

12600 Traffic Signal Underground Installation**Index**

12600-1	Scope	2
12600-2	Plans and Drawings	2
12600-3	Site Layout / Clearances	2
12600-4	Temporary Traffic Control	2
12600-5	Trenching, Boring & Backfill	3
5.1	Trenching in Existing Roadway	3
5.2	Trenching in Unpaved Roadway	3
5.3	Trenching in Natural Ground	4
5.4	Boring	4
12600-6	Underground Conduit	4
12600-7	Junction Boxes	5
12600-8	Pre-Cast Pole Bases	6
12600-9	Cast-In Place Cabinet Base	7
9.1	Cast-in-Place Cabinet Base in Natural Ground	7
9.2	Cast-in-Place Cabinet Base in Sidewalk	8
12600-10	Pre-Cast Cabinet Base (Temporary)	9
12600-11	Service Pedestals	10

12600-1 Scope

This Section describes the materials used and the normal procedures followed for installation of the underground components of traffic signals indicated below.

- location of existing utilities
- installation of underground conduit (trenching or directional bore)
- installation of junction boxes
- installation of pole bases
- installation of traffic signal cabinet concrete base
- installation of service pedestals

12600-2 Plans and Drawings

All material shall be installed according to the plans and drawings provided. Where modifications to the plans are required or would enhance the installation, they should be brought to the attention of the Engineer for approval prior to being installed.

Any changes made to the original plans during the field installation shall be noted, and submitted upon project completion to the Engineer.

12600-3 Site Layout / Clearances

All conduit, pole base, junction box, cabinet base, and service pedestal locations shall be marked in the field as per the plans provided and shall be confirmed with the Engineer prior to installation.

The Contractor shall be responsible for acquiring all underground clearances for each location.

12600-4 Temporary Traffic Control

Where the Contractor is the sole workforce at a worksite they shall coordinate and supervise all temporary traffic controls required. The Contractor shall be responsible for maintenance, control and safeguarding of vehicular and pedestrian traffic within and immediately abutting the work area in accordance with City Standards.

Where the City is the primary work force at a worksite, the City will be responsible for maintenance, control and safeguarding of vehicular and pedestrian traffic within and

immediately abutting the work area in accordance with City Standards and on all detours that are not within the work area, at no cost to the Contractor.

12600-5 Trenching, Boring & Backfill

Trenches/boring shall be performed to result in a straight line between termination points as shown on the drawings, and as per the current City of Saskatoon Standard Drawing 102-0016-032 available on the City's web site. Trenches will be 150mm to 200mm in width and trenched to 1 metre below finished grade when under a roadway, and 750mm below grade when installed behind sidewalks or curbs. Trenching will only be permitted with the approval of the Engineer.

5.1 Trenching in Existing Roadway

Trenches in existing roadways shall be backfilled with fillcrete or 20MPa concrete. Backfill shall extend to 100mm below existing asphalt to allow for hot mix asphalt to be placed matching the existing roadway. Patching shall be performed by City staff and will be coordinated through the Engineer.

Measurement and payment for roadway trenching and backfill will be on a unit price bases per linear metre excavated, and will include all material, labour and equipment required to excavate to 1 metre below finished grade, remove and dispose of surplus material, and provide 20MPa concrete backfill after conduit has been installed.

5.2 Trenching in Unpaved Roadway

Trenches located within a roadway structure through earth or granular materials prior to asphalt placement shall be backfilled with base aggregate as per Section 03001-3.2.2 available on the City's web site. This material shall be compacted to 98% of Standard Proctor Density using mechanical compacting equipment.

Measurement and payment for trenching in unpaved roadway shall be at unit price per lineal metre excavated, and will include all material, labour and equipment required to excavate to 1 metre below finished grade, remove and dispose of surplus material, and provide granular backfill after conduit has been installed.

5.3 Trenching in Natural Ground

Natural ground is defined as any area that will be finished with topsoil, typically located behind sidewalks, curbs, or in medians. Trenches in uncovered ground shall be backfilled with similar material as removed from the trench, compacted to meet the surrounding soil density.

Measurement and payment for trenching in natural ground shall be at unit price per lineal metre excavated, and will include all material, labour and equipment required to excavate to 750mm below finished grade, remove and dispose of surplus material, and backfill after conduit has been installed.

5.4 Boring

Boring shall be defined as any method of creating a void in the in-situ material without disturbing the surface and includes directional boring and auguring. Boring shall be performed from a sufficient distance away from any existing or future structure or roadway as not to cause damage to that structure. The boring depth shall meet the same depth specifications for trenching. Any excavation required for boring operations shall be backfilled as per the trenching backfill specifications.

