National Capital Commission
Commission de la Capitale nationale

Contract Documents
Documents du contrat

COLONEL BY DRIVE
PEDESTRIAN REFUGE ISLAND

RD 5254 – 08

August, 2013

Unit Prices
Colonel By Drive Pedestrian Refuge Island at Hartwell Locks

PAY ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	Earth Excavation and Removals	m^3	425		
2	Partial Depth Asphalt Removal (50 mm)	m^2	800		
3	Rock Excavation	m^3	20		
4	200 mm dia catchbasin leads PVC class SDR 35	m	27		
5	1200 mm dia. Storm maintenance hole per OPSD 701.010	Ea.	1		
6	PCC catchbasin per NCC 850.1	Ea.	2		
7	Connect to existing maintenance hole,sewer	Ea.	2		
8	Concrete Barrier Curb per NCC 210.1	m	396		
9	Concrete Median	m^2	31		
10	Granite Cobbles	m^2	170		
11	Granular A	Tonne	327		
12	Granular B Type II	Tonne	675		
13	Dust Suppression (Calcium Chloride)	kg	500		
14	Hot Mix 12.5mm Level C (PG 58-34)	Tonne	173		
15	Hot Mix 19 mm Level C (PG 58-34)	Tonne	121		
16	Asphalt pathway 12.5 mm level B (PG 58-28)	m^2	94		
17	Pavement Markings and Signage		LUMP SUM		
18	Site Restoration		LUMP SUM		
	SUBTOTAL				

August, 2013

Unit Prices
Colonel By Drive Pedestrian Refuge Island at Hartwell Locks

PAY ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
	ELECTRICAL				
19	50 mm Polymeric PVC rigid duct direct buried	m	120		
20	3 x 100 mm Polymeric PVC rigid duct, concrete encased	m	15		
21	Electrical handhole for streetlighting as per OPSD 2112.02	ea	1		
22	2 X #4 + #8 grd AWG Copper RWU 90 low voltage cable in duct	m	150		
23	Ground Rods with #8 insulated Ground Wire	ea	4		
24	Install NCC Aggregate light post and brackets (direct bury)	ea	4		
25	Supply and install 75W LED luminaires for NCC light poles	ea	4		
26	Miscellaneous works for connection to existing wiring in new manhole		LUMP SUM		
27	Miscellaneous works for connection to Street Lighting Electrical Kiosk		LUMP SUM		
	SUBTOTAL **TOTAL**				

ITEM NO. 1: EARTH EXCAVATION AND REMOVALS, PARTIAL DEPTH ASPHALT REMOVAL

.1 This Lump Sum item consists of the removal of items marked on the removals drawing as noted including removal of:

- curbs
- abandoned services including manholes, handholes, chambers etc.
- plugging abandoned sewers with 25 Mpa concrete
- Asphalt along Colonel By Drive due to trenching operations
- Full Depth Asphalt removal along Colonel By Drive to accommodate refuge Island etc.
- Asphalt paths as noted on contract drawings

This item also includes removal of all other concrete and asphalt required to undertake the complete excavation, trenching and backfill operations for placement of the sewers, concrete encased duct bank and all associated appurtenances including that disturbed or destroyed by the contractor in the undertaking of this project.

.2 Payment at the lump sum price for this item shall be full compensation for all labour and equipment to:

.1 Saw cut an even edge between the pavement/sidewalk/curb being removed and the pavement/sidewalk to remain.

.2 Remove and dispose of the asphalt, curb, concrete, and materials to waste areas, provided by the contractor at his own expense.

ITEM NO. 2: PARTIAL DEPTH ASPHALT REMOVAL

.1 This unit price item consists of partial depth asphalt removal by dry grinding.

.2 Measurement for payment for partial depth asphalt removal shall be in square metres based on total area partial depth asphalt removal (50 mm depth) as noted on drawings and approved by the Construction Administrator.

ITEM NO. 3: ROCK EXCAVATION FOR SEWER, AND DUCT BANK

.1 This unit price item consists of rock excavation within the storm sewer and duct bank trenchs, including associated structures and disposal of excess materials off site.

.2 Rock removal shall be undertaken by mechanical means only. Explosives will not be permitted.

.3 Measurement for payment for rock removal shall be in cubic metres based on depth of rock times trench width both of which are described as follows:

.1 Depth; Sewers, & Water Pressure Pipe — the difference in height between the upper limit of the rock and theoretical bottom of pipe bedding.

Duct Bank — The difference in height between the upper limit of rock and the theoretical bottom of duct bank.

The upper limit of the rock surfaces is measured after removal of overburden but before rock excavation or the top of shatter, whichever is lower. Alternatively, the upper limit of rock excavation may be established after excavation from the rock surface elevations on both sides of the trench.

.2 Theoretical trench Width; Diameter width of the pipe/duct bank plus 300 mm. on each side of the pipe/duct bank.

.3 Manholes < 1000 mm deep: width will be increased by the width of the Manhole i.e.: 1200 mm. wide plus 300 mm. each side

.4 Manholes/Chambers > 1000mm deep: width will be increased by the width of the manhole i.e.: 1200 mm. wide (varies) plus 800 mm. each side

.4 Payment at the unit price for this item shall be full compensation for all the labour, equipment and materials, disposal of excess materials off site to undertake rock removal. No payment will be made for rock removal in excess of the theoretical trench dimensions as described above. All other works related to rock removal shall be deemed inclusive in the unit price of this item.

ITEM NO 4 200 MM CATCHBASIN LEADS

.1 This item consists of the supply and installation of the 200 mm dia. PVC catchbasin leads as indicated on the drawings.

.2 Measurement for Payment: per meter of installed sewer pipe.

.3 Payment at the contract unit price per meter of installed pipe entered under the appropriate item shall be full compensation for providing all labour, equipment and materials for earth excavation; dewatering; supplying and installing the pipe; providing bedding and cover, backfilling, disposal of excess excavated material; and for all other work necessary to complete the works as specified.

ITEM NO 5 & 6: MAINTENANCE HOLES AND CATCHBASINS

.1 These items consist of supply and placing of maintenance holes and catchbasins, inclusive of excavation, trenching, bedding, backfill; and other operations necessary to provide for a complete and neat job.

.2 Payment at the Contract price per each type of structure installed shall be full

compensation for providing all labour, equipment and materials required: for all excavation (except rock excavation) regardless of the type and depth of the material encountered; for the hauling and disposal of surplus excavated materials; for the placing and compacting of granular bedding; for the placing and compacting of backfill materials, and Granular A surround, for the supply and installation of the frame and grate or frame and cover; for the placing of concrete bed and pre-cast concrete adjustment units; for placing the cast in situ concrete ring where installations occur in flexible pavement; for placing and maintaining filter fabric in frames an covers until project completions; and for all other work necessary to complete the structure in accordance with the Contract requirements.

.3 Payment for rock excavation required is deemed to be included in the unit price bid for rock excavation.

ITEM NO 7: BREAK INTO EXISTING MAINTENAMCE HOLES, SEWERS

.1 This item consists of breaking in and connecting to existing sewers in locations as indicated on the contract drawings. For the purposes of measurement for payment. “existing” means structures not part of new construction under this contract.

.2 Payment for this unit price item (each) shall be full compensation for all labour, materials and equipment to complete the work as specified.

ITEM NO 8: CONCRETE CURB (ALL TYPES)

.1 This unit price item consists of the construction of concrete curb (including gutter, if existing) to match existing as indicated and in the contract documents.

.2 Concrete curb will be measured in place in metres.

.3 Payment at the contract unit price for this item shall be full compensation for all labour, equipment and material, except as othewise provided in the contract documents to do the following work: supply and place and compact granular A base; construct new concrete curb inclusive of any handicap ramps or depressions as directed by the Engineer, cure and protect concrete, and all other work necessary to complete the work as specified herein.

.4 Replacement of concrete curb not designated for removal but damaged by the Contractor will not be measured for payment unless approved in advance by the Engineer.

ITEM NO 9: CONCRETE MEDIAN

.1 This unit price item consists of the construction of concrete medians as indicated in the contract drawings. Median works include depressed medians at the pedestrian crossing and adjacent to depressed curbs as noted on drawings or as otherwise directed by contract administrator. Depressed median for the pedestrian crossing shall include full depth expansion joints at grade transitions,

.2 Concrete median will be measured in place in square metres.

.3 Payment at the contract unit price for this item shall be full compensation for all labour, equipment and material, except as othewise provided in the contract documents to do the following work: supply and place and compact granular A base; construct new concrete curb inclusive of any handicap ramps or depressions as directed by the Engineer, cure and protect concrete, and all other work necessary to complete the work as specified herein.

.4 Replacement of concrete curb not designated for removal but damaged by the Contractor will not be measured for payment unless approved in advance by the Engineer.

ITEM NO 10: GRANITE COBBLES

.1 This unit price item is for the supply and placement and compaction of 100 mm. Granular A and 50 mm of stone dust for the cobble base and for the placement of granite cobbles supplied by the NCC as directed by the Engineer. Contractor shall cut granite cobbles as required to provide a clean and neat job and to the satisfaction of the Engineer.

.2 Payment at the unit price measured in square metres for this item shall be full compensation for all labour, equipment and material required to supply, place and compact Granular A and stone dust and to place granite cobbles.

ITEM NO 11: GRANULAR A

.1 This unit price item is for the supply, placement and compaction of 150 mm. Granular A for the road base and as directed by the Engineer.

.2 Payment at the unit price measured in ton’s for this item shall be full compensation for all labour, equipment and material required to supply, place and compact Granular A inclusive of water for compaction.

ITEM NO 12: GRANULAR B TYPE II

.1 This unit price item is for the supply, placement and compaction of Granular B Type II to the road subbase as indicated in the contract drawings or as directed by the Engineer.

.2 Payment at the unit price measured in tons for this item shall be full compensation for all labour, equipment and material required to supply, place and compact Granular B inclusive of water for compaction.

ITEM NO 13: DUST SUPPRESSION

.1 This unit price item is for the supply and placement of Calcium Chloride as directed by the Engineer at a rate sufficient to minimize discomfort of the residents and visitors to the site.

.2 Payment for this item at the unit price shall be full compensation for all labour, equipment and materials to complete the work as specified.

ITEMS NO 14 & 15 & 16
HOT MIX SUPERPAVE ASPHALT 12.5 MM LEVEL C (PG 58-34)/ HOT MIX SUPERPAVE ASPHALT 19 MM LEVEL C (PG 58-34)/ ASPHALT PATHWAY 12.5 MM LEVEL B (PG 58-28)

.1 These unit price items are for the supply and placement of performance graded (PG 58-34) Hot Mix Asphalt (12.5mm and 19mm) to the depths and extent as indicated in the contract drawings and as directed by the Engineer and shall include all materials, supply, placement and labour related to these items.

.2 These items also includes the use of tack coating with an asphalt emulsion approved of by the engineer against all surfaces other than granular (and new asphalt binder course) that the asphalt is to come in contact with.

.3 Payment at the unit price measured in Tons for these items shall be full compensation for all labour, equipment and material required to prepare receiving surface, supply, place and compact Hot Mix asphalt to City of Ottawa Standards.

ITEM NO 17: PAVEMENT MARKINGS AND SIGNAGE

.1 This lump sum item includes all the supply and placement of pavement markings and signage as noted on contract drawings. The contractor is to install NCC provided NCC provided signage and posts as noted on contract drawings.

ITEM NO 18: SITE RESTORATION

.1 This lump sum item includes all reinstatement works and consists of restoration of grounds to original condition after installation of refuge islands and road widening, manholes, street lights and duct bank and all other works as identified on drawings but not identified with a separate contract pay item. This is inclusive of temporary path relocations (supply place and removal and reinstatement, temporary fencing removals any other works in this area disturbed by the contractor and as directed by the Engineer.

.2 Asphalt that in the opinion of the Engineer has been damaged by the Contractors forces in the undertaking of this construction contract shall be removed and replaced to match existing thickness and grades as directed by the engineer. All

associated costs will be borne by the contractor and shall be deemed to be included under this Lump Sum item.

.3 Topsoil and sod reinstatement consists of:

.1 Fine grading all areas to be reinstated with topsoil and sod to receive 100 mm. of topsoil and sod to match existing contours and grades.

.2 Supply and place 100 mm. of topsoil (after light compaction) and sod to all turf areas that have been excavated and otherwise adversely affected by the Contractors operations in undertaking this contract.

.4 Payment for this lump sum item shall be full compensation for all labour, materials and equipment to complete the work as specified. It includes topsoil and sod in all grassed areas effected. This item includes reinstatement of all areas (hard or soft surface) which have been damaged during the contractors work operations inclusive of temporary path relocation (supply placement, removal and reinstatement including pedestrian fencing. The contractor shall restore the site to original or better condition. Aeration of adjacent and “traveled” turf, All fertilizing, soil amendments, watering and warrantee are also included in the lump sum price.

ITEM NO 19: 50 MM. POLYMERIC PVC RIGID DUCT DIRECT BURRIED

.1 This unit price item consists of the supply and placement of direct bury electrical ducts inclusive of trenching, bedding, ducts, pull-ropes, yellow warning tape, backfill, and other operations necessary to provide for a complete and clean job.

.2 Measurement for 50mm direct buried duct will be per linear metre.

.3 Payment at the contract unit price for duct under the appropriate item shall be full compensation for providing all labour, equipment and materials for; earth excavation, regardless of material encountered, unwatering, sheathing and shoring, supplying and installing the pipe, pull ropes, capping of pipes for future connections, supplying, placing and compacting the cover material and backfill, native or granular as specified, disposal of excess excavated material and for all other work necessary to complete the duct work as specified.

