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NOTES:
1. NAMEPLATE LOCATED ON UPPER HANGER BRACKET.
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<th>CATALOG NUMBER</th>
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*NEW UNITS NO LONGER PURCHASED. CHECK ON AVAILABILITY PRIOR TO ORDERING.

NOTES:

1. SEE DWG. 06.00-10B FOR MORE TRANSFORMERS AND NOTES.
### POLEMOUNT TRANSFORMER CATALOG NUMBERS

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<th>CATALOG NUMBER</th>
<th>COMPATIBLE UNIT</th>
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* NEW UNITS NO LONGER PURCHASED. CHECK ON AVAILABILITY PRIOR TO ORDERING.
** NEW CATALOG NUMBER: CHECK ON AVAILABILITY OR LEAD TIME

### NOTES:

1. AS A GENERAL RULE, OVERHEAD-TYPE TRANSFORMERS USED ON THE PROGRESS ENERGY CAROLINAS DISTRIBUTION SYSTEM DO NOT HAVE VOLTAGE ADJUSTMENT TAPS. THE EXCEPTION IS:

2-BUSHING CONVENTIONAL UNITS WITH PRIMARY VOLTAGE RATINGS OF 14.4KV

THESE UNITS HAVE FOUR (4) TAPS BELOW NORMAL AT THE FOLLOWING VOLTAGES:
13800 / 13200 / 12870 / 12540.

2. SEE DWGS. 12.06-01A AND 12.06-01B FOR STAINLESS STEEL POLE TYPE TRANSFORMERS. THESE UNITS UNITS ARE TO BE USED ONLY IN DESIGNATED COASTAL AREAS.

3. SEE DWG. 06.00-10A FOR OTHER TRANSFORMERS.
### Typical Transformer Dimensions, Weights & Oil Capacities

#### Transformer Dimensions (Inches)

<table>
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<tr>
<th>KVA</th>
<th>12470 120/240 Volts</th>
<th>22860 120/240 Volts</th>
<th>34500 120/240 Volts</th>
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<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
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#### Transformer Weight (Pounds) and Oil Capacity (Gallons)

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</table>

**Notes:**

1. The dimensions, weights and oil capacities listed above will vary with the makes and styles of transformers. Contact Distribution Standards for information on designs for secondary voltages other than 120/240 Volts.

2. "B" and "C" dimensions include cooling fins when applicable.

3. Approximate net weights include weight of oil.
### Types of Commercial and Industrial Businesses

<table>
<thead>
<tr>
<th>Type of Business</th>
<th>Peak Demand Duration (Hours)</th>
<th>Type of Business</th>
<th>Peak Demand Duration (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Food</td>
<td>8</td>
<td>Convenience Stores</td>
<td>4</td>
</tr>
<tr>
<td>Supermarkets</td>
<td>8</td>
<td>Hotels</td>
<td>4</td>
</tr>
<tr>
<td>Large &amp; Small Retail Stores</td>
<td>8</td>
<td>Small Office Buildings</td>
<td>4</td>
</tr>
<tr>
<td>Large Office Buildings</td>
<td>8</td>
<td>Restaurants</td>
<td>4</td>
</tr>
<tr>
<td>Restaurants</td>
<td></td>
<td>Schools</td>
<td></td>
</tr>
<tr>
<td>Hotels</td>
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</tr>
<tr>
<td>Convenience Stores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-Phase Residential Overhead Transformers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transformer Size</th>
<th>Summer (100%)</th>
<th>Winter (140%)</th>
<th>Transformer Size</th>
<th>Summer (100%)</th>
<th>Winter (140%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>14</td>
<td>50</td>
<td>50</td>
<td>70</td>
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</tr>
<tr>
<td>25</td>
<td>25</td>
<td>35</td>
<td>100</td>
<td>100</td>
<td>140</td>
</tr>
<tr>
<td>37.5</td>
<td>37.5</td>
<td>52</td>
<td>167</td>
<td>167</td>
<td>233</td>
</tr>
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</table>

### Maximum KVA Loading

<table>
<thead>
<tr>
<th>Transformer Size</th>
<th>Summer (130%)</th>
<th>Winter (160%)</th>
<th>Transformer Size</th>
<th>Summer (130%)</th>
<th>Winter (160%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>13</td>
<td>16</td>
<td>50</td>
<td>65</td>
<td>80</td>
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<tr>
<td>15</td>
<td>19</td>
<td>24</td>
<td>75</td>
<td>97</td>
<td>120</td>
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<tr>
<td>25</td>
<td>32</td>
<td>40</td>
<td>100</td>
<td>130</td>
<td>160</td>
</tr>
<tr>
<td>37.5</td>
<td>49</td>
<td>60</td>
<td>167</td>
<td>217</td>
<td>267</td>
</tr>
</tbody>
</table>

### Maximum KVA Loading

<table>
<thead>
<tr>
<th>Transformer Size</th>
<th>Summer (100%)</th>
<th>Winter (140%)</th>
<th>Transformer Size</th>
<th>Summer (100%)</th>
<th>Winter (140%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>13</td>
<td>16</td>
<td>50</td>
<td>65</td>
<td>80</td>
</tr>
<tr>
<td>15</td>
<td>19</td>
<td>24</td>
<td>75</td>
<td>97</td>
<td>120</td>
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<tr>
<td>25</td>
<td>32</td>
<td>40</td>
<td>100</td>
<td>130</td>
<td>160</td>
</tr>
<tr>
<td>37.5</td>
<td>49</td>
<td>60</td>
<td>167</td>
<td>217</td>
<td>267</td>
</tr>
</tbody>
</table>

### Maximum Transformer Loading (OH)

<table>
<thead>
<tr>
<th>Hospitals and Special Care Facilities</th>
<th>Industrials and Vaults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank Size</td>
<td>Summer 100%</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>112</td>
<td>112</td>
</tr>
<tr>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

(PGN 06.00-14A)
## THREE-PHASE OVERHEAD CONVENTIONAL TRANSFORMER BANKS

<table>
<thead>
<tr>
<th>BANK SIZE OR TRANSFORMER SIZE</th>
<th>HOSPITAL AND SPECIAL CARE FACILITIES</th>
<th>INDUSTRIALS AND VAULTS</th>
<th>4 HOUR PEAK</th>
<th>8 HOUR PEAK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SUMMER 100%</td>
<td>SUMMER 100%</td>
<td>WINTER 140%</td>
<td>WINTER 140%</td>
</tr>
<tr>
<td>45</td>
<td>45</td>
<td>45</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>75</td>
<td>75</td>
<td>75</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>112</td>
<td>112</td>
<td>112</td>
<td>156</td>
<td>156</td>
</tr>
<tr>
<td>150</td>
<td>150</td>
<td>150</td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td>225</td>
<td>225</td>
<td>225</td>
<td>315</td>
<td>315</td>
</tr>
<tr>
<td>300</td>
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<td>300</td>
<td>420</td>
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<tr>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
<td>1,400</td>
<td>1,400</td>
</tr>
<tr>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>2,100</td>
<td>2,100</td>
</tr>
</tbody>
</table>

### NOTES:

1. SELECT THE TYPE OF BUSINESS. THE CORRESPONDING DEMAND DURATION IS HOW LONG THE CUSTOMER'S DEMAND LASTS ON PEAK DAYS BASED ON DATA FROM LOAD RESEARCH STUDIES. THE CUSTOMER'S DEMAND TYPICALLY DROPS TO 75% OF THE MAXIMUM DURING ALL OTHER TIMES.

2. NOTE THAT TRANSFORMER LOADING IS GIVEN IN KVA. ADJUSTMENTS FOR POWER FACTOR NEED TO BE DEFINED BY THE ENGINEER.

3. HIGHLY FLUCTUATING INTERMITTENT LOADS (HFIL): TAKE THE SUM OF THE HFILS AND DIVIDE BY THREE (1/HFIL/3), AND ADD TO THE CONSTANT LOAD. FUSE CURVES NEED TO BE CHECKED BY USING THE SUM OF THE HFIL (NOT DERATED BY 3) AND THE CONSTANT LOAD DUE TO FUSE PERFORMANCE.
DISTRIBUTION TRANSFORMERS ARE PRIMARY COST COMPONENTS IN PROVIDING CUSTOMER SERVICE. THE ESTIMATED SERVICE LIFE FOR TRANSFORMERS IS 30 YEARS. TRANSFORMERS SHOULD NOT BE REPLACED UNLESS ABSOLUTELY NECESSARY.

DO NOT REPLACE A TRANSFORMER UNLESS:

- PHYSICAL DAMAGE OCCURS THAT CANNOT BE FIELD REPAIRED SUCH AS BROKEN BUSHINGS, RUSTING, LEAKING OIL, PROBLEMS WITH SECONDARY BREAKER, ETC.
- THE CONDITION OF THE TRANSFORMER IS AN IMMEDIATE SAFETY HAZARD.
- THE TRANSFORMER IS OVERLOADED.
- THE TRANSFORMER IS UNDERLOADED AND CAN BE ECONOMICALLY DOWNSIZED.
- THE TRANSFORMER IS KNOWN TO HAVE A PCB CONCENTRATION OF 50 PPM OR MORE.

REINSTALLATION POLICY

ONLY NON-PCB TRANSFORMERS (LESS THAN 50 PPM) AS SHOWN BY BLUE DOT, BLUE NON-PCB LABEL, OR NAMEPLATE SHOULD BE INSTALLED. ANY TRANSFORMER OF UNKNOWN PCB CONTENT THAT HAS BEEN REMOVED FROM SERVICE SHOULD HAVE A "PCB ARTICLE STORAGE FOR REUSE" LABEL PLACED ON IT (CN 9220066730) AND SENT TO THE GARNER TRANSFORMER SHOP. THE LABEL MUST BE PLACED ON THE TRANSFORMER AS SOON AS IT ARRIVES AT THE L&S YARD.

NON-PCB TRANSFORMERS IN OPERABLE CONDITION SHOULD BE RESTOCKED AND RE-USED. DO NOT SEND OPERABLE TRANSFORMERS TO THE TRANSFORMER SHOP UNLESS THEY NEED REPAIR, PAINTING, TESTING, OR HAVE A KNOWN OR ASSUMED PCB CONTENT OF 50 PPM OR MORE.

A POLE MOUNT TRANSFORMER OF UNKNOWN PCB CONTENT MAY NOT BE TRANSFERRED FROM ONE POLE TO ANOTHER IN THE FIELD.

CSP UNITS

ANY CSP UNIT BEING INSTALLED, REINSTALLED OR RE-ENERGIZED MUST HAVE A FUSED CUTOUT. IF AN ARRESTER NEEDS TO BE REPLACED ON A CSP UNIT AND A CUTOUT IS NOT PRESENT, INSTALL A CUTOUT WHEN THE ARRESTER IS REPLACED. FUSE THE CUTOUT WITH THE SAME FUSE SIZE AND FUSE SPEED REQUIRED FOR A SIMILAR CONVENTIONAL TRANSFORMER.
NOTES:

1. USE ON ALL NEW NON-COASTAL INSTALLATIONS. DO NOT INSTALL WILDLIFE GUARDS ON ANY TRANSFORMER INSTALLED IN A COASTAL ENVIRONMENT DUE TO SALT BUILDUP IN THE WILDLIFE GUARD.

2. INSTALL WILDLIFE GUARD ON TOP OF TRANSFORMER PRIMARY BUSHING BETWEEN THE FIRST AND SECOND SKIRT.

3. ALL NEW ARRESTERS ARE DIRECT CONNECTED WHERE THE LEAD SHOULD BE BROUGHT OUT OF THE SIDE SLOT (KNOCKOUT) ON THE WILDLIFE GUARD. EXTERNALLY GAPPED ARRESTERS SHALL BE REPLACED.

4. ANY "SOFT TYPE" WILDLIFE GUARDS WHICH ARE REMOVED, SHALL BE SCRAPPED AND REPLACED.
NOTES:

1. USE THESE GUARDS ONLY WHEN AN ANIMAL GUARD MUST BE STICK APPLIED.

2. INSPECT CONDITION OF INSULATOR PRIOR TO INSTALLATION. DO NOT INSTALL ON AN INSULATOR THAT IS SUSPECT.

3. USE ON SINGLE BUSHING TRANSFORMERS OR ON PRIMARY BUSHING ON A DOUBLE BUSHING TRANSFORMER.

4. DO NOT USE ON THE NORTH RIVER 34.5KV FEEDERS.

5. INSTALL WITH THE SPLIT OPENING POINTING TOWARDS THE LIGHTNING ARRESTER.

6. INSTALL WITH THE FLAT SIDE DOWN.

7. WHEN INSTALLED, THE OUTER EDGES SHOULD BE AT LEAST 1-1/2 INCHES FROM THE LIGHTNING ARRESTER LEAD AND 2-1/2 INCHES FROM THE ARRESTER INSULATOR. ALSO MAINTAIN AT LEAST 2-1/2 INCHES FROM THE POLE, OTHER INSULATORS OR ANY OTHER GROUNDED OBJECT.

