Specification

Niagara Health System
Proposed Parking Lot

Parking Lot Lighting, Electrical Service and Distribution

St. Catharines, Ontario

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Project R088

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1. **REFERENCE STANDARDS**

1.1 Conform to latest date of issue of referenced standards in effect on date of submission of bids, except a specific date or issue is specifically noted.

2. **GENERAL**

2.1 The purpose of this project is to provide an Parking Lot Lighting, Electrical Service and Distribution for Niagara Health System at their Proposed Parking Lot..

2.2 All references made in these documents as to the Contractor is intended to imply the General Contractor and/or their sub-contractors.

2.3 All work shall conform to the General Requirements and the Instructions to Bidders, Quotation Request Form and General Conditions sections.

2.4 The Contractor shall visit the site and become thoroughly familiar with all the conditions to be met in carrying out the work covered by these specifications, prior to submitting bid. No extras will be allowed for failure to properly evaluate conditions which affect the scope of work.

2.5 The work shown in these documents will take place at the following site;
Niagara Health System, 1242 Fourth Ave., St. Catharines, ON L2R 6P9.

3. **REQUIREMENTS OF REGULATORY AGENCIES**

3.1 The Contractor shall abide by all laws, rules, regulations, bylaws and ordinances covering the class or character of the work, in particular the following:

1. The Ontario Regulation 403/2006 Ontario Building Code and as amended.
2. The Occupational Health and Safety Act, August 1991, and Regulations for Construction Projects.

3.2 Material and work shall be of the highest quality, conforming to the rules of the Canadian Standards Association and any other Board, Service Company or authorities having jurisdiction. The Code, Regulation, Statute, By-Law or this specification having the most stringent requirement applies. Should anything in the drawings or specifications not conform with this, notify the Engineer prior to the time of tender. An addendum will be issued as a clarification.

3.3 Provide warning signs as specified or to meet the requirements of the Authorities or Engineer.

3.4 Carry out all changes and alterations required by the Authorities having jurisdiction without delay to the progress of the work.

3.5 The contractor shall complete the entire project as detailed on the drawings and this specification.

3.6 Coordinate the installation of the building with the existing services.

4. **DOCUMENTS REQUIRED**

4.1 Maintain at job site, one copy each of the following:

1. Contract drawings/plans
2. Project Manual/Specifications
3. Addenda
4. Change Orders
5. Other modifications to Contract
6. Copy of approved work schedule
7. Manufacturer's installation and application instructions
8. All materials required for Posting by Authorities
9. Shop Drawings and Submittals

5. **WORK PROVIDED BY OWNER OR PERFORMED UNDER SEPARATE CONTRACTS**

5.1 The term "NIC" means that work of this Project which is not being performed or provided by the; the term means "Not In This Contract" or "Not a Part of The Work to be Performed or by The Contractor".

5.2 “NIC" work is specified and/or indicated on the Drawings as an aid to the Contractor in scheduling the amount of time and materials necessary for the completion of the Contract.

6. **DIVISION OF WORK**

6.1 Work specified in the Specifications is divided into Sections for reference purposes only. Division of work between Contractor and Subcontractors is the Contractor's responsibility. The Owner and Consultant assume no responsibility to act as an arbitrator to establish subcontract limits between Sections or Divisions of the Work.

7. **EXAMINATION OF EXISTING CONDITIONS**

7.1 Submission of bid shall be deemed evidence that Contractor has examined the site and is familiar with conditions under which work will be done and obtained all information which may be necessary for proper execution of Contract.

7.2 Signing of Contract indicates acceptance by Contractor of conditions under which work will be done.

7.3 Extra payments will not be authorized for work that could have been determined by a careful examination of site and existing conditions.

8. **EXAMINATION OF PRECEDING WORK DURING CONSTRUCTION**

8.1 Before executing work against work prepared by other Sections, examine such work. Do not accept defective work, or do any work to or on them, until the defects are remedied.

8.2 Commencement of work shall indicate acceptance of preceding work and responsibility concerning the conditions of same.

9. **CUTTING AND PATCHING**

9.1 Perform cutting, fitting, and patching including excavation and fill, to complete the Work.

9.2 Remove and replace defective and non-conforming work.

9.3 Perform work to avoid damage to other work.

9.4 Prepare proper surfaces to receive patching and finishing.

9.5 Cut rigid materials using power saw or core drill. Pneumatic or impact tools not allowed.

9.6 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

9.7 At penetration of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated material, full thickness of construction element.

9.8 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

10. **SAFETY MEASURES**

10.1 Comply with the safety regulations of the Occupational Health and Safety Act and authorities having jurisdiction for the safety of the Work.

11. **PROJECT MEETINGS**

11.1 The Contractor shall attend project meetings as scheduled.

12. **SCHEDULING OF THE WORK**

12.1 The Contractor shall perform his work in full cooperation with other trades, and coordinate the schedule and sequence of all work with all other trades.

