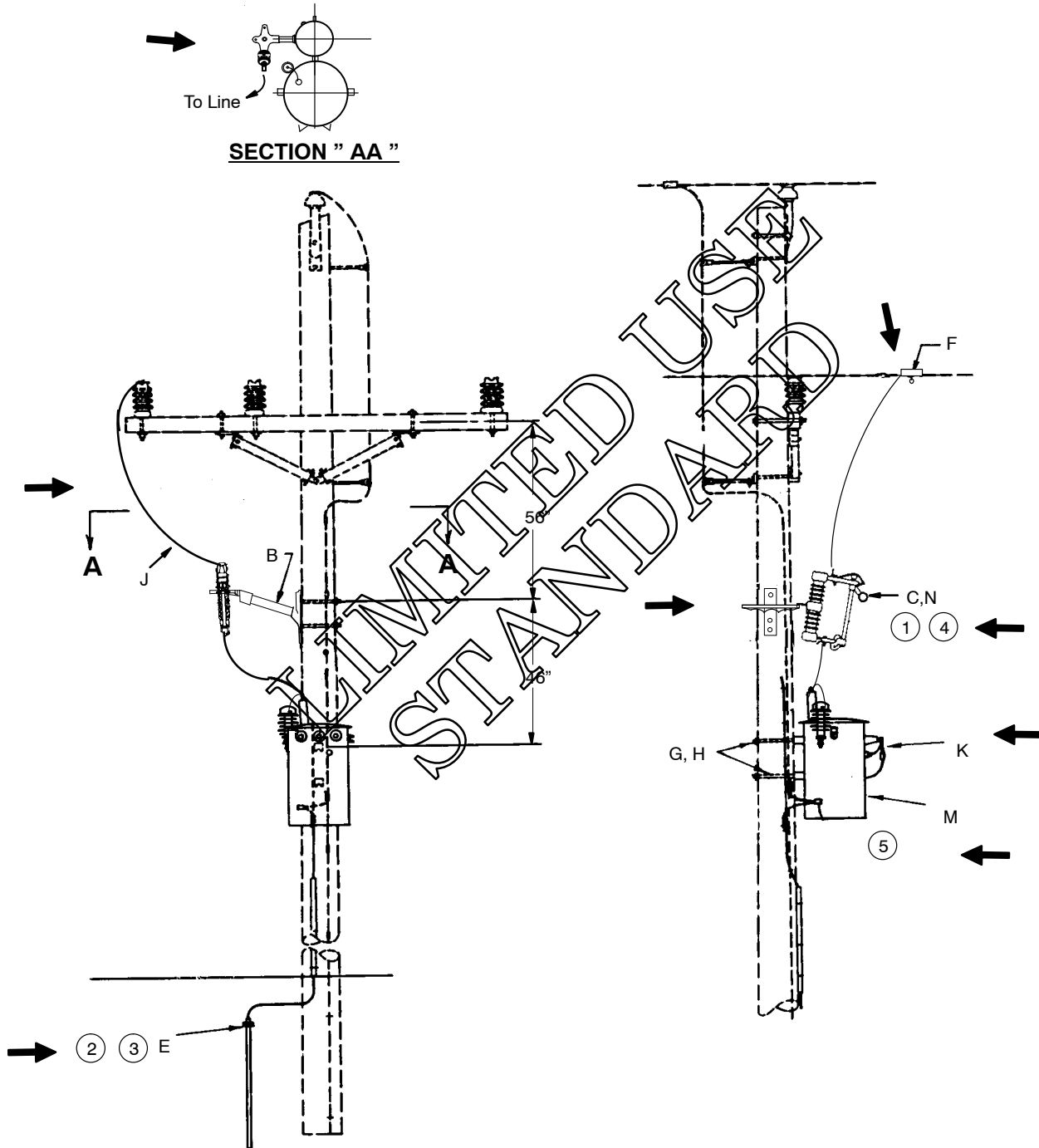
13 20 85 **
Sheet 3 of 3

		Std. / Stk. No.	Description	13 20 85 **	01	02	03
@1	A	03 20 10 01	15kV & Below – Spacer Cable Single Circuit – Dead End Structure		1	1	1
7	B	54 07 208	Switch, Fused, 100A 15kV		3	3	3
T	C	18 51 025	Primary Leads (ft.) (See 13 00 03 01)		40	40	40
@	D	17 62 088	Hot Line Clamp 1/0 through 477 Spacer Cable		3	3	3
		17 62 143	Hot Line Clamp 795 Spacer Cable		3	3	3
@	E	23 17 209	Mounting Unit, 3 Pos. Light (Up To Three 50 KVA Trans.)		1		
		23 17 202	Mounting Unit, 3 Pos. Heavy (Three 75kVA to 167kVA Trans.)			1	
		23 17 354	Mounting Unit, 3 Pos. Xtra Hvy (Three 250kVA to 333kVA Trans.)				1
@	F		Transformer (See 13 00 01 02)		3	3	3
T	G		Secondary Leads (ft.) (See 13 00 03 01)				
T	H	PG*W	Connector, Lead Wire Connections (See 07 00 25 00)				
@6	I	12 00 10 02	Grounding Unit, 7#10 Copperweld With Ground Rod		1	1	1
@	J		Link, Fuse, See Three Phase Trans. Table in 10 00 01 01		3	3	3
@4	K	16 01 301	Tag, Banked Transformer		3	3	3
@	L	17 58 054	Bracket, Crossarm, Heavy Duty		3	3	3
	M	23 17 411	Cover, Cutout, 100 Amp		3	3	3
	N	23 52 219	Bolt, Mach., 3/4" x 14"		2	2	
	O	23 66 031	Washer, Curved, 3/4"		2	2	

NOTES:

- Construct pole using 03 20 10 01. Mount the equipment arm on the guyed side of the pole as shown and omit the three lightning arresters and replace with switches as specified in this standard. The tank mounted arrester will be used to protect the phases that are tapped for the transformers.
- Transformer may be received with the LA mounted beside either the bushing H1 or H2 bushing. Both positions are acceptable. The arrester may be shifted to the most convenient side of the tank.
- See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
- Install tag "Banked Transformer, 120/208Y" stock #16 01 301 to identify transformers that have been rewired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally. See DCS 13 00 07 09.
- This dimension may be reduced to 48" for installation on existing pole.
- All poles with spacer cable should be installed with a pole ground. Add a pole ground if not already installed. Pole ground shall extend up to the messenger which is the system neutral and attached on the single switch side of the pole.
- Substitute 200A fused switches stock #54 07 209 for transformer banks greater than 500kVA on 4kV circuits.
- Note that the messenger also serves as the system neutral, so the high voltage neutral must extend from the neutral bushings up to the messenger separate from the pole ground. The transformer neutral connection to the messenger shall be the furthest from the pole and separated from the pole ground connection as far as practical.
- 2400/4160 Y Transformers may have sidewall or cover mounted HV bushings. If sidewall mounted bushings:
 - Build according to the DCS except use 2.5 kV primary lead wire per Table 2.2 of DCS 13 00 03 01 or
 - If pole is congested, 2.5 kV primary lead wire in conduit similar to DCS 13 04 54 01.

