## 1. Access

### 1.1 General – Check Specifics from Form 2226

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unimpeded access</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Direct street frontage access or permanent all weather access</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Vehicle headroom no less than 5.5m (slope not exceeding 1:8)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2500mm² loading slab with floor anchor (slope not exceeding 1:20)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Floor anchors installed</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Permanent Lifting equipment installed. Certification supplied to ENERGEX</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Cable pulling eyes</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Bollard required</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Clearances – 900mm between equipment and walls</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>– 1500mm in front of equipment to be operated</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>– 1200mm for cable bending radii</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

### Personnel

- Unrestricted access without notice 24 hours/7 days a week | ☐ | ☐ | ☐ |
- Two separate personnel access doorways | ☐ | ☐ | ☐ |
- Entry to substation is only possible through doors/gates – not through gattic | ☐ | ☐ | ☐ |
- Key box (S3 keyed) with key or swipe card for access to substation | ☐ | ☐ | ☐ |

### Mains

- Easements registered (Contact Planner) | ☐ | ☐ | ☐ |

### 1.2 Outdoor Substations

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum clear opening of 2100mm</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Doors swing outwards</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

### Personnel

- Minimum clear opening of 1200mm | ☐ | ☐ | ☐ |
| Doors swing outwards | ☐ | ☐ | ☐ |

### 1.3 Indoor Substations

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum clear opening of 2500mm x 3100mm</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Doors swing 180° outwards</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>One door leaf secured with standing bolt (top &amp; bottom), the other door leaf fitted with Lockwood 570 series or similar</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Door operated by key from outside and Lockwood lever handle on inside</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Each door fitted with D handles on both sides. Vermin proof mesh fitted to rear of louvers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Ceiling height; Bottom entry 3200mm, Top entry 3750mm</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Doors with louvers as Drawing 7874-A4 for Dry Type transformers (external doors only)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Hatch way fitted with retractable safety guard &amp; tray weatherproof and self draining</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Harness anchoring points as per ENERGEX BMS 01605 3.3.2.5</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

### Personnel

- Minimum clear opening of 800mm | ☐ | ☐ | ☐ |
| Doors swing outwards | ☐ | ☐ | ☐ |

## 2. Construction

### 2.1 General

- Chamber dry and water tight. Drained cavity wall (for external walls below ground) | ☐ | ☐ | ☐ |
- Building material to ENERGEX specifications | ☐ | ☐ | ☐ |
- All block walls concrete filled (indoor substations) | ☐ | ☐ | ☐ |
- Chamber isolated from remainder of building with a 2 hour fire rating | ☐ | ☐ | ☐ |
- Construction prevents the entry of vermin and birds | ☐ | ☐ | ☐ |
- No other services pass through the site | ☐ | ☐ | ☐ |
- Chamber clean and in good order | ☐ | ☐ | ☐ |
- Concrete floor level with correct finish | ☐ | ☐ | ☐ |

### 2.2 Painting

- Walls – Light straw | ☐ | ☐ | ☐ |
- Ceiling – gloss/semi gloss ceiling white | ☐ | ☐ | ☐ |
- Steel work – non galvanised metal (primed and grey paint) | ☐ | ☐ | ☐ |
- Doors – natural (aluminium to be finished with clear anodising and clear lacquer) | ☐ | ☐ | ☐ |
- Floors – Sealed for Dry Type transformers | ☐ | ☐ | ☐ |

### 2.3 Trench

- As per ENERGEX specifications | ☐ | ☐ | ☐ |
- Suspended slab over trench for transformer (Width; 1400mm for Oil & 1100mm for Dry) | ☐ | ☐ | ☐ |
- Undercut trench corners below slab – rounded edges | ☐ | ☐ | ☐ |
- Trench covers (correct type, finish, hand holes) | ☐ | ☐ | ☐ |
- Channel support to specifications | ☐ | ☐ | ☐ |
- Trench junctions – 300mm radius undercut | ☐ | ☐ | ☐ |
- Suitable drained complying with local council requirements and EPA regulations | ☐ | ☐ | ☐ |
### Cable

#### 3.1 Conduits
- Installed to ENERGEX specifications – (minimum radius bends of 1830mm) [Yes][No][N/A]
- Installed as per the approved substation construction drawings [□][□][□]
- Draw rope in each conduit [□][□][□]
- Entries to be bell mouthed [□][□][□]
- Conduits / cable ducts sealed [□][□][□]
- 2 hour fire rating encased [□][□][□]

#### 3.2 Cable Stand
- Low voltage stand ENERGEX specifications [□][□][□]
- Flexible braids connectors supplied [□][□][□]
- Low voltage cable guard to ENERGEX specifications [□][□][□]
- Stabilising bar fitted [□][□][□]

#### 3.3 Cable Risers
- Installed to ENERGEX specifications [□][□][□]
- Unimpeded access to cable at all times [□][□][□]
- Full width & height doors on each level of building [□][□][□]
- Unistrut or similar fixed at a minimum vertical spacings of 1000mm [□][□][□]
- False ceiling to be removable & area above to be kept clear of services [□][□][□]
- 2 hour fire rated [□][□][□]
- Cabling pulling eyes at top of riser & where required along internal cable route [□][□][□]