12.2 Refer to the overall project master schedule for requirements.

13. **SUBMITTALS**

13.1 Administrative

1. Submit to Consultant submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in the Work.
2. Work affected by submittal shall not proceed until review is complete.
3. Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of the Work and Contract Documents.
4. Verify field measurements and affected adjacent Work are co-ordinated.

13.2 Shop Drawings and Product Data

1. Indicate materials, methods of construction and attachment or anchorage, erection

diagrams, connection, explanatory notes and other information necessary for completion of Work.
2. Adjustments made on shop drawings by Consultant are not intended to change Contract Price.
3. Make changes in shop drawings as consultant may require.
4. Submit 1 electronic copy of all shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

13.3 Samples
1. Submit samples for review as requested in respective specification Sections.
2. Deliver samples prepaid to Consultant's business address.

13.4 Operating Maintenance Manuals
1. Two weeks prior to Substantial Performance of the Work, submit to Consultant, three copies of operating and maintenance manuals.
2. Manuals to contain operational information on equipment, cleaning and lubrication schedules, filters, overhaul and adjustment schedules and similar maintenance information.
3. Bind contents in a three-ring, hard covered, plastic jacketed binder. Organize contents into applicable categories of work, parallel to specifications Sections.
4. On completion of Work and prior to final inspection, the Operating Maintenance Manuals shall be turned over to the Consultant for review. Substantial performance holdback release is conditional on receipt and approval of these documents.

13.5 Record Drawings
1. Accurately and neatly record deviations from Contract Documents caused by site conditions and changes ordered by Consultant. Mark all changes correctly with red ink. These drawings shall consist of 2 sets of clean drawings marked up as required.
2. Identify drawings as "Project Record Copy". Maintain in new condition and make available for inspection on site by Consultant.
3. As built drawings shall be produced by the Contractor recording all changes correctly with red ink.
4. These drawings shall consist of 2 sets of clean drawings marked up as required.
5. Record locations of concealed components of mechanical and electrical services.
6. On completion of Work and prior to final inspection, the as built drawings shall be turned over to the Consultant for review. Substantial performance holdback release is conditional on receipt and approval of these drawings.

14. OWNER'S QUALITY CONTROL

14.1 Independent inspection/testing agencies may be engaged by Owner for purpose of inspecting and/or testing portions of Work. Costs shall be paid out of cash allowance.

14.2 Provide equipment required for executing inspection and testing by appointed agencies.

15. CONSTRUCTION FACILITIES

15.1 Installation/Removal
1. Provide construction facilities in order to execute work expeditiously. Remove from site all such work after use.

15.2 Hoisting and Delivery
1. Arrange for delivery and unloading of materials at areas designated by the building management. Do not interfere with vehicular traffic on the streets and pedestrian traffic on the sidewalks.

15.3 Hoarding and Barricades
1. Erect hoarding and barricades to protect public, workers, public and private property from injury or damage.
2. Provide lockable doors within hoarding for access to site by workers.

15.4 Weather Enclosures
1. Provide weathertight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
2. Close off floor areas where walls are not finished; seal off other openings; enclose building interior work area for temporary heat.

15.5 Site Storage/Loading

1. Confine the Work and operations of employees to limits indicated by Contract Documents. Do not unreasonably encumber premises with Products.
2. Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the Work.

15.6 Sanitary Facilities
1. Provide sufficient portable sanitary facilities for workers in accordance with local health authorities.

15.7 Temporary Power Supply
1. The Contractor shall be responsible to provide temporary power supply and distribution.

15.8 Temporary Lighting
1. The Contractor shall provide temporary lighting required during construction period to allow all work to be carried out in a safe manner.
2. Maintain lighting at levels required by Sections doing the work.

15.9 Temporary Heat
1. The Contractor shall be responsible to provide temporary heating as required during construction period.
2. At no time can the newly installed mechanical heating equipment be used to provide temporary heat for the building.

15.10 Temporary Ventilation
1. The Contractor shall be responsible to provide any temporary ventilation associated with temporary heating systems as required by the Ministry of Labour during construction period.
2. At no time can the newly installed mechanical ventilation equipment be used to provide temporary ventilation for the building.

15.11 Equipment/Tool/Materials Storage
1. Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
2. Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

15.12 Project Cleanliness
1. Maintain the Work in tidy condition, free from accumulation of waste products and debris.
2. Remove waste material and debris from site at end of each working day. Do not burn waste materials on site.
3. Immediately clean up debris resulting from the Work deposited outside of construction areas. Make a daily inspection to ensure that work and construction access areas are maintained clean and undamaged.
4. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

16. MATERIAL AND EQUIPMENT

16.1 Product and Material Quality
1. Products, materials, equipment and articles (referred to as Products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
2. Whenever Products are specified exclusively by trade name, manufacturer's name or by catalogue reference, use only those items, unless written approval for substitution is obtained from Consultant.
3. Where the Specifications include "or other approved equivalents" clause, substitutions proposed with bid submission or after award of Contract will be considered only under the following conditions:
   (1) if the materials and products specified are not available; or
   (2) if substitute materials and products to those specified, which are brought to the attention of and considered by the Consultant as equivalent to those specified, will not change the Contract Price and Contract Time; or
   (3) if substitute materials and products to those specified, which are brought to the

attention of and considered by the Consultant as superior to those specified, will not change the Contract Price and Contract Time; or

(4) if a material or product is specified together with a requirement for performance and, in the opinion of the Contractor, the specified material or product will not produce the required results.

