**Specification for Installation of Underground Conduit Systems**

**THE LATEST VERSION OF THIS GUIDE CAN BE FOUND AT**
https://www.fortisbc.com/services/electricity-services/request-or-change-your-electricity-service/

<table>
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<th>DATE</th>
<th>REV.</th>
<th>DESCRIPTION</th>
<th>REVIEWED/CHECKED</th>
<th>APPROVED</th>
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<td>Conduits must be proved by mandrel, new duct crossing diagram, ownership</td>
<td>D. GRETCHEN</td>
<td>D. WALDEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>transfer information.</td>
<td>D. POWER</td>
<td></td>
</tr>
<tr>
<td>Nov. 2016</td>
<td>4</td>
<td>Update backfill and trench detail. Add Royal Pipe to approved list. Add</td>
<td>D. WALDEN</td>
<td>D. KRENZ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>manufacturer drawings of conduit</td>
<td>A. BOWERS</td>
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</table>
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Note: All current revisions and additions are highlighted in grey.
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.

Technical Safety British Columbia (TSBC) - Independent, self-funded organization that has jurisdiction over the safe installation and operation of customer owned technical systems and equipment across British Columbia.

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 – Structure and Assembly Details – 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 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 they are 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.
4 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.
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 their 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.
  c) Take the necessary safety precautions as outlined in Section 6 Safety Precautions.

- 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 reinsated 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 – Structure and Assembly Details – for more details.)
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 BC 1 Call at 1 800 474 6886 or log a ticket at www.bc1c.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; however, it should 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>
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</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>
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<td>26</td>
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<td>0.600mm</td>
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<td>17</td>
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<tr>
<td>0.300mm</td>
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<td>0</td>
</tr>
<tr>
<td>0.075mm</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

**Table 2: Optional Bedding Material**

<table>
<thead>
<tr>
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</tr>
</thead>
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<td>4.75mm</td>
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<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.

• Washed Bedding Material shall be used 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.

• Horizontal and vertical clearances shall be met as per the 1216 drawings in Appendix B – Structure and Assembly Details.

• 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.

• For primary voltage ducts the preferred bedding material listed in Table 1 should be used. This is to ensure cable ampacity as outlined in drawing 1301, Underground and Riser Cable Ampacities, found in Appendix B – Structure and Assembly Details.
9 Source of Materials

- FortisBC reserves the right to specify material manufacturers in order to ensure the quality of materials installed. Manufacturers and part numbers are listed in Table 3 below. The approved manufactures are:
  - Kon Kast
  - South Okanagan Concrete Products (SOCP)
  - Channell (distributed by EECOL)