#### 3.4 Cable Tray/ Ladder/ T-Brackets
- Supported along the centre line only or cantilevered off wall [□][□][□]
- Brackets at 600mm spacing, between centres (Ladder between 1000mm & 1500mm) [□][□][□]
- Cable support brackets braced to end walls [□][□][□]

### Earthing

#### 4.1 Pockets
- Construction to ENERGEX specifications [□][□][□]
- Chases across doorway only for earth strap or between pockets for bare earth wire [□][□][□]
- PVC pipes [□][□][□]

#### 4.2 Remote
- Clear of obstacles & building lightning protection system [□][□][□]
- Two separate conduits [□][□][□]
- 40mm encased structurally or outer steel pipe or hat section for surface mounted [□][□][□]
- Earth riser & test pockets formed with removable covers fitted with ENERGEX identification [□][□][□]
- Earth cable route marked with identification markers [□][□][□]

### Substation Light and Power

#### 5.1 Switchboard – supplied from Essential Supply section of Main Switchboard [□][□][□]
- Fluorescent light fittings – Not above plant [□][□][□]
- Micro switch to personnel door or stairwell to activate light [□][□][□]
- Light switches (heavy duty) adjacent to personnel doors [□][□][□]
- Minimum of two GPO’s & Battery charger to be hard wired via junction box or isolator [□][□][□]
- Fan control switch to stop operation of fan (thermostat set point 32ºC) [□][□][□]

### Fire Protection

#### 6.1 Fire rating and protection system certified by the appropriate authority supplied by customer [□][□][□]
- Fire protection system [□][□][□]

### Locks

#### 7.1 ENERGEX barrels installed [□][□][□]
- ENERGEX barrels installed [□][□][□]

### Ventilation

#### 8.1 Certification received from customer – 1330 litres/sec per transformer [□][□][□]
- Location as per substation construction drawings [□][□][□]
- Clearances 900mm to any equipment [□][□][□]
- Duct 100mm from floor & Fire Dampers [□][□][□]
- Fan – positive pressure [□][□][□]
- Louvres at top of room on opposite side to fan with vermin proof mesh fitted [□][□][□]

### Comments

---

<table>
<thead>
<tr>
<th>Planning Design Officer</th>
<th>Initial</th>
<th>Inspection</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substation Officer</td>
<td>Progress</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customers Representative</td>
<td>Final</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
20 Old Contract Items

NOTE: All Drawings are out of date.

- The following drawings have all been superseded by new contract items
- These earlier versions are included for assistance to use for previous switchgear and transformers

Dry Type Transformers

7930A4c Sh1 Ground Transformer Details - Enclosed Dry Type (315 - 1500kVA)
7930A4b Sh2 Ground Transformer Details - Enclosed Dry Type (315 - 1500kVA)
8995-A4a Ground Transformer Details - Enclosed Dry Type (315 - 1500kVA)
8996-A4a ABB Air Cooled Epoxy Transformers- Cable Top Entry (Materials & Estimating)
9076-A4c Glandplates details - ABB Air Cooled Transformers
9079-A4a Cable Cleats Arrangement - ABB Air Cooled Transformers
9088-A4c Circuitry Standard - ABB Dry Type Transformers
9680-A4 LV Surge Divertors & Transf MEN Information for Top Entry Dry Type Transf
9681-A4 LV Surge Divertors & Transf MEN Information for Bottom Entry Dry Type Transf

Oil Type Transformers

7931-A4c Ground Transformer Details - Oil Filled Transformer (750 - 1500kVA)

11kV Switchgear

8430-A4c ABB SafePlus - 2 Transformer Switchboard -Intermediate Mesh Point
8431-A4c ABB SafePlus - 3 Transformer Switchboard -Intermediate Mesh Point
8432-A4c ABB SafePlus - 3 Transformer Switchboard -Mesh Point
11011-A4a ABB SafePlus Metering Panel Use with non-compact style ABB SafePlus RMUs (SC 20715, 20716, 20717)
# Enclosed Dry Type Ground Transformers

<table>
<thead>
<tr>
<th>KVA</th>
<th>Description</th>
<th>Stock Code</th>
<th>Height (Top Entry)</th>
<th>Length (See 91)</th>
<th>Width (See 101)</th>
<th>Noise (dBA)</th>
<th>% Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>315</td>
<td>11kV/415V Epoxy Dry Type</td>
<td>19092</td>
<td>2177</td>
<td>1650</td>
<td>1400</td>
<td>52</td>
<td>4%</td>
</tr>
<tr>
<td>500</td>
<td>11kV/415V Epoxy Dry Type</td>
<td>19091</td>
<td>2177</td>
<td>1800</td>
<td>1500</td>
<td>54</td>
<td>6%</td>
</tr>
<tr>
<td>750</td>
<td>11kV/415V Epoxy Dry Type</td>
<td>19090</td>
<td>2177</td>
<td>2000</td>
<td>1500</td>
<td>56</td>
<td>6%</td>
</tr>
<tr>
<td>1000</td>
<td>11kV/415V Epoxy Dry Type</td>
<td>19099</td>
<td>2177</td>
<td>2050</td>
<td>1500</td>
<td>57</td>
<td>6%</td>
</tr>
<tr>
<td>1500</td>
<td>11kV/415V Epoxy Dry Type</td>
<td>19098</td>
<td>2277</td>
<td>2250</td>
<td>1600</td>
<td>59</td>
<td>6%</td>
</tr>
</tbody>
</table>

