## Specification for Installation of Underground Conduit Systems

**Document No. 801-07**

The latest version of this guide can be found at fortisbc.com/electricity/customerservice/forhomes

<table>
<thead>
<tr>
<th>Date</th>
<th>REV.</th>
<th>Description</th>
<th>Reviewed/Checked</th>
<th>Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 2016</td>
<td>4</td>
<td>Update backfill and trench detail. Add Royal Pipe to approved list. Add manufacturer drawings of conduit</td>
<td>D. Walden</td>
<td>D. Krenz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A. Bowers</td>
<td></td>
</tr>
</tbody>
</table>
Table of Contents

List of Tables .................................................................................................................. ii

Table of Figures ............................................................................................................... ii

1 Definitions ..................................................................................................................... 1

2 References ..................................................................................................................... 2

3 User Notifications ........................................................................................................ 3

4 Scope ............................................................................................................................... 4

5 Responsibility of Developer ......................................................................................... 5

6 Safety Precautions ......................................................................................................... 7

7 Joint Trenching ............................................................................................................... 8

8 Excavation and Trenching ............................................................................................. 9

9 Source of Materials ....................................................................................................... 11

9.1 Pre-Cast Concrete Boxes, Vaults and Lids ................................................................. 11

9.2 Grounding ................................................................................................................... 15

9.3 Conduit and Fittings ................................................................................................. 16

10 Conduit Installation ...................................................................................................... 19

11 Installing Duct Using Direction Drilling .................................................................... 21

12 Pole Risers .................................................................................................................... 21

13 Drainage of Pre-Cast Boxes ....................................................................................... 23

14 Concrete and Grout ...................................................................................................... 24

15 Inspection of Installations ........................................................................................... 25

15.1 Development Owner/Service Provider Constructed Subdivision Inspections .......... 26

Appendix A – Field Inspection Form ............................................................................. I

Appendix B – Structure and Assembly Details .............................................................. II

Appendix C – Conduit Manufacturer Drawings ............................................................. III
List of Tables

Table 1: Preferred Bedding Material .................................................................................................................. 9
Table 2: Optional Bedding Material .................................................................................................................. 9
Table 3: Common Structure Reference Numbers .............................................................................................. 11
Table 4: Common Grounding Reference Numbers ............................................................................................ 15
Table 5: Common Conduit Component Reference Numbers .............................................................................. 16
Table 6: List of Facility Installation Standards ................................................................................................. 20
Table 7: List of Facilities Placement Standards ................................................................................................. 24

Table of Figures

Figure 1: Joint Trenching ................................................................................................................................. 8
Figure 2: Service Stubs ..................................................................................................................................... 8
Figure 3: Grounding Detail ............................................................................................................................... 15
Figure 4: Conduit Termination .......................................................................................................................... 21
Figure 5: Riser Pole Detail ............................................................................................................................... 22

Note: All current revisions and additions are highlighted:
1 Definitions

The following definitions shall apply to this document:

**COMPANY** shall mean FortisBC, or its duly authorized representatives.

**CONTRACTOR** shall mean a qualified constructor who holds a valid certificate issued by the Governing Authority. In the context of this document, the Contractor has been retained by, and is acting under the direction and authority of the Developer or their duly appointed representative to physically construct the underground distribution facilities as defined in the plans.

**DEVELOPER** shall mean the Registered Owner or Corporation, or its duly appointed representative(s), including their engineering consultant(s) and/or contractor(s), having an interest in the land on which the underground electrical system specified is being installed.

**DEPOT** shall mean a supplier's warehouse or storage yard, a Company storage yard or any other place or places designated by the Company as a material pick-up point.

**GOVERNING AUTHORITY** shall mean the British Columbia Safety Authority, City, Municipality, Regional District, Provincial Government Agency, First Nations Band or Federal Government Agency having jurisdiction over the work site.

**PLANS** shall mean the drawings, approved by the Governing Authority and issued by the Company, detailing the location and grades of conduit, pre-cast concrete boxes, and concrete pads or like structures required to be placed for the Company on a specific project.

**PROPERTY OWNER** shall mean the person(s) and/or entity (ies) named as the registered owner(s) of real property as registered on the property title with the Land Titles Office.

**STANDARD DRAWINGS** shall mean those drawings illustrating typical installations and/or specifying materials to be used.

**UNDERGROUND ELECTRIC SYSTEM** shall mean an underground network of underground electrical components used to supply and transfer electric power.

**UNDERGROUND CIVIL SYSTEM** shall mean the duct and structures referenced in Appendix B in which the electric system is installed in.

**FIELD INSPECTIONS FORM** – shall mean final document issued by FortisBC field inspector after civil work has been inspected.
2 References

- Joint Trenching Requirements for Shallow Utilities
- Joint Trenching Requirements for Shallow Utilities – Addendum A
- FortisBC Service and Metering Guide
- AASHTO HB-17 - Standard Specifications for Highway Bridges
- AASHTO M 306-10 - Standard Specifications for Drainage, Sewer, Utility and Related Castings
3 User Notifications

Use of FortisBC Engineering and Construction Standards.

a) In accordance with FortisBC Engineering Practices Policy, FortisBC Engineering and Construction Standards are developed and used only for FortisBC designs and construction, and only for FortisBC distribution facilities.

b) FortisBC Engineering and Construction Standards are copyright protected. Drawings and specification within this document, in whole or in part, shall not be copied, modified, amended nor changed without written consent from FortisBC.

c) Use of FortisBC Engineering and Construction Standards by any Developer is done at the Developer’s own risk and liability.

d) These standards may carry the name or logo of “West Kootenay Power”, “UtiliCorp Networks Canada” or “Aquila Networks Canada”. Any such references shall be taken as reference to “FortisBC”.

e) FortisBC expects that construction by others for any electrical system or distribution facility adjoining, attaching, or otherwise affecting FortisBC distribution facilities shall meet or exceed FortisBC Engineering and Construction Standards.

f) FortisBC recommends that the Developer retain a professional engineer to coordinate and assess the completeness of the overall project design and/or construction to ensure that it meets the requirements as defined by this document and those of other parties involved. Overall project design and/or construction includes, but is not limited to, underground electrical distribution facilities, underground sanitary sewer installations, underground storm sewer installations, underground water distribution and irrigation facilities, underground cable television facilities, underground natural gas facilities, underground telephone facilities, underground fiber optic cable installations, legal survey requirements, required permits, etc.

g) Review and/or comment on the overall project designs and/or constructions by FortisBC does not relieve the Developer from full responsibility and liability for designs and/or constructions produced by themselves or on their behalf.

h) By requesting and/or accepting copies of any FortisBC Engineering and Construction Standards, the Developer automatically accepts the terms and conditions of this letter.
4 Scope

This specification describes the materials to be used, the standard of work required, and the responsibility of the Developer in the construction of the underground electrical system.

These standards in no way imply that the Developer is allowed to construct anything other than what he or she is authorized to do in the FortisBC design package or as otherwise instructed by the FortisBC local representative.

These Standards shall not be used for work other than for FortisBC as this document only applies to the FortisBC system. For installations that involve other utilities, the developer shall carry out work under their standards and specification.
5 Responsibility of Developer

- The Developer must construct FortisBC shallow electric utilities in compliance with this document.

- Where the Developer retains a Contractor to construct the underground civil system, the responsibilities outlined herein will remain with the Developer. The developer is responsible to verify the qualifications of their retained contractor and must be prepared to provide documentation of said qualifications at the request of FortisBC.

- Where there is any question regarding the interpretation of these standards, or where information may be lacking, it is incumbent upon the Developer or his representative to contact the local FortisBC representative for a written explanation.

- The Developer must obtain the latest revision of this document and the Company stamped APPROVED FOR CONSTRUCTION plans before commencing work. Any work undertaken on the basis of supplied “preliminary information” is done so at the risk and responsibility of the Developer. Extra costs may result if not working from “approved for construction” drawings and information.

- The Developer shall comply with all requirements of the Governing Authority as to the manner in which all work is done. This means that all conduit, grounding, bonding and transformer pads are to be installed under the direct on-site supervision of a Field Service Representative (FSR) as per Safety Standards Act ELECTRICAL SAFETY REGULATION (B.C. Reg 100/2004). The on-site installation crew must be led by a certified FSR who must be present at all times that work is being performed.

- The Developer shall be fully responsible for proper coordination of the project including the provision of sufficient lead times for submission and approval of plans, field inspections, testing, and energization of the system.

- The Developer shall be responsible for all costs associated with:
  a) Purchase and installation of all materials necessary to install the civil system as specified in the Standard Drawings and Plans.
  b) Transportation of all materials supplied by the Company from the designated depots to the job site, and the return of surplus materials to the depots unless otherwise directed by the Company.
  c) Replacement of any materials lost or damaged after receipt of them.
  d) Supply of materials such as gravel, sand, pre-cast or poured in place material, forming lumber and other miscellaneous construction items.
e) All machine and hand excavations necessary for placing conduit, pre-cast concrete boxes, concrete pads, and other facilities as may be required in the standard drawings and plans.

- In all locations the Developer shall be responsible to minimize damage and restore all damaged pavement, sidewalks, curbs, gutters, developed or undeveloped areas to the satisfaction of the Property Owner(s) and the Governing Authority.

- Prior to excavation, the Developer shall:
  a) Comply with all regulatory requirements of the Governing Authority.
  b) Consult with the owners of buildings, retaining walls, poles, lamp standards, landscaping or any other structures which may be endangered by the work, and provide adequate support or measures necessary to protect those items to the satisfaction of the owner and the Governing Authority.

- After civil construction has been completed the Developer shall provide “as-built” information clearly noted in red on one of the FortisBC drawings. FortisBC will not issue a final “Field Inspection” with signoff or schedule electrical installation until “as-built” plans have been received by the Company.

- The Developer shall guarantee all grades. Any discrepancies between design and actual grades discovered during the final inspection shall be corrected by the Developer at the Developer's expense.

- The Developer shall be responsible for determining whether road cuts will be allowed by the Governing Authority. The Developer shall be responsible for any additional costs associated with boring or tunneling under road.

- Survey pins displaced by the Developer shall be reinstalled within 60 days by a legal surveyor at the Developer’s expense. Final approval cannot be granted by FortisBC until survey pins have been established.

- The Developer shall be responsible for maintaining the backfilled excavation until all settlement has ceased.

- The Developer shall maintain open excavations at his or her own liability and expense, and shall also be fully responsible to minimize hazards to people and property while trenches are open.

- When FortisBC facilities are to be installed jointly in the same trench with the facilities of telephone, cable, gas or any other utility, it is a responsibility of the Developer to ensure coordination is maintained with the respective parties. (See Appendix B for more details.)
• The Developer shall ensure that the minimum physical separations are maintained between FortisBC facilities and the facilities of other Utilities such as telephone, cable television, gas, water, sewer, fiber optic, etc. The Developer shall ensure that facility separations meet or exceed the requirements of all parties involved.

• The Developer shall ensure the installation of the underground civil system resembles the plans. Any changes or alterations to the plan must be approved by the company. These changes shall be reflected on “As-Built” drawings submitted to the company upon the completion of the underground civil system.