- 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>Manufacturer: 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>Kon Kast: 1060 SOCP: 1100</td>
<td>755-0501</td>
<td>1590</td>
<td>Group B</td>
<td>N/A</td>
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<tr>
<td>Service Box Lid</td>
<td>Kon Kast: 1061 SOCP: 1101</td>
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</tr>
<tr>
<td>HDPE Service Box</td>
<td>Channell: BULKU173018J062223</td>
<td>755-0498</td>
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<tr>
<td>Single Phase Junction Box</td>
<td>Kon Kast: 1031 SOCP: 1105</td>
<td>755-0506</td>
<td>1591</td>
<td>N/A</td>
<td></td>
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<tr>
<td>Single Phase Junction Box Lid</td>
<td>Kon Kast: 1037 SOCP: 1106</td>
<td>755-0611</td>
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<tr>
<td>58&quot; x 58&quot; Civil Box</td>
<td>Kon Kast: 1021 SOCP: 1120</td>
<td>755-0509</td>
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</tr>
<tr>
<td>58&quot; x 58&quot; Civil Box Lid - Two Door</td>
<td>Kon Kast: 1025 SOCP: 1122</td>
<td>755-0612</td>
<td>1592</td>
<td>Group B</td>
<td>N/A</td>
</tr>
<tr>
<td>58&quot; x 58&quot; Civil Box Lid - One Piece</td>
<td>Kon Kast: 1025S</td>
<td>-</td>
<td></td>
<td>Group B</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Manufacturer: 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>
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<td>--------------------------</td>
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</tr>
<tr>
<td>832 Junction Box</td>
<td>Kon Kast: 1032 SOCP: 1125</td>
<td>755-0560</td>
<td>1594</td>
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<tr>
<td>832 Junction Box Lid - Three Door</td>
<td>Kon Kast: 1033 SOCP: 1126</td>
<td></td>
<td></td>
<td>Group B</td>
<td></td>
</tr>
<tr>
<td>832 Junction Box Lid - One Piece</td>
<td>Kon Kast: 1033S SOCP: 1127</td>
<td></td>
<td></td>
<td>Group B</td>
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<tr>
<td>Single Phase Transformer Box</td>
<td>Kon Kast: 1031 SOCP: 1105</td>
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<tr>
<td>Single Phase Transformer Box Lid</td>
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<td>Street Light Base</td>
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<td>755-0206</td>
<td>1416</td>
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<td></td>
<td>Kon Kast: 1050</td>
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<td></td>
<td>Kon Kast: 935 SOCP: 1134</td>
<td>755-0210</td>
<td>1418</td>
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</tr>
<tr>
<td></td>
<td>SOCP: 1133</td>
<td>755-0207</td>
<td>1417</td>
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<tr>
<td><strong>Description</strong></td>
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<td><strong>FortisBC Item No.</strong></td>
<td><strong>Assembly or Structure No.</strong></td>
<td><strong>H-20/HS-20 Impact rating</strong></td>
<td><strong>Reference Image</strong></td>
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<tr>
<td>Switching Cubicle Box</td>
<td>Kon Kast: 1066 SOCP: 1129</td>
<td>755-0562</td>
<td>1595</td>
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<tr>
<td>Switching Cubicle Box Lid</td>
<td>Kon Kast: 1066ELA</td>
<td>755-0619</td>
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<td>Group B</td>
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<tr>
<td>Precast Pad 3 Phase Transformer 500kVA and Less</td>
<td>Kon Kast: 1058D SOCP: 1113</td>
<td>755-0507</td>
<td>1597</td>
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</tr>
<tr>
<td>3 Phase Transformer above 500kVA Deep Box</td>
<td>Kon Kast: 1066</td>
<td>755-0562</td>
<td>1596</td>
<td>N/A</td>
<td><img src="image4" alt="Image" /></td>
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<tr>
<td>3 Phase Transformer above 500kVA Deep Box Lid</td>
<td>SOCP: 1130</td>
<td>755-0623</td>
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<td>N/A</td>
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<tr>
<td>Vehicle Bollard</td>
<td>Kon Kast: 1080</td>
<td>755-0100</td>
<td>1589</td>
<td>N/A</td>
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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>
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</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 5: Common Conduit Component 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><strong>Pipe</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conduit, 2”, rigid PVC, 10ft length, bell end</td>
<td>Ipex</td>
<td>32120</td>
<td>632-3058</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>RC4002010</td>
<td></td>
</tr>
<tr>
<td>Conduit, 3”, rigid PVC, 10ft length, bell end</td>
<td>Ipex</td>
<td>32130</td>
<td>632-3056</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>RC4003010</td>
<td></td>
</tr>
<tr>
<td>Conduit, 4”, rigid PVC, 10ft length, bell end</td>
<td>Ipex</td>
<td>32140</td>
<td>632-3051</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>RC4004010</td>
<td></td>
</tr>
<tr>
<td>Conduit, 2”, DB2, 20ft length, bell end</td>
<td>Ipex</td>
<td>08226 (gray)</td>
<td>632-3020</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>DU02020</td>
<td></td>
</tr>
<tr>
<td>Conduit, 3”, DB2, 20ft length, bell end</td>
<td>Ipex</td>
<td>08234 (gray)</td>
<td>632-3030</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>DU03020</td>
<td></td>
</tr>
<tr>
<td>Conduit, 4”, DB2, 20ft length, bell end</td>
<td>Ipex</td>
<td>08241 (white)</td>
<td>632-3040</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>08245 (gray)</td>
<td></td>
</tr>
<tr>
<td><strong>End Bell Fittings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End bell, for 4” DB2</td>
<td>Ipex</td>
<td>29064</td>
<td>632-3640</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>BEL04</td>
<td></td>
</tr>
<tr>
<td>End bell, socket molded, for 3” rigid PVC</td>
<td>Ipex</td>
<td>077328</td>
<td>632-3453</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>REB45</td>
<td></td>
</tr>
<tr>
<td>End bell, socket molded, for 4” rigid PVC</td>
<td>Ipex</td>
<td>77330</td>
<td>632-3454</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>REB55</td>
<td></td>
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</table>
### Table: Specification for Installation of Underground Conduit Systems

#### Couplers

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer</th>
<th>Part No.</th>
<th>Item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupler, DB2, 2”</td>
<td>Ipex</td>
<td>29001</td>
<td>632-3120</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>SWC02</td>
<td></td>
</tr>
<tr>
<td>Coupler, DB2, 3”</td>
<td>Ipex</td>
<td>29002</td>
<td>632-3130</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>SWC03</td>
<td></td>
</tr>
<tr>
<td>Coupler, DB2, 4”</td>
<td>Ipex</td>
<td>29004</td>
<td>632-3140</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>SWC04</td>
<td></td>
</tr>
<tr>
<td>Coupler, rigid PVC, 2”</td>
<td>Ipex</td>
<td>77006</td>
<td>632-3172</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>REC35</td>
<td></td>
</tr>
<tr>
<td>Coupler, rigid PVC, 3”</td>
<td>Ipex</td>
<td>77008</td>
<td>632-3173</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>REC45</td>
<td></td>
</tr>
<tr>
<td>Coupler, rigid PVC, 4”</td>
<td>Ipex</td>
<td>77010</td>
<td>632-3174</td>
</tr>
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<td>Royal Pipe Systems</td>
<td>REC55</td>
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</tbody>
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#### Sweeps