8. DO NOT CUT OR ALTER THE GUARD TO MEET CLEARANCE REQUIREMENTS.
### Duty Cycle (KV) Ratings for Arresters Protecting Transformers

<table>
<thead>
<tr>
<th>Transformer Nameplate Primary Rating</th>
<th>Number of Primary Bushings</th>
<th>System Primary Rating</th>
<th>Transformer Primary Connection</th>
<th>Grounded Wye</th>
<th>Floating Wye See Note 3</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.47 GRDY/7.2 KV</td>
<td>1-B</td>
<td>12.47KV</td>
<td></td>
<td>10</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>7.2/12.47 Y KV</td>
<td>2-B</td>
<td>12.47KV</td>
<td></td>
<td>10</td>
<td>N/A</td>
<td>10</td>
</tr>
<tr>
<td>14.4/24.94 Y KV</td>
<td>2-B</td>
<td>12.47KV</td>
<td>N/A</td>
<td>N/A</td>
<td>10 OR 18</td>
<td></td>
</tr>
<tr>
<td>14.4/24.94 Y KV</td>
<td>2-B</td>
<td>22.86KV</td>
<td>18</td>
<td>18</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>22.86 GRDY/13.2KV</td>
<td>1-B</td>
<td>22.86KV</td>
<td>18</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>19.92/34.5Y KV</td>
<td>2-B</td>
<td>34.5KV</td>
<td>27</td>
<td>27</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>34.5 GRDY/19.92 KV</td>
<td>1-B</td>
<td>34.5KV</td>
<td>27</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### Catalog Numbers for Transformer Arresters Including Mounting Bracket, Primary Riser and Ground Strap

<table>
<thead>
<tr>
<th>Duty Cycle Rating (KV)</th>
<th>Catalog Number</th>
<th>Compatible Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>11231107</td>
<td>AREQOHTR10C</td>
</tr>
<tr>
<td>18</td>
<td>11231800</td>
<td>AREQOHTR18C</td>
</tr>
<tr>
<td>27</td>
<td>14002364</td>
<td>AREQOHTR27C</td>
</tr>
</tbody>
</table>

### Notes:

1. Arresters shall be positioned such that a blown disconnecter will not affect other energized equipment.

2. Always keep arrester tap and ground leads as short as possible.

3. When possible, always mount arresters on the transformer tank unless the primary is connected floating Wye. For floating Wye-Delta transformer bank connections, locate arresters on source-side of the cutout.

4. **Caution:** If arrester isolator has separated from the arrester, the bottom of the arrester could be energized.

5. Once silicon carbide arresters are removed, they should be scrapped.

6. Ground rods shall be installed at all poles containing arresters according to the standard procedures outlined on DWGs. 01.01-01A, 01.01-01B, 01.01-01C, and 01.01-05.

7. Arrester ground straps shall be directly connected and grounded to the transformer tank.
### Transformer Fuse Table

<table>
<thead>
<tr>
<th>Transformer Size (KVA)</th>
<th>Transformer Voltage Rating</th>
<th>Transformer Voltage Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Below 10</strong></td>
<td>1.25 AMP TYPE X 21123807</td>
<td>1.25 AMP TYPE X 21123807</td>
</tr>
<tr>
<td></td>
<td>2 AMP TYPE D 21123815</td>
<td>1.25 AMP TYPE X 21123807</td>
</tr>
<tr>
<td></td>
<td>3 AMP TYPE D 21123831</td>
<td>1.25 AMP TYPE X 21123807</td>
</tr>
<tr>
<td></td>
<td>5 AMP TYPE D 21123849</td>
<td>2 AMP TYPE D 21123815</td>
</tr>
<tr>
<td></td>
<td>7 AMP TYPE X 21123864</td>
<td>3 AMP TYPE D 21123831</td>
</tr>
<tr>
<td></td>
<td>10 AMP IS/KS/MS/S 21127303</td>
<td>5 AMP TYPE D 21123849</td>
</tr>
<tr>
<td></td>
<td>15 AMP IS/KS/MS/S 21127402</td>
<td>7 AMP TYPE X 21123864</td>
</tr>
<tr>
<td></td>
<td>20 AMP IS/KS/MS/S 21127501</td>
<td>10 AMP IS/KS/MS/S 21127303</td>
</tr>
<tr>
<td></td>
<td>30 AMP IS/KS/MS/S 21127709</td>
<td>15 AMP IS/KS/MS/S 21127402</td>
</tr>
<tr>
<td></td>
<td>50 AMP IS/KS/MS/S 21127907</td>
<td>25 AMP IS/KS/MS/S 21127600</td>
</tr>
<tr>
<td></td>
<td>65 AMP IS/KS/MS/S 21128004</td>
<td>30 AMP IS/KS/MS/S 21127709</td>
</tr>
<tr>
<td></td>
<td>80 AMP IS/KS/MS/S 21128103</td>
<td>40 AMP IS/KS/MS/S 21127808</td>
</tr>
</tbody>
</table>

### Notes:

1. **Type X Fuses** are Kearney. **Type D Fuses** are Cooper.

2. **Type IS, KS, MS and S Fuses** of the same Ampere rating can be substituted for one another. These are sometimes referred to as universal type fuses.

3. See DWG. 06.02-05 for fusing of Delta banks.

4. For installations not covered by this table contact distribution standards.

5. When one fuse is blown on a three phase bank, all fuses shall be replaced.
**Fusing Instructions**

**Delta-Delta Transformer Banks**

(12KV Line - 14.4KV Transformers)

*Typically will be on the 12540 volt tap setting for 12KV*

---

**Closed Delta Bank**

1. **Lighting Transformer Larger Than Power Transformer?**
   - **Yes**
   - **Fuse S1 & S2 for Lighting Transformer**
   - **Fuse S3 for Power Transformer**

2. **Identify Phase-to-Phase Voltage (Operating Voltage of Transformer)***
   - **Yes**
   - **Fuse S2 & S3 as for a Single-Phase Lighting Transformer**
   - **Fuse S1 for a Three Transformer Delta Connection**
   - **Proper Fusing of Bank**

3. **S2 or S3 Smaller Than S1?**
   - **Yes**
   - **Fuse S2 & S3 with Same Fuse**
   - **Proper Fusing of Bank**
   - **Closed Delta Bank**

---

**Open Delta Bank**

1. **Lighting Transformer Larger Than Power Transformer?**
   - **No**
   - **Fuse S1, S2, & S3 with Same Size Fuse (Lighting = Power)**

2. **Proper Fusing of Bank**

---

*---

**Ex. 1**

**Delta Connected 12KV Line**

- 20 KS S1
- 25 KS S2
- 25 KS S3

- 100 Power
- 167 Lighting
- 14.4KV Transformers

**Ex. 2**

**Delta Connected 12KV Line**

- 30 KS S1
- 30 KS S2
- 30 KS S3

- 167 Power
- 250 Lighting
- 167 Power

14.4KV Transformers

---

*---

**Closed Delta Bank**

- **For Open and Closed Wye Connected Banks Fuse Each Transformer Per DWG. 06.02-02.**
### Transformer Risers

#### Single-Phase, Wye Bank or Open Delta Bank Risers

<table>
<thead>
<tr>
<th>Transformer Size KVA</th>
<th>Secondary</th>
<th>Primary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120/208V 30 Wye</td>
<td>120/240V 10 or 30 277/480V 30 Wye</td>
</tr>
<tr>
<td></td>
<td>AL</td>
<td>AL</td>
</tr>
<tr>
<td>5</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>10</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>15</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>25</td>
<td>4/0</td>
<td>1/0</td>
</tr>
<tr>
<td>37.5</td>
<td>500</td>
<td>1/0</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
<td>4/0</td>
</tr>
<tr>
<td>75</td>
<td>2-500</td>
<td>500</td>
</tr>
<tr>
<td>100</td>
<td>2-500</td>
<td>500</td>
</tr>
<tr>
<td>167</td>
<td>3-500</td>
<td>2-500</td>
</tr>
</tbody>
</table>

#### Closed Delta Bank Risers

<table>
<thead>
<tr>
<th>Transformer Size KVA</th>
<th>Secondary</th>
<th>Primary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120/240V 30</td>
<td>480V 30</td>
</tr>
<tr>
<td></td>
<td>AL</td>
<td>AL</td>
</tr>
<tr>
<td>5-5-5</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>10-10-10</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>15-15-15</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>25-25-25</td>
<td>4/0</td>
<td>1/0</td>
</tr>
<tr>
<td>37.5-37.5-37.5</td>
<td>4/0</td>
<td>1/0</td>
</tr>
<tr>
<td>50-50-50</td>
<td>500</td>
<td>4/0</td>
</tr>
<tr>
<td>75-75-75</td>
<td>2-500</td>
<td>500</td>
</tr>
<tr>
<td>100-100-100</td>
<td>2-500</td>
<td>500</td>
</tr>
<tr>
<td>167-167-167</td>
<td>3-500</td>
<td>2-500</td>
</tr>
</tbody>
</table>

**Notes:**

1. All secondary transformer hot leg leads are 600 volt aluminum cable with cross-linked polyethylene insulation. Overhead neutral conductor can be bare aluminum.

2. Single service connection to transformers 50kVA and below shall use stem connectors. For multiple services, use secondary connector (CN 153529). For transformers above 75 kVA, leads are not necessary if the services will be connected directly to the secondary bushings. Multiple underground services shall be fed by a single riser. See DWG. 21.04-01.

3. For open delta-connected banks, either 120/240 or 240/480 volts, leads not common to two transformers are to be selected from the single phase table above according to the size of each transformer.

4. For closed delta and open delta-connected banks made up of unequal sized transformers, leads and jumpers common to two transformers are to be sized according to the larger transformer. Use top table for open delta connected banks and bottom table for closed delta connected banks.
### Transformer Size KVA

<table>
<thead>
<tr>
<th>Transformer Size</th>
<th>Delta Bank Leads Between Bushings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Secondary</td>
</tr>
<tr>
<td></td>
<td>120/240V 3Ø</td>
</tr>
<tr>
<td>5-5-5</td>
<td>1/0</td>
</tr>
<tr>
<td>10-10-10</td>
<td>1/0</td>
</tr>
<tr>
<td>15-15-15</td>
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</tr>
<tr>
<td>25-25-25</td>
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</tr>
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<td>37.5-37.5-37.5</td>
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</tr>
<tr>
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<td>4/0</td>
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<td>100-100-100</td>
<td>500</td>
</tr>
<tr>
<td>167-167-167</td>
<td>2-500</td>
</tr>
</tbody>
</table>

### Notes:

1. All secondary transformer hotleg leads are 600 volt aluminum cable with cross-linked polyethylene insulation. Overhead neutral conductor can be bare aluminum.

2. Single service connection to transformers 50kVA and below shall use stem connectors. For multiple services, use secondary connector (CN 153529). For transformers above 75 kVA, leads are not necessary if the services will be connected directly to the secondary bushings. Multiple underground services shall be fed by a single riser. See DWG. 21.04-01.

3. For open delta-connected banks, either 120/240 or 240/480 volts, leads not common to two transformers are to be selected from the single-phase table above according to the size of each transformer.

4. For closed delta and open delta-connected banks made up of unequal sized transformers, leads and jumpers common to two transformers are to be sized according to the larger transformer.
1. FOR TRANSFORMERS 75 KVA AND ABOVE, NO SECONDARY LEADS ARE NECESSARY. CONNECT SERVICES DIRECTLY TO THE SECONDARY BUSHING WITH TERMINAL LUGS (SEE DWG. 23.02-05).

2. SINGLE ALUMINUM SERVICE CONNECTIONS TO TRANSFORMERS 50KVA AND BELOW SHALL USE STEM CONNECTORS. FOR MULTIPLE SERVICES, USE SECONDARY CONNECTOR (ITEM # 153529) WITH COVER. FOR EXISTING TRANSFORMERS, MULTIPLE SERVICES MAY BE CONNECTED TOGETHER WITH ONE COMMON LEAD EXTENDING TO THE SECONDARY BUSHING. THE SIZE OF THE LEADS SHALL BE SIZED PER DWGS. 06.03-01A AND 06.03-01B.

3. ALL STEM CONNECTOR TERMINATIONS TO UNDERGROUND CABLES ARE TO BE AQUA-SEALED AND TAPED TO PREVENT WATER INTRUSION INTO THE CABLE.

<table>
<thead>
<tr>
<th>ITEM NUMBER</th>
<th>CONDUCTOR SIZE</th>
<th>COLOR CODE</th>
<th>STEM SIZE</th>
<th>BURNDY</th>
<th>KEARNEY</th>
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<tr>
<td>9220195899</td>
<td>#6 STR AL</td>
<td>BLUE</td>
<td>#4</td>
<td>W-BG</td>
<td>5/8</td>
</tr>
<tr>
<td>9220106044</td>
<td>#4 STR AL</td>
<td>ORANGE</td>
<td>#4 SOLID</td>
<td>W-BG</td>
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<tr>
<td>11199601</td>
<td>#2 STR AL</td>
<td>RED</td>
<td>#4 SOLID</td>
<td>W-BG</td>
<td>5/8</td>
</tr>
<tr>
<td>11199700</td>
<td>#1/0 STR AL</td>
<td>YELLOW</td>
<td>#2 SOLID</td>
<td>W-BG</td>
<td>840</td>
</tr>
<tr>
<td>11199809</td>
<td>#2/0 STR AL</td>
<td>GRAY</td>
<td>#1/0 SOLID</td>
<td>W-K840</td>
<td>840</td>
</tr>
<tr>
<td>11199502</td>
<td>#4/0 STR AL</td>
<td>PINK</td>
<td>#1/0 SOLID</td>
<td>W-K840</td>
<td>840</td>
</tr>
<tr>
<td>11199908</td>
<td>336.4 ACSR AL &amp; 350 MCM AL</td>
<td>GREEN</td>
<td>1/2&quot; DIA</td>
<td>W-K840</td>
<td>-</td>
</tr>
<tr>
<td>76333021</td>
<td>500 MCM</td>
<td>PINK</td>
<td>1/2&quot; DIA</td>
<td>U34ART</td>
<td>1-1/8 - 1</td>
</tr>
</tbody>
</table>

NOTES:

SECONDARY LEAD SPECIFICATIONS
NOTES:

1. NEVER INSTALL AN ALUMINUM CABLE IN THE TRANSFORMER SECONDARY BUSHINGS WITHOUT USING THE STEM CONNECTOR.

2. ALL TPX CABLES AND OPEN-WIRE CONDUCTORS SHALL HAVE A MINIMUM CLEARANCE OF 3" FROM THE TRANSFORMER TANK.

3. WHEREVER POSSIBLE, KEEP SECONDARY Drip LOOPS ABOVE THE BOTTOM OF THE TRANSFORMER TANK TO AVOID JOINT USE CLEARANCE ISSUES.