6 Safety Precautions

• The Developer shall ensure compliance with BC Occupational Health and Safety (OHS) Regulations, Workers’ Compensation Act and other applicable Standards, Codes and Regulations.

• Knowing what underground facilities are buried in or near your dig jobsite is essential if deadly, dangerous, or destructive accidents are to be avoided. The best way to find out what is buried on your dig site and which areas you must avoid when digging, call 1 800 474 6886 or log a ticket at www.bconecall.ca.

• If civil work is required on or near structures containing energized cables, the Developer shall give FortisBC 48 hour notice to arrange for a qualified Company representative to be on site during the excavation.
7 Joint Trenching

- The Developer shall ensure that the minimum physical separations are maintained between FortisBC facilities and the facilities of other Utilities such as telephone, cable television, gas, water, sewer, fiber optic, etc. For details refer to “Joint Trenching Requirements for shallow utilities” and “Joint Trenching Requirements for shallow utilities – Addendum A”. Figure 1 of this document specifies FortisBC’s minimum requirements; it should however be noted that other Utilities may specify separations that exceed those of FortisBC. The Developer shall ensure that facility separations meet or exceed the requirements of all parties involved.

- Figures below only apply to the FortisBC Electric service territory.

**Figure 1: Joint Trenching**

- Service stubs at property line to be installed as per below

**Figure 2: Service Stubs**
8  Excavation and Trenching

**Backfilling** - shall not be performed until a Company inspector has approved the phase of the project to be backfilled. Refer to Section 15 of this document. If native fill is specified it shall mean excavated material free of organic material and rock larger than 150 mm in diameter. Frozen material shall not be used as backfill.

- 150mm of duct bedding shall surround the utility facilities unless noted otherwise.

**Table 1: Preferred Bedding Material**

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Lower Percentage Pass</th>
<th>Upper Percentage Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.0mm</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>19.0mm</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>12.5mm</td>
<td>65</td>
<td>85</td>
</tr>
<tr>
<td>9.5mm</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>4.75mm</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>2.36mm</td>
<td>10</td>
<td>35</td>
</tr>
<tr>
<td>1.18mm</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>0.600mm</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>0.300mm</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>0.075mm</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

**Table 2: Optional Bedding Material**

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Lower Percentage Pass</th>
<th>Upper Percentage Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5mm</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>4.75mm</td>
<td>35</td>
<td>100</td>
</tr>
<tr>
<td>2.36mm</td>
<td>20</td>
<td>98</td>
</tr>
<tr>
<td>1.14mm</td>
<td>13</td>
<td>92</td>
</tr>
<tr>
<td>0.600mm</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>0.300mm</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>0.150mm</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>0.075mm</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>
• FortisBC reserves the right to request a Sieve Test to verify the material purchased by the Civil Contractor meets the gradation listed in Table 1 and 2. Sieve Test documentation to be requested by the FortisBC Civil Inspector and supplied by the Civil Contractor.

• FortisBC requires the use of washed Bedding Material when installing Feeder Duct systems. Washed meaning, maximum 2% fines (less than 0.075mm) in the pan. The direction of when the material is required shall be indicated in the FortisBC design package.

• Under freezing conditions, backfill material shall be dry. Where no suitable backfill material is available all ducts shall be encased in concrete.

• There shall be 300mm horizontal separation between electrical duct and other facilities.

• Underground warning tape shall be installed 300 mm below finished grade. Only 150mm wide, red plastic tape bearing the words “CAUTION BURIED ELECTRIC LINE” shall be used.

• All backfilling and compaction shall be done to the satisfaction and acceptance of FortisBC and the Governing Authority, and shall be subject to inspection at all times.

• Road crossings shall be excavated at right angles to the road.
9 Source of Materials

- FortisBC reserves the right to specify material manufacturers in order to ensure the quality of materials installed.

- The supply of conduit, fittings, pre-cast concrete products and grounding materials shall be the Developer's responsibility.

9.1 Pre-Cast Concrete Boxes, Vaults and Lids

Table 3: Common Structure Reference Numbers

<table>
<thead>
<tr>
<th>Description</th>
<th>Kon Kast Part No.</th>
<th>SOCP Part No.</th>
<th>FortisBC Item No.</th>
<th>Assembly or Structure No.</th>
<th>H-20/HS-20 Impact rating</th>
<th>Reference Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Box</td>
<td>1060</td>
<td>1100</td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Service Box Lid</td>
<td>1061</td>
<td>1101</td>
<td></td>
<td></td>
<td></td>
<td>Group B</td>
</tr>
<tr>
<td>Single Phase Junction Box</td>
<td>1031</td>
<td>1105</td>
<td>755-0506</td>
<td>1590</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Single Phase Junction Box Lid</td>
<td>1037</td>
<td>1106</td>
<td>755-0611</td>
<td>1591</td>
<td></td>
<td>Group B</td>
</tr>
<tr>
<td>58” x 58” Civil Box</td>
<td>1021</td>
<td>1120</td>
<td>755-0509</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>58” x 58” Civil Box Lid - Two Door</td>
<td>1025</td>
<td>1122</td>
<td>755-0612</td>
<td>1592</td>
<td></td>
<td>Group B</td>
</tr>
<tr>
<td>58” x 58” Civil Box Lid - One Piece</td>
<td>1025S</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td>Group B</td>
</tr>
<tr>
<td>Description</td>
<td>Kon Kast Part No.</td>
<td>SOCP Part No.</td>
<td>FortisBC Item No.</td>
<td>Assembly or Structure No.</td>
<td>H-20/HS-20 Impact rating</td>
<td>Reference Image</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>-------------------</td>
<td>---------------------------</td>
<td>--------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>832 Junction Box</td>
<td>1032</td>
<td>1125</td>
<td></td>
<td>755-0560</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>832 Junction Box Lid - Three Door</td>
<td>1033</td>
<td>1126</td>
<td></td>
<td>1594</td>
<td></td>
<td>Group B</td>
</tr>
<tr>
<td>832 Junction Box Lid - One Piece</td>
<td>1033S</td>
<td>1127</td>
<td>-</td>
<td>1594</td>
<td>Group B</td>
<td></td>
</tr>
<tr>
<td>Single Phase Transformer Box</td>
<td>1031</td>
<td>1105</td>
<td>755-0506</td>
<td>1593</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Single Phase Transformer Box Lid</td>
<td>1038</td>
<td>1107</td>
<td>755-0602</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Street Light Base</td>
<td>1045</td>
<td>1132</td>
<td>755-0206</td>
<td>1416</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>1050</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>935</td>
<td>1134</td>
<td>755-0210</td>
<td>1418</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1133</td>
<td>755-0207</td>
<td>1417</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>Kon Kast Part No.</td>
<td>SOCP Part No.</td>
<td>FortisBC Item No.</td>
<td>Assembly or Structure No.</td>
<td>H-20/HS-20 Impact rating</td>
<td>Reference Image</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>-------------------</td>
<td>---------------------------</td>
<td>--------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Switching Cubicle Box</td>
<td>1066</td>
<td>1129</td>
<td>755-0562</td>
<td>1595</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Switching Cubicle Box Lid</td>
<td>1066ELA</td>
<td>-</td>
<td>755-0619</td>
<td></td>
<td>Group B</td>
<td></td>
</tr>
<tr>
<td>Precast Pad 3 Phase Transformer 500kVA and Less</td>
<td>1058D</td>
<td>1113</td>
<td>755-0507</td>
<td>1597</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>3 Phase Transformer above 500kVA Deep Box</td>
<td>1066</td>
<td>-</td>
<td>755-0562</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>3 Phase Transformer above 500kVA Deep Box Lid</td>
<td>-</td>
<td>1130</td>
<td>755-0623</td>
<td>1596</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>3 Phase Transformer above 500kVA Precast Pad</td>
<td>1058B</td>
<td>-</td>
<td>-</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Vehicle Bollard</td>
<td>1080</td>
<td>-</td>
<td>755-0100</td>
<td>1589</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
9.1.1 Loading Standards

Structure lids shall comply with AASHTO H-20/HS-20 rating. For details refer to Section 3 of “AASHTO HB-17 Standard Specifications for Highway Bridges” and “AASHTO M306-10 - Standard Specifications for Drainage, Sewer, Utility and Related Castings”

- Group A – Structure Design to include a 30% impact factor (dynamic load). Structure application to be limited to:
  - Roadway
  - Highway
  - Highway on/off ramps

- Group B – Structure Design with no impact factor (static load). Structure application to be limited to:
  - Sidewalks
  - Boulevard
  - Driveway
  - Alleyway
  - Green space
9.2 Grounding

Table 4: Common Grounding Reference Numbers

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer</th>
<th>Manufacturer Part No.</th>
<th>FortisBC Item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable, #2/0 stranded copper, soft drawn, bare</td>
<td>General Cable (BICC)/Nexans/Prysmian Cables and Systems</td>
<td></td>
<td>531-0202</td>
</tr>
<tr>
<td>Cable, #2/0 stranded copper, soft drawn, poly covered RW90, 600 volts</td>
<td>General Cable (BICC)/Nexans/Prysmian Cables and Systems</td>
<td></td>
<td>531-1122</td>
</tr>
<tr>
<td>Connector, copper, wrench installed, #2/0 copper to #2/0 copper</td>
<td>Burndy</td>
<td>GXW26C26</td>
<td>553-0629</td>
</tr>
<tr>
<td>Connector, copper, wrench installed, #2/0 copper to 3/4&quot; ground rod</td>
<td>Burndy</td>
<td>GXW29C58</td>
<td>553-0626</td>
</tr>
<tr>
<td>Rod, ground, copperbonded, plain, 3/4&quot; x 6'</td>
<td>Erico</td>
<td>3406CC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hubbell</td>
<td>613460</td>
<td>557-1308</td>
</tr>
<tr>
<td></td>
<td>Hydel</td>
<td>C613460</td>
<td></td>
</tr>
<tr>
<td>Cable, #4 stranded copper, soft drawn, bare, for welding or bonding</td>
<td>BICC Cable</td>
<td>166470</td>
<td>539-0602</td>
</tr>
<tr>
<td></td>
<td>Carol Brand</td>
<td>1777</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Grounding Detail
9.3 Conduit and Fittings

- The developer shall supply incidental construction materials such as PVC solvent weld, grout, sand and gravel appropriate for the construction method and conduit material.