.4 Payment for rock excavation required and road reinstatement shall be paid for under the applicable items.

ITEM NO 20: 3 X 100 MM. CONCRETE ENCASED POLYMERIC PVC DUCT BANK

.1 This unit price item consists of the supply and placement of concrete encased electrical duct bank inclusive of trenching, bedding, ducts, spacers, reinforcing steel, formwork, cast in place concrete, pull-ropes, yellow warning tape, backfill, and other operations necessary to provide for a complete and clean job.

.2 Measurement for 3 x 100 concrete encased duct bank will be per linear metre.

.3 Payment at the contract unit price for concrete encased duct bank under the appropriate item shall be full compensation for providing all labour, equipment and materials for; earth excavation, regardless of material encountered, unwatering, sheathing and shoring, supplying and installing the pipe, reinforcing steel and concrete for encasement, pull ropes, capping of pipes for future connections, supplying, placing and compacting the cover material and backfill, native or granular as specified, disposal of excess excavated material and for all other work necessary to complete the duct bank as specified.

.4 Payment for rock excavation required and road reinstatement shall be paid for under the applicable items.

ITEM NO 21: ELECTRICAL HANDHOLE FOR STREETLIGHTING PER OPSD 2112.02

.1 This item consist of supply and placing of electrical handhole, inclusive of excavation, trenching, bedding, backfill; and other operations necessary to provide for a complete and neat job.

.2 Payment at the Contract price per each type of structure installed shall be full compensation for providing all labour, equipment and materials required: for all excavation (except rock excavation) regardless of the type and depth of the material encountered; for the hauling and disposal of surplus excavated materials; for the placing and compacting of granular bedding; for the placing and compacting of backfill materials, and Granular A surround, for the supply and installation of the frame and grate or frame and cover; for placing and maintaining filter fabric in frames an covers until project completions; and for all other work necessary to complete the structure in accordance with the Contract requirements.

.3 Payment for rock excavation required is deemed to be included in the unit price bid for rock excavation.

ITEM NO 22 & 23: CABLE IN DUCT & GROUND RODS

.1 These unit price items are for the supply, installation, and testing of wiring between electrical cabinet and light standards, including new ground rods.

.2 Measurement for payment for Cable in Duct is in linear metres measured horizontally.

.3 Measurement for payment of ground rods is per each ground rod.

.4 Payment at the unit prices shall be deemed full compensation for all labour, equipment, materials and all other work necessary to complete the work as specified herein.

ITEM NO 24: INSTALL NCC AGGREGATE LIGHT POST AND BRACKETS (DIRECT BURY)

.1 This unit price item is for the installation of NCC supplied aggregate light post and bracket, including the transportation of materials from NCC warehouse to site.

.2 Payment at the unit price shall be deemed full compensation for all labour, equipment, materials and all other work necessary to complete the work as specified herein.

ITEM NO 25: SUPPLY AND INSTALL 75W LED LUMINAIRES FOR NCC LIGHT POLES)

.1 This unit price item is for the supply, installation, wiring and testing of 75W LED luminaires for NCC light poles and interconnecting wiring and conduit to electrical power supply.

.2 Payment at the unit price price for each 75 W LED luminaire installed shall be deemed full compensation for all labour, equipment, materials and all other work necessary to complete the work as specified herein.

ITEM NO 26: MISCELLANEOUS WORKS FOR CONNECTION TO EXISTING WIRING IN NEW MANHOLE

.1 This Lump sum item is identified to de-energize of existing 240V breaker in existing NCC cabinet and re-energize the existing 240V breaker to allow for new electrical modifications to suit new street lighting.

.2 Payment at the lump sum price shall be deemed full compensation for all labour, equipment, materials and all other work necessary to complete the work as specified herein.

ITEM NO 27: ELECTRICAL WIRING TO LIGHT STANDARDS

.1 This lump sum item is for the supply, installation, and splicing of wiring between new manhole and light standards.

.2 Payment at the Lump Sum price price shall be deemed full compensation for all labour, equipment, materials and all other work necessary to complete the work as specified herein.

END OF SECTION

1 DESCRIPTION OF WORK

.1 Work under this Contract covers :

- Installation of a pedestrian refuge island on Colonel By Drive in the vicinity of Hartwell Locks and Carleton University pedestrian crossing inclusive of curbs, concrete bullnoses and granite cobbles.
- Widening of Colonel By Drive to accommodate the pedestrian refuge island, shared use lanes and tapers inclusive of road granulars, curbs and hot mix asphalt.
- Installation of new catchbasins and leads connecting to adjacent storm sewer.
- Street lights and associated conduit and wiring, and electrical handhole. Poles (only) shall be supplied by NCC.
- Other miscellaneous works.
- All removals and reinstatement in kind associated with the above works.

2 CODES

.1 Perform work in accordance with National Building Code of Canada (NBC) and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.

.2 Meet or exceed requirements of:

.1 contract documents,

.2 specified standards, codes and referenced documents.

3 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each of following:

.1 Contract drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed shop drawings.

.5 Change orders.

.6 Other modifications to Contract.

.7 Field test reports.

.8 Copy of approved work schedule.

.9 Manufacturers' installation and application instructions.

.10 Copy of approved on-site traffic and equipment operation plan

4 WORKMANSHIP

.1 It is a requirement of this contract, that qualified tradesmen execute each type of work specified.

.2 Example: Landscape Contractor for landscape work, mason for masonry work, etc.

.3 Work unsatisfactorily completed by unqualified tradesmen shall be redone and paid for by the Contractor.

5 SITE CONDITIONS

.1 No geotechnical or borehole data is available for this project.

6 SITE VISIT

.1 Parties intending to submit tenders on the work must visit the site and obtain for themselves all information pertaining to existing conditions affecting the proper execution and completion of the work. Date of the site visit will be confirmed during the tendering stage. The submission of a tender shall be deemed as proof that the tenderer and his subtrades have complied with this requirement. Claims for additional compensation will not be entertained for any items of labour or material required to complete the work that could have been reasonably ascertained by a Site Examination.

7 PAYMENT

.1 Any minor or miscellaneous items indicated on the drawing as being part of the work of this contract and for which there are no specific pay items listed on the unit price table must be included by the Contractor in his overhead and indirect charges and incorporated into the unit prices which are listed on the unit price table.

.2 No separate payment will be made for work performed in respect to any of the special provisions for which there is no specific pay item on the unit price table. The cost of these works must be appropriated among, and included in, the unit prices bid for the pay items listed.

.3 Included in the unit prices bid for the respective items shall be, in addition to the actual cost of construction, all other items of work required to complete the contract to the extent indicated on the drawings and specified herein.

.4 Measurement for Payment

.1 Notify Engineer sufficiently in advance of operations to permit required measurements for payment.

8 CONTRACTOR'S USE OF SITE

.1 Use of site: exclusive and complete within the construction area as defined in the contract drawings for execution of work except as follows:

.1 Contractor may not operate any equipment outside of the limits of work area as identified in the contract drawings.

.2 Vehicle access to site is limited to Colonel By Drive.

.3 The contractor shall maintain pedestrian movements between Hartwell Locks/NCC pathway and Carleton University at all times and shall provide temporary path relocation (granular A hard surface) as required and at the direction of the Contract Administrator to provide suitable access. Utilization of steel pedestrian barricades shall be provided as necessary to provide suitable separation of pedestrians from construction activities.

.4 All trenches shall be closed up daily prior to shutdown to permit vehicle access.

.2 Areas for work and storage:

.1 No material, equipment or vehicles shall be stored/parked on lands other than NCC land.

.2 Work and storage area shall be limited. The contractor shall coordinate with the NCC to identify an acceptable location.

.3 All areas used for work and storage shall be maintained by the contractor and any asphalt, sod, pavers, curbs, trees, etc that are damaged due to the contractors use of the area shall be repaired/ reinstated at the contractors cost.

9 PROJECT MEETINGS

.1 The Engineer will arrange project meetings and assume responsibility for setting times and recording and distributing minutes. The contractor shall be obligated to attend all meetings at no additional cost.

10 SETTING OUT OF WORK

.1 Prior to commencement of work only, and not afterwards, the Engineer will provide two survey control points.

.2 Contractor shall set grades and lay out work in detail from control established by the Engineer.

.3 Contractor shall assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.4 Contractor shall provide devices needed to lay out and construct work.

.5 Contractor shall supply such devices as straight edges and templates required to facilitate Engineer's inspection of work.

.6 Contractor shall supply stakes and other survey markers required for laying out work.

11 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Engineer of impending installation and obtain his approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Engineer.

12 CUTTING, FITTING AND PATCHING

.1 Execute cutting (including excavation), fitting and patch as required to make work fit properly.

.2 Make cuts straight, with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.3 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

13 EXISTING SERVICES

.1 Where work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.

.2 Before commencing work, establish location and extent of all service lines in area of Work and notify Engineer of findings.

.3 Submit schedule to and obtain approval from Engineer for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.4 Where unknown services are encountered immediately advise Engineer and confirm findings in writing.

.5 Remove abandoned service lines within 2 m of new structures. Cap or otherwise seal lines at cut-off points as directed by Engineer.

.6 Record locations of maintained, re-routed and abandoned service lines.

14 ADDITIONAL DRAWINGS

.1 Engineer may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in Contract documents.

15 RELICS AND ANTIQUITIES

.1 Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.

.2 Give immediate notice to Engineer and await Engineer's written instructions before proceeding with work in this area.

.3 Relics, antiquities and items of historical or scientific interest remain her Majesty's property.

16 SCHEDULING OF WORK AND RESTRICTIONS:

.1 Provide in form acceptable to Engineer, within 5 working days after Contract award, schedule showing dates for:
- .1 Submission of shop drawings, material lists and samples.
- .2 Commencement and completion of work of each Section of Specification.
- .3 Final completion date within time period required by Contract documents.

.2 Interim reviews of work progress based on work schedule will be conducted as decided by Engineer and schedule updated by Contractor in conjunction with and to approval of Engineer.

.3 The contractor shall submit to the Engineer a proposed monthly cash flow chart identifying price breakdown per trade for review and acceptance by the Engineer prior to commencement of the work.

.4 The contractor shall update the schedule as requested by the Engineer. The contractor shall adhere to the approved schedule and cash flow charts.

.5 The contractor shall schedule the work activities to minimize any disruption to the existing building occupants and their operations. Disruptive work activities and their scheduling shall be done in co-ordination with the Engineer. The contractor shall coordinate commencement of work on site in a manner that material delivery will not hold up the construction process.

.6 Shop drawing submittal: To accommodate long delivery dates on specific items, contractor shall submit shop drawings of such long delivery items within 5 days of receipt of letter of intent to award from the Owner. Refer to section 01340 Shop Drawings, Product Data, Samples and Mock-Ups.

.7 **Scheduling Constraints:**

.1 Standard authorized hours of work are Monday to Friday, 07:00 hours to 18:00 hours. Obtain prior permission through Engineer for work outside of the standard authorized time frame. Assume any extra costs for labour, material or equipment associated with work performed outside of the standard time frame unless specifically requested (in writing) by the Engineer.

.2 Peak traffic hours: Maintain one full lane in each direction at all times during peak traffic hours defined as follows: 07:00 to 09:00 and 15:30 to 17:30 hours.

17 DAMAGES:

.1 Existing plant material, landscaping, roadways, pathways, structures, finishes and public utilities damaged during the execution of the work of this contract, will be restored to their original condition, replaced, or adequate compensation made to affected parties by the contractor as directed by the contract administrator.

.2 It is understood that restored or replaced work includes labour, equipment and material costs.

18 PERMITS AND BY-LAWS:

.1 The Contractor shall make himself fully acquainted with all Provincial, Local and other by-laws relating to the work of this contract, as he will be required to comply with such by-laws without extra compensation of any nature.

.2 Obtain and pay for permits, factory inspector's approval, and other licenses required for this project and also pay any other charges incidental to such permits.

19 WEIGHING OF MATERIALS:

.1 Unit Price Items, measured by the tonne for payment purposes, must be accompanied by delivery tickets issued by the supplier of the material, indicating what type of material and net weight in tonnes. Upon arrival at the site and before off loading, the loads must be approved and delivery ticket signed by the commissions on site representative. A duplicate copy of the signed ticket will be retained by the commission's representative, the original of which shall be retained by the contractor for submission with invoices at the time of payment.

.2 Weight shown on the delivery ticket must be the net weight of the materials only as weighed on a scale, which is tested and approved by the weight inspectors of the Government of Canada at least once per year. The Engineer retains the right to require the Contractor to provide on-site scales without additional charge to the Commission if, in his opinion, he considers the method being followed

unsatisfactory.

20 ADDENDAS

.1 Answers to questions directed to the Engineer, and any amendments to the drawings and specifications during the tender period will be communicated in the Form of Addenda to all General Contractors tendering. Such Addenda to be considered as and read as part of the specifications, and thereby included in the Contract Documents.

21 COORDINATION

.1 Co-ordinate operations of those involved in the work so that it progresses effectively and efficiently.

.2 Contractor shall notify and get approval from the NCC Representative to work during non-normal working hours.

.3 Ensure, before any trade or operation starts, that preceding or preparatory work is completed, and that conditions are appropriate to receive work of such trade or operation.

.4 Ensure that sub-contractors provide properly qualified superintendents on site to supervise trades involved in work. Do not permit change of personnel, except when approved.