4. There is no obligation on the part of the Consultant or Owner to accept proposed substitutions.
5. Acceptance of proposed substitutions by Owner does not relieve the Contractor's responsibility under the Contract.
6. Defective Products, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective Products at own expense and be responsible for delays and expenses caused by rejection.
7. Should any dispute arise as to quality or fitness of Products, decision rests strictly with Consultant based upon requirements of Contract Documents.

16.2 Storage, Handling and Protection

1. Handle and store Products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
2. Store packaged or bundled Products in original and undamaged condition with manufacturer's seals and labels intact.
3. Store products subject to damage from weather in weatherproof enclosures.

16.3 Manufacturer's Instructions

1. Unless otherwise indicated in specifications, install or erect Products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.
2. Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.
3. Improper installation or erection of Products, due to failure in complying with these requirements, authorizes Consultant to require removal and reinstallation at no increase in Contract Price.

16.4 Workmanship

1. Workmanship shall be best quality, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
2. Do not employ any unfit person or anyone unskilled in their required duties.
3. Decisions as to quality or fitness of workmanship in cases of dispute rest solely with Consultant, whose decision is final.

17. ACCESSORIES

17.1 Provide accessory items or materials required, such as brackets, cleats, connectors, sealants, lubricants, cleaners, protection, and similar items, whether specified or not, so that Work is complete and will perform as required.

18. SPARE PRODUCTS

18.1 Where specified in other Sections, provide spare materials and products for future repair and replacement.

18.2 Ensure such materials are of same production run as those incorporated in Work.

18.3 Deliver quantities required, in separate labelled containers, and store where directed.

18.4 Labels shall state material description, colour, pattern and location of installation.

19. CONTRACT CLOSEOUT

19.1 Final Cleaning

1. When the Work is Substantially Performed, remove surplus products, tools construction machinery and equipment not required for performance of remaining Work.
2. Leave work broom clean before inspection process commences.
3. Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures. Replace

broken, scratched or disfigured glass.
4. Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and ceilings.
5. Vacuum clean and dust building interiors, behind grilles, louvres and screens.
6. Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
7. Broom clean and wash exterior walks, steps and surfaces.
8. Remove dirt and other disfigurations from exterior surfaces.

19.2 Systems Demonstration
1. Prior to final inspection, demonstrate operation of each system to Owner.
2. Instruct personnel in operation, adjustment, and maintenance of equipment and systems, using provided operation and maintenance data as basis for instruction.

19.3 Documents
1. Collect reviewed submittals and assemble documents executed by Subcontractors, Suppliers, and Manufacturers.
2. Submit material prior to final application for payment.
3. Submit three copies of Project Record Manual consisting of operation and maintenance data and two sets of record drawings white prints.
4. Provide warranties fully executed and notarized.
5. Execute transition of Performance Bond to warranty period requirements.

19.4 Inspection/Takeover Procedures
1. Prior to application for certificate of Substantial Performance, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete, defects are corrected and building is clean and in condition for occupancy. Notify Consultant in writing, of satisfactory completion of the Work and request an inspection.
2. During Consultant inspection, a list of deficiencies and defects will be tabulated. Correct same.
3. When Consultant considers deficiencies and defects have been corrected and it appears requirements of Contract have been performed, make application for certificate of Substantial Performance.
4. Conform to OAA/OGCA Document No.100 for takeover procedures.
5. Submit a final statement of accounting giving total adjusted Contract Price, previous payments, and monies remaining due.
6. Consultant will issue a final change order reflecting approved adjustments to Contract Price not previously made.

End of Section

1. **General**

1.1 This section 03100 provides for the supply and installation of a precast concrete building.

1.2 This section 03100 shall conform to the General Requirements and the Instructions to Bidders, General Conditions sections.

2. **Codes and Standards**

2.1 The building shall meet the following standards;

1) ACI-318-83 “Building Code Requirements for Reinforced Concrete.”
2) Concrete Reinforcing Institute, “Manual of Standard Practice.”
3) ANSI “Building Code Requirements for Minimum Design Loads in Buildings and Other Structures.”
4) Fabricator must be certified by the Canadian Standards Association for the production of structural concrete.

3. **Manufacturer**

3.1 The building shall be designed, fabricated and installed by a reputable manufacturer with previous experience in the pre-cast concrete building industry. Acceptable manufacturer is Hygrade Precast Concrete, St. Catharines Ontario. Alternate manufacturers may be acceptable. Contractors shall submit information on alternate manufacturers to the Engineer for approval one week prior to the close of tenders. An addendum will be issued if an alternate manufacturer is accepted.