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer</th>
<th>Part No.</th>
<th>Item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweep, 90 degree, DB2, 2”, 24” radius</td>
<td>Ipex</td>
<td>29091</td>
<td>632-3220</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>90B2X24</td>
<td></td>
</tr>
<tr>
<td>Sweep, 90 degree, DB2, 3”, 36” radius</td>
<td>Ipex</td>
<td>29093</td>
<td>632-3230</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>90B3X36</td>
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</tr>
<tr>
<td>Sweep, 90 degree, DB2, 4”, 36” radius</td>
<td>Ipex</td>
<td>29095</td>
<td>632-3240</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>90B4X36</td>
<td></td>
</tr>
<tr>
<td>Sweep, 90 degree, rigid PVC, 2”, 24” radius</td>
<td>Ipex</td>
<td>NSL 2-24 or 69257</td>
<td>632-3352</td>
</tr>
<tr>
<td>Sweep, 90 degree, rigid PVC, 3”, 36” radius</td>
<td>Ipex</td>
<td>69261</td>
<td>632-3353</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>REE459036</td>
<td></td>
</tr>
<tr>
<td>Sweep, 90 degree, rigid PVC, 4”, 36” radius</td>
<td>Ipex</td>
<td>69267</td>
<td>632-3354</td>
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<td>Royal Pipe Systems</td>
<td>REE559036</td>
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</tbody>
</table>
## Specification for Installation of Underground Conduit Systems

Revision Date: Sept. 2021

Revision No. 5

Document No. 1669

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<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer</th>
<th>Manufacturer Part No.</th>
<th>FortisBC Item No.</th>
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</thead>
<tbody>
<tr>
<td><strong>Adapters</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Adapter, rigid PVC to DB2, 2”</td>
<td>Ipex</td>
<td>ARIG20 or 29181</td>
<td>632-3455</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>ARIG02</td>
<td></td>
</tr>
<tr>
<td>Adapter, rigid PVC to DB2, 3”</td>
<td>Ipex</td>
<td>29182</td>
<td>632-3459</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>ARIG03</td>
<td></td>
</tr>
<tr>
<td>Adapter, rigid PVC to DB2, 4”</td>
<td>Ipex</td>
<td>29184</td>
<td>632-3457</td>
</tr>
<tr>
<td></td>
<td>Royal Pipe Systems</td>
<td>ARIG04</td>
<td></td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
<td></td>
<td></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>
<td>Alarmline</td>
<td>1000RG</td>
<td>492-0102</td>
</tr>
<tr>
<td></td>
<td>Allen Systems</td>
<td>10571415</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brady</td>
<td>91296</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stranco Inc.</td>
<td>AL6100RE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terra</td>
<td>BT61052</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Top Tape and Label</td>
<td>PUWT-604</td>
<td></td>
</tr>
<tr>
<td>Polyester Measure/Pulling Tape 3/4” (19.1 mm) Wide</td>
<td>DCD Design and Manufacturing</td>
<td>58500-730</td>
<td>559-3200</td>
</tr>
</tbody>
</table>

---

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FortisBC Inc. does business as FortisBC. The Company is an indirect, wholly-owned subsidiary of Fortis Inc. FortisBC uses the FortisBC name and logo under license from Fortis Inc.
10 Conduit Installation

- Conduit installations shall be per structure 1214/1216 in Appendix B – Structure and Assembly Details. 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 °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 – Structure and Assembly Details for details).

- TSBC has the jurisdiction of inspecting the customer owned conduit and wire as necessary.

- 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.

- The conduit shall be kept free of any obstructions and foreign material (including sand, gravel). After backfilling, the Developer shall prove the conduit via mandrel inspection with a solid disc or ridged plastic mandrel. After proving, the final pull string shall be installed, which can be used for conductor installation.

- All conduits shall extend at least 50 mm and no more than 100 mm above drain rock or finished grade.
## 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>1301</td>
<td>15kV &amp; 25kV Underground and Riser Cable Ampacities</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>1589</td>
<td>Vehicle Protection (Bollard)</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>
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.

- Surveyed As-Builts or equivalent accurate coordinates of the conduit must be submitted to FortisBC after construction. The required coordinate system shall be NAD 83.
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.

- **For single phase installations of 200A or less** 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\(^1\) secondary services greater than 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

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\(^1\) Refer to the FortisBC Service and Metering Guide available at [www.fortisbc.com/servicemeterguide](http://www.fortisbc.com/servicemeterguide) 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 found in Appendix B – Structure and Assembly Details

<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 Encasement - Pole Riser</td>
</tr>
<tr>
<td>F-23</td>
<td>Placement of Facilities; Concrete Encasement - Deep Box Entry</td>
</tr>
<tr>
<td>G-23</td>
<td>Ground Rod Assembly</td>
</tr>
</tbody>
</table>

- Concrete **encasement** 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. Inspections will only occur once all specified work has been completed (e.g. inspection D cannot occur before curb installation or road paving). Note that survey evidence must be in place before an inspection can commence.