22 ENVIRONMENTAL EMERGENCY PLAN

.1 The contractor shall have an Environmental Emergency Plan in place.

An Environmental Emergency Plan is required in view of accidental events that could degrade the environment. This Plan must identify such things as the site's designated equipment maintenance areas (ie. refueling, oil changes, lubrication, cleaning) and hazardous materials storage area, which must be at least 30 metres from any watercourse. Properly constructed and maintained spill pans and tarps will be required for all machinery and storage tanks utilized. The contractor must have a spill kit on-site at all times. In the event of an accidental spill of fuel or other pollutant, the Contractor will immediately advise the NCC Emergency Service at 239-5353.

23 GUARANTEES AND WARRANTIES

.1 Before completion of work, collect all manufacturer's guarantees and warranties, and deposit to NCC Representative.

24 OPERATIONS AND MAINTENANCE

.1 Include the following information plus data specified:
- .1 maintenance instructions;
- .2 copy of hardware and paint schedules;
- .3 description: operation of the equipment;
- .4 guarantees, warranties, and bonds showing:
  - .1 name and address of project;
  - .2 guarantee commencement date (date of Final Certificate of Completion);
  - .3 duration of Guarantee;
  - .4 clear indication of what is being guaranteed and what remedial action will be taken under guarantee;
  - .5 signature and seal of contractor.

END OF SECTION

1 GENERAL

.1 This section specifies general requirements and procedures for contractors submissions of shop drawings, product data, samples and mock- ups to Engineer for review. Additional specific requirements for submissions are specified in individual sections of Divisions 2 to 16.

.2 Do not proceed with work until relevant submissions are reviewed by Engineer.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submissions.

.6 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer's review of submission, unless Engineer gives written acceptance of specific deviations.

.8 Make any changes in submissions which Engineer may require consistent with Contract Documents and resubmit as directed by Engineer.

.9 Notify Engineer, in writing, when resubmitting, of any revisions other than those requested by Engineer.

2 SUBMISSION REQUIREMENTS

.1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.

.2 Allow 5 days for Engineers review of each submission.

.3 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.4 Submissions shall include:
- .1 Date and revision dates.

.2 Project title and number.
.3 Name and address of:
  .1 Subcontractor.
  .2 Supplier.
  .3 Manufacturer.

.4 Contractor's stamp, signed by Contractors authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

.5 Details of appropriate portions of Work as applicable:
  .1 Fabrication
  .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  .3 Setting or erection details.
  .4 Capacities.
  .5 Performance characteristics.
  .6 Standards.
  .7 Operating weight.
  .8 Wiring diagrams.
  .9 Single line and schematic diagrams.
  .10 Relationship to adjacent work.

.5 After Engineer's review, distribute copies.

3 SHOP DRAWINGS

.1 Shop drawings: original drawings, or modified standard drawings provided by Contractor, to illustrate details of portions of Work, which are specific to project requirements.

.2 Maximum sheet size: 595 x 840 mm.

.3 Submit shop drawings as follows:

  .1 opaque diazo prints [number Contractor requires for distribution plus 3 copies which will be retained by Engineer].

  .2 Digital (PDF) submissions for 11” X 17” drawings and smaller are acceptable. Larger drawings must be submitted in hard copy.

.4 Cross-reference shop drawing information to applicable portions of Contract Documents.

4 PRODUCT DATA

.1 Product data: manufacturers catalogue sheets, brochures, literature,

performance charts and diagrams, used to illustrate standard manufactured products.

.2 Submit 3 copies of product data.

.3 Sheet size: 215 x 280 mm, maximum of 3 modules.

.4 Delete information not applicable to project.

.5 Supplement standard information to provide details applicable to project.

.6 Cross-reference product data information to applicable portions of Contract Documents.

5 SAMPLES

.1 Samples: examples of materials, equipment, quality, finishes, workmanship.

.2 Where colour, pattern or texture is criterion, submit full range of samples.

.3 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

6 MOCK-UPS

.1 Mock-ups: field-erected example of work complete with specified materials and workmanship.

.2 Erect mock-ups at locations acceptable to Engineer.

.3 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.

7 SHOP DRAWINGS REVIEW

.1 The review of shop drawings by the National Capital Commission is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that the National Capital Commission approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.

END OF SECTION

1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

.1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Engineer are specified under various sections.

2 APPOINTMENT AND PAYMENT

.1 Engineer will appoint and pay for services of testing laboratory except for the following:

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
- .4 Mill tests and certificates of compliance.
- .5 Tests specified to be carried out by Contractor under the supervision of Engineer.
- .6 Additional tests specified in paragraph 2.2.

.2 Where tests or inspections by designated testing laboratory reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests or inspections as Engineer may require to verify acceptability of corrected work.

3 CONTRACTOR'S RESPONSIBILITIES

.1 Furnish labour and facilities to:

- .1 Provide access to work to be inspected and tested;
- .2 Facilitate inspections and tests;
- .3 Make good work disturbed by inspection and test;
- .4 Provide storage on site for laboratory's exclusive use for storage of equipment and cure test samples.

.2 Notify Engineer sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Engineer.

END OF SECTION

1 ACCESS

.1 Provide and maintain adequate access to project site.

.2 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads. Clean access roads (sweep/flush as necessary) at the end of each day or as directed by the Engineer.

2 STORAGE SHEDS

.1 Provide adequate weather tight sheds with raised floors, for storage of materials, tools and equipment that are subject to damage by weather.

3 SANITARY FACILITIES

.1 Contractor to provide private washroom facilities complete with flush or chemical type toilet, lavatory and mirror and maintain supply of paper towels and toilet tissue.

.2 Maintain in clean condition.

4 TEMPORARY FENCING OF WORK AREA

.1 The contractor shall erect and maintain black snow fencing around the perimeter of the working areas adjacent to Colonel By Drive works or as directed by the Engineer.
The existing pedestrian pathway or temporary pathway shall be separated from construction activities with steel pedestrian fencing.

5 REMOVAL OF TEMPORARY FACILITIES

.1 Remove temporary facilities from site when directed by Engineer.

END OF SECTION

1 FIRES

.1 Fires and burning of rubbish on site not permitted.

2 DISPOSAL OF WASTES

.1 Do not bury rubbish and waste materials on site unless approved by Engineer.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

3 DRAINAGE

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Contractor to apply for and receive a permit to take water from the Ontario Ministry of Environment (MOE).

.3 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local MOE requirements.

4 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties where indicated.

.2 Install construction fencing per contract drawings prior to commencement of construction and as described below:

.1 Black plastic snow fencing 1.25 m. high

.2 Metal “T” bar stakes spaced every 2.4 metres or as required to keep fence stable and secure within the shallow soil condition

.3 Be prepared to relocate fence to accommodate temporary pedestrian by-pass as directed by the engineer.

.4 Maintain the fence during the entire construction period, until machinery is no longer on site.

.2 Protect roots of designated trees to drip line during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.3 Minimize stripping of topsoil and vegetation.

.4 Restrict tree and shrub removal to areas indicated or designated by Engineer. Obtain confirmation from the Engineer of all trees and shrubs to be removed prior to removal.

5 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

6 SPILLS REPORTING

.1 Be financially responsible to ameliorate the adverse effects of a spill. The discharger is expected to contain and clean up the spilled contaminant or arrange for the contaminant to be contained and cleaned up. He is also expected to restore the spill site to essentially pre-spill conditions where this can reasonably be expected. To achieve this, the discharger may have to remove the contaminated soil and debris and dispose of these materials in an acceptable manner at an approved disposal site.

.2 The person in charge of a pollutant, at the time of a spill, is considered to have taken a foreseeable risk for which he can prepare himself.

.3 Prior to commencing construction, the Contractor is to prepare and submit for approval a contingency plan for the control and clean up of a spill. Said submission must adhere to the requirements and regulations of the WHMIS (Work Hazardous Material Information System) and shall include the applicable MSDS (Material Safety Data Sheet) for each substance.

.4 Any equipment utilized by the contractor which develops a fluid leak shall be immediately removed from the site by the contractor.

.5 In the event of a spill or other emission of a pollutant into the natural environment, every person responsible for the emission or who causes or permits it must forthwith notify:

.1 The Ministry of the Environment Spills Action Centre (SAC)
Tel: 1-800-268-6060.

.2 The City of Ottawa.

.3 The Owner of the pollutant, if known.

.4 The person having control of the pollutant, if known, of the spill, of the circumstances thereof, and of the action taken or intended to be taken with respect thereto.

7 WATERCOURSE PROTECTION

.1 The Contractor shall ensure that no contamination, waste or other substances which may be detrimental to marine life or quality of water shall enter any watercourse as either a direct or indirect result of construction and the Contractor shall meet the requirements of Government authorities or agencies with respect to environmental protection.

.2 The Contractor shall be prepared to immediately clean up any spills of contamination, waste or other substances which may be either detrimental to marine life or quality of water. In the event of a spill, the Contractor shall immediately commence a clean up operation. The Contractor shall be liable for all damages and/or charges laid which result, either directly or indirectly, from the spill, or contamination of any kind which results from his construction operations.

.3 The Contractor shall exercise reasonable care to ensure that sediment run-off does not enter watercourses. Berms, silt screens and other works, as required, shall be constructed at appropriate locations to ensure that turbidity shall be kept to a minimum as determined by the Government authorities and agencies.

.4 Run-off from construction materials and any stockpiles shall be contained and discharged in a manner that will prevent entry of sediment to watercourses.

.5 Where dewatering is required, effluent shall be discharged in a manner that will prevent entry of sediment to watercourses.

.6 Where the Contractor requires work in watercourses or on the banks of watercourses, operation of equipment within such areas shall be kept to a minimum necessary to perform the specified work and proceed in a continuous manner that will minimize the duration of such work.

.7 The Contractor shall submit a plan indicating how he intends to provide for securing the site against erosion and watercourse siltation problems for the full duration of the construction period, i.e. from start of construction to final completion. The Contractor shall not proceed with excavation of watercourse banks until approval of the sediment control plan is received from the Engineer.

.8 Various concerned Government agencies will likely be on site during construction and the Contractor shall provide easy access and meet the requirements of those agencies without delay.

.9 The Contractor shall immediately clean up and dispose of any floating debris which accumulates on the watercourse bed or banks as a result of construction.

.10 The Contractor shall not make any claim for extra compensation for the cost of fulfilling the obligations set out herein.

END OF SECTION

1 GENERAL

1.1 General Conditions

.1 The requirements of this specification take precedence over the requirements of any other specification for the management and disposal of excess material.

1.2 Section Includes

.1 Requirements for management and disposal of excess materials.

.2 Specific Site Selection Notification and Property Owner's Release forms necessary for certain excess materials handling.

1.3 Related Work

.1 Sections

1.4 Definitions

.1 Bituminous pavement: any combination of asphaltic material and aggregate, excluding asbestos modified asphaltic material.

.2 Concrete: concrete mixtures produced with Portland cement, which may include blended hydraulic cement, supplementary cement materials, spent debris and silica sand abrasive blasting media from abrasive cleaning of concrete and reinforcing steel, concrete brick, block and associated mortar. Can include embedded steel, and excludes asbestos modified Portland cement concrete mixtures.

.3 Disposable fill: excess material, other than that disposed of at a certified disposal site, that is managed in berms and mounds, and as fill, other than in road embankments.

.4 Earth: all soils except those defined as rock, and excludes stone masonry, concrete and other manufactured materials.

.5 Excess material: Material removed as a result of Work outlined in the Contract, for which management is not specified. Includes surplus and unsuitable materials.

.6 Fabricated metal and plastic products: metal and plastic products such as culverts, fence materials, and guide rails. Does not include containers, other packing materials, storage tanks, septic tanks, and ancillary equipment associated with sanitary sewage systems, septic systems, and fuel/lubricant dispensing and storage systems.

.7 Groundwater: subsurface water and water that occurs beneath the water table in soils and rock formations that are fully saturated.

.8 Masonry: clay brick, stone and associated mortar.

.9 Natural wood: stumps, trunks, branches, and debris, from tree and shrub removal, and wood products that are not treated, coated or glued.

.10 Non-Hazardous contaminated material: material identified as unsuitable for re-use on site or unsuitable for disposal as clean fill off-site and must be disposed of as a non hazardous waste at an MOE approved landfill if removed from the site.

.11 Re-use: utilization, processing, re-processing or recycling of excess material into a construction material or other useful product, and management by these means for the Contract and other work.

.12 Rock: natural beds or massive fragments, of the hard, stable, cemented part of the earth=s crust, igneous, metamorphic, or sedimentary in origin, which may or may not be weathered, and includes boulders having a volume of 1 m or greater.

.13 Swamp material: materials within the swamp excavation limits, except those defined as rock, and excludes stone masonry, natural wood and manufactured materials.

.14 Waste: excess material managed by re-use or as disposable fill.

.15 Waterbody: any body of water or watercourse or wetland, or a portion thereof, and excludes ditches other than those functioning as natural watercourses.

1.5 Submission Requirements

.1 Copy of Site Selection Notification form shall be submitted to Engineer when property is to be used for:
- .1 Stockpiling for re-use and for disposable fill.
- .2 Management as disposable fill.

.2 Notification shall be submitted prior to commencement of such work.

.3 After work is complete, copy of Property Owner's Release form shall be provided to Engineer.

.4 Where excess material audit or inventory is imposed by statute, or is condition of the Contract, copy of document shall be provided to Engineer.