4. FOR MULTIPLE SERVICES, ON TRANSFORMERS RATED 50KVA OR LESS, USE SECONDARY CONNECTOR (CN 153529) WITH COVER. FOR AN EXISTING TRANSFORMER, SEE EXCEPTION IN NOTE 2 ON DWG. 06.03-04.
NOTES:

1. USE THESE CONNECTORS ON THREE-PHASE BANKS OR SINGLE-PHASE TRANSFORMERS WITH MULTIPLE SERVICES. TRANSFORMER UNITS MUST BE 50KVA OR SMALLER. LARGER UNITS WILL HAVE SECONDARY SPADES.

2. ALL BANK LEADS MUST BE FULLY INSULATED. SIZE PER DWGS. 06.03-01A AND 06.03-01B.

3. PUSH CONNECTOR STEM THROUGH COVER HOLE. CONNECT CONNECTOR STEM IN TRANSFORMER LUG. CLEAN WIRE AND APPLY INHIBITOR. INSERT WIRE IN BOTTOM OF CONNECTOR.

4. BEND WIRE AS NEEDED BEFORE INSERTING IN CONNECTOR.

5. MAINTAIN AT LEAST 3" CLEARANCE FROM TANK TO INSULATED LEAD.
NOTES:

1. IF ARRESTER MOUNTING PROVISION EXISTS ON THE TRANSFORMER TANK, THE ARRESTERS SHOULD BE MOUNTED ON THE TANK UNLESS IT IS A 3-TRANSFORMER FLOATING WYE-Delta BANK. LOCATE ARRESTERS FOR 3-TRANSFORMER FLOATING WYE-Delta BANKS ON SOURCE SIDE OF CUTOUT. IF ARRESTERS COME MOUNTED ON TRANSFORMER TANK, RELOCATE TO SOURCE SIDE OF CUTOUTS. IF ARRESTER MOUNTING PROVISION DOES NOT EXIST, MOUNT THE ARRESTERS ON THE CUTOUT BRACKET.
RACK TYPE BRACKET
CU BKTTFFRSMALC
CN 12912507
5 THRU 50 KVA UNITS

NOTES:
1. USE TWO 3/4" BOLTS TO MOUNT BRACKET TO POLE. USE TWO 5/8" BOLTS TO ATTACH EACH TRANSFORMER TO BRACKET.

THREE UNIT WING TYPE CLUSTER BRACKET
CU BKTTFFRSMEDALC
CN 12912200
75 THRU 167 KVA UNITS

NOTES:
1. USE TWO 3/4" BOLTS TO MOUNT BRACKET TO POLE. USE TWO 3/4" BOLTS TO ATTACH EACH TRANSFORMER TO BRACKET.
NOTES:

1. USE TWO 5/8" BOLTS TO MOUNT BRACKET TO POLE. USE TWO 3/4" BOLTS TO MOUNT EACH TRANSFORMER TO BRACKET.

2. A PLATFORM IS THE PREFERRED MOUNTING FOR TRANSFORMERS OF THIS SIZE. CONSULT WITH DISTRIBUTION STANDARDS ON POLE SIZE AND GUYING PRIOR TO USING THIS TRANSFORMER MOUNTING BRACKET.

3. CHECK ON AVAILABILITY AS THIS IS A SPECIAL ORDER ITEM.
NOTES:
1. USE NON-LOADBREAK CUTOUTS.
   CU TFUSE27CO100C (CN 11211802)
2. USE 18KV LIGHTNING ARRESTERS ON A 23KV LINE.
   CU AREQOHTR18C (CN 11231800)
3. USE 10KV LIGHTNING ARRESTERS ON A 12KV LINE.
   CU AREQOHTR10C (CN 11231307)
4. USE 27KV LIGHTNING ARRESTER ON A 34.5 LINE.
   CU AREQOHTR27C (CN 14002364)
5. USE CUTOUT BRACKET ON THE POLE OR CROSSARM BRACKET ON A CROSSARM.
   CUTOUT BRACKET - CU BKTCOLA18STLC (CN 12912002)
   CROSSARM BRACKET - CU BKTCOLASTLXARM (CN 9220240204)
6. USE #6 SD COPPER WP PRIMARY RISERS.
7. FOR UNITS WITH EXTERNAL LIGHTNING ARRESTERS, ROTATE ARRESTER FROM SHIPPING POSITION TO STRAIGHT OUT FROM TANK.
8. NON-COASTAL INSTALLATIONS - IF TRANSFORMER DOESN'T HAVE WILDLIFE GUARDS, ADD ONE TO EACH PRIMARY BUSHING(S) AND ARRESTER. SEE DWG. 06.00-23. CU WGEQBUSHSNAPC (CN 10300507). DO NOT INSTALL WILDLIFE GUARDS ON ANY TRANSFORMER INSTALLED IN A COASTAL ENVIRONMENT DUE TO SALT BUILDUP INSIDE THE WILDLIFE GUARD.
9. RURAL TYPE GAPPED TRANSFORMERS ARE OBSOLETE AND SHALL NOT BE USED FOR NEW INSTALLATIONS. EXISTING INSTALLATIONS SHOULD BE REMOVED WHEN OTHER WORK IS REQUIRED ON THE POLE.
10. CSP UNITS BEING REINSTALLED SHALL BE FUSED WITH A CUTOUT.
11. FOR 50 KVA AND SMALLER, USE QUANTITY TWO - 5/8" X 12" GALVANIZED BOLTS TO MOUNT TRANSFORMER. FOR 75 KVA - 167 KVA, USE QUANTITY TWO - 3/4" X 12" GALVANIZED BOLTS TO MOUNT TRANSFORMER.
NOTES:

1. MINIMUM BOLT HOLE SPACING IS 4"; NO HOLES SHOULD BE DRILLED CLOSER THAN 4".

2. THE CUTOUT CAN BE MOUNTED AT VARIOUS HEIGHTS AND/OR POSITIONS ON THE POLE FOR EASE OF INSTALLATION AND OPERATION.

3. THE BOTTOM OF THE TRANSFORMER TANK MUST MAINTAIN 30 INCHES OF CLEARANCE ABOVE JOINT USE CABLES.
<table>
<thead>
<tr>
<th>PRIMARY LINE VOLTAGE</th>
<th>SECONDARY DELIVERY VOLTAGE</th>
<th>NAME PLATE RATING OF TRANSFORMER TO BE USED</th>
<th>PRIMARY NEUTRAL CONNECTION</th>
<th>SECONDARY NEUTRAL CONNECTION</th>
<th>TYPE OF TRANSFORMER</th>
<th>SPECIFICATION DWG. NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>23KV</td>
<td>120</td>
<td>22860 GRD Y /13200</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>CSP OR ONE BUSHING CONVENTIONAL</td>
<td>06.10-01, II</td>
</tr>
<tr>
<td>23KV</td>
<td>120</td>
<td>14400/24940 GRD Y</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>TWO BUSHING CONVENTIONAL</td>
<td>06.10-01, IV</td>
</tr>
<tr>
<td>23KV</td>
<td>120/240</td>
<td>22860 GRD Y /13200</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>CSP OR ONE BUSHING CONVENTIONAL</td>
<td>06.10-02, II</td>
</tr>
<tr>
<td>23KV</td>
<td>120/240</td>
<td>24940 GRD Y /14400</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>RURAL</td>
<td>06.10-02, IV</td>
</tr>
<tr>
<td>23KV</td>
<td>120/240</td>
<td>14400/24940 GRD Y</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>TWO BUSHING CONVENTIONAL</td>
<td>06.10-03, II</td>
</tr>
<tr>
<td>12KV</td>
<td>120</td>
<td>12470 GRD Y /7200</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>CSP OR ONE BUSHING CONVENTIONAL</td>
<td>06.10-01, I</td>
</tr>
<tr>
<td>12KV</td>
<td>120</td>
<td>7200/12470 GRD Y</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>TWO BUSHING CONVENTIONAL</td>
<td>06.10-01, III</td>
</tr>
<tr>
<td>12KV</td>
<td>120/240</td>
<td>14400/24940 GRD Y</td>
<td>NONE</td>
<td>CENTER TAP</td>
<td>TWO BUSHING CONVENTIONAL</td>
<td>06.10-03, II</td>
</tr>
<tr>
<td>12KV</td>
<td>120/240</td>
<td>12470 GRD Y /7200</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>CSP OR ONE BUSHING CONVENTIONAL</td>
<td>06.10-02, I</td>
</tr>
<tr>
<td>12KV</td>
<td>120/240</td>
<td>12470 GRD Y /7200</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>RURAL</td>
<td>06.10-02, III</td>
</tr>
<tr>
<td>12KV</td>
<td>120/240</td>
<td>7200/12470 GRD Y</td>
<td>GROUNDED</td>
<td>CENTER TAP</td>
<td>TWO BUSHING CONVENTIONAL</td>
<td>06.10-03, I</td>
</tr>
</tbody>
</table>

NOTES:
1. TO PARALLEL SECONDARY COILS IN 120/240 VOLT TRANSFORMERS, REFER TO THE REFERENCED SPECIFICATION DWGS. SHOWN IN THE TABLE.
1. LENGTH OF ARRESTER LEADS SHOULD BE AS SHORT AS POSSIBLE.
2. USE #4 WPC FOR ALL TRANSFORMER RISERS.
3. MAY ALSO BE USED AS A 7.2 TO 13.2KV STEP-UP TRANSFORMER BY CONNECTING 7.2KV SOURCE TO SECONDARY BUSHINGS.
4. FOR 167KVA TRANSFORMER, ADD GUY TO POLE TO KEEP POLE FROM LEANING WITH WEIGHT OF TRANSFORMER ON ONE SIDE.
5. MOUNT ARRESTERS NEXT TO H1 AND X1 BUSHINGS IF MOUNTING NUTS ARE AVAILABLE. IF NOT AVAILABLE, MOUNT THE 18KV ARRESTER ON THE CUTOUT COLA BRACKET AND THE 10KV ARRESTER ON A SEPARATE COLA BRACKET.
### 23 KV

#### LARGEST TRANSFORMERS THAT WILL CLEAR BEYOND FUSES

<table>
<thead>
<tr>
<th>FUSE AMPS</th>
<th>TYPE KS FUSE</th>
<th>TYPE K FUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CONV. (KVA)</td>
<td>CSP (KVA)</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
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</tr>
<tr>
<td>80</td>
<td>500</td>
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</tr>
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<td>167</td>
<td>37.5</td>
</tr>
<tr>
<td>20</td>
<td>100</td>
<td>25</td>
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</tbody>
</table>

#### LARGEST TRANSFORMERS THAT WILL CLEAR BEYOND RECLOSERS

<table>
<thead>
<tr>
<th>RCL SIZE</th>
<th>CONV. (KVA)</th>
<th>CSP (KVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>250</td>
<td>50</td>
</tr>
<tr>
<td>70</td>
<td>200</td>
<td>50</td>
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<tr>
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### 12 KV

#### LARGEST TRANSFORMERS THAT WILL CLEAR BEYOND FUSES

<table>
<thead>
<tr>
<th>FUSE AMPS</th>
<th>TYPE KS FUSE</th>
<th>TYPE K FUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CONV. (KVA)</td>
<td>CSP (KVA)</td>
</tr>
<tr>
<td>100</td>
<td>333</td>
<td>50</td>
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<td>80</td>
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<tr>
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<td>50</td>
</tr>
<tr>
<td>50</td>
<td>167</td>
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<tr>
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<td>100</td>
<td>25</td>
</tr>
<tr>
<td>25</td>
<td>75</td>
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</tr>
</tbody>
</table>

#### LARGEST TRANSFORMERS THAT WILL CLEAR BEYOND RECLOSERS

<table>
<thead>
<tr>
<th>RCL SIZE</th>
<th>CONV. (KVA)</th>
<th>CSP (KVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>70</td>
<td>100</td>
<td>37.5</td>
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<td>50</td>
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<td>-</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**NOTES:**

1. The sizes shown in the above tables are a guide. Unusual circumstances or coordination problems may require a departure from the above. Refer such problems to distribution reliability.

2. The above tables are for single-phase transformers, for three-phase PMT's, divide actual transformer KVA rating by three and then enter table.