<table>
<thead>
<tr>
<th>Table 5: Common Conduit Component Reference Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Pipe</strong></td>
</tr>
<tr>
<td>Conduit, 2”, rigid PVC, 10ft length, bell end</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>End Bell Fittings</strong></td>
</tr>
<tr>
<td>End bell, for 3” DB2</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>End bell, for 4” DB2</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>End bell, socket molded, for 3” rigid PVC</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>End bell, socket molded, for 4” rigid PVC</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td><strong>Couplers</strong></td>
</tr>
<tr>
<td>Coupler, DB2, 2”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Coupler, DB2, 3”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Coupler, DB2, 4”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Coupler, rigid PVC, 2”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Coupler, rigid PVC, 3”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Coupler, rigid PVC, 4”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Sweeps</strong></td>
</tr>
<tr>
<td>Sweep, 90 degree, DB2, 2”, 24” radius</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Sweep, 90 degree, DB2, 3”, 36” radius</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Sweep, 90 degree, DB2, 4”, 36” radius</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Sweep, 90 degree, rigid PVC, 2”, 24” radius</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Sweep, 90 degree, rigid PVC, 3”, 36” radius</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Sweep, 90 degree, rigid PVC, 4”, 36” radius</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Adapters</strong></td>
</tr>
<tr>
<td>Adapter, rigid PVC to DB2, 2”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Adapter, rigid PVC to DB2, 3”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Adapter, rigid PVC to DB2, 4”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
</tr>
<tr>
<td>Tape, underground warning, CAUTION BURIED ELECTRIC LINE, red tape with black lettering, 6” wide, heavy duty polyethylene 4.0 mil thick</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Polyester Measure/Pulling Tape 3/4” (19.1 mm) Wide</td>
</tr>
</tbody>
</table>
10 Conduit Installation

- Conduit installations shall be per structure 1214/1216. In all cases the minimum depth of duct shall be 900mm. Exceptions to this minimum shall only be permitted with prior written approval through a Non-Standard Approval.

- Conduit shall not be installed below $-10 \, ^\circ C$ temperature because of the high risk of duct damage and/or coupling separation.

- Conduit shall not be installed into any existing FortisBC infrastructure without a qualified Company representative on site. Modification of conduit entrance to structures, pads, buildings, etc., shall be pre-approved by FortisBC.

- Conduit terminating at buildings shall be installed in accordance with the latest version of CSA standard C22.3 – No. 7, “Underground Systems”, requiring that the ducts be adequately sealed, drained, graded or vented to prevent entry of gas or water, either from the outside surface or through the ducts.

- Conduit shall enter, exit, and be located in pre-cast concrete boxes and concrete pads in accordance with the following Standard Drawings (see Appendix B for details).
Table 6: List of Facility Installation Standards

<table>
<thead>
<tr>
<th>FortisBC Structure No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1203</td>
<td>Typ. Residential Subdivision Design</td>
</tr>
<tr>
<td>1204</td>
<td>Padmount Equipment Right of Way Requirements</td>
</tr>
<tr>
<td>1206</td>
<td>Padmount Equipment General Requirements</td>
</tr>
<tr>
<td>1214</td>
<td>Underground Road Crossings</td>
</tr>
<tr>
<td>1216</td>
<td>Trench Details</td>
</tr>
<tr>
<td>1342</td>
<td>Riser Pole Transition Details</td>
</tr>
<tr>
<td>1416</td>
<td>Three Foot Base for Street lighting</td>
</tr>
<tr>
<td>1417</td>
<td>Highway, Collector and Arterial Type C-1, Controller Base</td>
</tr>
<tr>
<td>1418</td>
<td>Highway, Collector and Arterial Five Foot Concrete Base Type C, for Street Lighting</td>
</tr>
<tr>
<td>1590</td>
<td>Concrete Service box Civil</td>
</tr>
<tr>
<td>1591</td>
<td>Single Phase 200A 15/25 kV Junction Civil</td>
</tr>
<tr>
<td>1592</td>
<td>58” x 58” Civil Box</td>
</tr>
<tr>
<td>1593</td>
<td>1 Phase Low Profile Pad-mount Transformer</td>
</tr>
<tr>
<td>1594</td>
<td>3 Phase Junction Vault (200A) 15/25 kV 832 Style</td>
</tr>
<tr>
<td>1595</td>
<td>15 kV Pre-cast switch Cubicle Base</td>
</tr>
<tr>
<td>1596</td>
<td>3 Phase Transformer base larger than 500 KVA</td>
</tr>
<tr>
<td>1597</td>
<td>Pre-cast 3 phase transformer base 500 kVA or less</td>
</tr>
<tr>
<td>1598</td>
<td>Above Grade 200A Junction</td>
</tr>
</tbody>
</table>

- All conduit terminated in full sized deep junction boxes shall be terminated with preformed end bells, grouted into place. All others shall be capped.

- Conduit terminating in side walls of junction and transformer boxes shall leave at right angles to the box wall for a minimum distance of 1 meter before being formed into the trench configuration.
- All terminated conduit shall be capped (but not sealed) and shall be marked with lot number and or duct designation. All conduits shall have Polyester Measure/Pulling Tape 3/4" x 3.0" (19.1 mm x 914m) installed. The pulling tape shall have a minimum tensile strength of 11,000 N. It is permitted to reuse Pulling Tape but it must be one continuous piece.

- All conduits shall extend at least 50 mm and no more than 100 mm above drain rock or finished grade.
11 Installing Duct Using Direction Drilling

- When the project calls for cable duct to be installed via direction drilling the contractor must use Schedule 80 High Density Polyethylene smooth walled Duct. This duct must be red in colour throughout the entire thickness of the duct.

- The installation must use permanent markers at surface level to indicate electrical conductors buried below. The permanent markers shall be cast iron plates with hazard wording that are set into the concrete at a distance of 3m apart or as directed by FortisBC.

- The direction drill design and installation must be approved through the FortisBC Non-Standard Approval process. Please contact the FortisBC designer for further information.

12 Pole Risers

- Conduit bends shall be installed at the base of poles designated as riser poles on the plans. These bends shall be located on the quadrant of the pole as illustrated in Standard Structure Drawing No. 1342 (see Appendix A).

- All conduit bends shall be located to permit the use of standoff brackets on the pole.

- The Developer shall install appropriately sized 90° sweeps terminating at the base of the riser pole; these shall be capped and identified, but not sealed.
- FortisBC shall supply and install conduit up the riser structure when the underground electrical system installed by the Developer is connected to the FortisBC distribution system. In other words, the Developer shall not be required to supply nor install conduit up the pole when the underground system being installed connects to FortisBC’s overhead primary facilities.

- On customer owned secondary services over 200A, or any three phase secondary services, the Developer shall supply the duct required to run up the pole. FortisBC shall install this customer owned conduit up the pole.

Figure 5: Riser Pole Detail

1 Refer to the FortisBC Service and Metering Guide available at www.fortisbc.com for more information on demarcation between customer and FortisBC owned and maintained facilities.
13 Drainage of Pre-Cast Boxes

- The Developer shall ensure that drain holes in all pre-cast boxes are clear and free draining (open), and are positioned or oriented at the lowest point of grade.

- Where water drains are required, the Developer shall provide a means of drainage to storm sewers or catch basins as indicated on the standard plans and drawings. Such drain systems shall meet the approval of the Company and the Governing Authority. Out-fall shall be proven prior to boxes being placed.
14 Concrete and Grout

- All concrete, reinforced or not, shall meet the requirements of the current edition of the Canadian Standards Association standard CSA-A23.1-00, “Concrete Materials and Methods of Concrete Construction”.

- Concrete shall be sulphate resistant, Type 50, 3000 psi (20 MPA) minimum 28 day compressive strength.

- Air entraining agents shall be between 4-7% of final product, and shall conform to the requirements of ASTM International standard ASTM C260-01, “Standard Specification for Air-Entraining Admixtures for Concrete”.

- Calcium chloride accelerators shall not be used in the pour. Alternate accelerators might be used, subject to FortisBC approval.

- Grout or mortar shall be prepared as per the manufacturer’s instructions.

- All conduit sweeps except street lights shall be encased in concrete in accordance with the following Standard Drawings.

Table 7: List of Facilities Placement Standards

<table>
<thead>
<tr>
<th>FortisBC Drawing No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-20</td>
<td>Placement of Facilities; Concrete Encasement - Bends</td>
</tr>
<tr>
<td>F-21</td>
<td>Placement of Facilities; Concrete Capping - Pole Riser</td>
</tr>
<tr>
<td>F-23</td>
<td>Placement of Facilities; Concrete Capping - Deep Box Entry</td>
</tr>
<tr>
<td>G-23</td>
<td>Ground Rod Assembly</td>
</tr>
</tbody>
</table>

- Concrete capping shall be formed in place and finished to a minimum thickness of 100 mm. Maximum thickness shall not exceed 200 mm
15 Inspection of Installations

Inspection by FortisBC shall take place at the following construction phases. Note that survey evidence must be in place before an inspection can occur.

A) **Trenching** – After ducts are installed, prior to backfill or concrete capping
   - Proper horizontal spacing between utility ducts
   - Proper trench depth
   - Concrete encase all horizontal bends
   - Primary ducts are on the primary side of the transformer pad
   - Secondary ducts are on the secondary side of the transformer pad

B) **Structure Grounding** – After ground rods and counter poise connections have been made, prior to backfill
   - Concrete encase all vertical bends into transformer pads and secondary boxes
   - Ground grids/rods installed as per FortisBC structure standards
   - Grounding wire is inside box

C) **Duct Work** – During installation of pull strings
   - Pull rope and bell ends on all ducts
   - Ducts are in good shape
   - Ducts not too high or too low relative to drain rock

D) **Curb/Boulevard** – Upon completion of the curb installation or boulevard grading and road paving
   - Top of Junction Boxes are at the proper elevation, per appendix B.
   - Lids are not damaged
   - Concrete box is in good shape
   - Drain holes are opened and have drain rock underneath
   - Drain rock in place within open bottom structures
   - Eye bolts on ends are turned so eye (not nut) is inside the box (2 at each end)
   - Grounding wire is inside box
   - Street light base is in good shape
   - Street light bolts are straight and have nuts
   - Trench is properly backfilled (including behind street light bases)
E) **Completion** – After conduit system and structures have been installed and is ready for electrical construction

- Pull rope and bell ends on all ducts
- Boxes to be swept or vacuumed out prior to electrical installation or deficiency resolution

*After any inspection, all openings in boxes must be covered with securely fastened 1/2" plywood*

### 15.1 Development Owner/Service Provider Constructed Subdivision Inspections

- FortisBC will have access and the right to inspect the conduit system at any point/phase in its construction.
Appendix A – Field Inspection Form
Field Inspections

Developer

Site Address

Contractor

Site Foreman

SAP WO #

FortisBC Inspector

☐ Accepted  ☐ Rejected

Overhead Inspection List

Underground Inspection List

Structures and Anchors

☐ Framing (to standard)

☐ Setting (depth / raked)

☐ Backfill (tamped)

☐ Correct class

☐ Anchor depth

☐ Anchor location and rod angle

☐ Guy tension

☐ Guy guards

☐ Insulators

☐ Right of way clearing

☐ Offset

Equipment

☐ Correct mounting

☐ Connections / lead size

☐ Bird proofed

☐ Grounding

☐ Cutout & arrestor

☐ Clearance

Protection

Wire

☐ Cutout rating  ☐ Size

☐ Fuse link rating  ☐ Sag

☐ Mounting & grounding  ☐ Sleeves

Additional Comments:

O/H Inspection Acceptance Date

By:

URD Inspection Acceptance Date

By:
Appendix B – Structure and Assembly Details
ENSURE 90 SWEEP IS LOCATED IN FortisBC QUADRANT

RISE POLLE

HIGH VOLTAGE JUNCTION BOX

ROW REQUIRED (SEE NOTE 4)

SERVICE DUCTS EXTENDED MINIMUM 1000 (3' 3"") INTO PROPERTY

NOTE:
1 - TRANSFORMER PAD TO BE PLACED IN THE CENTER OF ROW
2 - UNLESS OTHERWISE INDICATED, ALL DIMENSIONS ARE IN MILLIMETRES
3 - DISTANCE OF TRENCH FROM PROPERTY LINE VARIES TO CONFORM TO LOCAL REGULATIONS
4 - REFER TO STR. 1204 FOR ROW REQUIREMENTS
NOTES:

1) OPTION A, DOORS NOT FACING STREET SIDE FOR HIGH TRAFFIC INSTALLATIONS
2) OPTION B, DOOR FACING STREET FOR NON-TRAFFIC INSTALLATIONS
3) OPTION B – ANY STREET SIDE FENCE IS TO BE GATED, NOT TO RESTRICT ACCESS. NO FIXED STRUCTURE TO EXIST WITHIN A 3 METER CLEAR ZONE OF THE OPERATING DOORS.
4) LOCATE ALL SWITCHERS AS INDICATED IN CSA UNDERGROUND SYSTEMS 3.2.2
5) LOCATE OIL FILLED SWITCHERS AS INDICATED IN C.E.C. 28-014 DIELECTRIC LIQUID-FILLED EQUIPMENT.
6) GROUND LOOP BURIED 1M AWAY FROM EDGE OF EQUIPMENT.
7) IF REQUIRED BY PROJECT, 6m WIDE ACCESS ROW TO BE MEASURED FROM EDGE OF EQUIPMENT.
NOTES:
1) OPTION A, DOORS FACING STREETSIDE.
2) OPTION A – ANY STREET SIDE FENCE IS TO BE GATED, NOT TO RESTRICT ACCESS. NO FIXED STRUCTURE TO EXIST WITHIN A 3 METER CLEAR ZONE OF THE OPERATING DOORS.
3) OPTION B, DOORS FACING 3M LONG OPERATING ZONE (ON PRIVATE PROPERTY)
4) LOCATE ALL TRANSFORMERS AS INDICATED IN CSA UNDERGROUND SYSTEMS 3.2.2
5) LOCATE ALL TRANSFORMERS AS INDICATED IN CANADA CANADA. FORTISBC PAVEMENT DISTRIBUTION TRANSFORMERS ARE TYPICALLY PROTECTED WITH AN INTERNAL CURRENT LIMITING FUSE & EQUIPPED WITH A PRESSURE RELIEF DEVICE.
6) GROUND LOOP BURIED 1M AWAY FROM EDGE OF EQUIPMENT.
7) IF REQUIRED BY PROJECT, 6M WIDE ACCESS ROW TO BE MEASURED FROM EDGE OF EQUIPMENT.
NOTES:
1) OPTION A, DOORS FACING STREET SIDE.
2) OPTION A - ANY STREET SIDE FENCE IS TO BE GATED, NOT TO RESTRICT ACCESS. NO FIXED STRUCTURE TO EXIST WITHIN A 3 METER CLEAR ZONE OF THE OPERATING DOORS.
3) OPTION B, DOORS FACING 3M LONG OPERATING ZONE (ON PRIVATE PROPERTY).
4) LOCATE ALL TRANSFORMERS AS INDICATED IN CSA UNDERGROUND SYSTEMS 3.2.2.
5) LOCATE ALL TRANSFORMERS AS INDICATED IN C.E.C. 26-240. FORTISBC PAGMOUTH DISTRIBUTION TRANSFORMERS ARE TYPICALLY PROTECTED WITH AN INTERNAL CURRENT LIMITING FUSE & EQUIPPED WITH A PRESSURE RELIEF DEVICE.
6) GROUND LIQUID MELTED 1M AWAY FROM LIQUID LIQUID EQUIPMENT.
7) IF REQUIRED BY PROJECT, 6M WIDE ACCESS ROW TO BE MEASURED FROM EDGE OF EQUIPMENT.
NOTES:

1) OPTION A, DOORS FACING STREET SIDE (R/W SPLIT ON TWO PROPERTIES)
2) OPTION B, DOORS FACING STREET SIDE (R/W SPLIT ON TWO PROPERTIES)
3) OPTION A & B - ANY STREET SIDE Fence IS TO BE GATED, NOT TO RESTRICT ACCESS. NO FIXED
   STRUCTURE TO EXIT WITHIN A 3 METER CLEAR ZONE OF THE OPERATING DOORS.
4) OPTION C, DOORS FACING 3M LONG OPERATING ZONE (ON PRIVATE PROPERTY)
5) LOCATE ALL TRANSFORMERS AS INDICATED IN CSA UNDERGROUND SYSTEMS 3.2.2
6) LOCATE ALL TRANSFORMERS AS INDICATED IN C.E.C. 26-240. FORTISBC PADMOUNT DISTRIBUTION
   TRANSFORMERS ARE TYPICALLY PROTECTED WITH IN AN INTERNAL CURRENT LIMITING FUSE & EQUIPPED WITH A
   PRESSURE RELIEF DEVICE.
7) GROUND LOOP BURIED 1M AWAY FROM EDGE OF EQUIPMENT.
8) IF REQUIRED BY PROJECT, 6M WIDE ACCESS ROW TO BE MEASURED FROM EDGE OF EQUIPMENT.
NOTES:
1) NO FIXED STRUCTURE TO EXIST WITH 3m CLEAR ZONE OF OPERATING SIDE.
2) LOCATION OF JUNCTION BOX COULD VARY DEPENDING ON PROJECT REQUIREMENTS.
3) GROUND LOOP BURIED 1m AWAY FROM EDGE OF JUNCTION BOX.
4) ROW SHALL BE AT LEAST 1.2m AWAY FROM EDGE OF EQUIPMENT.
NOTES:

1. THIS STRUCTURE APPLIES TO ALL PADMOUNT EQUIPMENT. IN THE CASE WHERE THE EQUIPMENT HAS ONLY ONE SET OF DOORS, OPERATING ZONE AND GRADING REQUIREMENTS ONLY APPLY TO THAT SIDE.

2. LANDSCAPE GRADE WITHIN THE OPERATING ZONE OF PADMOUNT EQUIPMENT MUST NOT EXCEED ±15%. REQUIRED FOR SAFE FOOTING WHEN OPERATING THE EQUIPMENT.

3. THE SLOPE MUST NEVER EXPOSE THE GROUND LOOP.
NOTE:
1. DIMENSIONS IN mm.
2. STR. SHALL ONLY BE USED WHEN 1m OFF BACK OF TRANS. PAD IS NOT AVAILABLE.
3. FIREWALL ZONE SHALL MEET THE REQUIREMENTS OF CEC 26.242. MUST BE NON-FLAMMABLE SURFACE.
NOTE:
1. DIMENSIONS IN mm.
2. NO METALLIC OBJECTS SUCH AS FENCES OR GATES ARE PERMITTED WITHIN 2.0m OF THE TRANSFORMER BASE UNLESS EFFECTIVELY ISOLATED FROM EARTH AS SHOWN IN STRUCTURE 1206 SHEET 5.
3. THE CUSTOMER MUST PROVIDE FORTISBC ACCESS TO THE TRANSFORMER IF ANY FORM OF BARRIER IS INSTALLED, IE. FENCE. NO PERMANENT PORTION OF THIS STRUCTURE IS PERMITTED WITHIN THE RIGHT-OF-WAY.
4. NO LANDSCAPING IS PERMITTED WITHIN THE RIGHT-OF-WAY. FORTISBC RESERVES THE RIGHT REMOVE ANY LANDSCAPING PLACED BY THE CUSTOMER WITHIN THE RIGHT-OF-WAY.
5. VEHICLE BOLLARDS ARE REQUIRED FOR ALL 3PH TRANSFORMERS. MAY BE REQUIRED FOR 1PH TRANSFORMERS.
NOTES:
1. DIMENSIONS IN mm UNLESS INDICATED OTHERWISE.
2. GROUND LOOP TO BE BURIED 1m AWAY FROM EQUIPMENT.
3. GATE SHALL ALLOW FULL ACCESS TO FONT OF TRANSFORMER. GATE SHALL NOT INHIBIT CRANE ACCESS.
4. GATE SHALL BE BONDED TO EQUIPMENT GROUND.
5. THIS STRUCTURE SHALL ONLY BE USED IF THERE IS 14.5m OF UNOBSERVED SPACE IN FRONT OF THE TRANSFORMER CAVITY. MEASURING FROM THE EDGE OF THE BUILDING. REQUIRED FOR CRANE ACCESS.
6. ANY OTHER CONFIGURATION REQUIRE FBC APPROVAL.

<table>
<thead>
<tr>
<th>UPTO 300kVA</th>
<th>5.0m</th>
</tr>
</thead>
<tbody>
<tr>
<td>500kVA TO 2500kVA</td>
<td>8.3m</td>
</tr>
</tbody>
</table>

FENCE GATE

GROUND LOOP

FENCE

PLAN VIEW

SIDE VIEW

FRONT VIEW
PVC DUCT OR CONDUIT SIZE AS REQUIRED

FILL WITH THIN MIX OF NON-SHRINK GROUT, THEN PUSH POST IN.