2 PRODUCTS

Not applicable

3 EXECUTION

3.1 Construction

.1 Management of excess material shall be as described below:
- .1 Earth, aggregate, swamp material, rock and natural wood: Manage by re-use or disposal off-site.
- .2 Bituminous pavement, concrete, masonry, fabricated metal and plastic products: Manage by disposal off-site.
- .3 Where excess materials are suspected of being contaminated or if types of materials are encountered which are not addressed in this specification, direction on management shall be obtained from Engineer.

.4 Excess material that is mixture of materials shall be disposed of according to most stringent conditions associated with any one of individual constituents.

.5 Excess materials shall be managed using methods which prevent their entry into waterbodies and other sensitive areas. These may be identified in Contract. Exceptions may be made when materials are re-used in accordance with requirements specified elsewhere in Contract.

.6 Notification requirements shall be complied with and approvals, releases, and agreements shall be obtained that are necessary for management of excess material.

.2 Management by-re-use shall be as specified. When not specified, management by re-use shall be outside Commission's property.

.1 Distance separations described in Table 1 do not apply for:

.1 Re-use of excess materials for same purpose.

.2 Re-use of bituminous pavement, concrete and masonry within road right-of-way.

.3 Re-use of concrete as aggregate in bituminous pavement.

.4 Re-use of concrete as rip rap, gabion stone or rock protection in compliance with requirements specified elsewhere in this contract.

.3 Management as disposable fill, within Commission's property and on other property designated in Contract, shall be as specified.

.4 Management by open burning is not permitted.

.5 Stockpiling on the Commission's property and on other property designated in contract shall be as specified, otherwise it shall be outside Commission's property.

.1 Stockpiles of bituminous pavement, concrete and masonry shall be located minimum of 30 m from waterbodies and minimum of 100 m from residences unless:

.1 Stockpiles are located within the road right-of-way or on property with boundary common to right-of-way. Both must be within Contract limits and be for period not exceeding one hundred and twenty calendar days..

.2 Stockpiles are located within provincial or municipal works yards or commercially licensed pit or quarry.

.2 Stockpiling of natural wood is subject to management conditions in Table 1. These conditions only apply to stockpiles to be in place for period exceeding one hundred and twenty calendar days.

TABLE 1: EXCESS MATERIAL MANAGEMENT
DISTANCE SEPARATION REQUIREMENTS

ADJACENT FEATURE	MINIMUM DISTANCE SEPARATION
Groundwater	2 m (above)
Waterbodies	30 m
Water Wells	100 m
Residences	100 m

END OF SECTION

SITE SELECTION NOTIFICATION FOR MANAGEMENT AS DISPOSABLE FILL

Contract Information

Contract No._____ Owner: _____

The following describes the notification process between the National Capital Commission and the Contractor, wherein the Contractor formally notifies the NCC that agreement has been reached with a third party property owner for the deposition of Contract generated excess material. Such excess material, managed as disposable fill shall be limited to one or a combination of: earth; aggregate; swamp material; rock and natural wood, provided the conditions on management are satisfied.

Site Information

Property Owner(s) for the subject property: _____

Site Location: _____

_____

_____

Quantity and Type of Excess Material used as fill: _____

_____

_____

This is to notify the NCC that permission has been obtained from the property owner(s) named herein for the management of excess materials from this Contract. The property owner has also been provided with a copy of this form and has been advised that a Property Owner=s Release Form will be required. The use of this management site will comply with the following:

Conditions on Management

Bituminous pavement, concrete, masonry, and metal, plastic and polystyrene products will not be accepted for management as disposable fill.

These conditions do not supersede any constraints imposed on this property by Federal, Provincial or Municipal statute or regulations and bylaws made thereto.

Dated this_____day of_____19__

_____
Print Contractor=s Name & Field Representative=s Name

_____
Contractor=s Field Representative Signature

_____
Property Owner(s) Signature(s)

cc: Engineer, Property Owner(s), Contractor

SITE SELECTION NOTIFICATION FOR MATERIALS STOCKPILING

Contract Information

Contract No. _____ Owner: _____

The following describes the notification process between the National Capital Commission and the Contractor, wherein the Contractor formally notifies the NCC that agreement has been reached with a third party property owner for the stockpiling of Contract generated excess material. Such excess material, stockpiled for re-use, may be one or a combination of: earth; aggregate; swamp material; rock; concrete; masonry; bituminous pavement; natural wood; metal, plastic and polystyrene, provided the conditions on management are satisfied.

Site Information

Property Owner(s) for the subject property: _____

Site Location: _____

_____

_____

Quantity and Type of Excess Material stockpiled: _____

_____

_____

This is to notify the NCC that permission has been obtained from the property owner(s) named herein for the management of excess materials from this Contract. The property owner has also been provided with a copy of this form and has been advised that a Property Owner=s Release Form will be required. The use of this management site will comply with the following:

Conditions on Management

It is understood that materials are stockpiled to be re-used.

Stockpiles of bituminous pavement, concrete and masonry may only be located:

.1 a minimum of 30 m from waterbodies; and
.2 a minimum of 100 m from residences unless such stockpiles are located within a provincial or municipal works yard or in a commercially licensed pit or quarry.

These conditions do not supersede any constraints imposed on this property by Federal, Provincial or Municipal statute or regulations and bylaws made thereto.

Dated this_____day of_____19__

_____
Print Contractor=s Name & Field Representative=s Name

_____
Contractor=s Field Representative Signature

_____
Property Owner(s) Signature(s)

cc: Engineer, Property Owner(s), Contractor

PROPERTY OWNERS RELEASE

Contract No. _____

Work description: _____

_____

_____

Site Location: _____

_____

_____

I/We _____ being the owner(s) of the above Site, verify that the contractor for the above noted work has placed excess material from the above noted Contract on my/our property with my/our permission. I/We have been advised by the Contractor of the conditions of section 01562 of the specification and have been assured by the contractor that these conditions have been met.

Where materials are managed as disposable fill, I/We agree to be responsible for any subsequent relocation and management of the material so placed.

Dated this_____day of_____19__

_____
Print Contractor=s Name & Field Representative=s Name

_____
Contractor=s Field Representative Signature

_____
Property Owner(s) Signature(s)

cc: Engineer, Property Owner(s), Contractor

1 GENERAL

1.1 REFERENCES

.1 Ontario Traffic Manual (OTM), Book 7, Temporary Conditions, March 2001

1.2 PROTECTION OF PUBLIC TRAFFIC

.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.

.2 When working on traveled way:
- .1 Place equipment in position to present minimum of interference and hazard to travelling public.
- .2 Keep equipment units as close together as working conditions permit and preferably on same side of traveled way.
- .3 Do not leave equipment on traveled way overnight.

.3 Do not close any lanes of road without approval of Engineer and the City of Ottawa. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in Book 7 of the Ontario Traffic Manual.

.4 Keep traveled way graded, free of potholes, and of sufficient width for required number of lanes of traffic.

.5 Provide and maintain road access and egress to property fronting along work under Contract and in other areas as indicated, unless other means of road access exist that meet approval of Engineer.

1.3 INFORMATIONAL AND WARNING DEVICES

.1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which requires road user response.

.2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in Book 7, Temporary Conditions of the Ontario Traffic Manual.

.3 Place signs and other devices in locations recommended in OTM.

.4 Meet with Engineer prior to commencement of work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of Engineer.

.5 Continually maintain traffic control devices in use by:
- .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
- .2 Removing or covering signs which do not apply to conditions existing from day to day.

1.4 CONTROL OF PUBLIC TRAFFIC

.1 Maintain one lane of traffic in each direction at all times. Exception may occur during periods of off peak hour active construction. Peak hours include weekdays (AM) 07:00 to 09:00 and (PM) 15:30 to 17:30. For all exceptions traffic control must be provided as per OTM book 7.

.2 Provide flag persons, trained in accordance with, and properly equipped as specified in, OTM manual in following situations:
- .1 When public traffic is required to pass working vehicles or equipment that block all, or part of traveled roadway.
- .2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
- .3 When workmen or equipment are employed on traveled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
- .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
- .5 For emergency protection when other traffic control devices are not readily available.
- .6 In situations where complete protection for workmen, working equipment and public traffic is not provided by other traffic control devices.

END OF SECTION

1 GENERAL

.1 Use new material and equipment unless otherwise specified.

.2 Within 5 days of written request by Engineer, submit following information for materials and equipment proposed for supply:
- .1 name and address of manufacturer,
- .2 trade name, model and catalogue number,
- .3 performance, descriptive and test data,
- .4 manufacturer's installation or application instructions,
- .5 evidence of arrangements to procure.

.3 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.

2 MANUFACTURERS INSTRUCTIONS

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.2 Notify Engineer in writing of any conflict between these specifications and manufacturers instructions. Engineer will designate which document is to be followed.

3 DELIVERY AND STORAGE

.1 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.

.2 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.

.3 Store material and equipment in accordance with suppliers instructions.

.4 Touch-up damaged factory-finished surfaces to Engineer's satisfaction. Use primer or enamel to match original. Do not paint over name plates.

4 SUBSTITUTION

.1 No substitutions will be permitted without prior written approval of Engineer.

.2 Proposals for substitution may only be submitted after award of contract. Such request must include statements of respective costs of items originally specified and the proposed substitution.

.3 Proposals will be considered by Engineer if:
- .1 materials selected by tenderer from those specified, are not available;

.2 delivery date of materials selected from those materials specified would unduly delay completion of contract, or

.3 alternative material to those specified, which are brought to the attention of and considered by Engineer as equivalent to the material specified and will result in a credit to the Contract amount.

.4 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on project. Pay for design or drawing changes required as result of substitution.

.5 Amounts of all credits arising from approval of substitutions will be determined by Engineer and Contract Price will be reduced accordingly.

5 CONSTRUCTION EQUIPMENT AND PLANT

.1 On request prove to the satisfaction of Engineer that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.

.2 Maintain construction equipment and plant in good operating order.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 RELATED SECTIONS

.1 Section 01340 – Shop Drawings, Product Data, Samples & Mock-ups

.2 Section 02316 - Rock Removal

1.3 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

.2 Province of Ontario

.1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. [1990 as amended 213/91].

1.4 SUBMITTALS

.1 Make submittals in accordance with Section 01340 – Shop Drawings, Product Data, Samples & Mock-ups.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation.

.3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports contract administrator weekly.

.4 Submit copies of reports or directions issued by Federal, and Provincial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit Material Safety Data Sheets (MSDS) to Contract Administrator.

.7 Contract Administrator will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Contract Administrator within 3 days after receipt of comments from Contract Administrator.

.8 Contract Administrator's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.9 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Contract Administrator.

.10 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.

1.5 FILING OF NOTICE

.1 File Notice of Project with Provincial authorities prior to commencement of Work.

1.6 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.7 MEETINGS

.1 Schedule and administer Health and Safety meeting with Contract Administrator prior to commencement of Work.

1.8 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Section Regulatory Requirements.

1.9 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to commencing any site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Contract Administrator may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.10 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Health and Safety Act and Regulations for Construction Projects.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.12 UNFORSEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Ontario having jurisdiction. Advise Contract Administrator verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have minimum 2 years of site-related working experience specific to activities associated with contaminated material (overburden) removal.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work.

1.14 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Ontario having jurisdiction, and in consultation with Contract Administrator.

1.15 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Contract Administrator.

.2 Provide Contract Administrator with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Contract Administrator may stop Work if non-compliance of health and safety regulations is not corrected.

1.16 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.17 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

END OF SECTION

1 RECORD DRAWINGS

.1 Engineer will provide two sets of white prints for record drawing purposes.

.2 Maintain project record drawings and record accurately deviations from Contract documents.

.3 Survey, using Total Station Co-ordinates, all underground utilities and any major deviation of layout of project. This information is to be provided to NCC Survey and Mapping Section on ASCII diskette.

.4 Record changes in red. Mark on one set of prints and at completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to Engineer.

.5 Record following information:

.1 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
.2 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
.3 Field changes of dimension and detail.
.4 Changes made by Change Order or Field Order.

END OF SECTION

1 GENERAL

1.1 Related Sections

.1 Section 02226 - Removal of Existing Asphalt Pavement
.2 Section 02315 - Excavating, Trenching and Backfilling
.3 Section 02316 - Rock Removal

1.2 Storage And Protection

.1 Protect in accordance with Section 02315 - Excavating, Trenching and Backfilling.

.2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Engineer and at no cost to Owner.

2 PRODUCTS Not Used.

3 EXECUTION

3.1 Preparation

.1 Inspect site with Engineer and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

3.2 Sequences Of Operation

.1 Removal

.2 Remove items as indicated.
  .1 Do not disturb items designated to remain in place.
  .2 In removal of pavements, curbs and gutters:
    .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Engineer.
    .2 Protect adjacent joints and load transfer devices.

.3 When removing pipes under existing or future pavement area, excavate at least 150 mm below pipe invert.

.4 Sealing
  .1 Seal pipe ends and walls of manholes or catch basins as indicated using 25 Mpa concrete. Securely plug to form watertight seal.

.5 Disposal of Material

.1 Dispose of materials not designated for salvage or re-use in work, off-site.

.6 Disposal of Non-Hazardous Contaminated Material

1. Dispose of non-hazardous contaminated materials not designated for re-use in work, off-site to an MOE approved landfill for use as daily cover material.

.7 Backfill

.1 Backfill in areas as indicated and in accordance with Section 02315 - Excavating, Trenching and Backfilling.

3.3 Restoration

.1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

3.4 Cleanup

.1 Upon completion of work, remove debris, trim surfaces and leave work site clean.