3. For recloser coordination with underground transformers, see DWG. 08.05-04.

4. Additional fuse coordination guides on DWGS. 07.00-15, 08.05-03 and 08.05-04.
THE DISTRIBUTION TRANSFORMER CONNECTION DRAWINGS SHOW THE MOST COMMON TRANSFORMER CONNECTIONS PRESENTLY BEING USED. PARTICULAR NOTE SHOULD BE MADE OF THE FOLLOWING:

1. TRANSFORMER CONNECTIONS (DWGS. 06.10-01 THROUGH 06.10-13) ARE SHOWN FOR BOTH SUBTRACTIVE AND ADDITIVE POLARITY TRANSFORMERS AND ASSUME THAT ALL TRANSFORMERS IN A BANK ARE THE SAME POLARITY. THIS IS TRUE IN MOST CASES AND AS A RESULT THE SECONDARY BUSHING MARKINGS (X₁, X₂, X₃, ETC.) WILL BE THE SAME FOR EACH TRANSFORMER IN THE BANK. **THE DRAWINGS DO NOT APPLY WHERE UNITS OF DIFFERENT POLARITY ARE IN THE SAME BANK.** IN THIS CASE THE SECONDARY BUSHING MARKINGS WILL BE DIFFERENT AND CARE MUST BE TAKEN IN ORDER TO ENSURE THAT CONNECTIONS ARE MADE ACCORDING TO THE BUSHING DESIGNATIONS (X₁, X₂, X₃, ETC.). **IF TRANSFORMERS OF DIFFERENT POLARITIES ARE NOT CONNECTED PROPERLY, HIGH SECONDARY VOLTAGES CAN RESULT, OR SECONDARY VOLTAGES CAN CANCEL RESULTING IN HIGH CIRCULATING CURRENTS, BLOWN FUSES, ETC.** SEE DWG. 06.07-05.

2. WHEN TRANSFORMERS IN A BANK ARE REPLACED, IT IS NECESSARY TO KEEP CUSTOMERS' MOTORS RUNNING IN THE SAME DIRECTION. PHASE ROTATION SHOULD BE CHECKED BEFORE AND AFTER ANY CONNECTIONS ARE CHANGED. ROTATION MAY BE REVERSED BY SWAPPING CONNECTIONS OF TWO OF THE PHASE WIRES. IF THE BANK HAS A LIGHTING TRANSFORMER, SWAP THE TWO LARGE LIGHTING WIRES.

3. FOR CLARITY, SOME GROUND CONNECTIONS ARE SHOWN AS TAPS. WHEREVER POSSIBLE, A CONTINUOUS LOOP SHOULD BE USED BETWEEN BUSHINGS OR FROM A BUSHING TO GROUND.


5. BE SURE TO REMOVE GROUND STRAP CONNECTIONS ON THE SECONDARY OF POWER TRANSFORMERS IN BANKS WITH DELTA SECONDARIES.

6. IN CLOSED BANKS WITH A DELTA SECONDARY CONNECTION, THE VOLTAGES OF THE TAP SETTINGS OF ALL TRANSFORMERS MUST BE IDENTICAL TO PREVENT CIRCULATING CURRENTS AND OVERHEATING. THE PERCENT IMPEDANCE SHOULD BE APPROXIMATELY THE SAME TO ESTABLISH PROPER LOAD DIVISION. FOR UNITS OF EQUAL CAPACITY WITH ONE ODD IMPEDANCE, SUCH AS WHEN A FAILED UNIT MUST BE REPLACED, THE TOTAL BANK DERATING IS APPRORIATATED IN THE FOLLOWING TABLE:

<table>
<thead>
<tr>
<th>RATIO OF ODD UNIT IMPEDANCE TO IMPEDANCE OF OTHER TWO UNITS</th>
<th>DERATING FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6</td>
<td>0.91</td>
</tr>
<tr>
<td>1.5</td>
<td>0.93</td>
</tr>
<tr>
<td>1.4</td>
<td>0.94</td>
</tr>
</tbody>
</table>

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7. FOR 240/120 VOLT, THREE-PHASE BANKS, THE TWO POWER (WING) TRANSFORMERS SHOULD HAVE THE SAME KVA RATING AND SIMILAR IMPEDANCE (ATTEMPT TO KEEP IMPEDANCE VALUES WITH +/-5% OF EACH OTHER). UNEQUAL KVA OR IMPEDANCE VALUES CAN LEAD TO TRANSFORMER OVERLOADS.

8. DO NOT USE SINGLE BUSHING TRANSFORMERS IN THREE TRANSFORMER BANKS EXCEPT FOR WYE-WYE 208Y/120 VOLT BANKS.

9. DO NOT MIX SINGLE BUSHING TRANSFORMERS AND DOUBLE BUSHING TRANSFORMERS TOGETHER IN THE BANK.
### Notes:

1. **Primary Switching of Unloaded Banks Should Be Done at the Transformers to Prevent Ferroresonat Overvoltages.**

2. **For Two Transformer Banks, Use Two Single Bushing or Two Double Bushing Transformers, But Do Not Use a Single Bushing and a Double Bushing Transformer Together in a Bank.**

---

<table>
<thead>
<tr>
<th><strong>Primary Line Voltage</strong></th>
<th><strong>Secondary Delivery Voltage</strong></th>
<th><strong>Name Plate Rating of Transformer to Be Used</strong></th>
<th><strong>Primary Neutral Connection</strong></th>
<th><strong>Secondary Neutral Connection</strong></th>
<th><strong>Bank Connection</strong></th>
<th><strong>Spec. Dwg. Number</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>23KV</td>
<td>240/120</td>
<td>14400/24940 Y 13200/22860Y</td>
<td>GROUNDED</td>
<td>OPEN</td>
<td>OPEN WYE</td>
<td>06.10-03, IV</td>
</tr>
<tr>
<td>23KV</td>
<td>240/120</td>
<td>22860 GRD Y /13200</td>
<td>GROUNDED</td>
<td>OPEN</td>
<td>OPEN WYE</td>
<td>06.10-04, II</td>
</tr>
<tr>
<td>23KV</td>
<td>240</td>
<td>14400/24940 Y 13200/22860Y</td>
<td>GROUNDED</td>
<td>OPEN</td>
<td>OPEN WYE</td>
<td>SAME AS 06.10-03, IV</td>
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<td>23KV</td>
<td>240</td>
<td>22860 GRD Y /13200</td>
<td>GROUNDED</td>
<td>NONE</td>
<td>OPEN WYE</td>
<td>SAME AS 06.10-04, II</td>
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<td>480</td>
<td>14400/24940 Y 240/480</td>
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<td>NONE</td>
<td>OPEN WYE</td>
<td>06.10-11, II</td>
</tr>
<tr>
<td>12KV</td>
<td>240/120</td>
<td>14400/24940 Y 120/240</td>
<td>NONE</td>
<td>CENTER TAP LTG. TRANS.</td>
<td>OPEN DELTA</td>
<td>06.10-04, IV</td>
</tr>
<tr>
<td>12KV</td>
<td>240</td>
<td>14400/24940 Y 120/240</td>
<td>NONE</td>
<td>NONE</td>
<td>OPEN DELTA</td>
<td>SAME AS 06.10-04, IV</td>
</tr>
<tr>
<td>12KV</td>
<td>480</td>
<td>14400/24940 Y 240/480</td>
<td>NONE</td>
<td>NONE</td>
<td>OPEN DELTA</td>
<td>06.10-11, IV</td>
</tr>
<tr>
<td>12KV</td>
<td>240/120</td>
<td>7200/12470 Y 120/240</td>
<td>GROUNDED</td>
<td>CENTER TAP LTG. TRANS.</td>
<td>OPEN WYE</td>
<td>06.10-03, III</td>
</tr>
<tr>
<td>12KV</td>
<td>240/120</td>
<td>12470 GRD Y /7200</td>
<td>GROUNDED</td>
<td>CENTER TAP LTG. TRANS.</td>
<td>OPEN WYE</td>
<td>06.10-04, I</td>
</tr>
<tr>
<td>12KV</td>
<td>240</td>
<td>7200/12470 Y 120/240</td>
<td>GROUNDED</td>
<td>NONE</td>
<td>OPEN WYE</td>
<td>SAME AS 06.10-03, III</td>
</tr>
<tr>
<td>12KV</td>
<td>240</td>
<td>12470 GRD Y /7200</td>
<td>GROUNDED</td>
<td>NONE</td>
<td>OPEN WYE</td>
<td>SAME AS 06.10-04, I</td>
</tr>
<tr>
<td>12KV</td>
<td>480</td>
<td>7200/12470 Y 240/480</td>
<td>GROUNDED</td>
<td>NONE</td>
<td>OPEN WYE</td>
<td>06.10-11, I</td>
</tr>
</tbody>
</table>

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**Notes:**

1. **Primary Switching of Unloaded Banks Should Be Done at the Transformers to Prevent Ferroresonat Overvoltages.**

2. **For Two Transformer Banks, Use Two Single Bushing or Two Double Bushing Transformers, But Do Not Use a Single Bushing and a Double Bushing Transformer Together in a Bank.**
### PRIMARY LINE VOLTAGE | SECONDARY DELIVERY VOLTAGE | NAME PLATE RATING OF TRANSFORMER TO BE USED | PRIMARY NEUTRAL CONNECTION | SECONDARY NEUTRAL CONNECTION | BANK CONNECTION | SPECIFICATION DWG. NUMBER
---|---|---|---|---|---|---
23KV | 240/120 | 14400/24940 Y 13200/22860Y | 120/240 | FLOATING | CENTER TAP LTG. TRANS. | WYE 1-Delta | 06.10-05, II 06.10-06, II
23KV | 208Y/120 | 22860 GRD Y /13200 14400/24940 Y 13200/22860Y | 120 | GROUNDED | GROUNDED | WYE - WYE | 06.10-07, II 06.10-07, IV 06.10-09, II
23KV | 480Y/277 | 14400/24940 Y 277 | GROUNDED | GROUNDED | WYE - WYE | 06.10-10, II
23KV | 240 | 14400/24940 Y 13200/22860Y | 120/240 | FLOATING | NONE | WYE 1-Delta | SAME AS 06.10-05, II 06.10-06, II W/O SEC.NEU.
23KV | 480 | 14400/24940 Y 277 | GROUNDED | FLOATING | WYE - WYE | 06.10-12, III
23KV | 480 | 14400/24940 Y 240/480 | FLOATING | NONE | WYE 1-Delta | 06.10-12, II
23KV | 600 | 14400/24940 Y 600 | FLOATING | NONE | WYE 1-Delta | 06.10-13, II
12KV | 240/120 | 14400/24940 Y | 120/240 | NONE | CENTER TAP LTG. TRANS. | DELTA 2-Delta | 06.10-05, IV 06.10-06, IV
12KV | 208Y/120 | 14400/24940 Y | 120 | GROUNDED | DELTA 2-WYE | 06.10-08, II 06.10-09, IV
12KV | 480Y/277 | 14400/24940 Y | 277 | GROUNDED | DELTA 2-WYE | 06.10-10, IV
12KV | 240 | 14400/24940 Y | 120/240 | NONE | NONE | DELTA 2-Delta | SAME AS 06.10-05, IV 06.10-06, IV W/O SEC.NEU.
12KV | 480 | 14400/24940 Y | 277 | NONE | FLOATING | DELTA 2-WYE | SAME AS 06.10-10, IV W/O SEC.NEU.
12KV | 480 | 14400/24940 Y | 240/480 | NONE | NONE | DELTA 2-Delta | 06.10-12, IV
12KV | 600 | 14400/24940 Y | 600 | NONE | NONE | DELTA 2-Delta | 06.10-13, IV
12KV | 240/120 | 7200/12470 Y | 120/240 | FLOATING | CENTER TAP LTG. TRANS. | WYE 1-Delta | 06.10-05, I 06.10-06, I 06.10-06, II
12KV | 208Y/120 | 12470 GRD Y /7200 7200/12470 Y | 120 | GROUNDED | GROUNDED | WYE 1-WYE | 06.10-07, I 06.10-07, III 06.10-09, I
12KV | 240 | 7200/12470 Y | 120/240 | FLOATING | NONE | WYE 1-Delta | SAME AS 06.10-05, I 06.10-06, I W/O SEC.NEU.
12KV | 480 | 7200/12470 Y | 240/480 | FLOATING | NONE | WYE 1-Delta | 06.10-12, I

**NOTES:**
1. PRIMARY SWITCHING OF UNLOADED BANKS SHOULD BE DONE AT THE TRANSFORMERS TO PREVENT FERREORESONANT OVERVOLTAGES.
2. TO PARALLEL SECONDARY COILS IN 120/240 VOLT TRANSFORMER, REFER TO THE REFERENCED SPECIFICATION DWGS. SHOWN IN THE TABLE.
3. DO NOT USE SINGLE BUSHING TRANSFORMERS IN THREE TRANSFORMER BANKS EXCEPT FOR WYE-WYE 208Y/120 VOLT BANKS.

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**THREE-PHASE**

**THREE TRANSFORMER INSTALLATION**

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**Progress Energy**

**CAR**

**DWG.** 06.07-04
Polarity is especially important when banking transformers and when two or more transformers are to be paralleled. Connections to additive and subtractive polarity will be in different physical locations on the tank. Bushing markings on the nameplate will be as shown below. Note that the H-bushing is always on the left when facing the low voltage side of the transformer, and that the physical location of the secondary bushings (X₁, X₂, X₃, etc.) on an additive polarity transformer is different from that of a subtractive polarity transformer.

Additive polarity - all single-phase transformers rated 167 kVA and smaller, having high voltage winding 7200 volts and below.

Characteristics of additive polarity:
1. The low voltage X₁ bushing is on the right when facing the low voltage side of the transformer.
2. The direction of induced voltage from H₁ to H₂ is opposite the direction of induced voltage from X₁ to X₂

Subtractive polarity - all single-phase transformers having high voltage windings of 13200 and above, all dual voltage (13200 x 7200) transformers and all transformers larger than 167 kVA.