A) **Trenching** – After ducts are installed, prior to backfill or concrete encasement
   - 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 counterpoise 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)
   - Prove ducts by mandrel inspection
E) **Completion** – After conduit system and structures have been installed, proved by mandrel, and 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**

**Ownership of underground equipment transfers to FortisBC after the Construction Complete Certificate is signed by FortisBC. Prior to that time the equipment is the Developer’s responsibility.**

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

<table>
<thead>
<tr>
<th>Overhead Inspection List</th>
<th>Underground Inspection List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structures and Anchors</td>
<td>Trench and Conduit</td>
</tr>
<tr>
<td>- Framing (to standard)</td>
<td>- Trench depth</td>
</tr>
<tr>
<td>- Setting (depth / raked)</td>
<td>- Trench offset</td>
</tr>
<tr>
<td>- Backfill (tamped)</td>
<td>- Trench condition</td>
</tr>
<tr>
<td>- Correct class</td>
<td>- Sand bed</td>
</tr>
<tr>
<td>- Anchor depth</td>
<td>- Correct duct installed</td>
</tr>
<tr>
<td>- Anchor location and rod angle</td>
<td>- Duct spacing</td>
</tr>
<tr>
<td>- Guy tension</td>
<td>- Sanding / Backfill</td>
</tr>
<tr>
<td>- Guy guards</td>
<td>- Compaction</td>
</tr>
<tr>
<td>- Insulators</td>
<td>- Warning tape</td>
</tr>
<tr>
<td>- Right of way clearing</td>
<td>- String blown / duct / capped</td>
</tr>
<tr>
<td>- Offset</td>
<td>- As Built</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Street Lights</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Correct mounting</td>
<td>- Pad / box alignment</td>
</tr>
<tr>
<td>- Connections / lead size</td>
<td>- Pad / box grade</td>
</tr>
<tr>
<td>- Bird proofed</td>
<td>- Box / pad grounding</td>
</tr>
<tr>
<td>- Grounding</td>
<td>- Proper offset / easement</td>
</tr>
<tr>
<td>- Cutout &amp; arrestor</td>
<td>- Backfilled</td>
</tr>
<tr>
<td>- Clearance</td>
<td>- Access</td>
</tr>
<tr>
<td>- Protection</td>
<td>- Covers / lids</td>
</tr>
<tr>
<td>- Wire</td>
<td>- Correct pad / base</td>
</tr>
<tr>
<td>- Cutout rating</td>
<td>- Property pins</td>
</tr>
<tr>
<td>- Fuse link rating</td>
<td>- Base alignment</td>
</tr>
<tr>
<td>- Mounting &amp; grounding</td>
<td>- Base grade</td>
</tr>
<tr>
<td>- Size</td>
<td>- Correct base size</td>
</tr>
<tr>
<td>- Sag</td>
<td>-</td>
</tr>
<tr>
<td>- Sleeves</td>
<td>-</td>
</tr>
</tbody>
</table>

### Additional Comments:

### O/H Inspection Acceptance Date

### URD Inspection Acceptance Date
Appendix B – Structure and Assembly Details
ENSURE 90 SWEEP IS LOCATED IN FortisBC QUADRANT

RISER POLE

HIGH VOLTAGE JUNCTION BOX

ROW REQUIRED (SEE NOTE 4)

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

LOW VOLTAGE SERVICE BOX

NOTE:
1 - TRANSFORMER PAD TO BE PLACED IN THE CENTER OF ROW
2 - UNLESS OTHERWISE INDICATED, ALL DIMENSIONS ARE IN MILLIMETERS
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 STREETSIDE FOR HIGH TRAFFIC INSTALLATIONS
2) OPTION B, DOOR FACING STREET FOR NON-TRAFFIC INSTALLATIONS
3) 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.
4) LOCATE ALL SWITCHERS AS INDICATED IN CSA UNDERGROUND SYSTEMS 3.2.2
5) LOCATE OIL FILLED SWITCHES 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 EXIT 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. 26-246. FORTISBC PADMOUNT 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 PAGOURIO DISTRIBUTION TRANSFORMERS ARE TYPICALLY PROTECTED WITH AN INTERNAL CURRENT LIMITING FUSE & EQUIPPED WITH A PRESSURE RELIEF DEVICE
6) GROUND UPHILL 1M AWAY FROM LOWER LEVEL EQUIPMENT.
7) IF REQUIRED BY PROJECT, 6m WIDE ACCESS ROW TO BE MEASURED FROM EDGE OF EQUIPMENT.
NOTES:

1) OPTION A, DOORS FACING STREETSIDE (R/W SPLIT ON TWO PROPERTIES)
2) OPTION B, DOORS FACING STREETSIDE (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 EXIST 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.C.C. 26-240. FORTISBC PADMOUNT DISTRIBUTION
   TRANSFORMERS ARE TYPICALLY PROTECTED WITH 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.