END OF SECTION

1 GENERAL

1.1 Related Work

.1 Aggregates: General: Section 02701

.2 Concrete Asphalt Paving: Section 02743

1.2 Protection

.1 Protect existing pavement not designated for removal, curbs, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Engineer at no additional cost.

2 PRODUCTS Not applicable to this section.

3 EXECUTION

3.1 Preparation

.1 Prior to commencing removal operation, inspect and verify with Engineer areas, depths and lines of asphalt pavement to be removed.

3.2 Removal

.1 Remove existing asphalt pavement to lines and grades indicated or established by Engineer in field.

.2 Use equipment and methods of removal and hauling which do not tear, gouge, break or otherwise damage or disturb underlying pavement.

.3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.4 Provide for suppression of dust generated by removal process.

3.3 Sweeping

.1 Sweep remaining surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01561 Environmental Protection.

.2 Section 02225 Sitework Demolition and Removal.

.3 Section 02316 Rock Removal.

.4 Section 02630 Storm Sewer

.5 Section 02581 Concrete Encased Duct Banks

.6 Section 02701 Aggregates: General

1.2 N/A

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 0.5 m^3.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.3 Waste material: excavated material unsuitable for use in work or surplus to requirements.

.4 Unsuitable materials:
.1 Weak and compressible materials under excavated areas.
.2 Frost susceptible materials under excavated areas.
.3 Frost susceptible materials:
.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to [ASTM D422] [and] [ASTM C136]: Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	% Passing
2.00 mm	100

0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45

.2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

.5 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 PROTECTION OF EXISTING FEATURES

.1 Existing buried utilities and structures:
- .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .2 Prior to commencing excavation work, notify applicable owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
- .3 Confirm locations of buried utilities by careful test excavations.
- .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
- .5 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before re-routing.
- .6 Record location of maintained, re-routed and abandoned underground lines.

.2 Existing buildings and surface features:
- .1 Conduct, with Engineer, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by work.
- .2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Engineer.
- .3 Where required for excavation, cut roots or branches as approved by Engineer in accordance with this section as identified below.

2 PRODUCTS

2.1 MATERIALS

.1 Granular A and Granular B (Type II) fill: properties to section 02701 - Aggregates: General.

.2 Type 3 fill: selected material from excavation or other sources, approved by Engineer for use intended, unfrozen and free from rocks larger than 150 mm,

cinders, ashes, sods, refuse or other deleterious materials.

3 EXECUTION

3.1 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 SETBACKS FOR WORK AROUND TREES

.1 Unless otherwise directed or approved, trenching shall respect the minimum setback distances set out in Table 1.

Table 1: Tree Protection Setbacks

Trunk Dia. (cm) of Existing Tree(s)	Min. Setback (distance from trunk in metres)
less than 30	3.0
30 to 60	4.5
60 to 100 or more	6.0

.2 In specific instances, where minimum setbacks cannot be met due to site conditions, notify Engineer for approval of revised setback distance.

3.3 STRIPPING OF TOPSOIL

.1 Commence topsoil stripping of areas after area has been cleared and removed from site.

.2 Dispose of unused off site.

3.4 DEWATERING

.1 Provide all labour and equipment necessary to pump and dewater excavations.

.2 Protect open excavations against flooding and damage due to surface run-off.

.3 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas. Contractor shall submit his proposed schedule and

staging of construction activities indicating complete details of the proposed sediment control measures to the Engineer for review prior to construction.

3.5 EXCAVATION

.1 General

.1 Excavate to lines, grades, elevations and dimensions as indicated.

.2 Remove concrete, masonry, paving, walks and rubble and other obstructions encountered during excavation in accordance with Section 02225 - Sitework Demolition and Removal.

.3 For trench excavation, unless otherwise authorized by Engineer in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.4 Dispose of surplus and unsuitable excavated material off site.

.5 Do not obstruct flow of surface drainage or natural watercourses.

.6 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.7 Notify Engineer when bottom of excavation is reached.

.8 Obtain Engineer approval of completed excavation.

.9 Remove unsuitable material from trench bottom to extent and depth as directed by Engineer.

.10 Correct unauthorized over-excavation as follows:
- .1 Fill under bearing surfaces and footings with fill concrete.
- .2 Fill under other areas with approved native material fill compacted to not less than 95% of corrected maximum dry density.

.11 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Engineer.

.2 Trenching Near Trees

.1 Provide 24 hour notice to Engineer when trenching is scheduled to occur around existing trees within setback limits outlined in Table 1.

.2 Operate trenching equipment on double, overlapping sheets of plywood wiithin Table 1 setback zones.

.3 Excavate sections of trench by hand where woody roots larger than 50 mm diameter are encountered. Roots larger than 50 mm diameter are not to be cut and shall be allowed to span across the open trench.

.4 Excavated soil shall not be stockpiled within setback zones around existing trees.

.3 Exposure of Tree Roots

.1 Excavations which expose tree roots shall not remain open for prolonged periods, longer than 2 weeks.

.2 In sections of trenching which have exposed tree roots, the following mitigative measures shall be implemented.

.1 The area of exposed roots shall be watered sufficiently to keep the soil, within a minimum of 1 metre of the edge of the trench, continuously moist. This can be achieved by applying a slow trickle of water over a time period of several hours or frequent higher volume waterings. Watering is most effective when applied to the table land immediately adjacent to the trench, on the side closest to the affected tree or trees.

.2 Ensure that watering does not cause splattering or displacement of soil around the exposed roots.

.3 Do not over-saturate the soil.

.4 At the end of each working day, cover exposed roots with a tarp to reduced moisture loss to the air.

.4 Loss of Anchor Roots

.1 Notify Engineer if major anchor roots over 150 mm in diameter are severed during trenching or excavation works around trees.

.5 Root Pruning

.1 Prior to backfilling trenches, all exposed, severed roots larger than 10 mm shall be pruned with a clean, sharp tool designed for arboricultural work.

3.6 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground

services as specified in Section 02630 – Storm Sewer

.2 Place bedding and surround material in unfrozen condition.

3.7 BACKFILLING

.1 Place backfill (type 3) material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.2 When backfilling trenches around trees carefully tamp soil by hand around severed and spanning roots to prevent damage and formation of air pockets.

.3 Backfill around installations.

.1 Place bedding and surround material as specified elsewhere.

3.8 RESTORATION

.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Engineer.

.2 Replace topsoil as directed by Engineer.

.3 Reinstate pavement and sidewalks and lawns to elevation which existed before excavation.

.4 Clean and reinstate areas affected by work as directed by Engineer.

.5 Alleviate compaction of adjacent turf caused by contractor's equipment by turf aeration.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01005 - General Instructions.

.2 Section 01705 – Health & Safety

.3 Section 02315 - Excavating, Trenching and Backfilling.

1.2 DEFINITION

.1 Rock: any solid material in excess of 0.5 m^3 and which cannot be removed by means of mechanical excavating equipment having a 0.95 to 1.15 m^3 bucket. Frozen material is not classified as rock.

2 PRODUCTS

Not applicable to this section.

3 EXECUTION

3.1 ROCK REMOVAL

.1 Remove rock to alignments, profiles, and cross sections as indicated.

.2 **Explosive blasting will not be permitted on this project.**

.3 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.

.4 Scale, pressure wash and broom clean rock surfaces, which are to bond to concrete.

.5 Excavate trenches to lines and grades to minimum of 300 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.

.6 Cut trenches to widths as indicated. Trench width for bedding and rock removal purposes shall be the pipe diameter plus 300 mm each side of the pipe.

.7 Remove boulders and fragments which may slide or roll into excavated areas.

.8 Correct unauthorized rock removal at no extra cost, in accordance with backfilling requirements specified in Section 02315 - Excavating, Trenching and Backfilling.

3.2 ROCK DISPOSAL

.1 Dispose of surplus removed rock off site.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02315 - Excavating, Trenching and Backfilling.
.2 Section 02911 – Topsoil and finish grading
.3 Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
  .1 CAN/CSA-A5-93, Portland Cement.
  .2 CSA-A23.1-2004, Concrete Materials and Methods of Concrete Construction.
  .3 CSA G30.18M (R2002), Billet-Steel Bars for Concrete Reinforcement.
  .4 CSA C22.2 No.211.1. , PVC Ducting.

2 PRODUCTS

2.1 PVC DUCTS

.1 PVC ducts, type EB1, encased in reinforced concrete.

2.2 PVC DUCT FITTINGS

.1 Rigid PVC opaque solvent welded type couplings, bell end fittings, plugs, caps, adaptors as required to make complete installation.

.2 Expansion joints.

.3 Rigid PVC 5 degree angle couplings.

2.3 MARKERS

.1 Yellow plastic underground warning tape, 6 inches wide, bearing characters “Utility Line Below”, or approved equal.

3 EXECUTION

3.1 INSTALLATION GENERAL

.1 Install underground duct banks including formwork.

.2 Build duct bank on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.

.3 Open trench completely between ends before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.

.4 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.

.5 Install base spacers at maximum intervals of 1 m levelled to grades indicated for bottom layer of ducts.

.6 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 75 mm horizontally and vertically. Stagger joints in adjacent layers at least 150 mm and make joints watertight. Encase duct bank with 75 mm thick concrete cover.

.7 Make transpositions, offsets and changes in direction using 5 degree sections, do not exceed a total of 20 degrees with duct offset.

.8 Use bell ends at duct terminations in manholes or buildings.

.9 Use conduit to duct adapters when connecting to conduits.

.10 Terminate duct runs with duct coupling set flush with end of concrete envelope when dead ending duct bank for future extension.

.11 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.

.12 Allow concrete to attain 50% of its specified strength before backfilling. (see clause 3.3.1 – this specification)

.13 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete. Tie ducts to spacers with twine or other non-metallic material. Remove weights or wood braces before concrete has set and fill voids.

.14 Clean ducts before laying. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.

.15 Immediately after placing of concrete, pull through each duct a steel mandrel not less than 300 mm long and of a diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Avoid disturbing or damaging ducts where concrete has not set completely. Pull stiff bristle brush through each duct.

.16 Install four 3 m lengths of 10 m reinforcing rods, one in each corner of duct bank when connecting duct to manholes or buildings. Wire rods to 10 m dowels at manhole or building and support from duct spacers. Protect existing cables and equipment when breaking into existing manholes. Place concrete down sides of duct bank filling space under and around ducts. Rod concrete with flat bar between vertical rows filling voids.

.17 Install reinforcing ties, throughout length of ductbank, per contract electrical drawings.

.18 In each duct install pull rope continuous throughout each duct run with 6 m spare rope at each end.

.19 Clear area around ductbank of all obstructions at completion of work in this section.

3.2 MARKERS

.1 Lay yellow plastic warning tape length of ductbank in manner specified on contract electrical drawings.

3.3 INSPECTIONS

.1 Inspection of ducts will be carried out by Engineer prior to placing of concrete or before any backfill is placed. Placement of concrete and duct cleanout to be done when Engineer present.

END OF SECTION

1 GENERAL

1.1 Related Work

.1 Section 02315: Excavating, Trenching and Backfilling

.2 Section 02316: Rock Removal

.3 Section 02701: Aggregates General

1.2 References

.1 ASTM D2680-90] Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.2 ASTM D3034-89, Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and fittings.

.3 CAN/CSA-B182.2-M90, PVC Sewer Pipe and Fittings (PSM Type).

.4 CSA B182.11-1967, Recommended Practice for the Installation of Plastic Drain and Sewer Pipe and Pipe Fittings.

1.3 Material Certification

.1 Certification to be marked on pipe.

1.4 Scheduling Of Work

.1 Schedule work to minimize interruptions to existing services and to maintain existing sewage flows during construction.

2 PRODUCTS

2.1 Plastic Pipe

.1 Type PSM Polyvinyl Chloride (PVC): to ASTM D3034 CAN/CSA-B182.2.
- .1 Standard Dimensional Ratio (SDR) 35
- .2 Locked-in gasket and integral bell system
- .3 Nominal lengths: 6 m

2.2 Service Connections

.1 Type PSM Poly (Vinyl) Chloride: to CAN/CSA-B182.2.
- .1 Acceptable material: PVC SDR 28.

2.3 Pipe Bedding And Surround Materials

.1 Granular material to Section 02701 – Aggregates: General and following requirements:

.1 Granular A per OPSS 1010

2.4 Backfill Material

.1 Type 3, in accordance with Section 02315 - Excavating, Trenching and Backfilling.

3 EXECUTION

3.1 Preparation

.1 Clean and dry pipes and fittings before installation.

3.2 Trenching

.1 Do trenching work in accordance with Section 02315 - Excavating, Trenching and Backfilling.

.2 Do not allow contents of any sewer or sewer connection to flow into trench.

.3 Trench alignment and depth require approval of Engineer prior to placing bedding material and pipe.

3.3 Granular Bedding

.1 Place bedding in unfrozen condition.

.2 Place granular bedding materials in uniform layer[s] not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% corrected maximum dry density.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.4 Installation

.1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Engineer.

.2 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.3 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.4 Do not exceed maximum joint deflection recommended by pipe manufacturer.

.5 Do not allow water to flow through pipe during construction, except as may be permitted by Engineer.

.6 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.7 Install plastic pipe and fittings in accordance with CSA B182.11.

3.5 Pipe Surround

.1 Place surround material in unfrozen condition.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density.

.5 When field test results are acceptable to Engineer, place surround material at pipe joints.

3.6 Backfill

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 98% corrected maximum dry density. In other areas, compact to at least 95% corrected maximum dry density.

3.7 Service Connections

.1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.