4. **Shop Drawings**

4.1 Shop drawings of the building shall be submitted for approval by the Engineer prior to construction of the building. The shop drawings shall include details of the building structure including all dimensions and a drawing showing the exterior finishes.

4.2 The shop drawings shall also show cast in place openings for ventilation louvres. The Contractor shall coordinate the sizes and locations of these openings with the building supplier, mechanical and electrical subcontractors.

5. **Dimensions and Design Loads**

5.1 Dimension 3.0 m x 2.4 m x 2.439 with precast pitched roof with overhangs.

5.2 Roof pitch shall be a slope of 4 vertical / 12 horizontal units.

5.3 Exterior building corners shall be mitre jointed. Butt jointed building corners are not acceptable.

5.4 The building structure and floor shall be designed by a professional engineer with a valid Certificate of Authorization in the Province of Ontario. Engineering load calculations carrying a professional engineer’s stamp shall be provided. Multiple copies of the stamped drawings are to be provided to form part of the City of St. Catharines, Ontario building permit application process. The permit application will be undertaken by others.

5.5 Standard Live Roof Load - 60 PSF

5.6 Standard Wind Loading - 27 PSF

5.7 Noise reduction coefficient: the building shall provide a noise reduction coefficient of at least 55 dB, attenuating noise transmission from interior to exterior.

5.8 Concrete strength - 30 MPA (28 days)

5.9 Cement type - Type 30 - Mix design MD-5

6. **Materials**

6.1 Concrete: Steel reinforced, polypropylene fibre reinforced 4000 psi minimum 38 day comprehensive strength, air entrained (ATSM C260).

6.2 Reinforcing steel: ASTM A615, grade 400 unless otherwise specified.

6.3 Reinforcing fibre: Fibrillated polypropylene fibre, Fibremesh or equal @ 1.6 pounds per cubic yard or equal.

6.4 Post-tensioning strand: 41K polystrand CP50, .50" 270 KSI, 7 wire strand, greased plastic sheath, (ASTMA416). Roof and floor each to be post-tensioned by a single continuous tendon. Said tendon shall form a substantially rectangular in the roof configuration having three gently curving corners and a fourth where the tendon members are anchored. Tendons shall be greased and enclosed within a sheath.

6.5 Panel Connections: All panel connections shall be securely fastened together with 1/4" thick steel brackets. Steel is to be of structural quality, hot-rolled carbon complying with ASTM A283, Grade C. All fasteners to be ½" diameter bolts. Cast-in anchors used for panel connections to be Dayton-Superior #F-63 or equal.

6.6 Doors and Frames: The building shall be equipped with one 16 gauge metal door with lock seam construction c/w vertical stiffeners and fully welded seams. Door frame shall be 16 gauge wipe coat galvanized. Doors and frames are to be painted (colour to be Sherwin-Williams #7036) Door and frame shall comply with the Steel Door Institute specification SDI-100.

1) Hinges: Ball Ball Bearing Hinges and Astragals Non-removable pins.
2) Lockset: Brass pin tumbler lock, one way screws, #SOU CD 1600PB. Locks to have key section on exterior only, blank plate on interior.
3) Threshold: K.N. Crowder CTG x 4" Aluminum.
4) Door Sweep: K.N. Crowder W13-S Aluminum with neoprene inserts.
5) Door Handles shall be provided on the exterior of all doors. Hand pull #SM1007-28.
6) Pushplates shall be supplied on the interior of all doors. Push plate #SM80A-28.
7) Door closer with provision to hold door in open position.
8) Steel security plate over exterior lock set.

7. Curing and Sealing

7.1 All precast concrete surfaces will be treated with Sealtite CS-309, non-yellowing curing compound.

7.2 All exposed aggregate exterior precast surfaces will be treated with Hydro-Tight invisible silicone coating.

7.3 All non-exposed aggregate exterior surfaces will be treated with Externit #50 special grey coating.

8. Finish

8.1 Concrete Finish

1) Smooth steel form finish on all interior surfaces
2) Exterior - Simulated Old Ashlar Stone.
3) Roof - Concrete simulated steel seam smooth finish painted, colour to be provided at shop drawing review stage.

9. Floor

9.1 The building supplier / manufacturer shall supply all materials and labour to design and install a concrete floor. The floor shall function as a foundation / support for the building. The floor shall be designed by a professional engineer with a valid Certificate of Authorization in the Province of Ontario. The floor shall meet all requirements under these contract specifications and the Ontario Building Code. The concrete floor thickness shall be a minimum of 125 mm and be cast on a granular 'A' base of a minimum thickness of 250 mm. The granular 'A' base shall be compacted to 98% SPDD. The floor shall be installed with sleeves for the electrical conduits. Concrete tests shall be performed by the contractor to verify the strength of the concrete. The cost of this test shall be included in the base contract price.

9.2 Electrical conduits shall be Rigid PVC schedule 40 electrical conduit as manufactured by Scepter. The conduit sizes are shown on the drawings. Conduits shall be installed in the locations shwon on the drawings.

9.3 The building manufacturer shall provide connection details and hardware necessary to attach the building walls to the floor.