Characteristics of subtractive polarity:
1. The low voltage X₁ bushing is on the left when facing the low voltage side of the transformer.
2. The direction of induced voltage from H₁ to H₂ is the same as the direction of induced voltage from X₁ to X₂

---

**NEMA Standards for Low Voltage External Terminals**

<table>
<thead>
<tr>
<th>Description of Connection</th>
<th>Additive Polarity</th>
<th>Subtractive Polarity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Two Terminals:</strong></td>
<td><img src="#" alt="Diagram" /></td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Single low voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Three Terminals:</strong></td>
<td><img src="#" alt="Diagram" /></td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Three wire 120/240 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(series connection)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two wire 120 Volts or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four wire 208Y/120 Volt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank (parallel connection)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On additive polarity trans., reconnect internally A &amp; C leads to X₃ neutral terminal &amp; B &amp; D leads to X₁ phase terminal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On subtractive polarity trans., reconnect internally A &amp; C leads to X₁ phase terminal &amp; B &amp; D leads to X₂ neutral terminal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Four Terminals:</strong></td>
<td><img src="#" alt="Diagram" /></td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Four wire 120/240 Volt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(series connection)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 3-wire 120/240 Volt (series) operation, connect X₂ to X₃ externally. For 4-wire 208Y/120 Volt (parallel) operation connect X₁ to X₃ and X₂ to X₄ externally.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. All general policies for single-phase transformer installations should be followed. General policies can be found on the following DWGs. 06.00-20, 06.07-01, 06.15-01A, 06.15-01B and 06.15-03.

2. The lighting transformer should be connected to the leading phase. A phase leads B phase, B phase leads C phase and C phase leads A phase.

3. The ground strap must be removed from the secondary neutral bushing on the power transformer.

4. Do not mix one bushing units and two bushing units in the same bank.

5. Lightning arresters should be mounted on the transformer tank for all primary bushings connected to an energized primary conductor. Mount arrester on cola bracket only if arrester provisions are not on tank. The H2 primary bushing should be connected to the system neutral with #6 SD BC.

6. Two single-phase cola brackets (CU BKTCOLA18STLC, CN 12912002) should be used.

7. A two transformer mounting bracket should be used. See DWGs. 06.04-07 and 06.07-10A for available bracket.

8. See DWG. 06.07-06B for transformer bank mounting dimensions.
NOTES:

1. THE DISTANCE "X" BETWEEN THE TOP BOLT OF THE TRANSFORMER MOUNTING BRACKET AND THE BOTTOM OF THE TRANSFORMER VARIES. TYPICAL MAXIMUM DISTANCES ARE SHOWN IN THE TABLE BELOW.

<table>
<thead>
<tr>
<th>SIZE OF TRANSFORMER</th>
<th>DISTANCE &quot;X&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5 KVA AND BELOW</td>
<td>32&quot;</td>
</tr>
<tr>
<td>50-100 KVA</td>
<td>39&quot;</td>
</tr>
<tr>
<td>167 KVA</td>
<td>48&quot;</td>
</tr>
</tbody>
</table>

2. SEE DWG. 06.07-06A FOR TRANSFORMER BANKS GENERAL POLICIES.
1. All general policies for two transformer bank installations should continue to be followed. General policies can be found on the following DWGs: 06.00-20, 06.07-01, 06.07-06A, 06.15-01A, 06.15-01B and 06.15-03.

2. The three-phase Cola bracket (CU BKTCOLATRIL, CN 12912101) should be used.

3. Cluster mounting brackets should be used.

4. On 3-transformer floating Wye-Delta banks, arresters shall be mounted on source side of cutout. If arresters come mounted on transformer tank, relocate to source side of cutouts.

### Cluster Mounting Brackets

<table>
<thead>
<tr>
<th>Transformer Sizes</th>
<th>Compatible Unit</th>
<th>Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 167 kVA 2 Transformer Bank</td>
<td>BKTTFMROPWYEC</td>
<td>76332584</td>
</tr>
<tr>
<td>5 to 50 kVA 3 Transformer Bank</td>
<td>BKTTFMRSMALC</td>
<td>12912507</td>
</tr>
<tr>
<td>75 to 167 kVA 3 Transformer Bank</td>
<td>BKTTFMRMEDALC</td>
<td>12912200</td>
</tr>
<tr>
<td>250 to 333 kVA (Class 1 pole required) 3 Transformer Bank</td>
<td>BKTTFMRLGEALC</td>
<td>12912705 (Non-stocked)</td>
</tr>
</tbody>
</table>

For 50 kVA and below, use 5/8" x 2" machine bolts. For 75 kVA and larger, use 3/4" x 2" machine bolts.
NOTES:

1. ALL GUYS ABOVE THE NEUTRAL POSITION MUST HAVE A GUY INSULATOR (LINK) OF SUFFICIENT LENGTH TO EXTEND BEYOND THE LOWEST ENERGIZED COMPONENT BY 24".

2. 12" MINIMUM CLEARANCE MUST BE MAINTAINED BETWEEN PRIMARY RISER AND ANY GUY INSULATOR.


4. ARRESTERS NOT SHOWN FOR CLARITY. THEY COME MOUNTED ON THE TRANSFORMER FROM THE FACTORY. FOR WYE-DELTA CONNECTED BANKS ONLY, THEY MUST BE RELOCATED TO THE CUTOUT BRACKET AND CONNECTED ON THE SOURCE SIDE OF THE CUTOUTS.
1. Platform requires four 3/4" machine bolts, four 3/4" lock washers and four 2-1/4" x 2-1/4" square washers for two pole mounting. Bolts should be installed with bolt head towards the platform center. Use washers at all contact points.

2. The two pole platform will support a load of 13,500 lbs (no center stub required). For greater loads, use center stub support (CU PLFCPALC).

3. The cross members can be positioned anywhere along the beams to allow equipment to be properly spaced.

4. For banks using 250 and 333 KVA transformers, an extra large cluster mount bracket (CU BKTTFMRGALC CN 12912705) is available as a more economical option to using a platform. This bracket is special order, non-stocked. Use the extra large cluster mount bracket with Class 1 pole.

5. See DwG. 06.08-03B for platform assembly instructions.
PLATFORM ASSEMBLY INSTRUCTIONS

FOR EASE OF INSTALLATION, THIS ADJUSTABLE PLATFORM MAY BE PRE-ASSEMBLED IN THE SHOP AND CARRIED TO THE JOB SITE. IT MAY ALSO BE ASSEMBLED AT THE BASE OF THE POLES.

IT IS RECOMMENDED YOU PROCEED AS FOLLOWS:

1. OPEN THE BOXED PARTS. EXAMINE THE ERECTION DIAGRAM. LOCATE AND IDENTIFY ALL ITEMS LISTED ON THE DIAGRAM.

2. POSITION THE I-BEAMS AND SLIDE 1/2" X 1-1/4" BOLTS INTO PLACE.

3. CRITICAL - BEGIN ASSEMBLY OF THE CROSSMEMBERS (C14'S, B2'S ETC.) AT THE CENTER OF THE PLATFORM, WORKING OUTWARD TOWARD THE ENDS. HEX NUTS AND PAL-TYPE LOCKNUTS ARE PROVIDED FOR EACH 1/2" BOLT.

4. COMPLETE THE ASSEMBLY WITH THE "A-FRAME" POLE FACE ATTACHMENTS IN THE APPROXIMATE FINAL POSITIONS. LEAVE ONE "A-FRAME" LOOSE TO SLIDE IN THE BEAMS FOR FINAL ADJUSTMENT.

5. HOIST PLATFORM TO DESIRED HEIGHT, LEVEL AND MAKE FINAL ADJUSTMENT OF "A-FRAME" ENDS TO INSURE GOOD CONTACT WITH THE POLES. BOLT THE "A-FRAMES" TO THE POLES USING THE THRU-BOLTS AND LAG BOLTS SPECIFIED ON THE ERECTION DIAGRAM. INSTALL THE POLE THRU-BOLTS WITH THE HEADS TOWARD THE PLATFORM CENTER.

6. CHECK TO BE SURE ALL NUTS ARE TIGHT AND ALL LOCKNUTS ARE IN PLACE.

7. INSTALL EQUIPMENT DIRECTLY ON ALUMINUM CROSSMEMBERS. THE CROSSMEMBERS MAY BE ADJUSTED TO SUPPORT THE LOAD. NO ADDITIONAL EQUIPMENT MOUNTING BOLTS ARE NECESSARY FOR NORMAL APPLICATIONS.

NOTES:

1. SEE DWG. 06.08-03A FOR PLATFORM DETAIL, NOTES AND BILL OF MATERIALS.
NOTES:
1. SEE DWGS. 06.10-01 THROUGH 06.10-13 FOR TRANSFORMER CONNECTIONS.
2. DO NOT GROUND 1/4" GUSTRAND SECONDARY MESSENGERS.
3. POTENTIAL TRANSFORMERS ARE REQUIRED FOR METERING 480 VOLT, 30, 3W SERVICES. METERING SHOWN IS FOR 240/120, 30, 4W SERVICES.
4. PLATFORM RATED WEIGHT CAPACITY WITHOUT CENTER STUB POLE IS 13,500 LBS. SEE DWGS. 06.08-03A AND 06.08-03B FOR INFORMATION ON STUB POLE.
5. ISSUE TRANSFORMERS, LOW VOLTAGE CONDUCTOR AND TERMINATIONS, METERING EQUIPMENT AND POLES SEPARATELY.
6. PARALLELED SERVICE CONDUCTORS ARE TO BE SPIRAL WRAPPED TOGETHER.
7. FOR SPADE EXTENSIONS, SEE DWG. 27.06-12.
8. SEE SECTION 01 FOR ADDITIONAL GROUNDING DETAILS.
9. EACH END OF PLATFORM TO BE ATTACHED TO POLE WITH QUANTITY TWO 3/4" BOLTS. SEE DWGS. 06.08-03A AND 06.08-03B FOR PLATFORM SPECIFICATIONS.
10. SEE DWG. 06.08-04B FOR BILL OF MATERIALS.
11. MOUNT PRIMARY ARRESTERS ON SOURCE SIDE OF CUTOUTS. IF ARRESTERS COME MOUNTED ON TRANSFORMER TANK, RELocate TO SOURCE SIDE OF CUTOUTS.
12. CLEARANCE TO BOTTOM OF PLATFORM CAN BE 11' ONLY IF THE AREA UNDER THE PLATFORM IS SUBJECT TO PEDESTRIANS OR RESTRICTED TRAFFIC. IF AREA UNDER PLATFORM IS SUBJECT TO RIDERS ON HORSEBACK OR OTHER LARGE ANIMALS, VEHICLES OR OTHER MOBILE UNITS EXCEEDING 8' IN HEIGHT, THE DIMENSION TO THE BOTTOM OF THE PLATFORM SHALL BE 15' MINIMUM.

WYE-DELTA TRANSFORMER PLATFORM INSTALLATION
**NOTES:**

1. SEE DWG. 06.08-04A FOR DESIGN SPECIFICATIONS.
DELTA-WYE TRANSFORMER PLATFORM INSTALLATION

1. SEE DWGS. 06.10-01 THROUGH 06.10-13 FOR TRANSFORMER CONNECTIONS.
2. FOR SPECIAL INSTALLATIONS CONTACT LOCAL ENGINEER.
3. PLATFORM RATED WEIGHT CAPACITY WITHOUT CENTER STUB POLE IS 13,500 LBS.
4. TRANSFORMERS SHOULD BE BOLTED TO PLATFORM USING BOLTS IN CROSSMEMBER T-SLOTS.
5. PARALLELLED SERVICE CONDUCTORS ARE TO BE SPIRAL WRAPPED TOGETHER.
6. FOR SECONDARY CONNECTOR BLOCKS, SEE DWG. 27.06-12.
7. SEE SECTION 01 FOR ADDITIONAL GROUNDING DETAILS.
8. EACH END OF PLATFORM TO BE ATTACHED TO POLE WITH QUANTITY TWO 3/4" BOLTS. SEE DWGS. 06.08-03A AND 06.08-03B FOR PLATFORM SPECIFICATIONS.
9. SEE DWG. 06.08-05B FOR BILL OF MATERIALS.
10. MOUNT PRIMARY ARRESTERS ON THE TRANSFORMER TANK AT ALL HIGH VOLTAGE BUSHINGS IF PROVISIONS ARE AVAILABLE. OTHERWISE, MOUNT ON THE TIMBER ADJACENT TO CUTOUTS.
11. CLEARANCE TO BOTTOM OF PLATFORM CAN BE 11' ONLY IF THE AREA UNDER THE PLATFORM IS SUBJECT TO PEDESTRIANS OR RESTRICTED TRAFFIC. IF AREA UNDER PLATFORM IS SUBJECT TO RIDERS ON HORSEBACK OR OTHER LARGE ANIMALS, VEHICLES OR OTHER MOBILE UNITS EXCEEDING 8' IN HEIGHT, THE DIMENSION TO THE BOTTOM OF THE PLATFORM SHALL BE 15' MINIMUM.
### NOTES:

1. ISSUE TRANSFORMERS, LOW VOLTAGE CONDUCTOR AND TERMINATIONS, METERING EQUIPMENT AND POLES SEPARATELY.

2. SEE DWG. 06.08-05A FOR DESIGN SPECIFICATIONS AND NOTES.

3. SEE DWGS. 06.08-03A AND 06.08-03B FOR PLATFORM SPECIFICATIONS.
NOTES:

1. SEE DWG. 06.08-06B FOR NOTES AND BILL OF MATERIALS.
WYE-WYE STEPDOWN INSTALLATION
12470Y/7200 OR 4160Y/2400 SECONDARY

NOTES:

1. SPANS AND TENSIONS ON BOTH SIDES OF STRUCTURE SHOULD BE EQUAL. STRUCTURE SHOULD NOT LEAN. GUYING MAY BE REQUIRED.

2. TRANSFORMERS SHOWN ARE FOR 4KV SECONDARY.

3. GROUND PLATFORM WITH COPPER GROUNDING LUG.

4. PLATFORM RATED WEIGHT CAPACITY WITHOUT CENTER STUB POLE IS 13,500 LBS.

5. TRANSFORMERS SHOULD BE BOLTED TO PLATFORM USING BOLTS IN CROSSMEMBER T-SLOTS.

6. EACH END OF PLATFORM TO BE ATTACHED TO POLE WITH QUANTITY TWO 3/4" BOLTS. SEE DWGS. 06.08-03A 06.08-03B FOR PLATFORM SPECIFICATIONS.