.2 Maintain grade for 125 and 150 mm diameter sewers at 1 vertical to 50 horizontal unless directed otherwise by Engineer.

.3 Service connection pipe: not to extend into interior of main sewer.

.4 Make up required horizontal and vertical bends from 45 bends or less, separated by straight section of pipe with minimum length of four pipe diameters. Use long sweep bends where applicable.

3.8 Field Testing

.1 Repair or replace pipe, pipe joint or bedding found defective.

END OF SECTION

1 GENERAL

1.1 RELATED WORK

.1 Section 02630: Storm Sewers

.2 Section 02315: Excavation and Trenching and Backfill

.3 Section 02316: Rock Removal

1.2 REFERENCES

.1 ASTM C139-[99], Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.

.2 ASTM C478M-[97], Specification for Precast Reinforced Concrete Manhole Sections [Metric].

.3 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

1.3 SCHEDULING OF WORK

.1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

2 PRODUCTS

2.1 MATERIALS

.1 Cast-in-place concrete:
- .1 To Section 03300 - Cast-in-Place Concrete.
- .2 Precast manhole units: to ASTM C478M, circular or oval. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

.2 Precast catch basin sections: to ASTM C139, ASTM C478M.

.3 Joints: to be made watertight using rubber rings.

.4 Mortar:
- .1 Aggregate: to CSA A82.56.
- .2 Cement: to CAN/CSA-A8.

.5 Ladder rungs: Extruded hollow circular aluminum 20 mm O.D. and 14 mm I.D.

.6 Adjusting rings: to ASTM C478M.

.7 Drop manhole pipe: SDR 35 PVC pipe.

.8 Steel gratings, I-beams and fasteners: as indicated.

.9 Granular bedding and backfill: to Section 02701 - Aggregates: General and following requirements:
.1 Granular A per OPSD 1010.

3 EXECUTION

3.1 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 02315 - Excavating Trenching and Backfilling and as indicated.

.2 Obtain approval of Engineer before installing, manholes or catch basins.

3.2 CONCRETE WORK

.1 Do concrete work in accordance with Section 03300 - Cast-in-Place Concrete.

3.3 INSTALLATION

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses.

.3 Dewater excavation to approval of Engineer and remove soft and foreign material before placing granular base.

.4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density.

.5 Precast units:
.1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight with Engineer approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination thereof.
.2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
.3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.6 For sewers:

.1 Place stub outlets at elevations and in positions indicated.
.2 Bench to provide a smooth U-shaped channel. Side height of channel to be full diameter of sewer. Slope adjacent floor at 1 in 20. Curve channels smoothly. Slope invert to establish sewer grade.

.7 Compact granular backfill to 95% corrected maximum dry density.

.8 Installing units in existing systems:
.1 Where new unit is to be installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
.2 Make joints watertight between new unit and existing pipe.
.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.9 Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.

.10 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

.11 Install safety platforms in manholes having depth of 5 m or greater.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02315: Excavate Trenching and Backfill
.2 Section 02630: Storm Sewers
.3 Section 02631: Manholes and Catchbasins
.4 Section 02721: Granular Base

1.2 REFERENCES

.1 ASTM D4791-[99], Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

2 PRODUCTS

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

.2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  .1 Greatest dimension to exceed five times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  .1 Natural sand.
  .2 Manufactured sand.
  .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.4 Coarse aggregates satisfying requirements of applicable section to be:
  .1 Crushed rock.
  .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

GRADATION REQUIREMENTS ***

MTO SIEVE DESIGNATION	PERCENTAGE PASSING		
	GRANULAR A	GRANULAR O	GRANULAR B TYPE II****
150 mm	-	-	100
37.5 mm	-	100	-
26.5 mm	100	95 – 100	50 – 100
19 mm	85 – 100 87 – 100*	80 – 95	-
13.2 mm	65 – 90 75 – 95*	60 – 80	-
9.5 mm	50 – 73 60 – 83*	50 – 70	-
4.75 mm	35 – 55 40 – 60*	20 – 45	20 – 55
1.18 mm	15 – 40	0 – 15	10 – 40
300 µm	5 – 22	-	5 – 22
50 µm	-	-	-
75 µm	2 – 8 2 – 10**	0 - 5	0 – 10

.2 Type 3 fill: selected material from excavation or other sources, approved by Engineer for use intended, unfrozen and free from rocks larger than 200 mm, cinders, ashes, sods, refuse or other deleterious materials.

2.2 SOURCE QUALITY CONTROL

.1 Inform Engineer of proposed source of aggregates and provide access for sampling at least 2 weeks prior to commencing production.

.2 If, in opinion of Engineer, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Advise Engineer 2 weeks in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

3 EXECUTION

3.1 PREPARATION

.1 Processing
- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Engineer.
- .3 Wash aggregates, if required to meet specifications. Use only equipment approved by Engineer.
- .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

.2 Handling
- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.3 Stockpiling
- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Engineer. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules.
- .3 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02701: Aggregates General

1.2 REFERENCES

.1 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.

2 PRODUCTS

2.1 MATERIALS

.1 Granular base: material to Section 02701 - Aggregates: General and following requirements:
- .1 Granular A per OPSS 1010 and as further described herein.

3 EXECUTION

3.1 SEQUENCE OF OPERATION

.1 Place granular base after sub-base surface is graded, proof rolled, inspected and approved by Engineer.

.2 Placing
- .1 Construct granular base to depth and grade in areas indicated.
- .2 Ensure no frozen material is placed.
- .3 Place material only on clean unfrozen surface, free from snow and ice.
- .4 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Engineer may authorize thicker lifts if specified compaction can be achieved.
- .5 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .6 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment
- .1 Compaction equipment to be capable of obtaining required material densities.

.4 Compacting
- .1 Compact to density not less than 100% corrected maximum dry density.
- .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.5 Proof rolling

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain approval from Engineer to use non standard proof rolling equipment.

.3 Proof roll at level in granular base as indicated. If use of non standard proof rolling equipment is approved, Engineer to determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade or sub-base:

.1 Remove base, sub-base /and subgrade material to depth and extent as directed by Engineer.

.2 Backfill excavated subgrade with common material and compact as directed by Engineer.

.3 Replace sub-base material and compact as directed by Engineer.

.4 Replace base material and compact in accordance with this section.

.6 Where proof rolling reveals defective base, remove defective materials to depth and extent as directed by Engineer and replace with new materials in accordance with this section at no extra cost.

3.2 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.3 PROTECTION

.1 Maintain finished base in condition conforming to this section until succeeding material is applied or until acceptance by Engineer.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 OPSS 310 shall apply except as may be amended and extended herein.

.2 OPSS 311 shall apply except as may be amended and extended herein.

.3 OPSS 1101 shall apply except herein

2 PRODUCTS

2.1 MATERIALS

.1 Aggregates to: OPS 1010.
- .1 Granular A,
- .2 Granular B Type II.
- .3 Select subgrade.

.2 Asphalt cement: Asphalt binder shall comply with all the physical requirements listed in Table 1 of AASHTO MP1 for the PG 58-34 grade.

.3 Tack coat: SS-1 to OPSS 1103.

.4 Asphalt concrete: to OPSS 1150.

3 EXECUTION

3.1 FOUNDATIONS

.1 Foundations and pavement thickness for trench reinstatement shall match existing thickness or as follows (whichever is greater):

.2 Foundations for roadways comprise:
- .1 500 mm compacted thickness of granular sub-base, Granular B Type II.
- .2 150 mm compacted thickness of granular base, Granular A.

.3 Construction of granular foundations: OPSS 314.07.

.4 Compaction: compact each lift of granular material to 100% maximum density to ASTM D698-78. Maximum lift thickness: 150 mm.

.5 All adjacent structures that will be in contact with Hot Mix Asphalt shall be coated with SS-1 Asphalt Emulsion (to OPSS 1103).

3.2 PAVEMENT THICKNESS

.1 Pavement thickness for trench reinstatement shall match existing thickness or as follows (whichever is greater):

.1 Pavement for Colonel By Drive:

Lower Binder course:	40mm	19mm	C (PG58-34)
Upper Binder Course:	40mm	19mm	C (PG58-34)
Surface course:	50mm	12.5mm	C (PG58-34)
Asphalt Path:	50mm	12.5mm	B (PG58-28)

3.3 PAVEMENT CONSTRUCTION

.1 Application of prime coat: OPSS 302.

.2 Construction of asphalt concrete: OPSS 310.07.

3.4 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line.

.2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix.

.3 Haul trucks: of sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.1 Boxes with tight metal bottoms.

.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.

.3 In cool weather or for long hauls, insulate entire contact area of each truck box.

.4 Suitable hand tools.

3.5 ASPHALT CONCRETE PAVING

.1 Obtain approval of tack coat and base from Engineer before placing asphalt mix.

.2 Place asphalt concrete in one lift per course as specified. Minimize hand raking of surface to avoid segregation.

.3 Compact asphalt concrete to density not less than 98% of density obtained with Marshall specimens prepared in accordance with ASTM D1559 from samples of mix being used. Roll until roller marks are eliminated.

.4 Keep roller speed slow enough to avoid mix displacement and do not stop roller on fresh pavement.

.5 Moisten roller wheels with water to prevent pick up of material.

.6 Compact mix with hot tampers or other equipment approved by Engineer, in areas inaccessible to roller.

.7 Finish surface to be within 5 mm of design elevation and with no irregularities greater than 5 mm in 3 m.

.8 Repair areas showing checking, rippling or segregation as directed by Engineer.

3.6 JOINTS

.1 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 For cold joints, cut back to full depth vertical face and tack face with hot asphalt.

.3 For longitudinal joints, overlap previously laid strip with spreader by 25 to 50 mm.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02315 - Excavating, Trenching and Backfilling.

.2 Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

.1 Canadian Standards Association (CSA).
  .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

2 PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials: to Section 03300 - Cast-in-Place Concrete.

.2 Joint filler Curing Compound: to Section 03300 - Cast-in-Place Concrete.

3 EXECUTION

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 02315 - Excavating, Trenching and Backfilling.

3.2 GRANULAR BASE

.1 Obtain Engineer's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base to at least 95% of maximum density to ASTM D698.

3.3 CONCRETE

.1 Obtain Engineer's approval of granular base and reinforcing steel prior to placing concrete.

.2 Do concrete work in accordance with Section 03300 - Cast-in-Place Concrete.

.3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.

.4 Provide edging as indicated with 10 mm radius edging tool.

3.4 TOLERANCES

.1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals to match existing path joint intervals.

.2 Install expansion joints as directed by Engineer.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

.4 Install joint filler in expansion joints.

.5 Seal expansion joints with sealant approved by Engineer.

3.6 CURING

.1 Cure concrete by adding moisture continuously in accordance with CAN/CSA-A23.1 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound approved by Engineer.

.2 Where burlap is used for moist curing, place two pre-wetted layers on concrete surface and keep continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film. In accordance with manufacturer's requirements.

END OF SECTION

1 GENERAL

1.1 DESCRIPTION

.1 Work of this section consists of subsoil preparation, supply and installation of topsoil, and fine grading, including the supply of all materials, labour and equipment.

1.2 RELATED SECTIONS

.1 Section 02933 – Sodding.

1.3 SOURCE QUALITY CONTROL

.1 Advise Engineer of sources of topsoil to be utilized 7 days in advance of starting work.

.2 Testing of topsoil will be carried out by testing laboratory designated by Engineer. Contractor is responsible for soil analysis and requirements for amendments to supply topsoil as specified.

.3 Test topsoil from source for clay, sand and silt, NPK mg, soluble salt content, pH value, growth inhibitors, soil sterilants, organic matter and conductivity.

.1 Use 25 mm diameter sampling tube or spade and, in presence of Engineer, take 25 samples per hectare to full depth of topsoil at random across entire area to be stripped, or 1 sample per 100 cu. m of stockpiled topsoil. Mix samples together thoroughly before submitting for testing.

.2 Submit 0.5 kg sample of topsoil to testing laboratory and indicate present use, intended use, type of subsoil and quality of drainage. Prepare and ship sample in accordance with provincial regulations and testing laboratory requirements.

.3 Determine required limestone treatment to bring pH value of soil between range of 5.5 to 7.5 level.

.4 Submit two copies of soil analysis and recommendations for corrections to Engineer.

1.4 SCHEDULING OF FINISH WORK

.1 Schedule placing of topsoil and grading to permit seeding within seven days.

2 PRODUCTS

2.1 TOPSOIL

.1 Topsoil for seeded areas: mixture of mineral particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70% sand and contain 2 to 10% organic matter by weight. (Soil placed in the "geoblock" turf reinforcement shall consist of 50 to 70% sand).

.2 Fertility: major soil nutrients present in following ratios:

.1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

.2 Phosphorus (P): 10 to 20 micrograms of phosphate per gram of topsoil.

.3 Potassium (K): 80 to 120 micrograms of potash per gram of topsoil.

.4 Calcium, Magnesium, sulfur and micro-nutrients presented in balanced ratios to support germination and/or establishment of intended vegetation.

.5 pH value: 5.5 to 7.5.

.6 Contain no toxic elements or growth inhibiting materials.

.7 Free from:

.1 Debris and stones over 50 mm diameter.

.2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.8 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could inhibit growth.

.4 Shredded particles minimum size: 5 mm.

.2 Limestone:

.1 Ground agricultural limestone containing minimum 85% of total carbonates.

.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.3 Fertilizer:

.1 Complete commercial synthetic fertilizer with minimum 65% insoluble nitrogen.