METALLIC POST

CUSTOMER SPECIFIED CONCRETE

GLUE CAP

100mm MINIMUM
NOTE:
1. BACKFILL UNDER THE ROADWAY SHALL CONSIST OF COMPACTED SAND FILL
   OR AS REQUIRED BY THE MUNICIPAL AUTHORITY OR DEVELOPER
2. NOMINAL BURIAL DEPTH IS 1.2m
3. DESIGNER MAY SPECIFY CONCRETE INCASSEMENT ON FEEDER CLASS CROSSINGS
1. Seal both ends of the duct with sealer prior to backfilling.
2. Duct/cabling will be placed on a 152.4mm thick layer of sand and will be covered with 152.4mm of sand. Above this will be native soil.
3. Crossings will be made at 90 degree angles to the highway.
4. All bored ducts will be 151.6mm diameter.
5. Red burial tape will be placed halfway between the duct/cable and finished grade.
1. SEAL BOTH ENDS OF THE DUCT PRIOR TO BACKFILLING.
2. HIGHWAYS CROSSINGS WILL BE MADE AT 90 DEGREE ANGLES TO THE HIGHWAY.
3. RED BURIAL TAPE WILL BE PLACED HALF WAY BETWEEN THE DUCTABLE AND FINISHED GRADE.
4. THIS STANDARD WILL CONFORM TO NATURAL UTILITY MANUAL SECTION 11 AND 13 UNLESS OTHERWISE NOTED.
5. MINI CONCRETE COVER OVER CONDUIT AND REBAR TO BE 76 (2").
6. CONCRETE TO BE FORMED AND Poured.
7. ALL FORMS TO BE REMOVED BEFORE BACKFILL.
8. SAND BEDDING IN TRENCH MAY BE USED AS BOTTOM FORM ONLY IF CLEAN AND LEVEL.
9. FORTISBC BC TO INSPECT FORM AND REINFORCEMENT BEFORE POUR.
10. 25 MPa CONCRETE WILL BE USED.
11. MAINTAIN A MINIMUM 25mm (1") CONCRETE BETWEEN ALL CONDUITS WITH SPECIAL ATTENTION PAID TO INNER BEND RADIUS.
12. COMMERCIAL MANNED SPACERS SHALL BE USED TO MAINTAIN CONDUIT HORIZONTAL CLEARANCE FOR CONCRETE INFECTION.
13. SPACERS SHALL NOT BE CLOSER THAN 300mm TO JOINTS AND AT INTERVALS NOT TO EXCEED 2.4m.
14. BACKFILL SHALL BE PLACED IN LAYERS NOT EXCEEDING 150mm AND EACH LAYER WILL BE COMPACTED TO A MINIMUM OF 95% PROCTOR DENSITY AND THE FINAL 300mm WILL BE COMPACTED TO 100%.
15. SHOULD MORE THAN 16 CONDUITS BE NEEDED A DUPLICATE DUCT BANK WILL BE PLACED DIRECTLY BELOW THE ORIGINAL ONE.
16. 1m MINIMUM CLEARANCE IS NEEDED EVERYWHERE WITHIN THE HIGHWAYS RW.
NOTES:
1. ALL DIMENSIONS IN MILLIMETERS.
2. DRAWINGS DO NOT APPLY TO ROAD CROSSINGS. REFER TO STRUCTURE 1214.
3. TRENCH DEPTH IS DETERMINED FROM ROAD GRADE.
4. SIZE AND QUANTITY OF DUCTS MAY VARY FROM DRAWING AS REQUIRED IN DESIGN.
5. DRAWING SHOWS PREFERRED ORIENTATION OF PRIMARY, SECONDARY AND STREET LIGHT DUCT WITHIN TRENCH.
6. ELECTRICAL DUCT SHALL BE ON PROPERTY SIDE OF COMM. DUCT.
7. MINIMUM DEPTH OF ELECTRICAL DUCT IS 900mm UNLESS SPECIFIED IN DESIGN. EXCEPTIONS ONLY PERMITTED AT DUCT CROSSINGS SUBJECT TO APPROVAL BY FORTISBC CIVIL INSPECTOR.
8. ¾" ROAD MULCH SURROUNDING ELECTRICAL DUCT SHALL BE TYPE 1, 20mm SIEVE PER SECTION 31-05-17-2.7 OF THE MMCD.
9. MINIMUM HORIZONTAL DISTANCE OF 300mm MUST BE MAINTAINED BETWEEN ELECTRICAL DUCT OF OTHER UTILITIES.
10. MINIMUM VERTICAL SEPARATION AT CROSSINGS SHALL BE
   10.1. 150mm ELECTRICAL DUCT TO COMM. DUCT
   10.2. 300mm ELECTRICAL DUCT TO GAS LINE
   10.3. DISTANCES MAY BE REDUCED PROVIDED APPROVED BARRIERS ARE USED.
11. ELECTRICAL DUCTS SHALL HAVE 150mm ¾" ROAD MULCH BELOW DUCT BANK AND AT LEAST 150mm ABOVE DUCT BANK.
12. RED MARKER TAPE SHALL BE PLACED ABOVE ELECTRICAL DUCT.
13. TRENCH MUST BE SMOOTH AND LEVEL TO REDUCE STRESS ON DUCT.
14. THIS STRUCTURE REFERS TO FORTISBC ELECTRIC SPECIFIC REQUIREMENTS. REFER TO THE APPLICABLE STANDARDS FROM EACH UTILITY AS REQUIRED.
15. REFER TO THE "JOINT TRENCHING REQUIREMENTS FOR SHALLOW UTILITIES" WHERE APPLICABLE.
16. TRENCH ALIGNMENT SHALL BE DETERMINED BASED ON THE REQUIREMENTS LAID OUT BY THE AUTHORITIES HAVING JURISDICTION OF THE SITE. TYPICAL ALIGNMENT IS 1.8m OFF PL.

DESCRIPTION OF CHANGE:
CHANGE MINIMUM DEPTH DIMENSION
NOTES:
1. ALL DIMENSIONS IN MILLIMETERS.
2. DRAWINGS DO NOT APPLY TO ROAD CROSSINGS. REFER TO STRUCTURE 1214.
3. TRENCH DEPTH IS DETERMINED FROM ROAD GRADE.
4. SIZE AND QUANTITY OF DUCTS MAY VARY FROM DRAWING AS REQUIRED IN DESIGN.
5. DRAWING SHOWS PREFERRED ORIENTATION OF PRIMARY, SECONDARY AND STREET LIGHT DUCT WITHIN TRENCH.
6. ELECTRICAL DUCT SHALL BE ON PROPERTY SIDE OF COMM. DUCT.
7. MINIMUM DEPTH OF ELECTRICAL DUCT IS 900mm UNLESS SPECIFIED IN DESIGN. EXCEPTIONS ONLY PERMITTED AT DUCT CROSSINGS SUBJECT TO APPROVAL BY FORTISBC CIVIL INSPECTOR.
8. 3/4" ROAD MULCH SURROUNDING ELECTRICAL DUCT SHALL BE TYPE 1, 20mm SIEVE PER SECTION 31-05-17-2.7 OF THE MMCD.
9. MINIMUM HORIZONTAL DISTANCE OF 300mm MUST BE MAINTAINED BETWEEN ELECTRICAL DUCT OF OTHER UTILITIES.
10. MINIMUM VERTICAL SEPARATION AT CROSSINGS SHALL BE
   10.1. 150mm ELECTRICAL DUCT TO COMM. DUCT
   10.2. 300mm ELECTRICAL DUCT TO GAS LINE
   10.3. DISTANCES MAY BE REDUCED PROVIDED APPROVED BARRIERS ARE USED.
11. ELECTRICAL DUCTS SHALL HAVE 150mm 3/4" ROAD MULCH BELOW DUCT BANK AND AT LEAST 150mm ABOVE DUCT BANK.
12. RED MARKER TAPE SHALL BE PLACED ABOVE ELECTRICAL DUCT.
13. TRENCH MUST BE SMOOTH AND LEVEL TO REDUCE STRESS ON DUCT.
14. THIS STRUCTURE REFERS TO FORTISBC ELECTRIC SPECIFIC REQUIREMENTS. REFER TO THE APPLICABLE STANDARDS FROM EACH UTILITY AS REQUIRED.
15. REFER TO THE "JOINT TRENCHING REQUIREMENTS FOR SHALLOW UTILITIES" WHERE APPLICABLE.
16. TRENCH ALIGNMENT SHALL BE DETERMINED BASED ON THE REQUIREMENTS LAID OUT BY THE AUTHORITIES HAVING JURISDICTION OF THE SITE. TYPICAL ALIGNMENT IS 1.8m OFF PL.
NOTES:
1 - VARIATION TO THIS ARRANGEMENT SHALL BE APPROVED BY FORTIS.
2 - DUCTS SHALL BE GROUPED AS CLOSELY AS POSSIBLE TO OTHER UTILITIES.
3 - BOLTS SHALL NOT BE TIGHTENED AS TO DEFORM THE DUCT.
4 - DUCTS SHALL NOT BE ENCASED IN PHONE COMPANIES CONCRETE PILASTER.
5 - POWER UTILITY DUCT SHALL Normally BE LOCATED IN QUADRANT OPPOSITE NEAREST TRAFFIC FLOW.
6 - PVC CONDUIT TO BE CONCRETE CAPPED. ALL DUCT TO BE PVC.
7 - THE POWER UTILITIES QUADRANT MAY BE SWITCHED BY SPECIAL PERMISSION FROM FORTIS.
8 - CUT THE END OF THE BOLT Flush WITH THE POLE.
<table>
<thead>
<tr>
<th>ASSEMBLY REF #</th>
<th>ITEM #</th>
<th>UI</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
<th>-4</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4.3</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>BOLT, MACHINE, GALV, 3/4&quot; X 12&quot;</td>
</tr>
<tr>
<td>F4.3</td>
<td>2</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>BOLT, MACHINE, GALV, 3/4&quot; X 14&quot;</td>
</tr>
<tr>
<td>F4.3</td>
<td>3</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>BOLT, MACHINE, GALV, 3/4&quot; X 16&quot;</td>
</tr>
<tr>
<td>F4.3</td>
<td>4</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>BOLT, LAG, GALVANIZED, 1/2&quot; X 4&quot;</td>
</tr>
<tr>
<td>F4.3</td>
<td>5</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>WASHER, SQ. 3 X 3 X 1/4, 13/16 HOLE</td>
</tr>
<tr>
<td>F4.3</td>
<td>6</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>WASHER, SPRING LOCK, DOUBLE 3/4</td>
</tr>
<tr>
<td>F4.3</td>
<td>7</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>BRACKET, ALUMINUM, STANDOFF</td>
</tr>
<tr>
<td>F4.3</td>
<td>8</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>BRACKET, T SLOT, 4 WAY, 24 INCHES LONG</td>
</tr>
<tr>
<td>F4.3</td>
<td>9</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>STRAP, KIT, GALV, FOR 3&quot;</td>
</tr>
<tr>
<td>F4.3</td>
<td>10</td>
<td></td>
<td>8</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>STRAP, KIT, GALV, FOR 4&quot;</td>
</tr>
</tbody>
</table>

**REMARKS:**
1. 1342-1 for single 3 inch duct entrance with provision for 1 extra conduit
2. 1342-2 for single 4 inch duct entrance with provision for 1 extra conduit
3. 1342-3 for multi duct entrance with provision for 3-3 inch duct
4. 1342-4 for multi duct entrance with provision for 3-4 inch duct
5. Order additional length of T-Slots as required.
   24" item 589-0456
   36" item 589-0457
   48" item 589-0458
6. Order appropriate DB2 to Rigid PVC adaptor as required;
   1.- Item 632-3455 is for 2" applications
   2.- Item 632-3459 is for 3" applications
   3.- Item 632-3457 is for 4" applications
CONSTRUCTION DRAWING SYMBOL

TOP VIEW

25.4 [1"] DIAMETER CAL. ANCHOR BOLTS

51 [2"] PVC DB2 GREY DUCT

MINIMUM 75 [3"] WELL COMPACTED DRAIN ROCK

SECTION VIEW

NATIVE FILL

25mm [1"] CLEAN DRAIN ROCK

5mm [3/16"] SCREENED SAND COMPACTED

FILL REQUIRED BY TELCO OR CABLE

NOTES:
1) MAXIMUM POLE HEIGHT, 9mx2.4m [30'x8']
2) FOR POLE MOUNTING - RESIDENTIAL

FOR STREET LIGHTING "RESIDENTIAL"
<table>
<thead>
<tr>
<th>Item #</th>
<th>UI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7550206</td>
<td>1</td>
<td>BASE, STREET LIGHT, CONCRETE</td>
</tr>
</tbody>
</table>