DESCRIPTION OF CHANGE:
GENERAL REVISON OF FORMAT
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.

DESCRIPTION OF CHANGE:
REMOVED SIDES AND ROOF FROM FIREWALL
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.

DESCRIPTION OF CHANGE:
REMOVED FIREWALL INFORMATION WHICH IS NOW SHOWN ON SHEET 2
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 UNOBSSTRUCTED 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.
PVC DUCT OR CONDUIT SIZE AS REQUIRED

METALLIC POST

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

100mm MINIMUM

CUSTOMER SPECIFIED CONCRETE

GLUE CAP

GLUE CAP

CUSTOMER SPECIFIED CONCRETE

100mm MINIMUM

GLUE CAP

CUSTOMER SPECIFIED CONCRETE

GLUE CAP
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 INCASEMENT 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 halfway between the ductile pipe and finished grade.
4. This standard will conform to the utility manual section 11 and 13 unless otherwise noted.
5. Bend of concrete cover over conduit and rebar to be 76 (2").
6. Concrete to be formed and poured.
7. All forms are 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. Commercially manufactured conduit spacers shall be used to maintain conduit horizontal clearance for concrete inflation.
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 right of way.
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.
## TYPICAL TRENCH WITH UTILITY CROSSINGS

**FIGURE 1 - SECTION VIEW**

### MINIMUM CLEARANCES BETWEEN ELECTRICAL DUCTS AND OTHER UTILITIES

<table>
<thead>
<tr>
<th>TYPE OF PIPE</th>
<th>FORTISBC SUPPLY CABLES IN DUCTS (FIGURE 1)</th>
<th>FORTISBC GROUNDING RODS AND COUNTERPOISE (FIGURES 2, 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINIMUM CLEARANCE (mm)</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>TELEPHONE CABLE TV</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>GAS</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>WATER, SANITARY, SEWER</td>
<td>300</td>
<td>900</td>
</tr>
</tbody>
</table>

* Gas pipe not to exceed 50 mm diameter. Gas line to be protected by an appropriately coloured or marked non-metallic casing pipe for a distance of 600 mm beyond the counterpoise in both directions.

** These utilities shall not cross underneath the ground wire loop without approval from FortisBC.

### NOTES:

1. Minimum set depth is as per CSA 22.3 No. 7 - Underground systems must be met by every utility. Minimum separations are required from other utilities to provide clearance for repairs.
2. Pipe or duct crossings must be perpendicular.
3. FortisBC boxes and vaults may be placed offset from center of the joint trench to avoid conflict with other utilities upon approval from inspector.
4. If a utility crosses over an electric duct while crossing underneath the counterpoise, both vertical clearance requirements must be met.
5. FortisBC box varies in size and shape. Counterpoise is always 1m offset.
6. Secondary service boxes do not have counterpoise. Contact a FortisBC designer to determine what type of equipment is present.
7. Gas pipe shall cross above electrical and communication duct. Gas pipe will cross below counterpoise or sweep around.
8. 3m of separation required between telecom walk in closets and FortisBC counterpoise.
9. If ducts need to be closer than those listed above, all parties involved shall agree on a solution which will permit maintenance, without damage and prevent future contact with the other system or structure.

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FortisBC INC.  
Digitally signed by  
Diane Gretchen  
2021-09-23

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**REVISION DATE**  
**P. ENG SEAL**  
**ORIGINAL ISSUE**  
**UNDERGROUND EQUIPMENT STRUCTURES**  
**TRENCH DETAILS: CLEARANCE**  
**DUCT CROSSINGS AND COUNTERPOISE**  
**SHEET 3 OF 3**

**DRAWING No.**  
**REV.**

1216  
0
NOTES:

1) THIS TABLE WAS CREATED WITH CYNICAP SOFTWARE WITH THE FOLLOWING ASSUMPTIONS:

1.1) PARAMETERS FOR LG INSTALLATION:
- Assumed Earth Ambient Temperature = 20°C
- Thermal Conductivity of Backfill = 0.777 m²K/W
- As per measured value of preferred backfill found in Project Document RL-PE-0129/2021 and specified in document RL-PE-0127-07
- Duct = 75 mm and 100 mm PVC
- Depth to Centre of Top Duct = 1m
- Spacing of ducts, both vertically and horizontally = 100 mm Centre-to-Centre
- Resistance, calculated by CYNICAP
- Neutral Bonding: Calculated for one end bonded and for both ends bonded
- Load Factors of 0.3, 0.5, & 1.0
- Cable temperatures of 90°C, 110°C, and 130°C

1.2) PARAMETERS FOR RISER APPLICATION:
- Only a single riser per structure (THE SOFTWARE ONLY SUPPORTS ONE RISER)
- No wind, full sun, and vented at the top of ducts
- Intensity of Solar Radiation: 925.013 W/m²
- Air Ambient Temperature: 40°C
- Duct Material: PVC
- Spacing between ducts: 127mm Centre-to-Centre
- Load Factor = 1.0
- Rise Length: 914m

2) CURRENT RATINGS ARE PER CONDUCTOR AS STEADY STATE.