7. MOUNT PRIMARY ARRESTER ON THE TRANSFORMER TANK AT ALL PRIMARY H1 BUSHINGS IF PROVISIONS ARE AVAILABLE. OTHERWISE, MOUNT ON THE TIMBER ADJACENT TO CUTOUTS.

8. CLEARANCE TO BOTTOM OF PLATFORM CAN BE 11' ONLY IF THE AREA UNDER THE PLATFORM IS SUBJECT TO PEDESTRIANS OR RESTRICTED TRAFFIC. IF AREA UNDER PLATFORM IS SUBJECT TO RIDERS ON HORSEBACK OR OTHER LARGE ANIMALS, VEHICLES OR OTHER MOBILE UNITS EXCEEDING 8' IN HEIGHT, THE DIMENSION TO THE BOTTOM OF THE PLATFORM SHALL BE 15' MINIMUM.

9. SEE DWG. 06.08-06A FOR DESIGN SPECIFICATIONS.

10. SECONDARY BUSHINGS FOR 12470Y/7200 VOLT SYSTEMS WILL BE ON COVER OF TRANSFORMERS.
NOTES:
1. SEE DWG. 06.08-08B FOR NOTES AND BILL OF MATERIALS.
NOTES:

1. SPANS AND TENSIONS ON BOTH SIDES OF STRUCTURE SHOULD BE EQUAL. STRUCTURE SHOULD NOT LEAN. GUYING MAY BE REQUIRED.

2. SEE DWGS. 06.10-01 THROUGH 06.10-13 FOR TRANSFORMER CONNECTIONS.

3. FOR SPECIAL INSTALLATIONS CONTACT LOCAL ENGINEER.

4. PLATFORM RATED WEIGHT CAPACITY WITHOUT CENTER STUB POLE IS 13,500 LBS. SEE DWGS. 06.08-03A AND 06.08-03B FOR INFORMATION ON STUB POLE.

5. SEE SECTION 01 FOR ADDITIONAL GROUNDING DETAILS.

6. EACH END OF PLATFORM TO BE ATTACHED TO POLE WITH QUANTITY TWO 3/4" BOLTS. SEE DWGS. 06.08-03A AND 06.08-03B FOR PLATFORM SPECIFICATIONS.

7. MOUNT PRIMARY ARRESTERS ON THE TRANSFORMER TANK AT ALL PRIMARY H1 BUSHINGS IF PROVISIONS ARE AVAILABLE. OTHERWISE, MOUNT ON THE TIMBER ADJACENT TO CUTOUTS.

8. CLEARANCE TO BOTTOM OF PLATFORM CAN BE 11' ONLY IF THE AREA UNDER THE PLATFORM IS SUBJECT TO PEDESTRIANS OR RESTRICTED TRAFFIC. IF AREA UNDER PLATFORM IS SUBJECT TO RIDE ON HORSEBACK OR OTHER LARGE ANIMALS, VEHICLES OR OTHER MOBILE UNITS EXCEEDING 8' IN HEIGHT, THE DIMENSION TO THE BOTTOM OF THE PLATFORM SHALL BE 15' MINIMUM.

9. SEE DWG. 06.08-08A FOR DESIGN SPECIFICATIONS.

10. PARALLEL SERVICE CONDUCTORS ARE TO BE SPIRAL WRAPPED TOGETHER.

11. SEE DWG. 27.06-12 FOR SECONDARY CONNECTOR BLOCKS.
1. See DWG. 06.10-01 through DWG. 06.10-13 for transformer connections.
2. For special installations contact local engineer.
3. Platform rated weight capacity without center stub pole is 13,500 lbs.
4. Transformers should be bolted to platform using bolts in crossmember t-slots.
5. Paralleled service conductors are to be spiral wrapped together.
6. For secondary connector blocks, see DWG. 27.06-12.
7. Each end of platform to be attached to pole with quantity two 3/4" bolts. See DWGs. 06.08-03A and 06.08-03B for platform specifications.
8. See DWG. 06.08-10B for bill of materials.
9. Clearance to bottom of platform can be 11' only if the area under the platform is subject to pedestrians or restricted traffic. If area under platform is subject to riders on horseback or other large animals, vehicles or other mobile units exceeding 8' in height, the dimension to the bottom of the platform shall be 15' minimum.
## NOTES:

1. ISSUE TRANSFORMERS, LOW VOLTAGE CONDUCTOR AND TERMINATIONS, METERING EQUIPMENT AND POLES SEPARATELY.

2. SEE DWG. 06.08-10A FOR DESIGN SPECIFICATIONS AND NOTES.

3. SEE DWGS. 06.08-03A AND 06.08-03B FOR PLATFORM SPECIFICATIONS.

### BILL OF MATERIALS

<table>
<thead>
<tr>
<th>MACRO UNIT</th>
<th>DESCRIPTION</th>
<th>ITEM NO</th>
<th>COMPATIBLE UNIT</th>
<th>QTY REQ'D</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO750T23GCM</td>
<td>TFMR OH MU 750KVA 2-B/TAP MILD 12.47KV 480V 3-WIRE WYE</td>
<td></td>
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<tr>
<td></td>
<td>TFMR OH MU 1000KVA 2-B/TAP MILD 12.47KV 480V 3-WIRE WYE</td>
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<td></td>
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</tr>
<tr>
<td>TO1500T23GCM</td>
<td>TFMR OH MU 1500KVA 2-B/TAP MILD 12.47KV 480V 3-WIRE WYE</td>
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</tbody>
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### BILL OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM NO</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PLF16HDALC</td>
</tr>
<tr>
<td>2</td>
<td>TFUSE27CO100C</td>
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<tr>
<td>3</td>
<td>IDES25PC</td>
</tr>
<tr>
<td>4</td>
<td>ARMS18WC</td>
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<tr>
<td>5</td>
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<td>6</td>
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<td>PINCARM586C</td>
</tr>
<tr>
<td>9</td>
<td>BTKCOLASTLXARMC</td>
</tr>
<tr>
<td>10</td>
<td>TF0250DTM25FC</td>
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<table>
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<tr>
<th>ITEM NO</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STRUCTURE PLATFORM 16' HEAVY DUTY ALUMINUM</td>
</tr>
<tr>
<td>2</td>
<td>TRANS/CAP FUSE 27KV CUTOUT 100 AMP</td>
</tr>
<tr>
<td>3</td>
<td>INSULATOR DEADEND/SUSPENSION 25 KV POLYMER</td>
</tr>
<tr>
<td>4</td>
<td>XARM SINGLE 4&quot; X 6&quot; X 18' PENTA WOOD FOR REG</td>
</tr>
<tr>
<td>5</td>
<td>INSULATOR PIN 23 KV</td>
</tr>
<tr>
<td>6</td>
<td>INSULATOR PIN SCREW X 6&quot; X 1&quot; HEAD</td>
</tr>
<tr>
<td>7</td>
<td>CROSSARM SINGLE, FIBERGLASS, 72&quot;</td>
</tr>
<tr>
<td>8</td>
<td>INSULATOR PIN POLE TOP PIN 20&quot; STEEL</td>
</tr>
<tr>
<td>9</td>
<td>INSULATOR PIN 23 KV</td>
</tr>
<tr>
<td>10</td>
<td>INSULATOR PIN 23 KV</td>
</tr>
<tr>
<td></td>
<td>PIN, SHOULDER, 5/8&quot; X 6&quot;, STEEL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ITEM NO</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>OH 250KVA 2-B CON W/TAP MILD 14.4/24.94Y KV 277/480V</td>
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</table>

### BILL OF MATERIALS

- PLF16HDALC: STRUCTURE PLATFORM 16' HEAVY DUTY ALUMINUM
- TFUSE27CO100C: TRANS/CAP FUSE 27KV CUTOUT 100 AMP
- IDES25PC: INSULATOR DEADEND/SUSPENSION 25 KV POLYMER
- ARMS18WC: XARM SINGLE 4" X 6" X 18' PENTA WOOD FOR REG
- IPIN23C: INSULATOR PIN 23 KV
- ARMSDE72FC: CROSSARM SINGLE, FIBERGLASS, 72"
- PINPT920C: INSULATOR PIN POLE TOP PIN 20" STEEL
- PINCARM586C: PIN, SHOULDER, 5/8" X 6", STEEL
- BTKCOLASTLXARMC: BRACKET FOR CO OR ARR, STEEL, XARM MNTED.
- TF0250DTM25FC: OH 250KVA 2-B CON W/TAP MILD 14.4/24.94Y KV 277/480V
-SINGLE PHASE CONNECTION-  
12470 GRD. Y/7200 TO 120/240 VOLT CSP TRANSFORMERS  
120 VOLT SINGLE PHASE SERVICE  
-ADDITIVE POLARITY-

12 KV SYSTEM

A
B
C

H1
H2
N

-X1
-X2
-X3

SECONDARY CONDUCTORS

a
120V

120 VOLT SINGLE PHASE SERVICE

7200/12470Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS  
120 VOLT SINGLE PHASE SERVICE  
-ADDITIVE POLARITY-

23 KV SYSTEM

A
B
C

H1
H2
N

-X1
-X2
-X3

SECONDARY CONDUCTORS

a
120V

120 VOLT SINGLE PHASE SERVICE

13200/22860Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS  
-ADDITIVE POLARITY-

120 VOLT TWO-WIRE SERVICE

-ADDITIVE AND SUBTRACTIVE POLARITY -
12 KV SYSTEM

PRIMARY CONDUCTORS

-ADDITIVE POLARITY-

DISTRIBUTION TRANSFORMER CONNECTIONS - ADDITIVE AND SUBTRACTIVE POLARITY -

120/240 AND 240/480 VOLT SINGLE-PHASE SERVICE

SECONDARY CONDUCTORS

(120/240 VOLT SINGLE PHASE SERVICE)

-CONNECTED PHASE TO PHASE CONNECTED PHASE TO GROUND

12470 GRD. Y/7200 TO 120/240 VOLT CSP TRANSFORMER

12 KV SYSTEM

SECONDARY CONDUCTORS

(120/240 VOLT SINGLE PHASE SERVICE)

-CONNECTED PHASE TO PHASE CONNECTED PHASE TO GROUND

120/240 VOLT SINGLE PHASE SERVICE

-ADDITIVE POLARITY-

23 KV SYSTEM

PRIMARY CONDUCTORS

-SINGLE PHASE CONNECTION-

DISTRIBUTION TRANSFORMER CONNECTIONS - ADDITIVE AND SUBTRACTIVE POLARITY -

120/240 AND 240/480 VOLT SINGLE-PHASE SERVICE

SECONDARY CONDUCTORS

(240/480 VOLT SINGLE PHASE SERVICE)

-CONNECTED PHASE TO PHASE CONNECTED PHASE TO GROUND

22860 GRD. Y/13200 TO 120/240 VOLT CSP TRANSFORMER

23 KV SYSTEM

SECONDARY CONDUCTORS

(240/480 VOLT SINGLE PHASE SERVICE)

-CONNECTED PHASE TO PHASE CONNECTED PHASE TO GROUND

120/240 VOLT SINGLE PHASE SERVICE

-SUBTRACTIVE POLARITY-

14400/24940Y TO 240/480 VOLT CONVENTIONAL TRANSFORMERS

120/240 VOLT SINGLE PHASE SERVICE

-SUBTRACTIVE POLARITY-
THREE PHASE OPEN-WYE OPEN-DELTA CONNECTION

13200/22860Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS

14400/24940Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS

SUBTRACTIVE POLARITY

23 KV SYSTEM
PRIMARY CONDUCTORS

ADDITIVE POLARITY

120/240 VOLT SINGLE PHASE SERVICE

7200/12470Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS

SINGLE PHASE CONNECTION

SECONDARY CONDUCTORS

POWER LEG

12 KV SYSTEM

120/240V 1 PH AND 240/120V 3 PH (OPEN-DELTA) SERVICE

- ADDITIVE AND SUBTRACTIVE POLARITY -

DISTRIBUTION TRANSFORMER CONNECTIONS

120/240V 1 PH AND 240/120V 3 PH (OPEN-DELTA) SERVICE

120/240 VOLT SINGLE PHASE SERVICE

-ADDITIVE POLARITY-

120/240 VOLT THREE PHASE SERVICE

-ADDITIVE POLARITY-

120/240 VOLT SINGLE PHASE SERVICE

-SUBTRACTIVE POLARITY-

120/240 VOLT THREE PHASE SERVICE

-SUBTRACTIVE POLARITY-
DISTRIBUTION TRANSFORMER CONNECTIONS

- ADDITIVE AND SUBTRACTIVE POLARITY -

240/120 VOLT 3 PHASE (OPEN-DELTA) SERVICE
DISTRIBUTION TRANSFORMER CONNECTIONS
-ADDITIVE AND SUBTRACTIVE POLARITY-
240/120 VOLT THREE-PHASE SERVICE
THREE-PHASE WYE-DELTA CONNECTION
7200/12470Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS 167 & 200KVA
240/120 VOLT THREE-PHASE SERVICE

NOTE: DO NOT GROUND PRIMARY NEUTRAL OF TRANSFORMER BANK
-ADDITIVE POLARITY-

THREE-PHASE WYE-DELTA CONNECTION
13200/22860Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS 167 THRU 500 KVA AND
14400/24940Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS 167 THRU 500 KVA
240/120 VOLT THREE-PHASE SERVICE

NOTE: DO NOT GROUND PRIMARY NEUTRAL OF TRANSFORMER BANK
-SUBTRACTIVE POLARITY-

THREE-PHASE DELTA-DELTA CONNECTION
14400/24940Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS 167 THRU 500 KVA
240/120 VOLT THREE-PHASE SERVICE
-SUBTRACTIVE POLARITY-
-THREE PHASE WYE-WYE CONNECTION-

12470 GRD. Y/7200 TO 120/240 VOLT CSP TRANSFORMER
208Y/120 VOLT THREE PHASE SERVICE
-ADDITIVE POLARITY-

NOTE: DUAL VOLTAGE CSP TRANSFORMERS ARE SUBTRACTIVE POLARITY. CONNECT AS SHOWN IN PLATE II.