**NOTES:**

1. All Dimensions in Millimetres.
2. Transformers are suitable for INDOOR use only, they have an IP21 enclosure.
3. These transformers are designed for both top & bottom cable entry.
4. The total height includes the anti-vibration pads.
5. The HV cubicle doors are to be padlocked with ENERGEX lock (SC3160).
6. These units can only be supplied from switch fuse units with shunt trip devices installed.
7. **DO NOT LOAD DRY TYPE TRANSFORMERS BEYOND THEIR NAMEPLATE RATING!**
8. Temperature Settings Requirements

   When controlled by CB (wiring diag. as per substation circuitry)
   (a) Alarm - 140 deg C
   (b) Trip - 155 deg C

   When controlled by RMU (wiring diag. CCSTD-SC117-01)
   (a) Alarm - 140 deg C
   (b) Trip - 140 deg C Failure of the Temp unit, breaker will trip

9. Fit all transformers with MDIs. Mount the associated CTs over the transformer terminals and the MDI box on outside of transformer enclosure.
10. For overall length add 228 (for hold down lugs).
11. For overall width add 600 (for jacking lugs).
12. Where plots terminate at site, settings will be set as per CB units
13. Field test carry out commissioning
14. STOCK CODES shown in (Table 1) have been superseded by STOCK CODES for TOP & BOTTOM ENTRY.

## TABLE 1 (SEE NOTE 14)

<table>
<thead>
<tr>
<th>KVA</th>
<th>Stock Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>315</td>
<td>19092</td>
</tr>
<tr>
<td>500</td>
<td>19093</td>
</tr>
<tr>
<td>750</td>
<td>19094</td>
</tr>
<tr>
<td>1000</td>
<td>19095</td>
</tr>
<tr>
<td>1500</td>
<td>19096</td>
</tr>
</tbody>
</table>

---

**Ground Transformers**

Enclosed Dry Type Transformers

315 - 1500kVA 11kV/433V

Sheet 1 of 2

7930-A4
### ENCLOSED DRY TYPE GROUND TRANSFORMERS

<table>
<thead>
<tr>
<th>kVA</th>
<th>Lift Height (A)</th>
<th>Weight (kg)</th>
<th>Wheel Centre (mm)</th>
<th>LV Cable Glands (mm)</th>
<th>HV Cable Glands (mm)</th>
<th>HV Terminal Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>315</td>
<td>550</td>
<td>1800</td>
<td>820</td>
<td>3 x 100 x 200</td>
<td>300 x 450</td>
<td>200 x 300</td>
</tr>
<tr>
<td>500</td>
<td>800</td>
<td>2700</td>
<td>820</td>
<td>3 x 100 x 200</td>
<td>300 x 450</td>
<td>200 x 300</td>
</tr>
<tr>
<td>750</td>
<td>900</td>
<td>3100</td>
<td>1000 x 820</td>
<td>3 x 150 x 200</td>
<td>300 x 450</td>
<td>200 x 300</td>
</tr>
<tr>
<td>1000</td>
<td>900</td>
<td>3700</td>
<td>1000 x 820</td>
<td>3 x 150 x 200</td>
<td>300 x 450</td>
<td>200 x 300</td>
</tr>
<tr>
<td>1500</td>
<td>1000</td>
<td>5200</td>
<td>1000 x 820</td>
<td>3 x 150 x 200</td>
<td>300 x 450</td>
<td>200 x 300</td>
</tr>
</tbody>
</table>

---

**Ground Transformers**

Enclosed Dry Type Transformers

315 – 1500 kVA 11kV/4.33kV

Sheet 2 of 2

File: c:\km\s13\7930-A4-20.pdf
### Transformer General Arrangement

For ABB Air Cooled Epoxy
11kV/433V Transformers
(Cable Bottom Entry)