**REMARKS:**

1. Does not meet MMCD requirements for highways and arterial, collector, roadways.
2. Use for residential roadways only.
CONSTRUCTION DRAWING SYMBOL

PLAN

4-25 DIA. X 914 LONG [1"X36"] GALVANIZED ANCHOR BOLTS. GRADE SAE 4140

ELEVATION

51 [2"] R.PVC CONDUIT (2) 25 [1"] R.PVC CONDUIT (1) GROUND ENTRANCE

NOTES:
1) 30MPa @ 28 DAYS
2) FOR CONTROLLER MOUNTING.
### Fortis Bill of Material 2007/10/20

<table>
<thead>
<tr>
<th>Structure #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1417 CIVIL, STREET LIGHT CONTR BASE, TYPE C-1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item #</th>
<th>UI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7550207</td>
<td>1</td>
<td>BASE,HIGH AND ROAD WAYS LIGHTING,TYPE C1</td>
</tr>
</tbody>
</table>

**REMARKS:**
1. The base is used for mounting street lighting controller s1407
2. Meets MMCD requirements for highways, collector and arterial roadways
BOLT CIRCLE
DIAMETER = 280 [11"

CONSTRUCTION DRAWING

LOCATE CONDUIT IN CENTRE OF ANCHOR BOLT CIRCLE

PLAN

ORIENT 'V' GROOVE DRAIN IN THE SAME DIRECTION AS CONDUIT

4-25 DIA x 914 LONG
[1"x36"] GALVANIZED ANCHOR BOLTS GRADE SAE 4140

ELEVATION

51 [2"] R.PVC CONDUIT (2)

NOTES:
1) 30MPa @ 28 DAYS
2) FOR POLE MOUNTING - ARTERIAL
3) MAXIMUM POLE HEIGHT 11m [33"

FORTISBC

DRAWING No. 1418

REV. 1
<table>
<thead>
<tr>
<th>Item #</th>
<th>UI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7550210</td>
<td>1</td>
<td>BASE,HIGH&amp;ROAD WAYS POLEMOUNTING,TYPEC</td>
</tr>
</tbody>
</table>

**REMARKS:**
1. The maximum pole height mounted on this base is 11 meters (33 feet)
2. Meets MMCD requirements for highway, collector and arterial roadways.
NOTES:
1. THE PLASTIC PIPE OR CONDUIT AND CAP MUST BE INSTALLED TO INSULATE THE PIPE AND THUS PREVENT TRANSFER OF DANGEROUS TOUCH POTENTIAL IN THE EVENT OF THE FAULT.
2. PLASTIC CAP SHALL BE GLUED TO PLASTIC PIPE OR CONDUIT WITH CEMENT TO FORM A WATERPROOF JOINT.
3. BOLLARDS SHALL BE PLACED SO AS NOT TO OBSTRUCT ANY DOORS NOR RESTRICT THE OPERATION OF THE UNIT.
4. ALL DIMENSIONS ARE IN MILLIMETERS.
5. PRECAST CONCRETE BASE TO BE 6X6-6/6 RE-ENFORCEMENT MESH.
6. APPROXIMATE WEIGHT: 440 kg.
BOM # | SAP Mat # | UI | Description
--- | --- | --- | ---
1 | 7550100 | 1 | BOLLARD, 1.3M ABOVE GRD, 100MM DIA.

REMARKS:
1. 1589-1 is a precast bollard with yellow plastic high visibility cover.
2. FortisBC material number 7550100 is available at Kon Kast under part number 1080.
3. Revision changes shown in bold red.
9. ADDED BOX DIMENSIONS.
ADDED SHEET 2

NOTE:
1. CENTER CONDUITS IN BOX. BOX MAY BE PLACED OFFSET FROM CENTER TO AVOID CONFLICT WITH OTHER UTILITIES UPON APPROVAL FROM INSPECTOR.
2. STANDARD CONDUIT OFFSET PER DESIGN DRAWING OR LOCAL AUTHORITY.
3. FOR LEVEL GRADES, BOX TO BE SET SO THAT LD IS 50mm (2") ABOVE FINAL GRADE OR FLUSH IN SIDEWALK.
4. EXTEND CONDUIT 50mm (2") ABOVE TOP OF FILL INSIDE BOX.
5. PVC CONDUIT SHALL BE CONCRETE CAPPED AS PER ASSEMBLY F-20.
6. USE PENTA HEAD BOLTS TO SECURE LD.
7. CABLE MARKER 22.2mm x 2.62m (7/8"x8") PVC OR 50.8mm x 131.2mm (2"x4") WOOD STAKE PAINTED RED.
8. CONDUIT SHALL BE INSTALLED WITH END BELL, CAPPED AND MARKED (IDENTIFIED BY LOT NO.)

9. ENGINEERING AND DESIGN OF THE PRECAST CONCRETE BASE/VAULT DONE BY THE MANUFACTURER. MANUFACTURER OWNS LIABILITY ASSOCIATED WITH CONCRETE BASE/VAULT DESIGN.
NOTE:

1. CENTER CONDUITS IN BOX, Box may be placed offset from center to avoid conflict with other utilities upon approval from inspector.

2. STANDARD CONDUIT OFFSET PER DESIGN DRAWING OR LOCAL AUTHORITY

3. FOR LEVEL GRADES, BOX TO BE SET SO THAT LID IS 50mm (2") - 80mm (3") ABOVE FINAL GRADE OR FLUSH IN SIDEWALK

4. EXTEND CONDUIT 50mm (2") ABOVE TOP OF FILL INSIDE BOX

5. PVC CONDUIT SHALL BE CONCRETE CAPPED AS PER ASSEMBLY F-20

6. USE PENTA HEAD BOLTS TO SECURE LID

7. CABLE MARKER 22.2mm x 2.62m (7/8" x 8") PVC OR 50.8mm x 131.2mm (2" x 4") WOOD STAKE PAINTED RED

8. CONDUIT SHALL BE INSTALLED WITH END BELL, CAPPED AND MARKED (IDENTIFIED BY LOT NO.)

9. ENGINEERING AND DESIGN OF THE PRECAST CONCRETE BASE/VAULT DONE BY THE MANUFACTURER. MANUFACTURER OWNS LIABILITY ASSOCIATED WITH CONCRETE BASE/VAULT DESIGN.
REMARKS:
1. For use with structure 1501.
2. 1590-1 is intended for typical service box installations.
3. 1590-3 is intended for installations where service wire design requires a double run of conductors for the main feed and/or any branches.
4. 1590-1 and 1590-3 are designed to meet H20/HS20 Group B loading as described in the FortisBC Civil Binder. Not intended for roadway application. Refer to the FortisBC Civil Binder for further clarification.
5. Revision changes shown in **bold red**.

<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
<th>UI</th>
<th>-1</th>
<th>-3</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5571308</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>ROD, GROUND, COPPERBONDED, PLAIN 3/4&quot;</td>
</tr>
<tr>
<td>7550501</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>VAULT, CONCRETE, SERVICE BOX</td>
</tr>
<tr>
<td>7550506</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>BOX-TRANSF.SUPPORT- 48X40X24 C/W UNISTRUT</td>
</tr>
<tr>
<td>7550611</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>LID-PLATE-STEEL-RECESSED-48X 40</td>
</tr>
</tbody>
</table>

**ADD -3 OPTION.**
NOTES:
1. Center conduits in box. Box may be placed offset from center to avoid conflict with other utilities upon approval from inspector.
2. Standard conduit offset per design drawing or local authority.
3. Extend conduit 500mm (2") above top of fill inside box.
4. PVC conduit shall be concrete capped as per assembly F-20.
5. For electrical, see structure 1511-1512.
6. Conduit shall be installed with end bell capped and marked/identified.
7. Equal length sections of 2/0 RW90 insulated copper.
8. Engineering and design of the precast concrete base/vault done by the manufacturer. Manufacturer owns liability associated with concrete base/vault design.

SECTION 'A-A'

DETAILED NOTES

MINIMUM DEPTH OF DRAIN ROCK 100mm TO EXTEND 200mm BEYOND EDGE OF BOX

SEE NOTE 1 & 4

NOTE:

- Center conduits in box. Box may be placed offset from center to avoid conflict with other utilities upon approval from inspector.
- Standard conduit offset per design drawing or local authority.
- Extend conduit 500mm (2") above top of fill inside box.
- PVC conduit shall be concrete capped as per assembly F-20.
- For electrical, see structure 1511-1512.
- Conduit shall be installed with end bell capped and marked/identified.
- Equal length sections of 2/0 RW90 insulated copper.
- Engineering and design of the precast concrete base/vault done by the manufacturer. Manufacturer owns liability associated with concrete base/vault design.
**BOM # | SAP Mat # | UI | -1 | Description**
---|---|---|---|---
5310202 | M | 13 | WIRE, COPPER, STR, SD BARE, 2/0
5311122 | M | 8 | CONDUCTOR, STR CU, 2/0 POLY, 600 VOLTS
5530626 | | 4 | CONNECT, 3/4 CU TO 2/0 COND.
5530629 | | 3 | CONNECT, 2/0 CU COND.
5571308 | | 4 | ROD, GROUND, COPPERBONDED, PLAIN 3/4”
7550506 | | 1 | BOX-TRANSF. SUPPORT- 48 X 40 X 24 C/W UNISTRUT
7550611 | | 1 | LID-PLATE-STEEL-RECESSED-48 X 40.