-THREE PHASE WYE-WYE CONNECTION-

22860 GRD. Y/13200 TO 120/240 VOLT CSP TRANSFORMERS
208Y/120 VOLT THREE PHASE SERVICE
-SUBTRACTIVE POLARITY-

12470 GRD. Y/7200 TO 120/240 VOLT CONVENTIONAL TRANSFORMERS
208Y/120 VOLT THREE PHASE SERVICE
-ADDITIVE POLARITY-

-THREE PHASE WYE-WYE CONNECTION-

7200/12470Y TO 120/240 CONVENTIONAL TRANSFORMERS
208Y/120 VOLT THREE PHASE SERVICE
-SUBTRACTIVE POLARITY-

13200/22860Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS AND
14400/24940Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS
208Y/120 VOLT THREE PHASE SERVICE
-SUBTRACTIVE POLARITY-
12 KV SYSTEM

- SUBTRACTIVE POLARITY -

208Y/120 VOLT THREE-PHASE SERVICE
14400/24940Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS
- THREE-PHASE DELTA-WYE CONNECTION -
- SUBTRACTIVE POLARITY -

DISTRIBUTION TRANSFORMER CONNECTIONS
- ADDITIVE AND SUBTRACTIVE POLARITY -
208Y/120 VOLT THREE-PHASE SERVICE
DISTRIBUTION TRANSFORMER CONNECTIONS 167 KVA
- ADDITIVE AND SUBTRACTIVE POLARITY -
208Y/120 VOLT THREE-PHASE SERVICE

12 KV SYSTEM

-THREE PHASE WYE-WYE CONNECTION-
7200/12470Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS 167 KVA
208Y/120 VOLT THREE PHASE SERVICE
-ADDITIVE POLARITY-

-THREE PHASE WYE-WYE CONNECTION-
14400/24940Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS 167 KVA
208Y/120 VOLT THREE PHASE SERVICE
-SUBTRACTIVE POLARITY-

23 KV SYSTEM

-THREE PHASE WYE-WYE CONNECTION-
13200/22860Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS 167 KVA AND
14400/24940Y TO 120/240 VOLT CONVENTIONAL TRANSFORMERS 167 KVA
208Y/120 VOLT THREE PHASE SERVICE
-SUBTRACTIVE POLARITY-
12 KV SYSTEM

- PRIMARY CONDUCTORS -

- THREE PHASE DELTA-WYE CONNECTION -

14400/24940Y TO 277 VOLT CONVENTIONAL TRANSFORMERS
ADDITIVE POLARITY

- SECONDARY CONDUCTORS -

23 KV SYSTEM

- PRIMARY CONDUCTORS -

- THREE PHASE WYE-WYE CONNECTION -

13200/22860Y TO 277 VOLT CONVENTIONAL TRANSFORMERS AND
14400/24940Y TO 277 VOLT CONVENTIONAL TRANSFORMERS
SUBTRACTIVE POLARITY

- SECONDARY CONDUCTORS -

- DISTRIBUTION TRANSFORMER CONNECTIONS -

- ADDITIVE AND SUBTRACTIVE POLARITY -

480/277 THREE-PHASE FOUR-WIRE SERVICES

REVISED APRIL 11
7/9/11 SIMMONS BURLISON ELKINS
DISTRIBUTION TRANSFORMER CONNECTIONS
- ADDITIVE AND SUBTRACTIVE POLARITY -
480 VOLT 3 PHASE 3 WIRE (OPEN-DELTA) SERVICE

06.10-11
- THREE PHASE DELTA-DELTA CONNECTION -

14400/24940Y TO 600 VOLT CONVENTIONAL TRANSFORMERS

600 VOLT THREE-PHASE THREE-WIRE SERVICE

- SUBTRACTIVE POLARITY -

12 KV SYSTEM

PRIMARY CONDUCTORS

23 KV SYSTEM

PRIMARY CONDUCTORS

NOTE: DO NOT GROUND PRIMARY NEUTRAL OF TRANSFORMER BANK.

- THREE PHASE WYE-DELTA CONNECTION -

13200/22860Y TO 600 VOLT CONVENTIONAL TRANSFORMERS AND

14400/24940Y TO 600 VOLT THREE-PHASE THREE-WIRE SERVICE

- SUBTRACTIVE POLARITY -

12 KV SYSTEM

PRIMARY CONDUCTORS

600 VOLT THREE-PHASE THREE-WIRE SERVICE
12 KV SYSTEM

-THREE PHASE OPEN-WYE OPEN-DELTA CONNECTION-
7200/12470Y TO 240/480 VOLT CONVENTIONAL TRANSFORMERS - 100 KVA AND LESS
480 VOLT THREE-PHASE FOUR-WIRE SERVICE
-ADDITIVE POLARITY-

CAUTION: NO LOAD TO BE CONNECTED BETWEEN THE POWER LEG AND NEUTRAL

23 KV SYSTEM

-THREE PHASE OPEN-WYE OPEN-DELTA CONNECTION-
14400/24940Y TO 240/480 VOLT CONVENTIONAL TRANSFORMERS
480 VOLT THREE-PHASE FOUR-WIRE SERVICE
-SUBTRACTIVE POLARITY-

CAUTION: NO LOAD TO BE CONNECTED BETWEEN THE POWER LEG AND NEUTRAL

-THREE PHASE OPEN-DELTA OPEN-DELTA CONNECTION-
14400/24940Y TO 240/480 VOLT CONVENTIONAL TRANSFORMERS
480 VOLT THREE-PHASE FOUR-WIRE SERVICE
-SUBTRACTIVE POLARITY-

CAUTION: NO LOAD TO BE CONNECTED BETWEEN THE POWER LEG AND NEUTRAL
12 KV SYSTEM

**PRIMARY CONDUCTORS**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
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</thead>
<tbody>
<tr>
<td>1200V</td>
<td>2400V</td>
<td>4160V</td>
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**SECONDARY CONDUCTORS**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
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</thead>
<tbody>
<tr>
<td>2400V</td>
<td>2400V</td>
<td>2400V</td>
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</table>

**-THREE PHASE WYE-WYE CONNECTION-**

7200/12470Y TO 2400/4160Y VOLT CONVENTIONAL TRANSFORMERS
4160V/2400 VOLT THREE-PHASE FOUR-WIRE SERVICE
-ADDITIVE POLARITY-

---

23 KV SYSTEM

**PRIMARY CONDUCTORS**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
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<tbody>
<tr>
<td>1200V</td>
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<td>4160V</td>
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**SECONDARY CONDUCTORS**

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<th>C</th>
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<tr>
<td>2400V</td>
<td>2400V</td>
<td>2400V</td>
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**-THREE PHASE WYE-WYE CONNECTION-**

14400/24940Y TO 2400/4160Y VOLT CONVENTIONAL TRANSFORMERS
4160V/2400 VOLT THREE-PHASE FOUR-WIRE SERVICE
-SUBTRACTIVE POLARITY-

---

**DISTRIBUTION TRANSFORMER CONNECTIONS - ADDITIVE AND SUBTRACTIVE POLARITY**

**12 KV SYSTEM**

**PRIMARY CONDUCTORS**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200V</td>
<td>2400V</td>
<td>4160V</td>
</tr>
</tbody>
</table>

**SECONDARY CONDUCTORS**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400V</td>
<td>2400V</td>
<td>2400V</td>
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</table>

**-THREE PHASE DELTA-WYE CONNECTION-**

14400/24940Y TO 2400/4160Y VOLT CONVENTIONAL TRANSFORMERS
4160V/2400 VOLT THREE-PHASE FOUR-WIRE SERVICE
-SUBTRACTIVE POLARITY-
OPERATING PROCEDURES FOR WYE-DELTA CONNECTED TRANSFORMER BANKS

WHEN ENERGIZING OR DE-ENERGIZING WYE-DELTA TRANSFORMER BANKS, THE BANK ARRESTERS MAY BE TEMPORARILY SUBJECTED TO 2.65 TIMES PHASE TO GROUND VOLTAGE, RESULTING IN ARRESTER FAILURE AND OTHER DAMAGES IF THE BANK IS NOT TEMPORARILY GROUNDED. NEWER, MOV ARRESTERS ARE MORE SUSCEPTIBLE TO THIS TYPE OF FAILURE THAN OLDER, SILICON CARBIDE ARRESTERS.

1. ENERGIZING WYE-DELTA BANK
   - INSTALL A TEMPORARY MECHANICAL GROUND OR CLOSE THE GROUNDING CUTOUT IF ONE EXISTS, ON THE TRANSFORMER BANK HIGH SIDE (FLOATING) NEUTRAL.
   - ENERGIZE THE TRANSFORMER BANK BY CLOSING ALL THREE PRIMARY CUTOUTS.
   - REMOVE TEMPORARY MECHANICAL GROUND OR OPEN THE GROUNDING CUTOUT IF ONE EXISTS.

2. DE-ENERGIZING WYE-DELTA BANK
   - INSTALL A TEMPORARY MECHANICAL GROUND OR CLOSE THE GROUNDING CUTOUT IF ONE EXISTS, ON THE TRANSFORMER BANK HIGH SIDE (FLOATING) NEUTRAL.
   - OPEN ALL PRIMARY CUTOUTS SERVING THE TRANSFORMER BANK.

3. PARTIAL POWER ON WYE-DELTA BANK (1 OR 2 CUTOUTS FOUND OPEN)
   - OPEN REMAINING PRIMARY CUTOUT(S).
   - INSTALL A TEMPORARY MECHANICAL GROUND OR CLOSE THE GROUNDING CUTOUT IF ONE EXISTS, ON THE TRANSFORMER BANK HIGH SIDE (FLOATING) NEUTRAL.
   - VISUALLY INSPECT TRANSFORMER BANK AND DETERMINE CAUSE OF TROUBLE.
   - AFTER TROUBLE HAS BEEN CORRECTED, RE-FUSE ALL PRIMARY CUTOUTS AND RE-ENERGIZE THE TRANSFORMER BANK BY CLOSING ALL THREE PRIMARY CUTOUTS.
   - REMOVE TEMPORARY MECHANICAL GROUND OR OPEN THE GROUNDING CUTOUT IF ONE EXISTS.