3) WHERE BONDING IS AT ONE END ONLY, A SEPARATE NEUTRAL CONDUCTOR IS USED FOR RETURN PATH.

4) THE LOAD FACTOR IS THE RATIO OF THE AVERAGE LOAD OVER A DESIGNATED PERIOD OF TIME TO THE PEAK LOAD OCCURRING IN THAT PERIOD. FOR VARIABLE CONTINUOUS LOADING, THE BASE PERIOD IS 24 HOURS.

5) OPERATION AT THE EMERGENCY OVERLOAD TEMPERATURE OF 125°C SHALL NOT EXCEED 60 HOURS IN ANY 12 CONSECUTIVE MONTHS FOR MORE THAN 500 HOURS DURING THE LIFE TIME OF THE CABLE.

6) LOAD FACTOR FOR RISER APPLICATIONS IS CONSIDERED 1.0 FOR ALL SCENARIOS AS THE CABLES IN AIR RARELY REACH STEADY STATE DUE TO LOW THERMAL TIME CONSTANT OF AIR.

7) THE TABLE REPRESENTS CABLE AMPACITY ONLY, NOT FEEDER AMPACITY. REFER TO FEEDER DISTRIBUTION DESIGN CRITERIA FOR FEEDER AMPACITY CRITERIA.

CABLE AMPACITY VALUES WERE CALCULATED USING CYNICAP V2.0.0.0.
NOTES:
1 - VARIATION TO THIS ARRANGEMENT SHALL BE APPROVED BY FORTIS.
2 - DUCTS SHALL BE GROUPED AS CLOSSLY 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 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.
### Fortis Bill of Material 2012/02/13

#### Structure # 1342

**POLE RISER FOR MULTI DUCT ENTRANCE**

<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>
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<tbody>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>BOLT, MACHINE, GALV, 3/4&quot; X 12&quot;,</td>
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<tr>
<td>F43</td>
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<td>BOLT, LAG, GALVANIZED, 1/2&quot; X 4&quot;,</td>
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<tr>
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<td>4</td>
<td>4</td>
<td>4</td>
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<td>4</td>
<td>WASHER, SQ, 3 X 3 X 1/4, 13/16 HOLE</td>
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<tr>
<td>F43</td>
<td>6</td>
<td></td>
<td>4</td>
<td>4</td>
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<td>WASHER, SPRING LOCK, DOUBLE 3/4</td>
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<td>F43</td>
<td>7</td>
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<td>4</td>
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<td>BRACKET, ALUMINUM, STANDOFF</td>
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<td>4</td>
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<td>BRACKET, T SLOT, 4 WAY, 24 INCHES LONG</td>
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<td>F43</td>
<td>9</td>
<td></td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>STRAP, KIT, GALV, FOR 3&quot;,</td>
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<tr>
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<td>8</td>
<td>8</td>
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<td>STRAP, KIT, GALV, FOR 4&quot;,</td>
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</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;
   - Item 632-3455 is for 2" applications
   - Item 632-3459 is for 3" applications
   - Item 632-3457 is for 4" applications
CONSTRUCTION DRAWING SYMBOL

TOP VIEW

SECTION VIEW

NOTES:

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

FILL REQUIRED BY TELCO OR CABLE
<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.
   Use for residential roadways only
CONSTRUCTION DRAWING SYMBOL

BOLT CIRCLE
DIAMETER=380 [14.96"]

LOCATE CONDUIT IN CENTRE OF ANCHOR BOLT CIRCLE

PLAN

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

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 # 1417</th>
<th>CIVIL, STREET LIGHT CONTR BASE, TYPE C-1</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>7550207</td>
<td>1</td>
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</tbody>
</table>

**REMARKS:**
1. The base is used for mounting street lighting controller s1407
2. Meets MMCD requirements for highways, collector and arterial roadways
CONSTRUCTION DRAWING SYMBOL

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

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

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

BOLT CIRCLE
DIAMETER = 280 [11”]

LOCATE CONDUIT IN CENTRE OF ANCHOR BOLT CIRCLE

ELEVATION

1000 [39 3/8”]

451 [17 3/4”]

[39 3/8”]

197 3/4”

79 3/8”

151 [5 7/8”]

59 1/16”

27 1/2”

150 [59 1/16”]

700 1/16”

1000 1/16”

150 [59 1/16”]

51 [2"] R.PVC CONDUIT (2)
<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
<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
<th>UI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7550100</td>
<td>1</td>
<td>BOLLARD, 1.3M ABOVE GRD, 100MM DIA.</td>
</tr>
</tbody>
</table>

**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 - 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") 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 FENDA HEAD BOLTS TO SECURE LID

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.
SECTION 'A–A'

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") 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"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.
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>
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<th>SAP Mat #</th>
<th>UI</th>
<th>-1</th>
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<td></td>
<td></td>
<td>LID-PLATE-STEEL-RECESSED-48X 40</td>
</tr>
</tbody>
</table>
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. EXTEND CONDUIT 50mm (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.

