



## Customer Installed Pre-Cast Base, Grounding and Ducting Process

<b><u>GENERAL</u></b>	<b>1</b>
<b>Definitions:</b>	<b>1</b>
<b><u>CHAPTER ONE: PROCESS STEPS</u></b>	<b>2</b>
<b>1.0 Service Classification</b>	<b>2</b>
<b>2.0 Process Steps</b>	<b>2</b>
2.1 Initial Contact	2
2.2 New Service Quote	2
2.3 Customer Acceptance	2
2.4 Design: Preliminary Review/Meeting	2
2.5 Final review and Approved for Construction (AFC) approval	3
2.6 Construction	3
2.7 Contact Retailer	4
2.8 Meter Connection	4
<b>3.0 FortisAlberta Pre-Qualified Commercial Design Consultants and Construction Contractors</b>	<b>4</b>
<b><u>CHAPTER TWO: DESIGN AND INSTALLATION GUIDELINES</u></b>	<b>5</b>
<b>4.0 Drawing Requirements</b>	<b>5</b>
<b>5.0 Design &amp; Installation Guidelines</b>	<b>6</b>
5.1 Foundations	6
5.2 Grounding	6
5.3 Duct installation	6
5.4 Guard posts (Bollards)	6
5.5 Crossing/Proximity to Third Party Right-Of-Ways, High-Pressure Pipelines and Power Lines	7
5.6 Crossing/Proximity to Railways	7
5.7 Easements and Utility Right of Way	7
<b>6.0 Material Standards and Specification</b>	<b>7</b>
6.1 General requirements	7
6.2 Pre-Cast Concrete	8
6.3 Grounding Materials	8
6.4 Conduit Materials	8
<b>7.0 Inspection and testing</b>	<b>8</b>
7.1 General Requirements	8
7.2 Scheduling Inspections	8

## **General**

This process covers FortisAlberta's general requirements for the design and installation of underground electrical distribution facilities on Customer property; this includes cable ducts, transformer bases, grounding, etc. These Facilities are to be installed by the Customer. However, they will be energized and maintained by FortisAlberta. The purpose of this document is to provide assistance to our customers with the requirements specific to their services.

This process is applicable to the following pad-mount services: commercial, industrial, oil & gas, irrigation, Bareland Commercial Developments as well as apartment buildings and large farm services (greater than or equal to 75kW operating demand).

Please note that FortisAlberta will only accept designs and installations provided by Design Consultants and Construction Contractors that are currently on our pre-qualified list (see [section 3.0](#)). Exceptions can be made for *simple* services, as defined in section 1.0. In the case of a *simple* design, requirement for a pre-approved design consultant will be optional.

All requirements related to metering are not part of this document. Please refer to the [FortisAlberta Service & Metering Guide \(SMG\)](#).

The design and installation of underground residential developments, and underground residential bareland developments are not addressed in this document. These installations are a subject of the [Underground Residential Development \(URD\) Process](#).

If a customer fails to follow the process, all work associated with correcting any faults in the customer's installation, or exposing of already installed customer facilities due to premature backfilling, need to be completed by the customer at their expense.

This document is meant to compliment the SMG and in no way overrides it.

### **Definitions:**

**Duct/conduit:** Terms used interchangeably for plastic, metal or pvc tubing used to encase underground conductor

**Transformer or cubicle base/pad:** Terms used interchangeably for pre-cast concrete bases used to mount a switching cubicle or padmount transformer

**AFC:** Customer Approved for Construction drawing

**SMG:** FortisAlberta Service & Metering Guide

**Red-line:** Records of all construction deviations from AFC drawing.

**Record drawing:** Authenticated drawing created to record design changes for which the professional member has accepted responsibility.

# **Chapter One: PROCESS STEPS**

## **1.0 Service Classification**

*Simple services* - services will be classified as *simple* when all of the following apply:

- One transformer pad is servicing one site and;
- Length of duct is less than 150m and has combined deflections (sweep or bend) less than 90° (excluding the bend to the transformer pad) and;
- There are no crossings/proximities with other facilities that required approvals (pipe lines crossings etc.) and;
- Lot is up to final grade ( $\pm$  150mm).

*Complex services* - all services that do not satisfy the above *simple* service requirements.

## **2.0 Process Steps**

FortisAlberta recommends using designs provided by design consultants who are on our pre-qualified list, although this is only mandatory for design of *complex* services. Construction can only be performed by Construction Contractors who are currently on our pre-qualified list. Refer to the [FortisAlberta Pre-Qualified Commercial Design Consultants and Construction Contractors section \(3.0\)](#).

Note that only step 2.2.4 will differ between *simple* and *complex* services, while all other process steps remain the same.