**8995-A4**

---

### Item Description

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Material Quantity Per Phase &amp; Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SC 1500kVA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Φ  N</td>
</tr>
<tr>
<td>1</td>
<td>Cable gland for 300mm²</td>
<td>19749</td>
</tr>
<tr>
<td>2</td>
<td>50mm Lock Nut for Cable Gland</td>
<td>19750</td>
</tr>
<tr>
<td>3</td>
<td>300mm² PVC/XLPE Cable</td>
<td>7185</td>
</tr>
<tr>
<td>4</td>
<td>300mm² long shank Cable Lugs (Drilled)</td>
<td>20661</td>
</tr>
<tr>
<td>5</td>
<td>M12x60 SS Bolts</td>
<td>414</td>
</tr>
<tr>
<td>6</td>
<td>M12x50 SS Bolts</td>
<td>413</td>
</tr>
<tr>
<td>7</td>
<td>M12 Belleville Washers</td>
<td>1089</td>
</tr>
<tr>
<td>8</td>
<td>LV Surge Diveters</td>
<td>16346</td>
</tr>
<tr>
<td>9</td>
<td>Surge Diveter connector bar</td>
<td>10488</td>
</tr>
<tr>
<td>10</td>
<td>35mm² Crimp Lugs M10 hole</td>
<td>6232</td>
</tr>
<tr>
<td>11</td>
<td>35mm² PVC Cu Cable</td>
<td>7156</td>
</tr>
<tr>
<td>12</td>
<td>70mm² Crimp Lugs M12 hole</td>
<td>6260</td>
</tr>
<tr>
<td>13</td>
<td>70mm² PVC Cu Cable</td>
<td>19749</td>
</tr>
<tr>
<td>14</td>
<td>Cable Gland for 35mm²</td>
<td>20268</td>
</tr>
<tr>
<td>15</td>
<td>63mm Lock Nut for Cable Gland</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>2.5mm² 4 core PVC/PVC cable</td>
<td>07209</td>
</tr>
<tr>
<td>17</td>
<td>Cable Gland</td>
<td>04691</td>
</tr>
</tbody>
</table>

---

**CU No.**

- DSGTEFB15
- DSGTEFB10
- DSGTEFB7
- DSGTEFB5
- DSGTEFB3

---

**Original Issue**

© Copyright 2006

APP'D: K.Nuttall

CRC: R.Krosch

DNN: G.Jayaweera
UNCONTROLLED COPY

Gland Plates Details

ABB Air Cooled Epoxy
11kV/433V Transformers

NOTE: REFER DWG. 11429-A2 FOR DETAILS.
CABLE CLEATS ARRANGEMENT

(For 1500kVA & 1000kVA)

CABLE CLEATS ARRANGEMENT

(For 750, 500 & 350kVA)
PLEASE FILL DETAILS ON DWG NO. CCST0-SC117-02-A1 & RETURN TO SUBSTATION DESIGN OFFICE

SITE NUMBER

SITE NAME/ADDRESS

TRANSFORMER - MAKE & TYPE

TRANSFORMER - SIZE

TRANSFORMER - NUMBER

TRANSFORMER - STORE CODE

RING MAIN UNIT - MAKE

RING MAIN UNIT - MODEL & TYPE

RING MAIN UNIT - COIL VOLTAGE

RING MAIN UNIT - NUMBER

DOUBLE RING MAIN UNIT - ISOLATOR NO.

RING MAIN UNIT - STORE CODE

PROJECT NUMBER

NOTES:
OIL FILLED GROUND TRANSFORMERS

<table>
<thead>
<tr>
<th>KVA</th>
<th>DESCRIPTION</th>
<th>STOCK CODE</th>
<th>HEIGHT (mm)</th>
<th>WIDTH (mm)</th>
<th>LENGTH (mm)</th>
<th>WEIGHT (kg)</th>
<th>NOISE (dBA)</th>
<th>% Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>750</td>
<td>11kV/433-250V AIR BOX HV 7 TAP</td>
<td>21665</td>
<td>2162</td>
<td>1865</td>
<td>1513</td>
<td>1734</td>
<td>1899</td>
<td>4174</td>
</tr>
<tr>
<td>1000</td>
<td>11kV/433-250V AIR BOX HV 7 TAP</td>
<td>21666</td>
<td>2117</td>
<td>1906</td>
<td>1466</td>
<td>1730</td>
<td>1983</td>
<td>4773</td>
</tr>
<tr>
<td>1500</td>
<td>11kV/433-250V AIR BOX HV 7 TAP</td>
<td>21667</td>
<td>2312</td>
<td>2017</td>
<td>1663</td>
<td>1857</td>
<td>1947</td>
<td>5324</td>
</tr>
<tr>
<td>1500</td>
<td>11kV/433-250V HIGHZ</td>
<td>21663</td>
<td>2193</td>
<td>2002</td>
<td>1542</td>
<td>1730</td>
<td>2049</td>
<td>6663</td>
</tr>
</tbody>
</table>

NOTES:
1. All dimensions in millimetres.
2. Transformers suitable for INDOOR and OUTDOOR use.
3. These transformers are designed for both top and bottom cable entry.
Notes:
1. All dimensions in millimetres.
2. Suitable for top and bottom cable entry.
3. Use standard indoor terminations combined with right angled unscreened insulated boots (SC 18736).
4. Total Mass 900 kg.
5. Floor level ± 3mm for installation of SafePlus.