- NATIVE FILL
- 25mm (1") CLEAN DRAIN ROCK
- ROAD MulCh

MINIMUM DEPTH OF DRAIN ROCK 100mm TO EXTEND 200mm BEYOND EDGE OF BOX.
SEE NOTE 1 & 4.

PLAN VIEW

SECTION 'A-A'

ADDED DIMENSIONS TO DRAWING.
# BILL OF MATERIAL

<table>
<thead>
<tr>
<th>BOM #</th>
<th>SAP Mat #</th>
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<tr>
<td>5310202</td>
<td>M</td>
<td>13</td>
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<tr>
<td>5311122</td>
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<td>CONDUCTOR, STR CU, 2/0 POLY, 600 VOLTS</td>
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<tr>
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<td>CONNECT, 2/0 CU COND.</td>
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<td>ROD, GROUND, COPPERBONDED, PLAIN 3/4”</td>
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<td>BOX-TRANSF. SUPPORT- 48 X 40 X 24 C/W UNISTRUT</td>
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<td>LID-PLATE-STEEL-RECESSED-48 X 40.</td>
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</table>

### 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**.
DESCRIPTION OF CHANGE:

REVISION DATE  FEB/16
AUTHOR  SW  JUL/14
CHECKED  DCW  FEB/16
APPROVED  DK  FEB/16

NOTE:

1 - GROUT SHALL BE USED TO ENSURE ADEQUATE SEAL BETWEEN DUCT AND BOX
2 - STANDARD CONDUIT OFFSET PER DESIGN DRAWING OR LOCAL AUTHORITY
3 - FOR LEVEL GRADES, BOX TO BE SET SO THAT Lid IS 100mm ABOVE FINAL GRADE OR FLUSH IN SIDEWALK
4 - FOR PVC DUCT ONLY, END BELLS TO BE FLUSH WITH BOX
5 - CONDUIT SHALL BE-installed WITH BELL END, CAPPED AND MARKED/IDENTIFIED
6 - PVC CONDUIT SHALL BE CONCRETE CAPPED AS PER ASSEMBLY F-23
7 - GROUND ROCK SHALL EXTEND 200mm BEYOND THE OUTSIDE OF BOX
8 - ENGINEERING AND DESIGN OF THE PRECAST CONCRETE BASE/VAULT ZONE IS THE MANUFACTURER'S OWN LIABILITY ASSOCIATED WITH CONCRETE BASE/VAULT DESIGN.

CIVIL GENERAL ARRANGEMENT

SW  JAN/08
CHECKED  NG  JAN/08
APPROVED  BMB  MAY/08

D. C. WALDEN  # 37190
PROFESSIONAL ENGINEER

FORTIS BC

DRAWING No.  1592  REV.  1
<table>
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<td>5311122</td>
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<td>CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU</td>
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<td>CONNECTOR, 2/0 TO 2/0 CU</td>
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<td>LID-PLATE STEEL-RECESSED-58X58.</td>
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**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

REVISION DATE
AUTHOR
CHECKED
APPROVED
FEB/16
SM
DCW
DK
JUL/14
FEB/16
FEB/16

ORIGINAL ISSUE
DRAWING No.
FEB/16

UNDERGROUND STRUCTURES
10 LOW PROFILE TRANSFORMER
CIVIL GENERAL ARRANGEMENT
SHEET 1 OF 1

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.

PLAN VIEW

SECTION 'A-A'

SECTION 'B-B'

2/O Cu, RW90

NATIVE FILL

25mm (1") CLEAN DRAIN ROCK

ROAD MULCH

CONCRETE

MINIMUM OF 100 MM DRAIN ROCK

SEE NOTE 3

SEE NOTE 3
REMARKS:

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

1. ADD DIMENSIONS

GENERAL REVISION

ADD DIMENSIONS

ORIGINAL ISSUE

UNDERGROUND STRUCTURES

30 JUNCTION VAULT (200A)

15/25kV 832 STYLE (CIVIL)

FEB/16

SM

JUL/14

CHECKED

DCW

FEB/16

APPROVED

DK

FEB/16

AUTHOR

CHECKED

APPROVED

SW

NG

BMB

DEC/07

JAN/08

JAN/08

REV.

D. C. WALDEN

37120

FORTIS BC

1594

1
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**.