9.4 Provide perimeter pipe drainage for the floor slab granular base. Pipe drainage shall be a minimum of 150 mm diameter perforated pipe with filter sock. Pipe shall be bedded in a minimum 300 mm of clear stone in all directions. The clear stone shall be wrapped in filter cloth. Outlet pipe drainage with a minimum 150 mm diameter rigid PVC pipe. Connect rigid PVC pipe to nearest catchbasin. Catchbasin connections shall be fully parged with suitable materials.

10. **Walls**

10.1 The building walls and roof shall be fabricated with a ventilation opening at the south end gable wall to facilitate interior ventilation (side away from the pad mount transformer).

11. **Building Erection**

11.1 The building shall be erected on site on the floor/ foundation as shown on the drawings. The building erection contractor shall erect the building in a safe manner as per the building manufacture's instructions using suitable and proper equipment for the task.

11.2 The Contractor shall engage a qualified survey subcontractor to layout the location of the building as shown on the drawing. The Engineer shall be contacted to review the location of the building prior to the commencement of construction.

End of Section

1 General

1.1 All work shall conform to the General Requirements and the Niagara Health System Instructions to Bidders, Form of Contract, General Conditions and Special Provisions sections.

1.2 The Contractor shall visit the site and become thoroughly familiar with all the conditions to be met in carrying out the work covered by these specifications, prior to submitting bid. No extras will be allowed for failure to properly evaluate conditions which affect the scope of work.

2 Requirements of Regulatory Agencies

2.1 The Contractor shall abide by all laws, rules, regulations, bylaws and ordinances covering the class or character of the work, in particular the following:

2.1.1 The Ontario Regulation 403/97 (Ontario Building Code) and as amended.

2.1.2 The Occupational Health and Safety Act, August 1991, and Regulations for Construction Projects.

2.2 Material and work shall be of the highest quality, conforming to the rules of the local electrical authority, Ontario Electrical Safety Code Part 1, Canadian Standards Association and any other Board, Service Company or authorities having jurisdiction. The Code, Regulation, Statute, By-Law or this specification having the most stringent requirement applies. Should anything in the drawings or specifications not conform with this, notify the Engineer prior to the time of tender. An addendum will be issued as a clarification.

2.3 Immediately upon award of the contract, submit to the Electrical Safety Authority all necessary working drawings and specifications for examination and approval prior to commencement of work. Obtain all necessary permits and arrange for all necessary inspections.

2.4 Provide warning signs as specified or to meet the requirements of the Authorities or Engineer.

2.5 Carry out all changes and alterations required by the Authorities having jurisdiction without delay to the progress of the work.

2.6 The contractor shall complete the entire project as detailed on the drawings and this specification.

2.7 The contractor shall be responsible for the supply, installation and termination of all material as specified.

2.8 Coordinate the installation of the equipment with the existing services.

3 Description and Scope of Work

3.1 The Contractor shall comply with the specifications and drawing requirements and provide all items, articles, material, operations or methods listed, mentioned, scheduled or reasonably implied on the drawings or the specifications. This shall include all labour, equipment and incidentals necessary and required for a complete and operable electrical installation.

3.2 The plans and specifications are not mutually exclusive, that is they form a complete package. Items defined or implied in one but omitted in the other shall be interpreted as covered, and must be provided.

3.3 This work shall include, but not be limited to, the following:

3.3.1 General Requirements.

3.3.2 Supply and installation of new switchboard, distribution panels, contactors, control equipment, lighting in the new electrical building.

3.3.3 Supply and installation of all pathway lighting poles and luminaires, control equipment for the pathway lighting.

3.3.4 Supply and installation of underground conduits and junction boxes.

3.3.5 Supply and installation of electrical service, distribution and control equipment

3.3.6 Payments for all permits, deposits, inspections and other fees necessary.

3.3.7 Coordination between other contractors and suppliers.

3.3.8 Upon completion issue the Owner a formal certificate of completion of work before receipt of the final payment for the work.

3.3.9 Preparation and supply of as-built drawings before receipt of the final payment for

the work.

4 **Work Carried out by Others**

4.1 All electrical work will be coordinated by the Contractor. The Contractor shall engage qualified subcontractors as required to complete the work.

5 **Standards of Material and Equipment**

5.1 Base Bid

Materials and equipment are specifically described and named in this specification for the purpose of establishing a standard of materials and workmanship. The Contractor may propose an alternate product to those named, only during the tendering period. The following paragraph describes the the substitution of another manufacturer's product or group of products.

5.2 Procedure for Acceptance of a Proposed Product Substitution

5.2.1 The Contractor shall submit shop drawings and design information specific to the project site to the Engineer for review. The submission shall include sufficient information to allow the determination that the product is equal or exceeds the project requirements in all respects

5.2.2 The information package shall be submitted the Engineer a minimum of 14 calender days prior to the close of tenders.

5.2.3 The information package will be reviewed by the Engineer. Should information packages not provide sufficient information for the review, the submission will be rejected and the proponent of the information will be informed.