.2 Formulation ratio: 1:4:4.

.3 Bonemeal: finely ground with a minimum analysis of 20% phosphoric acid.

3 EXECUTION

3.1 PREPARATION OF EXISTING GRADE

.1 Proof roll and grade soil, eliminating uneven areas and low spots, ensuring positive drainage. Remove soil contaminated with toxic materials. Dispose of removed materials as directed by Engineer.

3.2 PLACING AND SPREADING OF TOPSOIL

.1 Place topsoil after Engineer has inspected and approved subgrade.

.2 Spread topsoil with adequate moisture in uniform layers over approved, unfrozen subgrade, where seeding and planting is indicated.

.3 Spread topsoil to a minimum depth of 100 mm for sodded areas. Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.3 SOIL AMENDMENTS

.1 Apply soil amendments at rate as specified and as determined from soil sample test.

.2 Mix soil amendments into full depth of topsoil prior to application of fertilizer.

3.4 APPLICATION OF FERTILIZER

.1 Apply fertilizer at least one week after limestone application.

.2 Spread fertilizer uniformly over entire area of topsoil at manufacturer's recommended rate of application or rate determined on basis of soil sample test.

.3 Mix fertilizer thoroughly to full depth of topsoil.

3.5 FINISH GRADING

.1 Fine grade and loosen topsoil. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Roll to consolidate topsoil for areas to be seeded leaving surface smooth, uniform, firm against deep foot printing, and with a fine loose texture to approval of Engineer.

3.6 ACCEPTANCE

.1 Engineer will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading. Approval of topsoil material is subject to soil testing and analysis.

.2 Testing of topsoil will be carried out by testing laboratory designated by Engineer. Soil testing and analysis to be in accordance with provincial regulations and standards. The Owner will pay for cost of tests.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02911 - Topsoil and Finish Grading .

1.2 SCHEDULING

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

2 PRODUCTS

2.1 MATERIALS

.1 Number One Turfgrass Nursery Sod: Sod that has been especially sown and cultivated in nursery fields as turfgrass crop.

- .1 Turfgrass Nursery Sod types:
  - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
  - .2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivar(s).
  - .3 Number One Named Cultivars: Nursery Sod grown from certified seed.
- .2 Turfgrass Nursery Sod quality:
  - .1 Not more than 2 broadleaf weeds or 10 other weeds per 40 square metres.
  - .2 Density of sod sufficient so that no soil is visible from height of 1500mm when mown to height of 50mm.
  - .3 Mowing height limit: 35 to 65mm.
  - .4 Soil portion of sod: 6 to 15mm in thickness.

.2 Sod establishment support:
- .1 Wooden pegs: 17 x 8 x 200 mm.

.3 Water:
- .1 Supplied by Contractor at his expense.

.4 Fertilizer:
- .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".

.2 Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.

.5 Sod to be placed within turf reinforcement "Geoblock" shall not contain any reinforcing mesh and shall not be of mature sod stock.

2.2 SOURCE QUALITY CONTROL

.1 Obtain approval from Engineer of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization.

3 EXECUTION

3.1 PREPARATION

.1 Verify that grades are correct and prepared in accordance with Section 02911 - Topsoil and Finish Grading . If discrepancies occur, notify Engineer and do not commence work until instructed by Engineer.

.2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

.3 Fine grade surface free of humps and hollows to smooth, match existing grade, to tolerance of plus or minus 8mm, for Turfgrass Nursery Sod. Surface to drain naturally.

.4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials off site.

3.2 SOD PLACEMENT

.1 Lay sod within 24 hours of being lifted.

.2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. All sod edges must be keyed into existing turf edges. Cut out irregular or thin sections with sharp implements. No thin slices of sod will be permitted at edges.

.3 Roll sod as directed by Engineer. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.3 FERTILIZING PROGRAM

.1 Fertilize during establishment and warranty periods in accordance with recommendations of nursery that supplied the sod.

3.4 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.

.2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.3 Cut grass to 50 mm when or prior to it reaching height of 75 mm. Remove clippings which will smother grassed areas.

.4 Maintain sodded areas weed free.

.5 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.

3.5 ACCEPTANCE

.1 Turfgrass Nursery Sod areas will be accepted by Engineer provided that:
- .1 Sodded areas are properly established.
- .2 Sod is free of bare and dead spots .
- .3 No surface soil is visible from height of 1500mm when grass has been cut to height of 50 mm.
- .4 Sodded areas have been cut minimum 2 times prior to acceptance.

.2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02315 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 ASTM International
- .1 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .2 ASTM D 260-86(2001), Standard Specification for Boiled Linseed Oil.
- .3 ASTM D 1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

.3 CSA International
- .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:
- .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
- .2 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario.

.4 At least 4 weeks prior to beginning Work, submit to , Consultant samples of following materials proposed for use: curing compound joint filler, waterstops.

1.5 QUALITY ASSURANCE

.1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures for Engineer's approval for following items:
- .1 Hot weather concrete.
- .2 Cold weather concrete.

.3 Curing.
.4 Finishes.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
.1 Do not modify maximum time limit without receipt of prior written agreement from Consultant and concrete producer as described in CSA A23.1/A23.2.
.2 Deviations to be submitted for review by the Consultant.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

2 PRODUCTS

2.1 DESIGN CRITERIA

.1 Alternative 1 - Performance Alternative to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Consultant and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Cement: to CSA A3001, Type GU HS.

.2 Blended hydraulic cement: Type GUb HSb to CSA A3001.

.3 Supplementary cementing materials: with minimum 20% Type F CI CH fly ash replacement N GGBFS, by mass of total cementitious materials to CSA A3001.

.4 Water: to CSA A23.1/A23.2.

.5 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.

.6 Welded steel wire fabric: to ASTM A 185.

.7 Premoulded joint filler:
.1 Bituminous impregnated fibreboard: to ASTM D 1751.

.8 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.

.9 Sealer: boiled linseed oil to ASTM D 260, mixed with mineral spirits 1:1 proprietary poly-siloxane resin blend.

.10 Other concrete materials: to CSA A23.1/A23.2.

2.4 MIXES

.1 Alternative 1 - Performance Method for specifying concrete: to meet performance criteria to CSA A23.1/A23.2.
- .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
- .2
- .3 Provide concrete mix to meet following hard state requirements:
  - .1 Durability and class of exposure: C-1
  - .2 Compressive strength at 28 day age: 32 minimum.
  - .3 Intended application: Foundations and Surface Concrete Slabs.
  - .4 Aggregate size 38 mm maximum.

3 EXECUTION

3.1 PREPARATION

.1 Provide Consultant 24 hours notice before each concrete pour.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:
- .1 Development of cold joints not allowed.
- .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.

.4 Protect previous Work from staining.

.5 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION / APPLICATION

.1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

.2 Sleeves and inserts:
- .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.
- .2 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Consultant.

3.3 FINISHES

.1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1/A23.2.

.2 Equipment pads: provide smooth trowelled surface.

.3 Pavements, walks, curbs and exposed site concrete:
.1 Screed to plane surfaces and use aluminum magnesium wood floats.
.2 Provide round edges and joint spacings using standard tools.
.3 Trowel smooth to provide lightly brushed non-slip finish.

3.4 CONTROL JOINTS

.1 Cut and Form control joints in slabs on grade at locations indicated, to CSA A23.1/A23.2 and install specified joint sealer/filler.

3.5 EXPANSION AND ISOLATION JOINTS

.1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

3.6 CURING

.1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.9 FIELD QUALITY CONTROL

.1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Owner. Accelerated test methods will apply.

3.10 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Use trigger operated spray nozzles for water hoses.

.3 Designate cleaning area for tools to limit water use and runoff.

.4 Cleaning of concrete equipment to be done in accordance with Section 01 35 43 Environmental Procedures.

1 GENERAL

1.1 General

.1 This Section covers items common to Sections of Division 16. This section supplements requirements of Division 01.

1.2 Codes and Standards

.1 Do complete installation in accordance with the Ontario Electrical Safety Code, 2012.

.2 Comply with CSA and OntarioElectrical Safety Code Bulletins in force at time of tender submission.

1.3 Care, Operation and Start-up

.1 Instruct Engineer and operating personnel in the operation, care and maintenance of equipment.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.4 Voltage Ratings

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.6 Record Drawing

.1 Show on the record drawings the approximate path of raceways linking all outlets, junction and pull boxes, the location of junction and pull boxes, the number and size of conductors in all raceways.

.2 Show on the riser diagrams all junction boxes and pull boxes and identify them with respect to location in the building. Cross reference these boxes between risers and floor plans.

1.7 Shop Drawings

.1 Refer to Section 01340 - Shop Drawings, Product Data, Samples and Mock-ups.

.2 Submit for review, shop drawings of the following equipment:
- .1 Light Standard
- .4 Any additional equipment as required by the Engineer.

1.8 Acceptable Materials

.1 Alternate materials or substitution shall be approved by addendum only.

1.9 Operation and Maintenance Data

.1 Include in operations and maintenance data:
- .1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

1.10 Permits, Fees and Inspection

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Notify Engineer of changes required by Electrical Inspection Department prior to making changes.

.4 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to Engineer.

1.11 Materials and Equipment

.1 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from

Electrical Inspection Department.

1.13 Finishes

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.14 Equipment Identification

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates:

.1 Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.2 Wording on nameplates and labels to be approved by Engineer prior to manufacture.

.3 Allow for average of fifty (50) letters per nameplate and label.

.4 Identification to be in both English and French.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

1.15 Wiring Identification

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

1.16 Conduit and Cable Identification

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	yellow	
up to 600 V	yellow	green

1.17 Wiring Terminations

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.18 Manufacturers and CSA labels

.1 Visible and legible after equipment is installed.

1.19 Warning Signs

.1 To meet requirements of Electrical Inspection Department and Engineer.

.2 Decal signs, minimum size 175 x 250 mm.

1.22 Load Balance

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Submit, at completion of work, report listing phase and neutral currents on panelboards, epoxy transformer, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.23 Conduit and Cable Installation

.1 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.2 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

1.24 Field Quality Control

.1 Conduct and pay for following tests:
- .1 Power distribution system including phasing, voltage, grounding and load balancing.
- .2 Circuits originating from branch distribution panels.

.2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.3 Insulation resistance testing.
- .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
- .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
- .3 Check resistance to ground before energizing.
- .4 Carry out tests in presence of Engineer.
- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit test results for Engineer's review.

1.25 Co-ordination of Protective Devices

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

1.27 Qualifications

.1 All electrical work to be completed by licensed journeymen.

END OF SECTION

1 GENERAL

1.1 Related Work

.1 Excavation and backfilling.

2 PRODUCTS

2.1 Not Used.

3 EXECUTION

3.1 Cable Installation in Ducts

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension. The pulling tension shall not exceed the safe tension recommended by the cable manufacturer.

.5 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.2 Markers

.1 Install plastic mark tape above ducts.

3.3 Field Quality Control

.1 Perform tests in accordance with Section 16010 - Electrical General Requirements.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests.
- .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
- .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests.
- .1 Ensure that terminations and accessory equipment are disconnected.
- .2 Ground shields, ground wires, metallic armour and conductors not under test.

.7 Provide Engineer with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

1 GENERAL

1.1 Materials

.1 Grounding Equipment to CSA C22.2 No. 41.

2 PRODUCTS

2.1 Equipment

.1 Clamps for grounding of conductor, size as required to electrically conductive underground water pipe.

.2 System and circuit, equipment, grounding conductors, bare stranded copper, soft annealed, size as required.

.3 Insulated grounding conductors: to Section 16062.

.4 Non-corroding accessories necessary for grounding system, type, size, material as required, including but not necessarily limited to:

.1 Grounding and bonding bushings.
.2 Protective type clamps.
.3 Bolted type conductor connectors.
.4 Thermit welded type conductor connectors.
.5 Bonding jumpers, straps.
.6 Pressure wire connectors.
.7 Rod electrodes copper clad steel 19mm dia by 3m long, or
.8 Plate electrodes copper, surface area 0.2m^2, 1.6mm thick.
.9 Grounding conductors: bare stranded copper, soft annealed, size as indicated on project drawings.

3 EXECUTION

3.1 Installation General

.1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, conductors, connectors, accessories, as required, to conform to requirements of local authority having jurisdiction over installation. Where metallic conduit is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.7 Make buried connections and connections to electrodes by thermit process.

3.2 Equipment Grounding

.1 Install grounding connections to typical equipment included in, but not necessarily limited to, following list: conduits, light standards, , etc.

3.3 Electrodes

.1 Make grounding connections to continuously conductive water pipe on street side of water meter.

.2 Install water meter shunt.

.3 Install electrodes and make grounding connections.

.4 Use size #4 copper conductor for connection to electrodes.

3.4 Field Quality Control

.1 Perform tests in accordance with Section 16010 - Electrical General Requirements.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

1 GENERAL

1.1 General

.1 In general, the wiring is not shown on the drawings for the different systems: the necessary wiring shall however be provided between all outlets and the panels and/or relays to which they are referred to on drawings. In some cases, the panel identification is not given for each circuit but is shown for a particular area.

2 PRODUCTS

2.1 Wires

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG. Size as noted on drawings.

.2 Copper conductors: size as indicated, with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 and RWU90 for working temperature of -7°C.

3 EXECUTION

3.1 Installation of Wires

.1 Install wiring as follows:
- .1 In conduit systems in accordance with Section 16133.
- .2 Group cables wherever possible.

END OF SECTION

1 GENERAL

1.1 Location of Conduit

.1 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.