TO BE USED ON 34kV SYSTEM WITH A NEUTRAL



		Std. / Stk. No.	Description	13 34 01 **	01	02
1 @ 2,3 @ T T T T @ @4	B	23 56 063	Bracket, 3 Position Equipment Mount		1	1
	C	54 07 234	Switch Fused 100A 27kV		1	
		54 06 052	Switch, SMD-20, Overhead			1
	E	12 00 10 **	Grounding Unit		1	1
	F	HLC*W	Hot Line Clamp		1	1
	G	23 52 063	Bolt, Mach., 5/8" x 10" (50kVA & Smaller) OR		2	2
		23 52 095	Bolt, Mach., 3/4" x 10" (75 thru 167kVA)		2	2
	H	23 66 027	Washer, Square 5/8" (50kVA & Smaller) OR		2	2
		23 66 031	Washer Curved 3/4 (75 thru 167kVA)		2	2
	J	18 51 025	Primary Leads (Ft.)		15	15
	K		Secondary Leads (Ft.) (See 13 00 03 01)		12	12
	L	PG*	See 07 00 25 00		4	4
	M	VAXXXF	Transformer (34500 GRD.Y / 19920)		1	1
	N		Link, Fuse (See 10 00 01 01)		1	
			Refill, Fuse			1

NOTES:

1. If available fault current is less than 12 kA asymmetrical use 13 34 01 01. If available fault current is equal to or greater than 12 kA asymmetrical but less than 16 kA asymmetrical use 13 34 01 02. If asymmetrical fault current is greater than 16 kA, contact Distribution Standards.
2. On existing structure, the static wire ground may not be adequate to use as a transformer ground. Therefore, a separate ground (DCS 12 00 10 02) shall be installed for the transformer and it shall be bonded to the static ground.
3. On new structure, use grounding unit 12 00 10 09 as both the static and transformer ground.
4. If fuse refill is required, contact Distribution Standards for proper size to use.
5. See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.

