<table>
<thead>
<tr>
<th>CONSTRUCTION</th>
<th>DESCRIPTION</th>
<th>DWG No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB - - 1S</td>
<td>100kN Stayed Bollard - Material List</td>
<td>5-11-3-1</td>
</tr>
<tr>
<td>CB - - 1S</td>
<td>100kN Stayed Bollard - Construction</td>
<td>5-11-3-2</td>
</tr>
<tr>
<td>CB - - 1U</td>
<td>100kN Unstayed Bollard - Material List</td>
<td>5-11-4-1</td>
</tr>
<tr>
<td>CB - - 1U</td>
<td>100kN Unstayed Bollard - Construction</td>
<td>5-11-4-2</td>
</tr>
<tr>
<td>CB - - 2S</td>
<td>200kN Stayed Bollard - Material List</td>
<td>5-11-5-1</td>
</tr>
<tr>
<td>CB - - 2S</td>
<td>200kN Stayed Bollard - Construction</td>
<td>5-11-5-2</td>
</tr>
</tbody>
</table>

**Bollard Construction Codes**

**100kN Stayed Bollard - Material List**

**100kN Stayed Bollard - Construction**

**100kN Unstayed Bollard - Material List**

**100kN Unstayed Bollard - Construction**

**200kN Stayed Bollard - Material List**

**200kN Stayed Bollard - Construction**

---

**OVERHEAD SUB-TRANSMISSION**

**BOLLARD CONSTRUCTION INDEX**

**DRAWING NUMBER: 5-11-1-1**

**VOLUME**: 5  
**FOLDER**: 11  
**PAGE**: 1-1  
**ISSUE**: 0B
**BOLLARD CONSTRUCTION:***

Small world object type: Pole

- **TYPE**
  - C: Concrete
  - S: Steel (future)
  - W: Wood (Future)

- **LENGTH**
  - 10m
  - 12m
  - 14m
  - 16m

- **BOLLARD POLES**
  - C
  - B
  - 1
  - 2
  - 1
  - S
  - N

- **BOLLARD CAPACITY**
  - 100kN Bollard
  - 200kN Bollard

- **POLE TYPE**
  - B: Bollard

- **STAYED**
  - S: Stayed
  - U: Unstayed

- **SOIL TYPE**
  - N: Normal soil
  - B: Black soil

---

Approved: P DE SOUSA ROQUE
Checked: R MARGANI
Drawn: K STOLZ

OVERHEAD SUB-TRANSMISSION
BOLLARD CONSTRUCTION
CONSTRUCTION CODE GUIDE

DRAWING NUMBER: 5-11-2-1

<table>
<thead>
<tr>
<th>VOLUME</th>
<th>FOLDER</th>
<th>PAGE</th>
<th>ISSUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>11</td>
<td>2-1</td>
<td>0B</td>
</tr>
<tr>
<td>ASSY</td>
<td>DESCRIPTION</td>
<td>CB101SN</td>
<td>CB121SN</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>1080-1</td>
<td>Reverse back to back stay brackets</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1150-1</td>
<td>10m x stayed bollard concrete pole</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1150-2</td>
<td>12m x stayed bollard concrete pole</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1150-3</td>
<td>14m x stayed bollard concrete pole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1150-4</td>
<td>16m x stayed bollard concrete pole</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Notes
1. Foundation design for cohesive soils with shear strengths of 100kPa or greater

<table>
<thead>
<tr>
<th>Overall bollard length (m)</th>
<th>'H1' Attachment height (m)</th>
<th>'R1' Tip rake (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>7.3</td>
<td>750</td>
</tr>
<tr>
<td>12</td>
<td>9.3</td>
<td>950</td>
</tr>
<tr>
<td>14</td>
<td>11.3</td>
<td>1150</td>
</tr>
<tr>
<td>16</td>
<td>13.3</td>
<td>1350</td>
</tr>
</tbody>
</table>

STAYED BOLLARD

Tip of C6SOl / C6RSDI30kN Pole

Over size hole required if bored vertically

1:8 cement stabilised backfill and compacted in 200mm layers

Construction Code
CB101SN
CB121SN
CB141SN
CB161SN

OVERHEAD SUB-TRANSMISSION
BOLLARD CONSTRUCTION
100kN STAYED BOLLARD CONSTRUCTION

OVERHEAD SUB-TRANSMISSION
BOLLARD CONSTRUCTION
100kN STAYED BOLLARD CONSTRUCTION

Construction Folder
Refer Pole Stay Construction Folder

Twin Aerial Stay Arrangement
Strength limit state tip capacity determined by number of ground stays

Assy Selection
1150-1 to 4

Construction Folder
Refer Pole Stay Construction Folder

Construction Folder
Refer Pole Stay Construction Folder

For biscuit

G.L.