**REMARKS:**

1. To be used with 1511 and 1512.
2. **1591-1** is designed to meet H20/HS20 Group B loading as described in the FortisBC Civil Binder. Not intended for roadway application. Refer to the FortisBC Civil Binder for further clarification.
3. Revision changes shown in **bold red**.
UNDERGROUND STRUCTURES
58" X 58" CIVIL BOX
CIVIL GENERAL ARRANGEMENT
SHEET 1 OF 1

DRAWING No. 1592
REV. 1

DESCRIPTION OF CHANGE:
GENERAL REVISION
ADD DIM, ADD NOTE 8, UPDATE HATCH DESCRIP.
### BILL OF MATERIALS

<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
<th>UI</th>
<th>Qty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5310202</td>
<td>M</td>
<td>16</td>
<td></td>
<td>WIRE, CU STR, 2/0, BARE, SOFT DRAWN</td>
</tr>
<tr>
<td>5311122</td>
<td>M</td>
<td>8</td>
<td></td>
<td>CONDUCTOR, CU STR, 2/0 POLY, 600V, RW90</td>
</tr>
<tr>
<td>5530626</td>
<td>4</td>
<td></td>
<td></td>
<td>CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU</td>
</tr>
<tr>
<td>5530629</td>
<td>3</td>
<td></td>
<td></td>
<td>CONNECTOR, 2/0 TO 2/0 CU</td>
</tr>
<tr>
<td>5571308</td>
<td>4</td>
<td></td>
<td></td>
<td>ROD, GROUND, COPPERBONDED, PLAIN 3/4&quot; ROD</td>
</tr>
<tr>
<td>7550509</td>
<td>1</td>
<td></td>
<td></td>
<td>BOX-CONCRETE PULL-58X58X54 C/W UNISTRUTS</td>
</tr>
<tr>
<td>7550612</td>
<td>1</td>
<td></td>
<td></td>
<td>LID-PLATE STEEL-RECESSED-58X58</td>
</tr>
</tbody>
</table>

### REMARKS:

1. To be used with 1533.
2. 1592-2 is designed to meet H20/HS20 Group B loading as described in the FortisBC Civil Binder. Not intended for roadway application. Refer to the FortisBC Civil Binder for further clarification.
3. Revision changes shown in **bold red**.
DESCRIPTION OF CHANGE:
GENERAL REVISION
ADD DIMENSIONS, MODIFY NOTES

PLANT VIEW

SECTION 'A-A'

SECTION 'B-B'

NOTES:
1 - PVC CONDUIT SHALL BE CONCRETE CAPPED AS PER ASSEMBLY F-20
2 - UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
3 - ENSURE MINIMUM OF 1.5' OF EXCESS GROUND WIRE ABOVE PAD.
4 - TRANSFORMER ALIGNMENT NEEDS TO BE CONFIRMED WITH FORTIS BC CIVIL INSPECTOR
5 - TRANSFORMER PAD 1219 X 1016 mm
6 - ENGINEERING AND DESIGN OF THE PRECAST CONCRETE BASE/VAULT DONE BY THE MANUFACTURER. MANUFACTURER OWNS LIABILITY ASSOCIATED WITH CONCRETE BASE/VAULT DESIGN.
### UNDERGROUND STRUCTURES
1φ LOW PROFILE PADMOUNT TRAN
BILL OF MATERIALS
BOM SHEET 1 OF 1

<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
<th>UI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5310202</td>
<td>M</td>
<td>13</td>
<td>WIRE, CU STR, 2/0, BARE, SOFT DRAWN,</td>
</tr>
<tr>
<td>5311122</td>
<td>M</td>
<td>8</td>
<td>CONDUCTOR, CU STR, 2/0, POLY, 600V, RW90,</td>
</tr>
<tr>
<td>5530626</td>
<td></td>
<td>4</td>
<td>CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU</td>
</tr>
<tr>
<td>5530629</td>
<td></td>
<td>3</td>
<td>CONNECTOR, 2/0 TO 2/0 CU</td>
</tr>
<tr>
<td>5571308</td>
<td></td>
<td>4</td>
<td>ROD, GROUND, COPPERBONDED, PLAIN 3/4&quot; ROD</td>
</tr>
<tr>
<td>7550506</td>
<td></td>
<td>1</td>
<td>BOX-TRANSF. SUPPORT - 48X40X24C/W UNISTRUT</td>
</tr>
<tr>
<td>7550602</td>
<td></td>
<td>1</td>
<td>LID-CONCRETE #1038 48 X 40 LESS METAL FIL</td>
</tr>
</tbody>
</table>

**REMARKS:**

1. **1593-1** is not intended for vehicle loading. It is only intended to support the equipment placed on it.
2. Revision changes shown in **bold red**.

### BILL OF MATERIALS SHEET 1 OF 1

- **5310202** M 13 WIRE, CU STR, 2/0, BARE, SOFT DRAWN
- **5311122** M 8 CONDUCTOR, CU STR, 2/0 POLY, 600V, RW90
- **5530626** 4 CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU
- **5530629** 3 CONNECTOR, 2/0 TO 2/0 CU
- **5571308** 4 ROD, GROUND, COPPERBONDED, PLAIN 3/4" ROD
- **7550506** 1 BOX-TRANSF. SUPPORT - 48X40X24C/W UNISTRUT
- **7550602** 1 LID-CONCRETE #1038 48 X 40 LESS METAL FIL

1. **1593-1** is not intended for vehicle loading. It is only intended to support the equipment placed on it.
2. Revision changes shown in **bold red**.
DESCRIPTION OF CHANGE:
ADD DIMENSIONS

GENERAL REVISION

NOTE:
1. The duct shall be used to ensure adequate seal between duct and box.
2. For level grades, the duct shall be set so that the top is 100 mm above final grade or flush with sidewalk.
3. For PVC duct, the ends shall be flush with box.
4. For 3-phase junction vault, the manufacturer's order STR100/03/53.
5. Engineering and design of the precast concrete base/vault are done by the manufacturer. Manufacturer's liability associated with concrete base/vault design.

15/25kV 832 STYLE (CIVIL)
<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
<th>UI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5310202</td>
<td>M</td>
<td>17</td>
<td>WIRE, CU STR, 2/0, BARE, SOFT DRAWN,</td>
</tr>
<tr>
<td>5311122</td>
<td>M</td>
<td>10</td>
<td>CONDUCTOR, CU STR, 2/0 POLY, 600V, RW90,</td>
</tr>
<tr>
<td>5530626</td>
<td></td>
<td>4</td>
<td>CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU</td>
</tr>
<tr>
<td>5530629</td>
<td></td>
<td>3</td>
<td>CONNECTOR, 2/0 TO 2/0 CU</td>
</tr>
<tr>
<td>5571308</td>
<td></td>
<td>4</td>
<td>ROD, GROUND, COPPERBONDED, PLAIN 3/4&quot; ROD</td>
</tr>
<tr>
<td>7550560</td>
<td></td>
<td>1</td>
<td>VAULT, 832 JUNCTION, C/W COLLAR</td>
</tr>
</tbody>
</table>

REMARKS:
1. 1594-1 is designed to meet H20/HS20 Group B loading as described in the FortisBC Civil Binder. Not intended for roadway application. Refer to the FortisBC Civil Binder for further clarification.
2. Revision changes shown in bold red.
2/0 RW90 Cu

PLAN VIEW

2/0 - 2/0 CONNECTOR

GROUND ROD AND CONNECTOR ASSEMBLY

SECTION A-A

25-50mm DRAIN ROCK EXTEND 200mm BEYOND EDGE OF BOX

SECTION B-B

(GROUNDING NOT SHOWN FOR CLARITY)

1. ENGINEERING AND DESIGN OF THE PRECAST CONCRETE BASE/Vault DONE BY THE MANUFACTURER. MANUFACTURER OWNS LIABILITY ASSOCIATED WITH CONCRETE BASE/Vault DESIGN.

DESCRIPTION OF CHANGE:
GENERAL REVISION
ADD NOTE 1

AUTHOR JAS SEP/15
CHECKED JMS SEP/15
APPROVED DK FEB/16

ORIGINAL ISSUE

UNDERGROUND STRUCTURES
PADMOUNT SWITCHER BASE
CIVIL GENERAL ARRANGEMENT

DRAWING No. 1595
REV. 2
**DESCRIPTION OF CHANGE:** REVISED GND ROD AND INCREASE CABLE LENGTH ADDED NOTE 6.

**REMARKS:**

1. 1595-2 is for 25kV AIS Hubbell or AIS S&C Switch
2. 1595-3 is for 15kV AIS Hubbell Switch
3. 1595-4 is for 15/25kV COOPER VFI Switch
4. 1595-5 is for 15/25kV Elastimold Switch
5. 1595-6 is for 15/25kV Primary Meter
6. 1595-1, 1595-2, 1595-3, 1595-4, 1595-5 and 1595-6 are not intended for vehicle loading. They are only intended to support the equipment placed on it.
7. Revision changes shown in bold red.

<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
<th>UI</th>
<th>-2</th>
<th>-3</th>
<th>-4</th>
<th>-5</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5310202</td>
<td>M</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>WIRE, CU STR, 2/0, BARE, SOFT DRAWN,</td>
</tr>
<tr>
<td>5311122</td>
<td>M</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>CONDUCTOR, CU STR, 2/0 POLY, 600V, RW90,</td>
</tr>
<tr>
<td>5530626</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU</td>
</tr>
<tr>
<td>5530629</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>CONNECTOR, 2/0 TO 2/0 CU</td>
</tr>
<tr>
<td>5571308</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>ROD, GROUND, COPPERBONDED, PLAIN 3/4”</td>
</tr>
<tr>
<td>7550616</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ADAPTOR PLATE 25KV AIS HUBBELL SWITCH</td>
</tr>
<tr>
<td>7550617</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ADAPTOR PLATE 15KV AIS HUBBELL SWITCH</td>
</tr>
<tr>
<td>7550618</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ADAPTOR PLATE 15/25KV COOPER VFI SWITCH</td>
</tr>
<tr>
<td>7550619</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ADAPTOR PLATE 15/25KV ELASTIMOLD SWITCH</td>
</tr>
<tr>
<td>7550621</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ADAPTOR PLATE 15/25KV PADMOUNT PRIM.</td>
</tr>
<tr>
<td>7550562</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>PULL BOX, PRECAST, 2.4M X 2.4M X 1.2M</td>
</tr>
</tbody>
</table>

**REMARKS:**

1. 1595-2 is for 25kV AIS Hubbell or AIS S&C Switch
2. 1595-3 is for 15kV AIS Hubbell Switch
3. 1595-4 is for 15/25kV COOPER VFI Switch
4. 1595-5 is for 15/25kV Elastimold Switch
5. 1595-6 is for 15/25kV Primary Meter
6. 1595-1, 1595-2, 1595-3, 1595-4, 1595-5 and 1595-6 are not intended for vehicle loading. They are only intended to support the equipment placed on it.
7. Revision changes shown in bold red.
NOTES:

1. ALL REBAR SHALL BE MIN 10M
2. CONCRETE COVER OVER STEEL SHALL BE 75mm MINIMUM
3. STEEL REBAR MAY BE SUBSTITUTED WITH 150 X 150mm 6 GAUGE GALVANIZED MESH PROVIDED 2 LAYERS ARE INSTALLED AT THE SAME SPACING AS REBAR
4. TIE REBAR AT ALL INTERSECTIONS
5. ALL DISTURBED MATERIAL BELOW PAD MUST BE REPLACED WITH 25mm MINUS CRUSHED ROCK AND MACHINE COMPACTED IN LIFTS NOT TO EXCEED 200mm
6. CONCRETE SHALL HAVE A MINIMUM STRENGTH OF 28 MPa
7. FOR PLACEMENT OF TRANSFORMER, REFER TO 1206 SHT 2 OF 3
8. CUSTOMER TO CONFIRM PAD MEASUREMENTS WITH FORTISBC PRIOR TO INSTALLATION
9. REFER TO STR 1514 FOR ELECTRICAL DETAILS
DESCRIPTION OF CHANGE:

REVISION DATE
AUTHOR
CHECKED
APPROVED

UNDERGROUND STRUCTURES
3 PH TRANS (>500KVA) BASE
DEEP POUR BASE

DRAWING No.
REV.

1596
1

NOTE:

1 - GROUT SHALL BE USED TO ENSURE ADEQUATE SEAL BETWEEN DUCT AND BOX.

2 - FOR LEVEL GRADES, BOX TO BE SET SO THAT LID IS 100mm ABOVE FINAL GRADE.