### **2.1 Initial Contact**

Customer calls 310-WIRE or fills out an online application form to request a new power service or a change to an existing service. The online form will differ for apartment/farm customers, oil and gas customers and commercial customers.

For Apartment/Farm customers, [Click Here](#).

For Oil and Gas customers, [Click Here](#).

For Industrial/Commercial customers, [Click Here](#).

### **2.2 New Service Quote**

The Customer submits a copy of the most recent site plan showing all utilities, buildings, transformer locations, ducting route (include burial depth), existing/proposed above-ground facilities, deep (water/sewer) services, dimensions of the property site and buildings, customer construction schedule and required connect date. A site meeting with a FortisAlberta Representative may take place as required. The FortisAlberta representative determines which category the new service will fall under: *simple* or *complex*. The new service is estimated by FortisAlberta and a quote letter is sent out.

### **2.3 Customer Acceptance**

The customer reviews the quote, and approves and makes payment, as required.

### **2.4 Design: Preliminary Review/Meeting**

FortisAlberta contacts the customer, and determines the type and location of any offsite work or facilities that FortisAlberta must perform or provide, and reviews and discusses preliminary design drawings and details with the customer/pre-approved design consultant. FortisAlberta provides the

customer/pre-approved design consultant with FortisAlberta's minimum design standards and any other details the customer may require to assure clarity of the design and safe construction practice.

The customer/pre-approved design consultant supplies Approved for Construction (AFC) drawings as soon as practical after review/meeting. The AFC drawings show details of the transformer base, grounding, post guards (bollards), location of pads relevant to buildings, driving services and other above and underground facilities. All drawings should be marked as AFC. The customer also supplies the construction schedule and required connection date.

Installation of ducting, transformer pad and grounding must not begin until AFC drawings have been accepted by FortisAlberta.

**Applicable only for *Complex Services*:**

Cable pulling calculations are required from the customer/pre-approved design consultant if it is considered *complex*. A pull is considered *complex* if the length of duct is greater than 150m or has combined deflections (sweep or bend) greater than 90° (excluding the bend to the transformer pad). A Cable Pulling Calculator based on the standard FortisAlberta cable, duct data and pulling methods is available on FortisAlberta's website.

For complex services, AFC drawings must be signed and stamped by the pre-approved design consultant's engineer.

The Design Consultant is responsible for obtaining all required third-party approvals for installation of FortisAlberta Facilities on customer site.

The consultant should also provide installations within Registered Easements and or Utility-Right-of-Ways (URW) when required. See [Section 5.7: Easements & Utility Right-of-Way](#).

**2.5 Final Review and Approved for Construction (AFC) Approval**

FortisAlberta reviews any requested changes and accepts the AFC. Once the AFCs are approved, FortisAlberta releases offsite construction packages.

The customer/pre-approved design consultant is responsible for contacting FortisAlberta if any changes are proposed after the AFC is issued; all post-AFC changes must be approved by FortisAlberta. The customer/pre-approved design consultant also must arrange a pre-approved contractor for the installation, and ensure that the contractor has all AFCs.

The final schedule for the service cannot be completed until AFC drawings are approved.

**2.6 Construction**

Only pre-approved construction contractors shall install transformer bases, switch cubical pads, grounding, and/or conduit. The pre-approved contractor is to call 310-WIRE three (3) working days prior to the backfill of any underground facilities to arrange an inspection by a FortisAlberta employee. The pre-approved contractor is required to follow all specifications laid out in the AFC drawing and in the FortisAlberta Service and Metering Guide, as well as all applicable legislation and codes. Failure to meet these requirements may result in a service delay.

Once the inspection is completed, it normally takes two to three weeks for the FortisAlberta construction to take place. The customer must provide an eighteen-month warranty on all facilities,

including any that may be leaning or are not to grade due to improper installation or tampering. This warranty should be effective following the service energization. Any changes made to AFC drawings during construction must be made with “red-lines”. For more information about drawing revisions, see section 4.2.

## **2.7 Contact Retailer**

The customer contacts the retailer to request a meter connection. A quote letter with service information is required (including civic address or legal land location, and site ID), along with billing information.

## **2.8 Meter Connection**

The connection and installation of metering occurs only after the FortisAlberta construction (on and off-site) is completed.

## **3.0 FortisAlberta Pre-Qualified Commercial Design Consultants and Construction Contractors**

FortisAlberta’s pre-qualification process is required for companies to do work for FortisAlberta. Our current list of pre-qualified Commercial Design Consultants and Construction Contractors is available via the “[Pre-Qualified Consultants and Contractors](#)” section of our website.

Design consultants and construction contractors who want to obtain more information on our pre-qualification process or who want to be listed can apply to our Contract Services group through e-mail at [contracts@fortisalberta.com](mailto:contracts@fortisalberta.com) or by fax at (403) 514-5981.