5.2.4 If in the sole opinion of the Engineer the product offered meets or exceeds the requirements of the project an addendum will be issued naming the product as a approved alternate. The addendum will be issued no later than 5 working days prior to the close of tenders. If in the sole opinion of the Engineer the product offered does not meet the requirements of the project, the product shall not be accepted as an alternate and the proponent will be informed of this decision.

6 **Submittals**

6.1 Shop Drawings

Prior to the fabrication of any materials and/or equipment, submit shop drawings covering all items and/or systems listed below:

- electrical service, distribution equipment, control equipment, all lighting fixtures and poles, urd boxes, EV charging stations.

All shop drawings shall be submitted to the Engineer for review and approval. All equipment shall be tagged with the equipment designation as shown on the drawings. One copy of all drawings shall be submitted unless noted otherwise in a specific equipment section. If changes are necessary corrected copies shall be re-submitted for review and distribution. **All shop drawings shall bear a stamp indicating that the contractor has reviewed and certified that the equipment specified in the shop drawings is in strict conformance with the specification.** Approved shop drawings will be scanned (PDF format) and returned electronically via e-mail..

6.1.1 The contractor shall take responsibility for all costs which result from ordering or installing all material prior to approval of the shop drawings.

6.2 Record Drawings

6.2.1 As built drawings shall be produced by the contractor recording all changes correctly with red ink. These drawings shall consist of 2 sets of clean drawings marked up as required.

6.2.2 Where wiring is buried, or not accessible dimensions shall be shown adequately detailing the location of all such wiring.

6.2.3 The as built drawings shall be turned over to the owner upon completion of the project. The contract shall not be deemed complete until this requirement is fulfilled.

6.3 Maintenance Data and Operating Instructions

6.3.1 Assemble all equipment literature, operating instructions and maintenance instructions and other pertinent data and submit three sets to the owner. Each set shall be assembled in a three ring binder and arranged in a logical order with a

table of contents.

6.3.2 The Contractor shall conduct an instruction tour of the entire facility for the Owner or his representative to familiarize him with the works and maintenance requirements.

6.3.3 The Contractor shall not be deemed complete until this requirement is fulfilled.

7 **Qualifications**

7.1 All electrical work shall be performed by qualified linemen and electricians holding valid Ontario certificates of qualification.

7.2 All lifting, moving and hoisting operations shall be performed by qualified personnel, using equipment rated for the loads to be moved.

8 **Subcontractors**

8.1 It will be the responsibility of the successful Contractor to engage any and all subcontractors required to complete the entire scope of work for this project. The subcontractors that may be required depending on each firms own forces or trades available to conduct the work required, include but are not limited too the following:
- trenching, concrete, pole installation, landscapping etc.

8.2 Subcontracting portions of these trades shall be allowed. However, any or all work undertaken by a Sub-Contractor shall be under the "Terms and Conditions" as set forth in this Specification and the use of Sub- Contractors shall in no way relieve the Contractor of his responsibilities.

9 **Other Agencies**

9.1 The Contractor shall be responsible for fully complying with the requirements of all official and other agencies governing all or part of the work under this contract. The Contractor shall be responsible for notifying the various agencies in regard to ensuring that inspectors are on site during all or any part of the construction undertaken under this contract.

9.2 The Contractor shall obtain all necessary permits and arrange for all inspections from the Electrical Inspection Authority. All costs for these permits shall be the responsibility of the Contractor.

10 **Inspection**

10.1 The Engineer will inspect the entire project. All equipment shall be installed to the satisfaction of the Owner and the Engineer.

11 **Minor Field Changes**

11.1 The location, arrangement and connection of equipment and material as shown on the drawings represents a close approximation to the intent and requirements of the contract. The right is reserved by the Engineer to make reasonable changes required to accommodate conditions arising during the progress of the work. Such changes shall be done at no extra cost to the Owner, provided the distance does not exceed 3M (10 ft.), information is given before installation and construction is similar. Contractor shall make allowance for this in his tender price.

12 **Cutting and Patching**

12.1 The existing surfaces include granular pathways, grass and natural environments. All cutting and patching of the existing surfaces required for the installation of electrical equipment shall be by the Contractor.

12.2 Approvals: Submit written request in advance of cutting or alterations which affect: structural integrity of any element of the project. integrity of weather-exposed or moisture-resistant elements; efficiency, maintenance, or safety or any operational element; work of owner or other contractor.

12.3 Make good material, and prepare surfaces and refinish all finished surfaces damaged, marred, replaced, or otherwise remedied in the existing building.

12.4 Finish new surfaces flush with existing surfaces. Make junctions between existing and new work, or at replaced or remedial work indistinguishable. Make surfaces adjacent to one another of the same material, unit sizes, colour, and texture. If this is impossible, make a proposal of intended method of making good for the Engineer's approval, before installation.

13 **Supports and Concrete Work**

13.1 Provide and erect all special structural steel or concrete work required solely for the installation of electrical equipment or wiring. Supply and install all anchor bolts and other fastenings. Where apparatus is required to be mounted on concrete pads, locate the pads accurately and with neatly chamfered edges and corners.