Measurement and payment for boring shall be at unit price per lineal metre bored based on hole size (100mm, 200mm, 300mm), and will include all material, labour and equipment required to bore the required hole, remove and dispose of surplus material.

12600-6 Underground Conduit

Underground conduit shall be installed in accordance with the location, size, and number specified on the drawings. All underground conduits shall be 50mm (2") Polyethylene Pipe (HDPE) when trenching or boring. 50mm (2") corrugated, double walled, flex pipe will no longer be supplied for trenching or boring. Flex pipe will only be supplied with adaptors to terminate the conduit into a junction box, pole base, cabinet base, or service pedestal as per the current City of Saskatoon Standard Drawings 102-0016-019, 102-0016-029, 102-0016-033, or 102-0016-034 available on the City's web site. The City of Saskatoon will supply all conduit materials for traffic signal applications unless otherwise stated in the contract documents.

All conduits shall be continuous, without kinks or splices (except when joining polyethylene pipe to corrugated flexible pipe at junction boxes, pole bases, cabinet bases, and service pedestals with a connector supplied by the City) and with minimal deviation from horizontal or vertical alignment between junction boxes. Conduit shall be installed at the bottom of the excavated trench or borehole at the trenching/boring depths specified. When traffic signal conduit and street light conduit are installed in a joint use trench, the uppermost shall always be the street light conduit.

Conduit terminating at a wooden pole shall extend from the ground and contact the pole at the ground surface. The conduit shall terminate one metre above the surface and shall be temporarily strapped to the pole. Conduit terminating on a steel pole or traffic signal cabinet base shall extend 300mm past the surface. Conduit entering precast or cast in place pole bases shall extend through the conduit ports and extend 20mm into the centre opening.

An orange polypropylene twine pull string with a minimum strength of 200 lbs (i.e. Field King 9600, Field King 9000 from the Co-op or equivalent) shall be installed in each conduit. Each duct shall be labelled at both ends to identify the conduit. The pull string (Field King 9600, Field King 9000 from the Co-op or equivalent) shall be taped to the conduit at each end to ensure it cannot be pulled back through the conduit. Each conduit end shall be closed shut with duct tape and/or wooden/plastic plugs to ensure that the interior of the conduit remains free of debris and moisture.

City staff shall inspect and approve all conduits prior to backfilling. All conduit shall be tested to ensure no kinks or blockage exist (with City staff present during testing) by pulling a 25 mm diameter ball through the conduit. The Contractor shall repair any areas that are blocked and repeat the test until the ball can be pulled freely from one conduit end to the other.

Measurement and payment for installation of conduit shall be at unit price per linear metre of each conduit installed and shall include: the pickup from City facilities and delivery to site of conduit; installation of conduit; supply and installation of pull strings, labelling tape and tape for conduit closure; testing of conduit.

12600-7 Junction Boxes

Junction boxes shall be installed in accordance with the location, size, and number specified on the drawings and as per the current City of Saskatoon Standard Drawing

102-0016-019 available on the City's web site. The City of Saskatoon will supply all junction box materials for traffic signal applications unless otherwise stated in a contract.

The junction box shall be placed on 200mm of clean pea gravel, compacted sufficiently to support the junction box and not allow for settlement. Where junction boxes are installed at locations finished with natural ground surface, the top of the box shall be flush with the surrounding surface or proposed ground surface. Where junction boxes are installed at locations finished with concrete surface, the junction box shall have four 100mm x 10mm galvanized bolt and washer anchors installed horizontally through the wall of the box, one on each side; shall be fitted with a galvanized lid; and the lid shall be set level with the proposed concrete elevation prior to concrete being cast. The concrete surrounding the junction box lid shall be shaped to provide a smooth finish without casting the lid into the concrete. Upon concrete curing, the lid shall be easily removed and replaced to the junction box. Conduit entering the junction box shall extend vertically a minimum of 100 mm into the junction box and shall be cut horizontally. The conduit shall be terminated in the centre of the junction box, bound together with a mechanical fastener such as duct tape or zip ties. The surrounding ground surface affected by the installation of the junction box shall be restored to its original condition.

Measurement and payment shall be per unit for each size and type of junction box installed and shall include: the pickup of all necessary material from City facilities and delivery to installation site; removal and installation of concrete or asphalt; excavation, removal and backfill of any material for installation of junction box; supply and installation of clean pea gravel; installation of the anchor bolts for junction box when installed in concrete.