R1

Assy 1080-1

Assy 1080-1

Refer Pole Stay Construction Folder

Refer Pole Stay Construction Folder

Refer Pole Stay Construction Folder

HARD COPY
UNCONTROLLED

Ergon Energy Corporation Ltd
ASX: 50 087 646 062

DRAWING NUMBER: 5-11-3-2

VOLUME  FOLDER  PAGE  ISSUE
5        11      3-2  0C
<table>
<thead>
<tr>
<th>ASSY</th>
<th>DESCRIPTION</th>
<th>CB101UN</th>
<th>CB121UN</th>
<th>CB141UN</th>
<th>CB161UN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1079-8</td>
<td>Stay brackets &amp; backing plate (700)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1079-7</td>
<td>Stay brackets &amp; backing plate (650)</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1079-6</td>
<td>Stay brackets &amp; backing plate (600)</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1151-1</td>
<td>10m x unstayed bollard concrete pole</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1151-2</td>
<td>12m x unstayed bollard concrete pole</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1151-3</td>
<td>14m x unstayed bollard concrete pole</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1151-4</td>
<td>16m x unstayed bollard concrete pole</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Unstayed Bollard
Base of 80kN Pole

Fill tip with concrete to depth of 300mm in lieu of pole cap

Twin Aerial Stay Arrangement

Assy Selection
1079-6 to 8

Assy Selection
1151-1 to 4

Over size hole required if bored vertically

1:8 cement stabilised backfill and compacted in 200mm layers

<table>
<thead>
<tr>
<th>Overall bollard length 'L' (m)</th>
<th>'T' Tip Ø (mm)</th>
<th>'R2' Tip rake (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>435</td>
<td>610</td>
</tr>
<tr>
<td>12</td>
<td>465</td>
<td>770</td>
</tr>
<tr>
<td>14</td>
<td>465</td>
<td>930</td>
</tr>
<tr>
<td>16</td>
<td>495</td>
<td>1090</td>
</tr>
</tbody>
</table>

Refer Pole Stay Construction Folder

Refer 5-7-3-3

Construction Code
CB101UN
CB121UN
CB141UN
CB161UN

Construction Folder
Refer Pole Stay Construction Folder

1079-6 to 8 Assy Selection

If bored vertically

1:8 cement stabilised backfill

1151-1 to 4 Assy Selection

in lieu of pole cap

1:8 cement stabilised backfill

and compacted in 200mm layers

Refer 5-7-3-3

Over size hole required if bored vertically

Unstayed Bollard
Base of 80kN Pole

A JOHNSTON

OVERHEAD SUB-TRANSMISSION
BOLLARD CONSTRUCTION
100kN UNSTAYED BOLLARD CONSTRUCTION

7/08/2013

R MARGANI

A JOHNSTON
<table>
<thead>
<tr>
<th>ASSY</th>
<th>DESCRIPTION</th>
<th>CB10SN</th>
<th>CB12SN</th>
<th>CB14SN</th>
<th>CB16SN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1080-1</td>
<td>Reverse back to back stay brackets</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1150-1</td>
<td>10m x stayed bollard concrete pole</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1150-2</td>
<td>12m x stayed bollard concrete pole</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1150-3</td>
<td>14m x stayed bollard concrete pole</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1150-4</td>
<td>16m x stayed bollard concrete pole</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**OVERHEAD SUB-TRANSMISSION**

**BOLLARD CONSTRUCTION**

**200kN STAYED BOLLARD**

**MATERIAL**

**Approved**
P. DE SOUSA ROQUE

**Checked**
R. MARGANI

**Drawn**
K. STOLZ

**Date**
7/08/2013

**DRAWING NUMBER:** 5-11-5-1

<table>
<thead>
<tr>
<th>VOLUME</th>
<th>FOLDER</th>
<th>PAGE</th>
<th>ISSUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>11</td>
<td>5-1</td>
<td>0A</td>
</tr>
</tbody>
</table>
**Notes**

1. Foundation design for cohesive soils with shear strengths of 100kPa or greater

<table>
<thead>
<tr>
<th>Overall bollard length (m)</th>
<th>'H1'</th>
<th>'R1'</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>6.8</td>
<td>750</td>
</tr>
<tr>
<td>12</td>
<td>8.8</td>
<td>950</td>
</tr>
<tr>
<td>14</td>
<td>10.8</td>
<td>1150</td>
</tr>
<tr>
<td>16</td>
<td>12.8</td>
<td>1350</td>
</tr>
</tbody>
</table>

**Twin Aerial Stay Arrangement**

Strength limit state tip capacity determined by number of ground stays

**Stayed Bollard**

Tip of C6S0L / C6RSD130kN Pole

- Construction Code
  - CB102SN
  - CB122SN
  - CB142SN
  - CB162SN

- For biscuit

- 1:8 cement stabilised backfill and compacted in 200mm layers

- Over size hole required if bored vertically