ABB SafePlus
2 Transformer Switchboard
Intermediate Mesh Point (VFFV)
8430-A4

SC 20715
Notes:
1. All dimensions in millimetres.
2. Suitable for top and bottom cable entry.
3. Use standard indoor terminations combined with right angled unscreened insulated boots (SC 18736).
4. Total Mass 1200 kg.
5. Floor level ± 3mm for installation of SafePlus.
Notes:
1. All dimensions in millimetres.
2. Suitable for top and bottom cable entry.
3. Use standard indoor terminations combined with right angled unscreened insulated boots (SC 18736).
4. Total mass 1400 kg.
5. Floor level ± 3mm for installation of SafePlus.
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. LOW VOLTAGE DOORS ARE HINGED TYPE AS STANDARD.
3. SUPPLIED WITH 3 X TJC4 VOLTAGE TRANSFORMERS
   INSTALLATION LEVEL 12/28/95kV,
   WINDING 1 11000/3/110/3 1P, 25VA
   WINDING 2 110/3 3P, do-dn RESIDUAL
4. APPRX WEIGHT FOR THE METERING PANEL IS APPRX 270KG C/W BASE PLINTH IS APPRX 380KG.
5. DESIGNERS TO NARRATE ON PRODUCT ORDER REQUEST THAT ABB PROVIDE THE ADAPTORS AS REQUIRED FOR THE RELATED SITE-EXISTING SAFEPLUS SWITCHGEAR (E.G. THE CONFIGURATION OF THE RMUs - 3, 4, 5 or 6 ways)

ABB SafePlus
Metering Panel
Use with old style ABB SafePlus RMU
(SC 20715, 20716, 20717)

SC 22359

energex
© Copyright 2012
APPD: R. English
CKD: B. Brunsmann
ORPH: P. Reif
AMENDMENT RECORD

02/10/2012
Version 7.6

Section 3.3 Clarified containment of contaminants and water

28/06/2012
Version 7.5

Section 16 Corrected Weights Tesar Dry Type StdsA226 v3 7390-A4d Sh2

15/05/2012
Version 7.4

Section 14 General Construction, Updated Drawing 7882-A4d
Section 17 11 kV Switchgear, Updated Drawings; 8430-A4d, 8431-A4d, 8432-A4d, 11011A4b
   Added 11010-A4a
Section 20 added Archived Drawing 7882-A4c, 8430-A4c, 8431-A4c, 8432-A4c
   Updated Front pages for Sections 14, 17 and 20

10/04/2012
Version 7.3

Section 18 LV Switchboards Updated Drawings - 7940-A4F, 7941-A4E Sh1 & 2, 9001-A4D
   Sh1 & 2, 9660-A4C, 9661-A4C, 9662-A4B Sh 2 & 3 as per StdsA114b

07/02/2012
Version 7.2

Section 16 Transformers 9088-A4 Sheets 2 and 3 Tesar Circuitry drawings updated
   StdsA226v2 and TSD0126e

11/11/2011
Version 7.1

Section 16 Transformers 7931-A4 E drawing amended to remove cable box from LV
   Minor spelling and grammatical changes sections 1-12.

31/08/2011
Version 7.0
The Commercial & Industrial Substation Manual has been reformatted into 3 distinct topics – General, Indoor Substation construction, and Outdoor Substation construction – to provide for the separation of outdoor and indoor substation construction.

A new drawing section – Section 20 - has been added entitled ‘Old Contract Items’ to provide the previous version of the drawings updated with the new contract products to allow easy access for existing stock and legacy products.

The new Manual has been adjusted -

<table>
<thead>
<tr>
<th>Version 7 - Section</th>
<th>Version 6 - Section</th>
<th>Version 7 Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Electrical equipment</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>Earthing</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Environment</td>
</tr>
<tr>
<td>Outdoor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2.1, 2.2</td>
<td>Site Selection</td>
</tr>
<tr>
<td>5</td>
<td>3.1, 3.2</td>
<td>Access</td>
</tr>
<tr>
<td>6</td>
<td>4.1, 4.2</td>
<td>Construction</td>
</tr>
<tr>
<td>Indoor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Part 2</td>
<td>Site Selection</td>
</tr>
<tr>
<td>8</td>
<td>Part 3</td>
<td>Access</td>
</tr>
<tr>
<td>9</td>
<td>Part 4</td>
<td>Construction</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>Ventilation</td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>Light and Power</td>
</tr>
<tr>
<td>12</td>
<td>9</td>
<td>Fire Protection</td>
</tr>
<tr>
<td>Drawings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>10</td>
<td>Typical Substation Arrangements</td>
</tr>
<tr>
<td>14</td>
<td>11</td>
<td>General Construction Drawings</td>
</tr>
<tr>
<td>15</td>
<td>12</td>
<td>Earthing Drawings</td>
</tr>
<tr>
<td>16</td>
<td>13</td>
<td>Transformers</td>
</tr>
<tr>
<td>17</td>
<td>14</td>
<td>11kV Switchgear</td>
</tr>
<tr>
<td>18</td>
<td>15</td>
<td>LV Switchboards</td>
</tr>
<tr>
<td>19</td>
<td>16</td>
<td>Miscellaneous Equipment</td>
</tr>
<tr>
<td>20</td>
<td>-</td>
<td>Old Contract Items</td>
</tr>
</tbody>
</table>