13.2 Welding to, cutting or burning of structural members by this Contractor will NOT be permitted, nor will holes be punched or drilled in structural members without prior consent of the Engineer.

14 **Storage and Site Operating Facilities**

14.1 The Contractor shall provide a trailer at the site to store all material, tools and to serve as a workshop.

15 **Temporary Power and Lighting**

15.1 The Electrical Contractor shall make necessary arrangements to provide temporary power and lighting for his use when the building electrical distribution system and lighting system are not available.

16 **Installation**

16.1 Install raceways, fittings, pull boxes, wiring, and cables which are to be concealed neatly and closely to building structure so that the necessary furring can be kept as small as possible.

16.2 Work Clearances. Where any parts of the systems and/or pieces of equipment are located by dimensions on the Drawings, such dimensions shall be checked and verified at the building. If any discrepancies or interference with other equipment is found which will necessitate an appreciable revision in or deviation from the work as indicated or specified, the Engineer shall be notified before proceeding further. The locations of conduit, raceways, wiring and other equipment shall be altered without charge to the Owner if so directed by the Engineer, provided the change is ordered before installation, and does not necessitate additional labour and material.

End of Section

1 **General**

1.1 This section 16100 covers the basic materials and methods used in the project.

1.2 This section 16100 shall conform to the General Requirements and the Niagara Health System Instructions to Bidders, Form of Contract, General Conditions and Special Provisions sections.

1.3 All materials supplied shall be new and be approved by the Canadian Standards Association and/or Electrical Safety Authority where applicable.

1.4 Competent and qualified supervision shall be supplied to oversee the electrical installation on a continuous basis.

1.5 The workforce shall consist of at least one foreman and qualified electricians or electrical linemen employed in sufficient numbers to ensure the completion of the work in accordance with the project, with the highest quality control. This contractor shall assure at all times that his work is completed to such an extent so as to avoid substantial delays to other divisions.

2 **Installation**

2.1 Install raceways, fittings, pull boxes, wiring, and cables which are to be concealed neatly and closely to building structure so that the necessary furring can be kept as small as possible.

2.2 Work Clearances. Where any parts of the systems and/or pieces of equipment are located by dimensions on the Drawings, such dimensions shall be checked and verified at the building. If any discrepancies or interference with other equipment is found which will necessitate an appreciable revision in or deviation from the work as indicated or specified, the Engineer shall be notified before proceeding further. The locations of conduit, raceways, wiring and other equipment shall be altered without charge to the Owner if so directed by the Engineer, provided the change is ordered before installation, and does not necessitate additional labour and material.

3 **Wire and Cable**

Power Conductors

3.1 All conductors shall be OESC approved type for 600 volt and be ULC Listed, unless otherwise noted.

3.2 All conductors shall be copper.

3.3 Minimum conductor size shall be 12 AWG stranded, with flame retardant RW90 XLPE insulation suitable for 90 degree Celsius unless specified otherwise in the Cable Legend.

3.4 Underground installations shall be wired with 600 Volt RWU90 type insulation.

3.5 All conductors shall be installed in a neat and orderly fashion. The utmost care shall be taken to avoid damage to conductor insulation when cables are installed. All conductors shall be installed in conduit.

3.6 Conductors shall be identified with the proper numbers and at all termination and junction points. Brady and Pilgrim type markers are acceptable.

3.7 All power conductors shall be colour coded at each termination as follows;

Phase "A" - Red	Ground - Green
Phase "B" - Black	Neutral - White
Phase "C" - Blue	

Control Conductors

3.8 All conductors shall be OESC approved type for 600 volt and be ULC Listed, unless otherwise noted.

3.9 All conductors shall be copper.

3.10 Minimum conductor size shall be 12 AWG stranded, with flame retardant RW90 insulation suitable for 90 degree Celsius.

3.11 All control conductor insulation shall be orange in colour.

3.12 Underground installations shall be wired with 600 Volt RWU90 type insulation.

3.13 All conductors shall be installed in a neat and orderly fashion. The utmost care shall be taken to avoid damage to conductor insulation when cables are installed. All conductors shall be installed in conduit.

3.14 Conductors shall be identified with the proper numbers and at all termination and junction points. Brady and Pilgrim type markers are acceptable.

3.15 All conductors shall be installed in a neat and orderly fashion. The utmost care shall be taken to avoid damage to conductor insulation when cables are installed. All conductors shall be installed in conduit.

4 **Neutral Wiring**

4.1 All circuits shall be wired with separate neutrals for each circuit. No sharing of neutrals shall be allowed. All neutrals shall be full size, no derating shall be allowed.

5 **Interior Conduit and Fittings**

5.1 All conduits shall be hot dipped galvanized heavy wall rigid conduit, electrical metallic tubing (EMT), or rigid PVC. Conduit fittings shall be suitable for use with the conduit specified.