The construction contractors and consultants listed on FortisAlberta’s pre-qualified commercial list are pre-approved to install and design underground electrical distribution systems.

## **Chapter Two: DESIGN AND INSTALLATION GUIDELINES**

### **4.0 Drawing Requirements**

The standard requirements for the engineering drawings and detailed plans submitted to FortisAlberta by the consultant are as follows:

#### **4.1 Drawing Issued for FortisAlberta Acceptance**

Drawings issued for acceptance must be authenticated (exceptions are made for [Simple Services – section 1.0](#)) and include a signing block or stamp with space for FortisAlberta and acceptance.

Approved for Construction (AFC) design drawings must include:

- Locations and installed depth of ducts - include alignments. Details of ducts complete with cable pulling lengths and tensions.
- Location of transformer pads relevant to buildings, driving surfaces, other aboveground facilities - e.g. fire hydrants and/or known underground facilities (Alberta One-Call markings).
- Blast wall and guard post requirements, as applicable.
- Property lines and ties to legal pins.
- Metering connect points.
- Locations of any third-party pipeline crossings, road crossings and/or other right-of-ways affecting customer on-site work and FortisAlberta cable routes on-site.

Pad-mount transformer pads must be located so 4.0m clear area is available in front of the transformer's access lid. This space is required for FortisAlberta to operate and maintain facilities.

#### **4.2 As-built Drawings Issued for FortisAlberta Commissioning**

“Red-lines” must be used to identify any revisions made to the AFC prints during construction. These will be used to create the as-built plans of the installation. The Contractor must maintain accurate “red-line” information and records of all construction as work progresses. This includes all changes to engineering drawings and other concealed services. The “red-line” information must be neatly noted on all plans. Where applicable, include overlapping detail as well as the composite plan. “Red-line” as-built drawings do not need to be authenticated by the consultant's engineer.

*Note: It is FortisAlberta's expectation the consulting engineer will have reviewed and approved all “red-line” information prior to the noted field changes actually being made. Furthermore, where significant changes have occurred, it is required the changes have been communicated and coordinated, (as required by the situation) with FortisAlberta prior to the changes actually occurring.*

#### **4.3 Record Drawings Issued to FortisAlberta**

The Record Drawing will be required if there is significant changes on the “red-line” as-built drawing. The significance of the changes will remain under FortisAlberta discretion. The “Record Drawings” are created to record design changes for which a professional member has accepted responsibility. They must be authenticated and should be stamped “Record Drawings”, and all “red-line” as-built information will be superimposed on the original design drawings, recorded in the revisions title block and prepared with the final drawing.

## **5.0 Design & Installation Guidelines**

All installations will be in accordance with the FortisAlberta accepted AFC drawings, and the material and construction standards and specifications provided in this publication. In cases where a conflict or discrepancy exists between the construction and detailed engineering drawings provided or the requirements of this document, the latter two will take precedence and will govern the installation. In the event of discrepancies, any ambiguity must be referred to the FortisAlberta designer prior to proceeding with that phase of the installation.

### **5.1 Foundations**

- Pad shall be installed on level, well compacted soil, and filled with a minimum of 150mm (6") compacted gravel.
- Not to be placed on soils that are in class 8 (wet, peat) without special foundation.
- Top of pad is to be 150mm (6") above final grade.
- Minimum vertical clearance from the top of pad to any fixed structure shall be no less than 3.9m (12'10").
- The slope or grade on which the transformer base sits and the 4.0 m operating area in front of the padmount transformer's access lid must be less than 9.5° or less than a 1:6 slope (i.e., 1 m rise in 6 m run). See drawing SMG 2.1 in section A.2.1 of the FortisAlberta [Service and Metering Guide Drawings webpage](#).
- Minimum distance from the edge of the pad to any property line shall be 1.0m (3'3").

### **5.2 Grounding**

- Transformer pad grounding should be determined by the FortisAlberta designer - single ring or three ring grounding. For single phase transformer see Figure 1300, SMG. For a three phase transformer with a multi-ground neutral (single ring) refer to Figure 1304, SMG and for a three phase transformer without a multi ground neutral (three rings) see Figure 1305, SMG. These figures can be viewed on section A.5 of the FortisAlberta [Service and Metering Guide Drawings webpage](#).
- Required ground grid must then be installed.
- The customer shall test all ground grids before connecting the concentric neutrals using the "three point method" or "fall-off potential" to six ohms, to ensure that they meet the code requirements. If the ground grid does not meet the code requirements, remedial action shall be taken by the customer to ensure compliance with the code.
- After inspection, remaining excavation can be backfilled and compacted to within  $\pm 150$ mm of final grade.
- No backfill will be allowed inside the transformer or cubicle bases.