12600-8 Pre-Cast Pole Bases

Pre-cast pole bases shall be installed in the locations specified on the plans and as per the current City of Saskatoon Standard Drawing 102-0016-029 available on the City's web site. The City of Saskatoon will supply all pre-cast pole base materials for traffic signal applications unless otherwise stated in the contract documents.

The excavation for the pole base shall be of sufficient width to allow for the mechanical compaction of the backfill material. All loose material shall be removed from the excavation and backfilled with base aggregate as per Section 03001-3.2.2 available on

the City's web site, and compacted to a minimum 95% Standard Proctor Density. The Contractor shall ensure that the pole bases are installed plumb and level, and that the anchor bolts are aligned with the intended direction of the signal arm. Pole bases shall extend a minimum of 75 mm and maximum 125mm above the final grade of the surrounding or proposed natural ground or concrete surface. A 19mm wooden cover plate shall be installed on each base to prevent moisture and debris from entering. A ground rod shall be installed within the nearest junction box beside each base to an elevation 100mm above the pea gravel. A clamp-on connector, and #6 AWG bare copper ground wire (contractor supplied) shall be attached to the ground rod, and the wire inserted into one of the ports of the pole base through an earth filled excavation. The copper wire (contractor supplied) shall extend past the top of the pole base no less than 0.6m and shall be coiled and stored within the pole base. The surrounding surface affected by the installation of the traffic signal pole base shall be restored to its original condition.

Measurement and payment shall be per unit for each pre-cast pole base installed and shall include: the pickup of all necessary material from City facilities and delivery to installation site; excavation, installation, and backfill of any material for installation of pole base; installation of ground rod; supply and installation of the wooden cover and ground wire.

12600-9 Cast-In Place Cabinet Base

Poured-in-place cabinet bases shall be installed in accordance with the location specified on the drawings. The City of Saskatoon will supply all ground rods and clamps, anchor bolts, and mounting template for traffic signal applications unless otherwise stated in the contract documents.

9.1 Cast-in-Place Cabinet Base in Natural Ground

Where boulevard space allows, the cast-in-place concrete cabinet base will be installed in natural ground in the boulevard as per the current City of Saskatoon Standard Drawing 102-0016-033 available on the City's web site.

The cast-in-place concrete cabinet base in natural ground shall be 1200mm x 1400mm with a minimum thickness of 300mm. The cast-in-place cabinet base shall be placed on 200mm of base aggregate as per Section 03001-3.2.2 available on the City's web site, compacted sufficiently to support the cabinet assembly base and not allow for

settlement. The rear section of the cabinet base shall be the pedestal pad and will be the portion of base closest to the roadway measuring 1200mm x 700mm. The pedestal pad will hold the anchor bolt and mounting template for the cabinet pedestal. The front section of the cabinet base shall be the foot pad and will be the portion of pad furthest from the roadway. The City will supply the required anchor bolts and mounting template for the cabinet pedestal. The template shall be oriented as to center the anchor bolts on the pedestal pad of the concrete base. Conduit terminating in the cabinet base shall be contained within a 300 mm diameter circle in the centre of the pedestal pad section of the controller base. Conduit shall extend a minimum of 50 mm above the upper surface of the base. 2 - 100mm (4") PVC 90 degree long sweep elbows shall be installed to the cabinet junction box and 2 – 50mm (2") ducts shall be installed as per the plan (either both through the cabinet junction box or one to the junction box the other to the service pedestal). A City supplied copper ground rod shall be installed within a 25mm PVC conduit and extend a minimum of 100 mm above the top of the PVC conduit inside the cabinet base. A clamp-on connector and a #6 AWG bare copper ground wire (contractor supplied) shall be attached to the ground rod and extend .6 m above the top of the cabinet base.

Upon completion of the installation of the conduit, ground rod, and anchor bolts, one mat of 10M deformed bars located at 300mm o/c shall be placed to ensure 75mm clearance on top, bottom, and sides, prior to concrete pour. 35MPa alkali resistant concrete shall be placed around the components. The upper surface of the concrete base shall be trowelled to a smooth finish. The surface of the base shall be gently sloped from the centre to the edges to prevent water from collecting on the pedestal base. The edges shall be bevelled to 45 degrees over 25mm. The surrounding ground surface affected as a result of the installation of the base shall be restored to its original condition.

9.2 Cast-in-Place Cabinet Base in Sidewalk

Where boulevard space is too small or nonexistent, the cast-in-place concrete cabinet base will be installed in the sidewalk as per the current City of Saskatoon Standard Drawing 102-0016-038 available on the City's web site.