2 PRODUCTS

2.1 Conduits

.2 Epoxy coated conduit: with zinc coating and corrosion resistant epoxy finish inside and outside, size as indicated.

.3 Rigid PVC conduit: to CSA C22.2 No. 211.2, as indicated on drawings.

2.5 Fish Cord

.1 Polypropylene.

3 EXECUTION

3.1 Installation

.4 Bend conduit cold. Replace conduit if linked or flattened more than 1/10th of its original diameter.

.7 Install fish cord in empty conduits.

.8 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.

.9 Dry conduits out before installing wire.

END OF SECTION

1 GENERAL

1.1 General

.1 This Section covers items common to Sections of Division 16. This section supplements requirements of Division 01.

.2 Section Include:

.1 Materials for exterior light fixtures, poles, light fixtures, mounting Brackets and assembly.

1.2 References

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2No.206-M1987 (R1999), Lighting Poles.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with the general conditions.

.2 Mark each data sheet with the appropriate fixture type designation for this project.

.3 Submit complete photometric data prepared by independent testing laboratory for luminaires as required by the Consultant, for approval and review.

1.4 Warranty

.1 Manufacturer(s) shall provide the Engineer with a written copy of warranty against defects in materials and workmanship:

.1 Luminaire and ballast: 1 year warranty against defects.
.2 Lamps: replace lamps burning out within 1 year of installation.
.3 Ballasts that fail or exceed their original noise level rating during the 12-month warranty period.
.4 poles: 2 year warranty against defects.

1.5 Maintenance Materials

.1 Provide 2 spare lamps of each type installed, prior to completion of work.

1.6 EQUIPMENT SUBSTITUTION

.1 All equipment supplied shall be exactly as specified herein.

.2 All substitutions or alternatives are to be submitted through the Contract Administer, all other submissions will be rejected.

.3 All equivalency decisions made by the Consultant will be final. The burden of proof of equivalent products both in terms of performance and quality shall be on the Contractor.

.4 The following supporting information shall be submitted for review:

.1 Copy of manufactures one year warrantee against defects in material and workmanship for the luminaire and ballast.

.2 Catalogue cut-sheets complete with technical specifications including photometric data from an independent laboratory.

.3 A sample fixture may be required at Consultants discretion.

1.7 COORDINATION

.1 Light standard assembly manufacturers' shall coordinate works and supply of equipment. Provisions to be made to ensure bracket arm templates, accessories and supports for luminaires, empty rigid PVC conduit is installed, etc. in order to ensure that a fully functional system is delivered to site.
Complete light standard assembly shall be made ready for prompt installation by electrical contractor.

Products

2.1 FIXTURE DETAILS

.1 Provide fixtures as indicated on the drawings or as in schedule included in this section.

.2 Provide supporting devices and associated accessories as required.

.3 The fixtures are denoted on the drawings by the letter A.

.4 All fixtures to be CSA approved or bear an approval label recognized by ESA.

2.2 LAMPS

.1 Provide all required lamps as indicated in fixture list.

Execution

3.1 FIXTURE INSTALLATION

.1 All fixtures will be installed in the standard manner for the type of fixture and in accordance with the manufacturer's instructions and to the approval of the Consultant.

.2 All mounting accessories for lighting fixtures are to be determined and provided by contractor as to the installation unless otherwise specified.

.3 All lamps will be of the type suitable for the fixture in which they are installed. Remove all defective ballasts, sockets, diffusers and wiring and replace with new equipment as required.

Fixture / Pole Schedule

Standard Products

Type	Fixture	Description	Manufacturer	Specifications	Lamps
A	LED	Exterior area light fixture mounted on pole c/w bracket arm and associated accessories.	Lighting Science Canada Ltd.	King Lminaire K200-FASH-III-75(SSL)-5000	75W

END OF SECTION

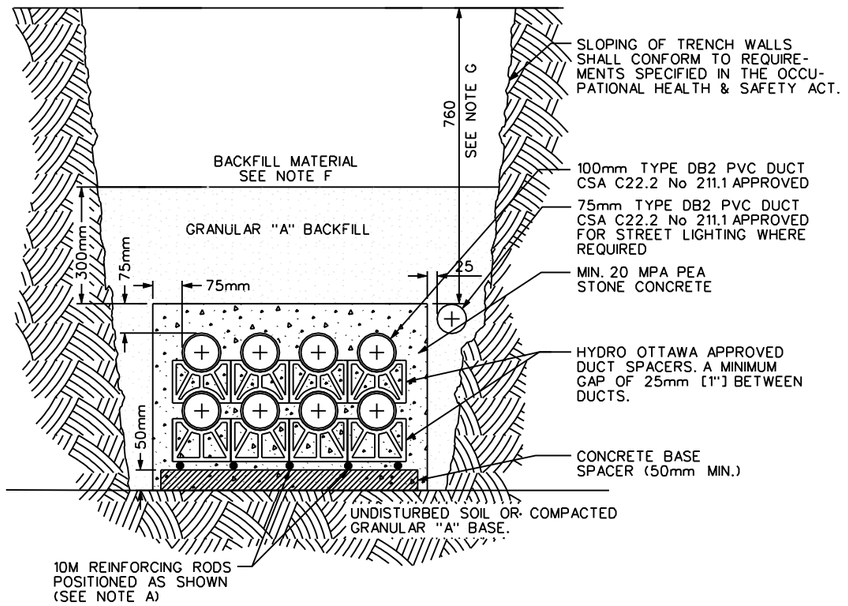


FIG 1. TYPICAL CONCRETE DUCT BANK SECTION VIEW

NOTES

A. REINFORCING RODS FULL LENGTH OF CONCRETE ENCASED DUCTS. OVERLAP JOINTS BY 150mm ON BASE SPACERS AND TIE BOTH ENDS. DRILL AND DOWEL RODS 85mm INTO WALL(S) OF CONCRETE STRUCTURE.

B. DUCT SPACERS TO BE PLACED AT A MAXIMUM OF 1500mm AND WITHIN 150mm OF COUPLING. PLASTIC DUCT SPACERS TO BE USED ONLY IF CONCRETE DUCT SPACERS ARE UNAVAILABLE.

C. FORMS REQUIRED FOR BOTH SIDES OF THE FULL LENGTH OF CONCRETE ENCASED DUCT STRUCTURE.

D. DUCTS AND TRENCHES MUST BE INSPECTED BY HYDRO OTTAWA BEFORE ANY CONCRETE IS POURED.

E. CONTRACTOR MUST ENSURE THAT ALL DUCTS ARE CLEANED, RODDED AND THAT A 8mm [3/8"] POLYPROPYLENE ROPE IS LEFT IN EACH DUCT.

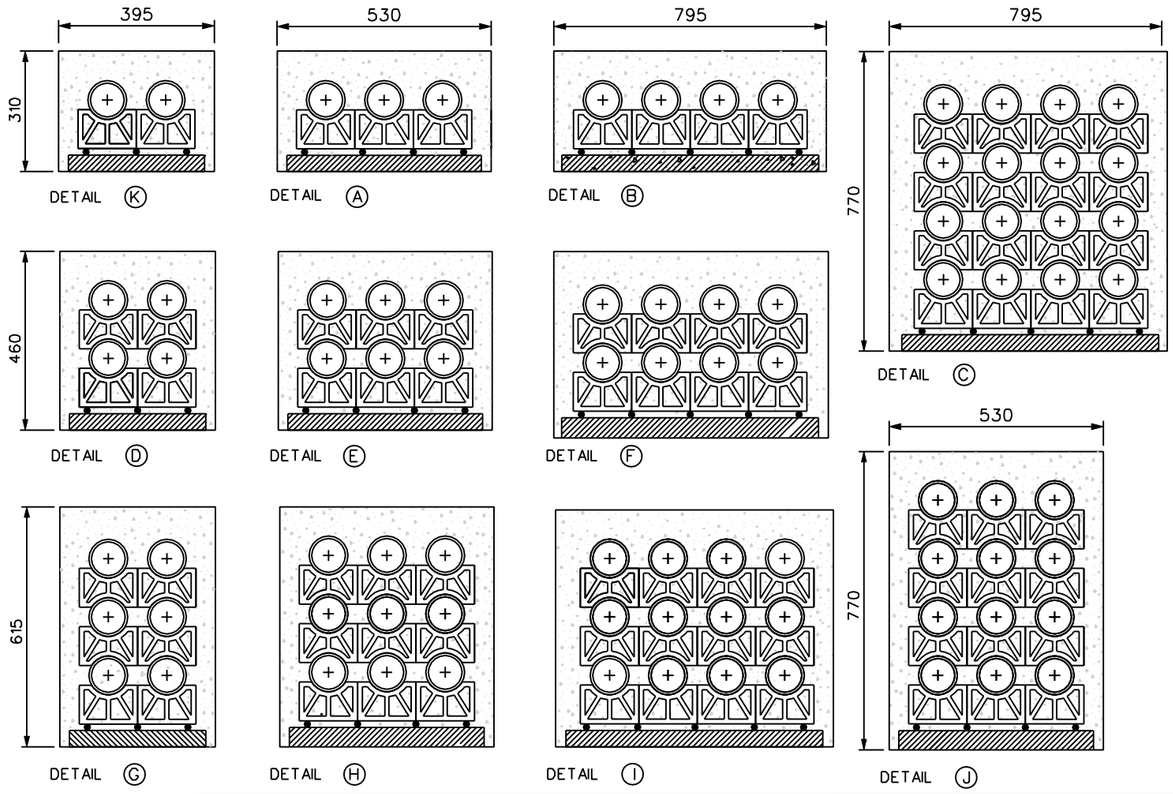
F. ALL BACKFILL MATERIAL MUST BE APPROVED BY HYDRO OTTAWA INSPECTOR: FOR ACCEPTABLE BACKFILL MATERIAL, SEE HYDRO OTTAWA SPECIFICATION DOCUMENT GCS0005 SECTION 6.1.5.

G. STEEL PLATES ARE TO BE USED IF THE COVER OVER THE DUCT BANK IS LESS THAN 450MM. THE PLATES ARE TO BE 6.5MM [1/4"] IN THICKNESS AND THE WIDTH OF THE DUCT BANK BEING COVERED. ANY DIVEATION FROM THE STANDARD COVER OF 760MM MUST BE APPROVED BY THE HYDRO OTTAWA INSPECTOR.

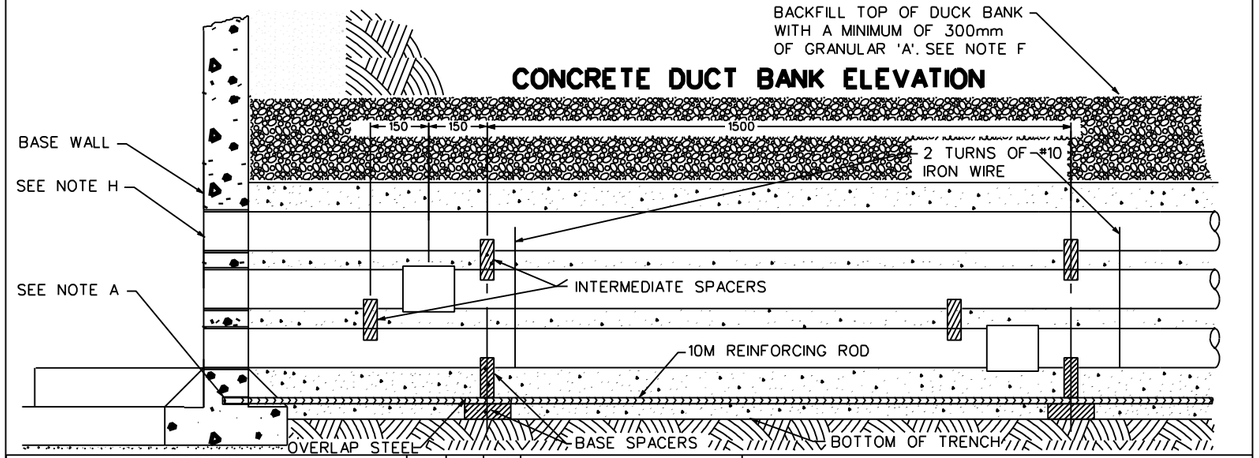
H. BELL END TERMINATORS ARE TO BE USED WHEN TERMINATING DUCTS IN STRUCTURES.

I. ALL MEASUREMENTS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

CONCRETE DUCT BANK SECTIONS



CONCRETE DUCT BANK ELEVATION



REVISIONS	PREP	CHKD	APPD
REV: 7 DATE: 2007-12-04 CHANGE: UPDATED DETAILS C,D,E,F,G ADDED DETAILS H, I, J	CP	CP	CSM
REV: 8 DATE: 2008-06-11 CHANGE: UPDATED DETAILS C,D,E,F,G ADDED DETAILS H, I, J	CP	CP	CSM
REV: 9 DATE: 2010-05-15 CHANGE: TITLE CHANGE	FB	RW	CSM

HydroOttawa
WWW.HYDRO-OTTAWA.COM

PREP: G. GOFORTH
CHKD: C. PROULX
APPD: C. MALONE P.Eng.
DATE: 2002-02-08
SCALE: N.T.S. @ ANSIB

TITLE
ENGINEERING SPECIFICATION
DUCT CONCRETE CROSS SECTIONS
CONSTRUCTION DETAIL

NO: UDS0001

1 OF 1

REV: 9

5/19/2010 2:13:35 PM K:\STANDARDS\U-Underground\D-ducts,trenching\UDS0001 R9-Duct Concrete Cross Sections.dgn