NOTES:
1. TEMPORARY MECHANICAL GROUND WILL NOT SERVE AS A PROTECTIVE GROUND. FOLLOW ALL APPLICABLE COMPANY SAFETY RULES FOR PROTECTIVE GROUNDING.
2. IF GROUNDING CUTOUT EXISTS, IT SHALL BE A 300-AMP SOLID-BLADE CUTOUT.
GROUNDBING CUTOUT FOR
FLOATING WYE-DELTA TRANSFORMER BANKS
(POLE-MOUNT)

NOTES:
1. GROUNDING CUTOUT IS 300 AMP SOLID-BLADE.
2. SEE DWG. 06.15-01A FOR THE OPERATING PROCEDURES FOR WYE-DELTA CONNECTED TRANSFORMER BANKS.
3. THE GROUNDING CUTOUT SHALL BE OPEN DURING NORMAL OPERATION.
4. THE GROUNDING CUTOUT SHALL BE CLOSED DURING ENERGIZING OR DE-ENERGIZING A WYE-DELTA BANK.
5. THE GROUNDING CUTOUT WILL NOT SERVE AS A PROTECTIVE GROUND. FOLLOW ALL APPLICABLE COMPANY SAFETY RULES FOR PROTECTIVE GROUNDING.
6. GROUNDING CUTOUT MOUNTING BRACKET IS CU BKTCOLA18STLC.
7. MOUNT GROUNDING CUTOUT BRACKET WITH BOTTOM BOLT 4" ABOVE TOP BOLT OF TRANSFORMER HANGER.
8. SEE SECTION 01 FOR ADDITIONAL GROUNDING DETAILS.
NOTES:

1. SEE DWG. 06.15-01A FOR THE OPERATING PROCEDURES FOR WYE-DELTA CONNECTED TRANSFORMER TANKS.
2. THE GROUNDING CUTOUT SHALL BE OPEN DURING NORMAL OPERATION.
3. THE GROUNDING CUTOUT SHALL BE CLOSED DURING ENERGIZING OR DE-ENERGIZING A WYE-DELTA BANK.
4. THE GROUNDING CUTOUT WILL NOT SERVE AS A PROTECTIVE GROUND. FOLLOW ALL APPLICABLE COMPANY SAFETY RULES FOR PROTECTIVE GROUNDING.
5. GROUNDING CUTOUT IS 300 AMP SOLID-BLADE.
6. LABEL GROUNDING CUTOUT AS FOLLOWS: "GRDSW". USE POLE MARKING LETTERS, PLACED DIRECTLY BELOW GROUNDING CUTOUT ON POLE.
7. SEE SECTION 01 FOR ADDITIONAL GROUNDING DETAILS.
### OVERHEAD SINGLE-PHASE TRANSFORMERS

<table>
<thead>
<tr>
<th>TRANSFORMER TO BE INSTALLED</th>
<th>TRANSFORMER TO BE REMOVED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15 KVA</td>
</tr>
<tr>
<td>10 KVA</td>
<td>NO</td>
</tr>
<tr>
<td>15 KVA</td>
<td>NA</td>
</tr>
<tr>
<td>25 KVA</td>
<td>NA</td>
</tr>
<tr>
<td>37.5 KVA</td>
<td>NA</td>
</tr>
<tr>
<td>50 KVA</td>
<td>NA</td>
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### SINGLE-PHASE PAD-MOUNTED TRANSFORMERS

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<tr>
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<th>TRANSFORMER TO BE REMOVED</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>37.5 KVA</td>
</tr>
<tr>
<td>25 KVA</td>
<td>NO</td>
</tr>
<tr>
<td>50 KVA</td>
<td>NA</td>
</tr>
<tr>
<td>100 KVA</td>
<td>NA</td>
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### THREE-PHASE PAD-MOUNTED TRANSFORMERS

<table>
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<tr>
<th>TRANSFORMER TO BE INSTALLED</th>
<th>TRANSFORMER TO BE REMOVED</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>150 KVA</td>
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<td>75 KVA</td>
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<tr>
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<td>750 KVA</td>
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<td>1000 KVA</td>
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</tr>
<tr>
<td>1500 KVA</td>
<td>NA</td>
</tr>
<tr>
<td>2500 KVA</td>
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</table>

### NOTES:

1. THESE GUIDELINES ARE BASED ON TRANSFORMER IN AND OUT COSTS AND TRANSFORMER PURCHASE COSTS. A "NO" IN THE TABLES MEANS THE TRANSFORMER IS NOT ECONOMICAL TO DOWNSIZE UNLESS IT MUST BE REPLACED FOR OTHER REASONS. A "YES" MEANS IT IS ECONOMICAL TO DOWNSIZE THE TRANSFORMER IF LOADING GUIDELINES ON DWGS. 06.00-14A AND 06.00-14B PERMIT.

2. FOR OVERHEAD THREE-PHASE CSP BANKS THE SINGLE-PHASE TRANSFORMER ECONOMIC GUIDELINES SHOULD BE FOLLOWED. FOR OVERHEAD THREE-PHASE CONVENTIONAL BANKS THE AVAILABILITY OF REPLACEMENT TRANSFORMERS IS THE FIRST CONCERN DUE TO VARYING SECONDARY VOLTAGES AND IMPEDANCE MATCHING. IF TRANSFORMERS ARE AVAILABLE RUN AN ENGINEERING ESTIMATE (IGNORING LOSSES) TO DETERMINE IF
IN THE PAST, THE TRANSFORMER IN FIGURE 1 (14400 AND 13200 VOLT CSP, SUBTRACTION POLARITY) MAY HAVE BEEN INCORRECTLY CONNECTED FOR 120 VOLT SERVICE (208Y/120 VOLT BANKS) AS SHOWN IN FIGURE 2.

WHEN THIS TRANSFORMER IS CONNECTED AS SHOWN IN FIGURE 2, IT HAS BEEN PROVEN IN THE FIELD AND IN THE SYSTEM ENGINEERING LABORATORY THAT HIGH ELECTROSTATIC VOLTAGE (APPROXIMATELY 7000 VOLTS) WILL EXIST ON THE X3 BUSHINGS UNDER THE FOLLOWING CONDITIONS:

1. THE SECONDARY WINDINGS ARE PARALLELED BETWEEN THE X2 AND X3 BUSHINGS (X2 GROUNDED).
2. THE CSP BREAKER CONTACTS ARE IN THE OPEN POSITION.
3. PRIMARY WINDING IS ENERGIZED.

THIS SITUATION EXISTS BECAUSE THE A-B LOW VOLTAGE WINDING IS FLOATING (DUE TO BREAKER CONTACT OPEN) CLOSE TO THE H1 END OF THE HIGH VOLTAGE WINDING (THE UNGROUNDED END).

FIGURE 3 IS THE PROPER METHOD OF PARALLELING THE SECONDARY WINDINGS IN THIS TRANSFORMER (SEE DWGS. 06.07-05 AND 06.10-07, II). WITH THE BREAKER CONTACT OPEN, THE C-D WINDING IS "FLOATING", BUT THIS WINDING IS SITUATED CLOSE TO THE GROUNDED END OF THE HIGH VOLTAGE WINDING. CONNECTED AS SHOWN IN FIGURE 3, SOME ELECTROSTATIC VOLTAGE MAY STILL EXIST (APPROXIMATELY 750 VOLTS) ON THE X1 BUSHINGS.

NOTE: THE WINDINGS IN THE 7200 VOLT CSP TRANSFORMERS ARE PARALLELED JUST THE OPPOSITE FROM ABOVE. FOR CORRECT PARALLELLING, SEE DWGS. 06.07-05 AND 06.10-07, I.
CURRENT CHECK POINTS - A, B, C
VOLTAGE CHECK POINTS - A TO N, B TO N, C TO N

KVA = \[CURRENT \times VOLTAGE (AN)] + [CURRENT \times VOLTAGE (BN)] / 1000

**Transformer A (Lighting Transformer)**

KVA = \[CURRENT \times VOLTAGE (CD)] / 1000

**Transformer B**

KVA = \[CURRENT \times VOLTAGE (EF)] / 1000

**Transformer C**

KVA = \[CURRENT \times VOLTAGE (EN)]

**120/240V. OR 240/480V.**

**Three-Phase Delta Secondary Connection**

CURRENT CHECK POINTS - A, B, C, D
VOLTAGE CHECK POINTS - A TO N, B TO N, C TO N, D TO N

KVA = \[CURRENT \times VOLTAGE (BN)]

**Transformer B**

KVA = \[CURRENT \times VOLTAGE (CD)] / 1000

**Transformer C**

KVA = \[CURRENT \times VOLTAGE (EF)] / 1000

**120/240V.**

**Three-Phase Delta Secondary Connection**

CURRENT CHECK POINTS - A, B, C
VOLTAGE CHECK POINTS - A TO N, B TO N

KVA = \[CURRENT \times VOLTAGE (AN)] + [CURRENT \times VOLTAGE (BN)] / 1000

**Transformer A (Lighting Transformer)**

KVA = \[CURRENT \times VOLTAGE (CD)] / 1000

**Transformer B**

KVA = \[CURRENT \times VOLTAGE (EF)] / 1000

**Transformer C**

KVA = \[CURRENT \times VOLTAGE (EN)]

**208Y/120 OR 480Y/277**

**Additive Polarity**

**Three-Phase Wye Secondary Connection**

**208Y/120 OR 480Y/277**

**Subtractive Polarity**

**Three-Phase Wye Secondary Connection**

Note: Transformers used in a 480Y/277 bank will have 2 bushings instead of 3 as shown above.
DEFINITION:

AN IDLE TRANSFORMER IS A TRANSFORMER THAT IS INSTALLED ON THE DISTRIBUTION SYSTEM BUT IS SERVING NO USEFUL PURPOSE. THERE IS NO CUSTOMER BEING SERVED, NO LIGHTS, NO TRAFFIC SIGNALS. THERE IS ALSO REASONABLE POTENTIAL FOR SERVING A CUSTOMER IN THE FUTURE. A TRANSFORMER INSTALLED IN A NEW DEVELOPMENT THAT IS SERVING NO CUSTOMERS BUT WILL IN THE FUTURE IS NOT CONSIDERED IDLE BECAUSE IT WILL BE SERVING CUSTOMERS IN THE NEAR FUTURE.

EXAMPLES ARE AS FOLLOWS:

1. A TRANSFORMER THAT WAS USED FOR TEMPORARY CONSTRUCTION SERVICE IS IDLE AFTER THE CONSTRUCTION IS COMPLETED AND THE TRANSFORMER IS NO LONGER NEEDED FOR CONSTRUCTION SERVICE.
2. A TRANSFORMER THAT SERVED A RESIDENTIAL CUSTOMER IS IDLE IF THE HOME IS NO LONGER OCCUPIED AND THERE IS NO PROSPECT OF SERVING A CUSTOMER AT THE SAME LOCATION.
3. A TRANSFORMER BANK THAT SERVED A COMMERCIAL/INDUSTRIAL CUSTOMER IS IDLE IF THE CUSTOMER IS NO LONGER IN BUSINESS AND THE TRANSFORMER BANK IS NOT NEEDED FOR A POTENTIAL NEW CUSTOMER AT THE SAME LOCATION.

ISSUES WITH IDLE TRANSFORMERS:

THERE ARE SEVERAL REASONS WHY IDLE TRANSFORMERS SHOULD BE REMOVED FROM THE SYSTEM. ONE THAT IS LEFT ENERGIZED EXPERIENCES "NO-LOAD" CORE LOSSES EVEN WHEN IDLE. THESE ARE ANNUAL LOSSES. A 25 KVA TRANSFORMER IS ESTIMATED TO HAVE $35 OF ANNUAL CORE LOSSES. A 167 KVA TRANSFORMER IS ESTIMATED TO HAVE $200 OF ANNUAL CORE LOSSES. A TRANSFORMER THAT IS IDLE IS A POTENTIAL FOR VANDALISM, RESULTING IN AN ENVIRONMENTAL ISSUE, AN OIL SPILL. THERE HAVE BEEN A NUMBER OF SPILLS DUE TO VANDALISM OF IDLE TRANSFORMERS AND SOME OF THESE REQUIRED SIGNIFICANT COSTS FOR CLEANUP.

A TRANSFORMER THAT IS IDLE IS A POTENTIAL HAZARD FOR CRIMINALS WHO WOULD ATTEMPT TO VANDALIZE THE UNITS TO STEAL COPPER. THEY WILL TAKE EXTRAORDINARY RISKS WITH NO REGARD FOR THEIR OWN SAFETY OR PROPERTY OF OTHERS.

TRANSFORMER COSTS HAVE INCREASED SUBSTANTIALLY SINCE 2004 DUE TO THE RISING COSTS OF RAW MATERIALS: COPPER, CORE STEEL, MINERAL OIL. COSTS WILL INCREASE AGAIN SIGNIFICANTLY IN JANUARY, 2010 AS NEW DEPARTMENT OF ENERGY (DOE) EFFICIENCY REQUIREMENTS ARE IMPLEMENTED. IT IS A SIGNIFICANT FINANCIAL BENEFIT TO THE COMPANY TO REMOVE AND RE-USE IDLE TRANSFORMERS VERSUS BUYING NEW ONES AT SIGNIFICANTLY HIGHER PRICES. ONES THAT HAVE BEEN REMOVED AND RE-USED DO NOT HAVE TO MEET THE MORE STRINGENT EFFICIENCY REQUIREMENTS OF DOE.

PROCEDURE:

ANY TRANSFORMER THAT IS IDLE BUT LEFT ON THE POLE SHALL BE DE-ENERGIZED TO SAVE ANNUAL CORE LOSSES. TRANSFORMERS WITH NO CUTOUTS (CSP) SHALL HAVE THE HOT LINE CLAMP REMOVED FROM THE PRIMARY AND GROUNDED TO THE SYSTEM NEUTRAL. TRANSFORMERS WITH CUTOUTS MAY BE DE-ENERGIZED BY OPENING THE CUTOUT AND REMOVING THE CUTOUT BARREL.

WHEN A TRANSFORMER HAS BEEN DE-ENERGIZED, ASSET ENGINEERING SHALL BE NOTIFIED. ASSET ENGINEERING WILL EVALUATE AND DETERMINE IF THE TRANSFORMER SHOULD BE REMOVED AND IF SO, PREPARE A WORK ORDER TO REMOVE, ASSOCIATED EQUIPMENT (CUTOUTS, ARRESTERS, SERVICE CONDUCTORS, ETC.) SHOULD BE REMOVED AT THE SAME TIME THE TRANSFORMER IS REMOVED.

FOR TRANSFORMER BANKS SERVING COMMERCIAL OR INDUSTRIAL CUSTOMERS, CONTACT WITH ACCOUNT MANAGERS WILL BE REQUIRED TO DETERMINE IF THERE IS POTENTIAL FOR FUTURE CUSTOMERS OCCUPYING A VACANT FACILITY.

TRANSFORMERS THAT HAVE BEEN REMOVED SHALL BE PLACED IN STOCK AT THE LOCAL STOREROOM, IF THE TRANSFORMER IS IN GOOD CONDITION AND IS NON-PCB. IF NOT IN GOOD CONDITION, OR THE PCB CONTENT IS UNKNOWN, THE TRANSFORMER SHALL BE RETURNED TO THE GARNER TRANSFORMER SHOP WHERE IT WILL BE EVALUATED, REPAIRED, REPAINTED AND RETURNED TO STOCK, IF POSSIBLE.