The following amendments are included in the new Sections 1-12, and updated drawings to sections 14 16 and 20 are listed -

**Sect 1-12**

Sect 2.3.3 – reference to Distribution Earthing Manual 03535.
Sect 3.1 – Flood resilience of substation
Sect 3.4.3 – SF6 Guidelines
Sect 4.1 – Selected substation site must be above defined flood level ------
Sect 6.1.8 – Conduits
Sect 7.1 - Selected substation site must be above defined flood level ------
Sect 7.2.4 – provided the room is above Defined Flood Level (DFL) prescribed by council with the floor of the substation a minimum of 75mm above the DFL
Sect 8.2 – Personnel Access (reference to doors being fitted with an emergency escape panic bar in the event of fire or explosion)
Sect 8.2.6 – In the case of movement of Dry Type Transformers either by winch cables or skates, the maximum grade/slope must not exceed 1:200
Sect 9.1.7 – Cable tray and support brackets must be earthed by 70mm cable

Section 14 - General Construction

- 7879-A4 (c) Typical Cable Ladder & Supports
- 7888-A4 (c) Layout of Consumers LV cables in a HV cable trench
- 7890-A4 (c) Typical Arrangement for connection of LV cables to transformers
- 7892-A4 (b) LV cable stands – for oil filled transformers
- 7894-A4 (b) LV surge diverters - assemblies
- 7895-A4 (c) Assembly of flexible leads, adapter plate cables & cable lug models – supplied by ENERGEX
- 7896-A4 (b) Assembly of flexible leads, adapter plate cables & cable lug models – materials supplied by electrical contractors
- 7897-A4 (c) Typical arrangement for connection of CT’s & LV monitoring meter
- 7898-A4 (b) Typical Arrangement for mounting LV monitoring meter & external CT’s
- 9680-A4 (b) sh1 LV surge divertors & MEN for Tesar Dry Type transf
- 9680-A4 (a) sh2 Tesar Dry Type Transformer typical earthing schematic

Section 16 – Transformers

- 7930-A4 sh1 (d) Tesar Dry Type Transformer 315-1500kVA 11kV / 433V
- 7930-A4 sh2 (c) Tesar Dry Type Transformer 315-1500kVA 11kV / 433V
- 7931-A4 (d) Tyree Oil Filled Transformers 750-1500kVA 11kV/433V
- 9088-A4 (d) sh1 Circuitry Std ABB Dry Type Transf for SafeLink Application
- 9088-A4 (a) sh2 Circuitry Std Tesar Dry Type Transf for SafeLink Application
- 9088-A4 (a) sh3 Circuitry Std Tesar Dry Type Transf for SafePlus Application
- 10851-A4 (a) sh1 Tesar Air Cooled Cast Resin 11kV/433V transformer
- 10851-A4 (a) sh2 LV cable Box Details for Tesar Air Cooled Cast Resin 11kV/433V transformer

Section 20 – Old Contract Items

Dry Type Transformers

- 7930A4c Sh1 Ground Transformer Details - Enclosed Dry Type (315-1500kVA)
- 7930A4b Sh2 Ground Transformer Details - Enclosed Dry Type (315-1500kVA)
- 8995-A4a Ground Transformer Details - Enclosed Dry Type (315-1500kVA)
- 8996-A4a ABB Air Cooled Epoxy Transformers- Cable Top Entry (Materials & Estimating)
- 9076-A4c Glandplates details - ABB Air Cooled Transformers
- 9079-A4a Cable Cleats Arrangement - ABB Air Cooled Transformers
- 9088-A4c Circuitry Standard - ABB Dry Type Transformers
- 9680-A4a LV Surge Divertors & Transf MEN Information for Top Entry Dry Type Transf
- 9681-A4a LV Surge Divertors & Transf MEN Information for Bottom Entry Dry Type Transf
Section 8.2 – Guidelines for Locating Padmount and Ground Transformers with Oil Volumes above 500L but less than 2000L in Sensitive Areas, refer to BMS 1607 – Supply and Planning Manual Sect 3.2 - clause 3.2.6.1. (Standards Alert StdsA185)

Drawings from Section 15 LV Switchboards of the C&I Manual will be updated with the new specifications as shown on Dwg 7940-A4, 7941-A4 Sh 1&2, 9001-A4 Sh 1&2, 9660-A4, 9661-A4, 9662-A4 Sh 1,2&3. Standards Alert StdsA114a
March 2010  
Version 6.0  

This issue of Commercial & Industrial Manual includes the following amendments  

Section 1-9.  