### **5.3 Duct Installation**

Ducting should be installed to a depth of 1.2m to 1.54m from the final ground grade, measured from the top of the conduit. Any installation from a transformer/switch cubical to a property line should include a 7mm pull rope. An above ground marker must be placed at end of the conduit on property line.

### **5.4 Guard Posts (Bollards)**

Guard posts (bollards) must be installed on all sides of a transformer or cubicle if it is located in an area exposed to vehicle traffic and is at the risk of incurring damage from a vehicle. Guard posts must be bonded to the ground grid. To avoid possible damage to the ground grid the bollards should be installed before or at the same time as the ground grid.

## **5.5 Crossing/Proximity to Third Party Right-Of-Ways, High-Pressure Pipelines and Power Lines**

The customer is required to obtain the necessary permissions to enter upon, cross over, or construct under any third-party right-of-ways, high pressure pipelines, power lines, etc for the installation of the underground electrical facilities. They are also responsible for the preparation and submission of the plans to the owners and/or proper authorities, and for any extra costs, work, damage claims and/or insurance costs related to meeting all conditions for any of the above mentioned crossings. During the inspection, the customer's consultant shall provide the FortisAlberta with one copy of the customer's crossing agreement (i.e. under the customer's name) with the third-party company (i.e. pipeline, transmission, etc.)

## **5.6 Crossing/Proximity to Railways**

If the customer owns, operates, and maintains the railway, he is responsible for casing a pipe installation under the rails in accordance with all applicable codes, in which case the detailed design and as-built engineer-signed and stamped drawing for the installation under the tracks is still be required. If an approval for the installation needs to be obtained from a third-party (Canadian Pacific or Canadian National Railway Company), FortisAlberta performs the installation under the tracks at the expense of the customer.

## **5.7 Easements and Utility Right of Way**

Every facility on a customer property that serves two or more customer properties must be protected either by Easements or a Utility-Right-of-Way. The necessity for Easement and Utility Right of ways will be at the discretion of the FortisAlberta designer.

## **6.0 Material Standards and Specification**

### **6.1 General Requirements**

The customer is responsible for supplying all materials required for meeting the minimum FortisAlberta standards throughout the duration of the work; this includes the customer's delegation to another party to carry out the completion of the work (design consultants, construction contractors, and sub construction contractors). Furthermore, the customer is responsible for all material supplied, and for the safe storage of all material, until it has been incorporated in the completed and accepted work by FortisAlberta. The customer will replace, at no cost to FortisAlberta, any material that has been damaged in transit, or has been damaged subsequent to delivery and prior to energization.

All materials used in the design and installation of the underground electrical system will be new and from a manufacturer stated in the accepted list of suppliers provided in sections 6.2, 6.3 and 6.4 of this publication. If other than accepted materials are incorporated in the work, all such materials will be removed and replaced with accepted materials. This replacement will be completed at the customer's expense, and to the satisfaction of the FortisAlberta field representative, prior to energization.

The accepted suppliers and catalogue numbers listed in the following material sub-sections been previously evaluated by and/or supplied to FortisAlberta. Any other materials and/or suppliers not listed will not be accepted without prior acceptance from FortisAlberta. Suppliers or manufacturers who want their products to be considered can submit samples and full technical information to FortisAlberta for evaluation.

## **6.2 Pre-Cast Concrete**

Pre-cast concrete bases are used for mounting single and three phase pad-mount transformers, switching cubicles, and pull boxes. To view the bases that can be used click the following links:

[For Single Phase Pre-cast Concrete Bases](#)

[For Three Phase Pre-cast Concrete Bases](#)

## **6.3 Grounding Materials**

The following materials can be used when installing the grounding and ground grids around padmount transformers, switching cubicles, secondary junction boxes and pedestals, street lights, and pull boxes. To view the grounding materials that can be used, click the following links:

[For Single Phase Grounding Materials](#)

[For Three Phase Grounding Materials](#)

## **6.4 Conduit Materials**

The following materials can be used when installing the conduit. To view the conduit materials that can be used, click the following links:

[For Single Phase Conduit Materials](#)

[For Three Phase Conduit Materials](#)

## **7.0 Inspection and Testing**

### **7.1 General Requirements**

FortisAlberta will have the final say regarding any installation/construction issues, discrepancies, and/or problems. Inspection will take place after the customer completes their installation, and before any backfilling takes place.

### **7.2 Scheduling Inspections**

Customers must call 310-WIRE three (3) working days prior to the backfill of any underground facilities. FortisAlberta field representatives work eight (8) hour days between the hours of 7:30 a.m. through 4p.m. (including travel time to site), Monday through Friday. It is the contractor's responsibility to coordinate all inspections accordingly. Any requests outside these hours will be at the discretion of the FortisAlberta field representative and at the contractor's cost. All notifications after 4 p.m. on any given working day will be considered as occurring the next business day.