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**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**.
1. 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
(GROUNDING NOT SHOWN FOR CLARITY)
<table>
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</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.
OUTLINE OF CONCRETE PAD

10M REBAR

OUTLINE OF VOID

100mm

100mm

100mm

100mm

100mm

REINFORCING STEEL LAYOUT

SECTION VIEW A--A

REINFORCING STEEL LAYOUT

PLAN VIEW

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
P. ENG SEAL
ORIGINAL ISSUE
AUTHOR
CHECKED
APPROVED

DRAWING No.
REV.
UNDERGROUND STRUCTURES
3 PH TRANS (>500kVA) BASE
DEEP POUR BASE
SHEET 3 OF 3
DEEP POUR BASE
FEB/16
MK
DCW
AUG/15
FEB/16
FEB/16

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

SECTION A-A

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 B-B

1596
1

FORTIS BC
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.

SECTION A-A

PLAN VIEW

PRE-CAST 30 TRANS BASE
500kVA OR LESS

DESCRIPTION OF CHANGE:
ADDED NOTE 3
### BILL OF MATERIALS

<table>
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<th>SAP Mat #</th>
<th>UI</th>
<th>Description</th>
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<td>CONNECTOR, 2/0 TO 2/0 CU</td>
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<td>PAD, PRECAST CONCRETE, TRANS, 75-500KVA</td>
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</table>

### 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.**
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 RODS 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

DESCRIPTION OF CHANGE:

UPDATED BORDER
ADDED NOTE 7
REVISION DATE  FEB/16  P. ENG. SEAL  D. C. WALDEN  # 37120  UNDERGROUND STRUCTURES ABOVE GRADE 200A JUNCTION BILL OF MATERIALS BOM SHEET 1 OF 1

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.

<table>
<thead>
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<th>SAP Mat #</th>
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<td>CONNECTOR, 3/4 CU GRD ROD TO 2/0 CU</td>
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<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>7550504</td>
<td>1</td>
<td>BASE, PRECAST FOR ABOVE GROUND 3 PHASE</td>
<td></td>
</tr>
</tbody>
</table>

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.
NOTES:
1 - UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWING ALL PVC SWEEPS, PRIMARY AND SECONDARY, EXCEPT SERVICE STUBS, TO BE CONCRETE ENCASED
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 ENCASEMENT
4 - MECHANICAL SEPARATION BETWEEN UTILITIES TO BE CONTINUOUS LAYER OF
   MINIMUM 6 MIL POLY SHEET OR 100mm (4") OF FINE CLEAN SAND
5 - CONCRETE REQUIRED 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 ENGAGED IN PHONE COMPANY CONCRETE PLASHER.
5. PVC CONDUIT TO BE CONCRETE ENCASED. ALL DUCT TO BE PVC.
6. POWER UTILITIES 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 SHEETS, PRIMARY AND SECONDARY TO BE CONCRETE ENCASED.
9. STREET LIGHT DUCT DOES NOT REQUIRE ENGAGEMENT.
10. MECHANICAL SEPARATION BETWEEN UTILITIES TO BE CONTINUOUS LAYER OF MIN 6 MIL POLY SHEET OR 100 MM (4") OF FINE CLEAN SAND.
11. ANY MECHANICAL SEPARATION TO KEEP CONCRETE 6" FROM POLE.

REVISION DATE JUL/21
AUTHOR DANO JUL/21
CHECKED DSGP JUL/21
APPROVED DNO JUL/21

DESCRIPTION OF CHANGE:
REPLACED CAPPING WITH ENGAGEMENT
UPDATED TITLE, NOTES 5, 8, AND 9

2021-09-24

DIGITALLY SIGNED BY
D.H. GRETCHEN
09/04/21

FORTISBC INC.
1001962

UNDERGROUND ASSEMBLY DRAWINGS
P-ENG SEAL
REPLACEMENT OF FACILITIES
CONCRETE ENGAGEMENT - POLE RISER
SHEET 1 OF 1
DRAWING No. REV.
F-21 3
CONCRETE CAPPING TO EXTEND FLUSH TO BOX

PLAN VIEW

HATCH DETAIL

GROUP

SECTION 'A-A'

NOTES:

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

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
FIRST UNITS ARE IN INCHES [SECOND UNITS ARE IN MILLIMETERS]
DIMENSIONS ARE SUBJECT TO CHANGES WITHOUT NOTICE. CONFIRM DIMENSIONS WHEN ORDERING

Royal Pipe Systems
Part Description: BEND DB2 02x90° 24"R HxS
Part Category: DB2 BENDS
DRAWN BY: Alan Li SCALE: 1:10 DATE: Apr. 1, 09
APPROVED BY: P. CREELMAN REVISION NO:
DRAWING NO.: PART NUMBER: 90B2X24
ALL UNITS ARE IN INCHES

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

PART DESCRIPTION: BEND DB2 3"X90° R36" HXS
PART CATEGORY: DB2 BENDS
DRAWN BY: A. LI
APPROVED BY: P. CREELMAN
DATE: 11/23/16
SCALE: N.T.S.
SHEET: 1-1
DRAWING NO.: 90B3X36

3" DB2 Hub
Min. 3.0
Max. 3.5
R36.0
4.5
42.5
43.0
ALL UNITS ARE IN INCHES

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