Section 10. Typical Substation Arrangements  

- 7853-A4e Earth Pocket added  
- 7855-A4e Earth Mat added for Meter Box  
- 7868-A4f Earth Mat added for Meter Box. Sh2 added  
- 8424-A4e Sh1 Notes – ref number Amended Sh2 added  
- 8425-A4e Sh1 Notes – ref number Amended Sh2 added  

New Drawings  

- 7868-A4a Sh2 Earthing of Meter Box when fitted externally  
- 8424-A4a Sh2 Indoor Substation cross sectional view SafeLink Sw Gr  
- 8425-A4a Sh2 Indoor Substation cross sectional view SafePlus Sw Gr  
- 17771-A3a Sh1 Major Customer Substation  
- 17772-A3a Sh2 Major Customer Substation  

Section 11. General Construction drawings  

- 7874-A4e Shooting bolt top and bottom added to note 3  
- 7877-A4c Specification of Plywood Trench Cover Ammended  
- 7879-A4b Note 2 earthing of cable tray & ladder  
- 7882-A4c CU’s added  
- 7884-A4c Detail A added, trench undercut enhanced  
- 7895-A4b Note 4 added  

New Drawings  

- 9679-A4a MEN info for LV Boards when used with Dry Type Transf  
- 9680-A4a LV surge divertors & transf MEN for Top entry Dry Type Transf  
- 9681-A4a LV surge divertors & transf MEN for Bott entry Dry Type Transf  
- 9779-A4a H-Frame for cable cleating supplied by builder for SafeLink Top Entry RMU’s  
- 9967-A4a Ground Transformer Non Standard Trench Support Bracket  

Section 13 Transformers  

- 7930-A4c Sh1 Note 8. Temp Alarm & temp trip updated  
- 7931-A4c Updated transformer heights  
- 9076-A4c 1500kVA gland plate amended  
- 9088-A4c Note 1 Dwg No updated
Section 14. 11kV Switchgear

- 8430-A4c Note 5 added
- 8431-A4c Note 5 added
- 8432-A4c Note 5 added
- 8443-A4d Cable Box extended
- 8446-A4c New ABB Boot – SC21511.
- 8447-A4c Top Entry Cable Box .extended
- 9264-A4d Top Entry Cable Box .extended
- 9265-A4d Top Entry Cable Box .extended
- 9266-A4b New ABB Boot – SC21511
- 9285-A4b Incoming note added and arrow reversed
- 9288-A4b CFCF description updated. Was incorrectly described as CFCC

Section 15. LV Switchboards

- 7940-A4d LV Bd 315 kVA to 750kVA added
- 7941-A4c Sh1 LV Bd 1000 kVA to 1500 kVA added
- 7941-A4c Sh2 LV Bd 1000 kVA to 1500 kVA added
- 9001-A4b Sh1 3150A LV Isolator Indoor Frame – Top Entry
- 9001-A4b Sh2 3150A LV Isolator Indoor Frame – Bottom Entry
- 9660-A4a 3150A Isolator (LHS Bott Entry – RHS Top Entry
- 9661-A4a 3150A Isolator (LHS Top Entry – RHS Bott Entry
- 9662-A4a LV Outdoor Cubicle
Section 16. Miscellaneous Equipment

- 7945-A4c SC21221 updated on side view (was SC19832)
- Form 2310 Commercial & Industrial Substation Construction Handover Checklist

August 07
Version 5.0

This issue of Commercial & Industrial Manual includes the following amendments:

Section 1-9.

Section 10. Typical Substation Arrangements

- 7853-A4 Concrete landing slabs and notes added. Earth pockets rescaled.
- 7868-A4 Title block text edits. Earth pocket moved &note added.
- 8424-A4 Concrete slab added at door “C”. Notes altered.
- 8426-A4 Concrete landing slabs added & notes added. Rescaled. Dim added.
- 8773-A4 Alternate doors & concrete landing slabs added.
- 9000-A4 Concrete landing slab added to door B. Altered dim.

New Drawings
- 9305-A4 Typical Layout – SafePlus HV Switchgear, SafeLink RMU, 1xDry Type Transf & LV Switchboard / Isolator
- 9306-A4 Typical Layout – Future SafePlus HV Switchgear, SafeLink RMU, 2xDry Type Transf & LV Switchboard / Isolator
- 9343-A4 Earthing Information Typical layout of Earth Pockets, Floor Chases & Earthwire Connections to Earth Strap

Section 11. General Construction drawings

New Drawings
- 9318-A4 Standard Cable Riser

Section 13. Transformers

- 9088-A4 Termination ID – N1, 23 added
Section 14. 11kV Switchgear

- 8430-A4 Stock Code Changed
- 8431-A4 Stock Code Changed
- 8432-A4 Stock Code Changed
- 8442-A4 CFI shown and title amend.
- 8443-A4 CFC HV Schematic added
- 8444-A4 CFI shown.
- 8445-A4 CFI shown.
- 8446-A4 CFI shown.
- 8447-A4 CCC HV Schematic added.
- 9626-A4 CFCC HV Schematic added. Changed from CFCC (Bottom entry) to CFCC (Top entry)
- 9265-A4 CFI shown.

New drawings
- 9266-A4 ABB SafeLink Type CCC (Bottom entry)
- 9285-A4 ABB SafeLink RMU’s – Placement of Cable Fault Indicators
- 9286-A4 ABB SafeLink RMU’s Concrete Plynth only
- 9287-A4 ABB SafeLink RMU’s Outdoor Switching Station
- 9288-A4 ABB SafeLink RMU’s Outdoor Enclosure only

Section 16. Miscellaneous Equipment

7945-A4 Stock Code 20752 added.