The cast-in-place concrete cabinet base in sidewalk shall be 600mm x 1200mm with a minimum thickness of 300mm. The cast-in-place cabinet base shall be placed on 200mm of base aggregate as per Section 03001-3.2.2 available on the City's web site,

compacted sufficiently to support the cabinet assembly base and not allow for settlement. The City will supply the required anchor bolts and mounting template for the cabinet pedestal. The template shall be oriented as to center the anchor bolts of the concrete base. Conduit terminating in the cabinet base shall be contained within a 300 mm diameter circle in the centre of the controller base. Conduit shall extend a minimum of 50 mm above the upper surface of the base. 2 - 100mm (4") PVC 90 degree long sweep elbows shall be installed to the cabinet junction box and 2 – 50mm (2") ducts shall be installed as per the plan (either both through the cabinet junction box or one to the junction box the other to the service pedestal). A City supplied copper ground rod shall be installed in conjunction with the conduit and extend a minimum of 100 mm above the top of the PVC conduit inside the cabinet base. A clamp-on connector and a #6 AWG bare copper ground wire (contractor supplied) shall be attached to the ground rod and extend .6 m above the top of the cabinet base.

Upon completion of the installation of the conduit, ground rod, and anchor bolts, one mat of 10M deformed bars located at 300mm o/c shall be placed to ensure 75mm clearance on top, bottom, and sides, prior to concrete pour. 35 MPa alkali resistant concrete shall be placed around the components. The pad is to be pinned into existing sidewalk or pinned for new sidewalk to prevent settling. The upper surface of the concrete base shall be trowelled to a smooth finish. The surface of the base shall be gently sloped from the centre to the edges to prevent water from collecting on the pedestal base. The surrounding ground surface affected as a result of the installation of the base shall be restored to its original condition.

Measurement and payment shall be per unit for each cast-in-place cabinet base installed and shall include: pickup of all necessary material from City facilities and delivery to installation site; removal and installation of concrete or asphalt; excavation, removal and backfill of any material for installation of cast-in-place cabinet base; installation of ground rod; supply and installation of rebar, 25mm PVC conduit and 100mm PVC elbows, concrete, and ground wire.

12600-10 Pre-Cast Cabinet Base (Temporary)

Pre-cast Cabinet Bases shall be installed in accordance with the location specified on the drawing. The City of Saskatoon will supply all materials for pre-cast cabinet base materials for traffic signal applications unless otherwise stated in the contract documents.

The excavation for the cabinet base shall be of sufficient width to allow for mechanical compaction of the backfill material. All loose material shall be removed from the excavation and backfilled with a base aggregate as per Section 03001-3.2.2 available on the City's web site, and compacted to a minimum 95% Standard Proctor density. The Contractor shall ensure that the cabinet base is installed plumb, level, and set to the level specified in the drawings. A 19 mm wooden cover plate shall be installed on the base to prevent moisture and debris from entering the enclosure.

A City supplied copper ground rod shall be installed in the centre of the base and extend a minimum of 100 mm above the surface of the finish ground inside the cabinet base. A clamp – connector and a #6 AWG bare copper ground wire (contractor supplied) shall be attached to the ground rod and extend .6 m above the top of the cabinet base and shall be coiled and stored within.

Measurement and payment for each pre-cast cabinet base installed shall include: the pickup of all necessary material from City Facilities and delivery to the installation site; excavation, removal and backfill of any material for installation of pre-cast cabinet base; installation of the ground rod and clamp; supply and installation of ground wire.

12600-11 Service Pedestals

Service pedestals shall be installed in accordance with the location specified on the drawings, and as per the current City of Saskatoon Standard Drawing

102-0016-034 available on the City's web site. The City of Saskatoon will supply all service pedestal materials for traffic signal applications unless otherwise stated in the contract documents.

The base of the service pedestal shall be buried between 100mm to 150mm into the soil. A ground rod shall be installed in the service pedestal and extend a minimum of 100mm above the pea gravel base. A clamp-on connector and a #6 AWG bare copper ground wire (contractor supplied) shall be attached to the ground rod and extend .6 m above the top of the cabinet base and shall be coiled and stored within. Conduit entering the junction box shall extend vertically a minimum of 100 mm into the service pedestal and shall be cut horizontally. The conduit shall be terminated in the front half of the service pedestal, bound together with a mechanical fastener such as duct tape or zip ties. The surrounding ground surface affected by the installation of the service pedestal shall be restored to its original condition.

Measurement and payment shall be per unit for each service pedestal installed and shall include: the pickup of all necessary materials from City facilities and delivery to installation site; supply and installation of clean pea gravel; excavation, removal and backfill of any material for installation of service pedestal; installation of the ground rod and clamp; supply and installation of ground wire.

End of Specification 12600