3 - FOR PVC DUCT ONLY, BELL ENDS TO BE FLUSH WITH BOX

4 - FOR ELECTRICAL DETAILS, REFER TO DSM SECTION 1514

5 - ENGINEERING AND DESIGN OF THE PRECAST CONCRETE BASE/VAULT DONE BY THE MANUFACTURER. MANUFACTURER OWNS LIABILITY ASSOCIATED WITH CONCRETE BASE/VAULT DESIGN.

SECTION A-A

SECTION B-B

100mm DEPTH MIN OF CLEAN DRAIN ROCK TO EXTEND 200mm BEYOND EDGE OF BOX

REPLICATED THE DRAWING FROM SHEET 3 OF STRUCTURE 1595
BOM # | SAP Mat # | UI | -1 | -2 | Description
--- | --- | --- | --- | --- | ---
1 | 5310202 | M | 17 | 20 | WIRE, CU STR, 2/0, BARE, SOFT DRAWN
2 | 5311122 | M | 6 | 10 | CONDUCTOR, CU STR, 2/0, POLY, 600V, RW90,
3 | 5530626 | 4 | 4 | CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU
4 | 5530629 | 3 | 3 | CONNECTOR, 2/0 TO 2/0 CU
5 | 5571308 | 4 | 4 | ROD, GROUND, COPPERBONDED, PLAIN 3/4" ROD
6 | 7550623 | 1 | 1 | ADAPTERLID, 2350x2350, 750-3000KVA TRANS
7 | 7550562 | 1 | 1 | PULL BOX, PRECAST, 2.4M X 2.4M X 1.2M

Remarks:
1. 1596-1 is for concrete transformer base which may be poured on site or precast.
2. 1596-2 is for deep pour transformer base. To be used with transformers larger than 1000kVA.
3. 1596-1 & 1596-2 not intended for vehicle loading. They are only intended to support the equipment placed on it.
4. Revision changes are shown in **bold red**.
NOTES:
1. APPROXIMATELY 300MM [1FT] OF CONDUIT WILL NEED TO BE CUT OFF INSIDE THE VAULT.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
3. ENGINEERING AND DESIGN OF THE PRECAST CONCRETE BASE/VAULT DONE BY THE MANUFACTURER. MANUFACTURER OWNS LIABILITY ASSOCIATED WITH CONCRETE BASE/VAULT DESIGN.

PLAN VIEW
REMARKS:
1. This structure not intended for vehicle loading. It is only intended to support the equipment placed on it.
2. Revision changes shown in **bold red**.

<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
<th>UI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5310202</td>
<td>M</td>
<td>16</td>
<td>WIRE, CU STR, 2/0, BARE, SOFT DRAWN,</td>
</tr>
<tr>
<td>5311122</td>
<td>M</td>
<td>8</td>
<td>CONDUCTOR, CU STR, 2/0 POLY, 600V, RW90,</td>
</tr>
<tr>
<td>5530626</td>
<td>4</td>
<td>CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU</td>
<td></td>
</tr>
<tr>
<td>5530629</td>
<td>3</td>
<td>CONNECTOR, 2/0 TO 2/0 CU</td>
<td></td>
</tr>
<tr>
<td>5571308</td>
<td>4</td>
<td>ROD, GROUND, COPPERBONDED, PLAIN 3/4&quot; ROD</td>
<td></td>
</tr>
<tr>
<td>7550507</td>
<td>1</td>
<td>PAD, PRECAST CONCRETE, TRANS, 75-500KVA</td>
<td></td>
</tr>
</tbody>
</table>

REVISION DATE: FEB/16
AUTHOR: JAS
CHECKED: JMS
APPROVED: DK

DESCRIPTION OF CHANGE: ADDED NOTE 1.
DESCRIPTION OF CHANGE:

REVISION DATE
AUTHOR
CHECKED
APPROVED

ORIGINAL ISSUE
AUTHOR
CHECKED
APPROVED

UNDERGROUND STRUCTURES
ABOVE GRADE 200A JUNCTION
CIVIL GENERAL ARRANGEMENT

DRAWING No.
REV.

1598
2

NOTES:
1. SLOPE GRADE AWAY FROM BASE FOR DRAINAGE
2. ENSURE A MINIMUM OF 1200 MM (4’) OF EXCESS GROUND WIRE ABOVE PAD
3. REFER TO ELECTRICAL DRAWING 1543 FOR ELECTRICAL DETAILS
4. CONDUIT SHALL BE CAPPED, MARKED AND IDENTIFIED “TO DIRECTION”, CENTER CONDUIT IN OPENING AND EXTEND CONDUIT 50 MM (2”) ABOVE TOP OF FILL INSIDE BASE
5. GROUND ROOS TO BE 300 MM (12”) BELOW FINISHED GRADE.
6. CONCRETE ENCASE BENDS AS PER F-20
7. ENGINEERING AND DESIGN OF THE PRECAST CONCRETE BASE/Vault DONE BY THE MANUFACTURER. MANUFACTURER OWNS LIABILITY ASSOCIATED WITH CONCRETE BASE/Vault DESIGN.

ITEM LIST:
1. 2/0-2/0 Cu CONNECTOR
2. GROUND ROD/CLAMP ASSEMBLY
3. 2/0 POLY COVERED Cu
4. PRECAST CONCRETE BASE
5. 2/0 BARE Cu

UPDATED BORDER
ADDED NOTE 7
## BILL OF MATERIALS

<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
<th>UI</th>
<th>-1</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5310202</td>
<td>M</td>
<td>16</td>
<td></td>
<td>WIRE, CU STR, 2/0, BARE, SOFT DRAWN,</td>
</tr>
<tr>
<td>5311122</td>
<td>M</td>
<td>8</td>
<td></td>
<td>CONDUCTOR, CU STR, 2/0 POLY, 600V, RW90,</td>
</tr>
<tr>
<td>5530626</td>
<td>4</td>
<td></td>
<td></td>
<td>CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU</td>
</tr>
<tr>
<td>5530629</td>
<td>3</td>
<td></td>
<td></td>
<td>CONNECTOR, 2/0 TO 2/0 CU</td>
</tr>
<tr>
<td>5571308</td>
<td>4</td>
<td></td>
<td></td>
<td>ROD, GROUND, COPPERBONDED, PLAIN 3/4&quot;ROD</td>
</tr>
<tr>
<td>7550504</td>
<td>1</td>
<td></td>
<td></td>
<td>BASE, PRECAST FOR ABOVE GROUND 3 PHASE</td>
</tr>
</tbody>
</table>

### REMARKS:

1. **1598-1** is the base foundation for standard structure 1543 (Above Grade 200A Junction)
2. This structure not intended for vehicle loading. It is only intended to support the equipment placed on it.
3. Revision changes shown in **bold red**.

---

**DESCRIPTION OF CHANGE:**

- UPDATED GND ROD.
- ADDED NOTE 2.
NOTES:

1 - UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWING ALL PVC SWEEPS, PRIMARY AND SECONDARY, EXCEPT SERVICE STUBS, TO BE CONCRETE CAPPED.

2 - DIMENSION ‘A’ TO BE 4 TIMES NOMINAL PIPE DIAMETER. FOR 100mm (4”) DUCT DIM ‘A’ = 400mm (16”)

3 - STREET LIGHT DUCT DOES NOT REQUIRE CONCRETE CAPPING

4 - MECHANICAL SEPARATION BETWEEN UTILITIES TO BE CONTINUOUS LAYER OF MINIMUM 6 MIL POLY SHEET OR 100mm (4”) OF FINE CLEAN SAND

5 - CONCRETE ON ALL SWEEPS OR 90 DEGREE BENDS
NOTES:
1 - VARIATION TO THIS ARRANGEMENT SHALL BE APPROVED BY FORTIS.
2 - DUCTS SHALL BE GROUPED AS CLOSELY AS POSSIBLE TO OTHER UTILITIES.
3 - BOLTS SHALL NOT BE TIGHTENED AS TO DEFORM THE DUCT.
4 - DUCTS SHALL NOT BE INCASED IN PHONE COMPANY CONCRETE PLASTER.
5 - PVC CONDUIT TO BE CONCRETE CAPPED. ALL DUCT TO BE PVC.
6 - POWER UTILITY'S QUADRANT MAY BE SWITCHED BY SPECIAL PERMISSION FROM FORTIS.
7 - CUT THE END OF THE BOLT FLUSH WITH THE POLE.
8 - UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWING ALL PVC SNEEPS, PRIMARY AND SECONDARY TO BE CONCRETE CAPPED.
9 - STREET LIGHT DUCT DOES NOT REQUIRE CAPPING.
10 - MECHANICAL SEPARATION BETWEEN UTILITIES TO BE CONTINUOUS LAYER OF MIN 5 ML POLY SHEET OR 100 MM (4") OF FINE CLEAN SAND.
11 - ANY MECHANICAL SEPARATION TO KEEP CONCRETE MIN 6" FROM POLE.
PLAN VIEW

HATCH DETAIL

GROUT

SECTION 'A–A'

NOTES:
1 - UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWING ALL PVC SWEEPS, PRIMARY AND SECONDARY, TO BE CONCRETE CAPPED.

2 - MECHANICAL SEPARATION BETWEEN UTILITIES TO BE CONTINUOUS LAYER OF MINIMUM 6 MIL POLY SHEET OR 100mm (4") OF FINE CLEAN SAND.

3 - BELL END SHOULD BE FLUSH OR NOT EXCEED 2" PAST BOX WALL.

4 - DIMENSION 'A' TO BE 4 TIMES NOMINAL PIPE DIAMETER.
    FOR 100mm (4") DUCT DIM 'A' = 400mm (16")
Appendix C – Conduit Manufacturer Drawings
ALL UNITS ARE IN INCHES

DIMENSIONS ARE SUBJECT TO CHANGES WITHOUT NOTICE, CONFIRM DIMENSIONS WHEN ORDERING.
ALL UNITS ARE IN INCHES

DIMENSIONS ARE SUBJECT TO CHANGES
WITHOUT NOTICE, CONFIRM DIMENSIONS
WHEN ORDERING

PART DESCRIPTION: BEND RIGID 2" X 90° R24" HXS
PART CATEGORY: RIGID BENDS
DRAWN BY: A. LI
APPROVED BY: P. CREELMAN
DATE: 11/23/16
DWG NO.: REE359024
SHEET: 1-1

29.0
Min. 3.0
Max. 3.5

32.0

R24.0

2" Rigid Hub
ALL UNITS ARE IN INCHES

DIMENSIONS ARE SUBJECT TO CHANGES WITHOUT NOTICE. CONFIRM DIMENSIONS WHEN ORDERING.

SIZE | PART# | DIMENSIONS
-----|-------|------------
2"  | REE359036 | L1 42.0  L2 42.5  L3 5.0  L4 5.0
2.5"| REE409036 | L1 45.3  L2 45.7  L3 8.0  L4 8.0
3"  | REE459036 | L1 42.5  L2 43.0  L3 5.0  L4 5.0
4"  | REE559036 | L1 46.8  L2 46.0  L3 8.5  L4 8.5