---

OCTOBER 2006
Version 4.0

This issue of Commercial & Industrial Manual includes the following amendments:

**Section 1-9.** These sections have been changed significantly.

**Section 10.** Typical Substation Arrangements

- 7852-A4 Title block amended.
- 7853-A4 Floor anchors added.
- 7854-A4 Floor anchors added.
- 7855-A4 Floor anchors added.
- 7856-A4 Floor anchors added.
- 7857-A4 Title block amended.
- 7868-A4 Title block amended.
- 8424-A4 Reinforced concrete slab over trench floor anchors added.
- 8425-A4 Reinforced concrete slab over trench floor anchors added.
• 8426-A4 Floor anchors added concrete loading slab.

New Drawings
• 8772-A4 Indoor substation in basement - cable entry direct from footpath.
• 8773-A4 Indoor substation in basement – remote from footpath.
• 9000-A4 Typical layout – SafeLink(CFCF) RMU, dry type transformer & LV switchboard.

Section 11. General Construction drawings
• 7873-A4 Steel checker plate added.
• 7874-A4 Solid panel introduced to aluminium door with louvers.
• 7876-A4 Solid panel introduced to aluminium door.
• 7877-A4 Priority 1 & 2 of trench covers changed. Structural plywood stress grade increased to F34.
• 7878-A4 Yellow warning strips and water proof seal shown.
• 7882-A4 Stock Code 20076 added.
• 7884-A4 Trench undercut dimensions added.
• 7888-A4 Note added.
• 7899-A4 Cable cleat (SC 14670 & 14671) added.
• 7900-A4 Outlet vent extraction fan changed.

New Drawings
• 8441-A4 Wooden cable cleats for LV switchboards – Two sheets.
• 8991-A4 ABB 3-Way Isolator – cubical mounted block foundation for level slope.
• 8993-A4 SafeLink(SF6) Insulated RMU outdoor enclosure with box culvert option.
• 8994-A4 Standard civil foundation – ABB RMU – Two sheets.
• 8997-A4 Equipment layout for square type padmount in existing ground type substations.
• 8998-A4 Typical Trench cross section – on consumer premises – Two sheets
• 9077-A4 RMU Support Angles for 900x900 Box Culvert Option fabrication details.

Section 12. Earthing Drawings
• 7919-A4 Earthing pocket details changed.
• 7921-A4 Note 2 & 3 added.
• 8443-A4 Earthing pocket details changed.

Section 13. Transformers
• 7930-A4-Sheet 1/2- Note 8(b) amended & Note 12&13 added.
• 7930-A4-Sheet 2/2- Suspended slab added.

New Drawings
• 8995-A4 ABB Air cooled epoxy transformer – Cable bottom entry (Materials & Estimating).
• 8996-A4 ABB Air cooled epoxy transformer - Cable top entry (Materials & Estimating).
• 9076-A4 Glandplates details- ABB Air Cooled Transformer
• 9079-A4 Cable Cleat arrangement - ABB Air Cooled Transformer
• 9088-A4 Circuitry standard – 11kV/433V ABB dry type transformers

Section 14. 11kV Switchgear

• 7938-A4 Title block amended
• 8442-A4 Note 4 & 5 added.
• 8443-A4 Back & side panels modified.
  Note 4 & 5 added.
• 8444-A4 Note 4 changed.
• 8445-A4 Type CFCF (Top Entry) changed to Type CFCF (Bottom Entry).

Section 15. LV Switchboards

• 7940-A4 New LV Board.
• 7941-A4 New LV Board, Sheet 2 added.

New drawings
• 7941-A4-2  3150A Isolator – Bottom Entry
• 8999-A4-1  Methods of mounting LV Board – above 900mm wide trench.
• 8999-A4-2  Methods of mounting LV Board – above 600mm wide trench.
• 9001-A4-1  3150A Isolator Indoor Frame – Bottom Entry
• 9001-A4-2  3150A Isolator Indoor Frame – Top Entry

Section 16. Miscellaneous Equipment

• 7945-A4 Stock Code 17471 & 17472 removed.
  Stock Code 19832 introduced.

05 April 2004
Version 3.0

• Equipment access door openings (for indoor substations) increased from 2100 to 2500.
• Equipment access gate openings (for outdoor substations) increased from 2000 to 2100.
• Outdoor substation layouts updated to include equipment spacing equivalent to those required for indoor substations.
• Bottom of ventilation ducts lowered from 325 to 100
• Requirement for keyed operational lock on equipment access doors now included.

01 March 2004
Version 2.0

Updated to include:
- Dry type distribution transformers
- Brisbane CBD Mesh substations and associated ABB SafePlus switchgear
- Top and bottom entry versions of ABB SafeLink RMUs for indoor substation use

22 November 2002
Version 1.0
Initial issue