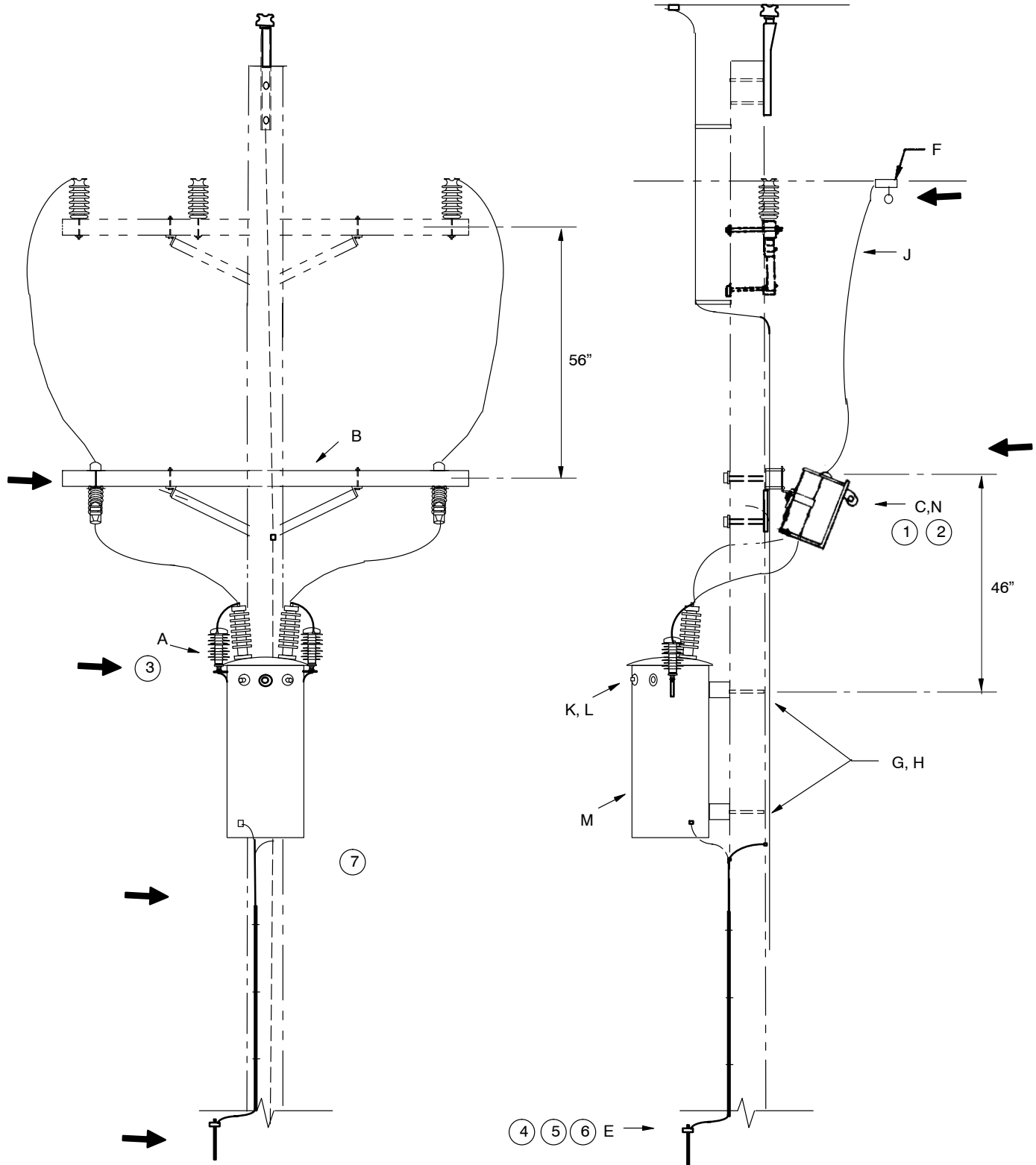
TRANSFORMERS

➔ 34kV – 120 or 120/240 Volt – Single Phase

13 34 02 **

Sheet 1 of 2

TO BE USED ON A THREE-WIRE 34 kV SYSTEM





		Std. / Stk. No.	Description	13 34 02 **	01	02
3	A	10 01 235	Arrester 36kV, w/Transformer Mtg Brkt		2	
	B	04 00 20 02	Crossarm, 8' w / 60" V Brace		1	1
1	C	54 07 234	Switch Fused 100A 27kV		2	2
@4,5,6	E	12 00 10 **	Grounding Unit		1	1
@	F	HLC*W	Hot Line Clamp		2	2
T	G	23 52 063	Bolt, Mach., 5/8" x 10" (50kVA & smaller) OR		2	2
		23 52 095	Bolt, Mach., 3/4" x 10" (75 thru 250kVA)			2
T	H	23 66 027	Washer, Square 5/8" (50kVA & smaller) OR		2	2
		23 66 031	Washer, Curved, 3/4" (75 thru 250kVA)			2
T	J	18 51 025	Primary Leads (Ft.)		30	30
T	K		Secondary Leads (Ft.) (See 13 00 03 01)		12	12
T	L	PG*	See 07 00 25 00		4	4
@8	M	QK0010G	Transformer (34500–120)		1	
		QAXXXXF	Transformer (34500–120/240)			1
@2	N	20 53 197	Link, Fuse, 0.75X		2	
			Link, Fuse (See 10 00 01 01)			2

NOTES:

1. If available fault current is less than 12 kA asymmetrical use switch and fuse link shown. If available fault current is equal to or greater than 12 kA asymmetrical but less than 16 kA asymmetrical use SMD–20 switch (54–06–052). If asymmetrical fault current is greater than 16 kA. contact Distribution Standards.
2. If fuse refill is required, for QK0010G transformer use 1A fuse refill (stock # 20–04–361). For QAXXXXF transformer, contact Distribution Standards for proper size to use.
3. QAXXXXF transformer are purchased with arresters pre-installed. Arresters must be field installed on QK0010G transformer.
4. On an existing structure the static ground may not be adequate to use as a transformer ground. Therefore, a separate ground (DCS 12 00 10 02) shall be installed for the transformer and it shall be bonded to the static ground.
5. On a new structure with a static wire having a minimum of four grounds per mile, use grounding unit 12 00 10 09 as both the static and transformer ground.
6. If no static or common/primary neutral is present refer to DCS 13 00 06 06 for installation of grounds.
7. See DCS 13 01 01 ** for secondary support and DCS 03 01 20 ** for secondary configurations.
8. For QK0010G, use 13 34 02 01. For QAXXXXF use 13 34 02 02.