5.2 The minimum conduit size shall be 19mm.

5.3 EMT shall be used in all installations in the electrical building except for the following or on approval by the Engineer.

5.3.1 Rigid conduit shall be used where subject to severe mechanical injury.

5.4 Where EMT conduit is installed, waterproof EMT conduit fittings shall be used throughout and be suitable for use with the conduit that is specified.

5.5 All conduits shall be installed with a suitably sized insulated copper green bonding conductor.

5.6 Install conduit neatly in appearance, running parallel to or at right angles to building lines, parallel and equally spaced in groups, not bent over sharp objects. Clean and seal conduit until wiring is installed.

5.7 Install grounding bushings, jumpers and ground straps as required to maintain continuity of grounding for the complete system.

5.8 Terminate empty conduit for future use with a cap and nylon pull cord in each empty conduit. Tie off pull cord at each end of run.

5.9 All conduit shall be fastened securely in place with approved straps and hangers in sufficient number to prevent movement of any part of the conduit. This includes conduit installed in forms before concrete is poured.

5.10 Expansion fittings shall be provided at all points where conduit crosses building expansion joints.

5.11 All connections to motorized equipment shall be made with sealtite flexible conduit, to minimize vibration.

5.12 All conduits shall be installed a minimum of 75mm from any hot water pipes.

5.13 Liquid-tight fittings shall be used where sealtite conduit is specified.

6 **Exterior Raceways and Fittings**

6.1 Conduit and raceway fittings shall be suitable for use with the conduit and raceway specified.

6.2 The minimum conduit and raceway size shall be 19mm, **except where otherwise noted**.

6.3 6.3.1 Rigid aluminum conduit shall be used where shown on the drawings.

6.3.2 Rigid PVC conduit shall be used in all underground trenching except when a conduit is encased in concrete. Type DBII duct may be used when ducts are encased in concrete.

6.3.3 ENT conduit may be used for the transition into the lighting poles from the rigid conduit at a point within 1 m of the pole.

6.3.4 All conduit and raceways shall be installed with a suitably sized insulated copper green bonding conductor.

6.4 Install grounding bushings, jumpers and ground straps as required to maintain continuity of grounding for the complete system.

6.5 Terminate empty conduit and raceway for future use with a cap and nylon pull cord in each empty conduit and raceway. Tie off pull cord at each end of run.

6.6 All conduit and raceway shall be fastened securely in place.

7 **Underground Raceways, Conduits, Ducts and Trenching**

7.1 All underground raceways shown on the drawings are to be installed using open cut excavation methods. The raceways shall be installed at the depth shown on the drawings where ever possible.

7.2 All underground conduits and ducts shall be type as shown on the drawings. All joints shall be solvent cemented. Ducts shall be dry and dirt free prior to cable installation. Where ducts are laid and cables are to be installed at a later time, cable pull wires shall be installed and both ends of the duct shall be capped in a waterproof manner and marked for ease of location by and appropriate method of staking.
Where spare ducts are installed pull wires shall be installed to facilitate the installation of cables at a later date. All ducts shall be mandrelled with appropriate size mandrels to ensure that they are continuous and free of obstructions.

7.3 All ducts shall be properly sloped to ensure drainage.

7.4 Proper protection and identification of all duct runs shall be made as required.

7.5 Alignment and Grade - The route of all directional bored accesses and trenching shall be laid out according to the information on the drawings. Any deviations from line or grade must be approved by the Engineer.

7.6 Excavation for raceways from underground junction boxes to poles.- All trenches shall be dug as true to line as possible to a minimum depth as indicated on the drawings. Clean sand free of rocks, stones and debris shall be provided and installed to depths indicated on the drawings.

7.7 Backfilling - The Contractor shall backfill the excavation with clean excavated material. Before backfilling is complete, a red warning tape shall be laid down, 100 mm below finished grade. Backfilling shall be mechanically tamped to 95 % Standard Procter Density in maximum 150 mm lifts. The Contractor shall restore the stone pathways, asphalt and concrete along the trench routes to match its original condition upon completion of the work.

7.8 All playing surfaces, pathways, roadways, sidewalks and retaining walls shall be reinstated. All driveways and walkways shall be restored using new material of the same type as was originally in place. All other areas shall be reinstated as per specification section 16100 paragraph 12.

7.9 Installation of cables - All cable runs shall be continuous between termination points. Cables cannot be spliced. Cables shall be laid in such a manner that they will not be damaged in any way and in no case shall one cable cross over another in such a manner that it will bear directly upon the lower cable. The contractor shall allow the Engineer to inspect cables in the trenches for cuts or abrasion prior to backfilling.

7.10 Cable Termination - Where cable ends are left exposed in transformers, vaults, pedestals or service locations, they shall be capped with a rubber tape and wrapped with a plastic tape, or some other approved waterproof capping device. A minimum of 10 feet of cable shall be left at each connection location.

7.11 Ducts shall be protected by concrete encasement and reinforcement steel where indicated on the drawings. Concrete shall be installed per the suppliers instructions to obtain the necessary strength.

7.12 Trenching
The Contractor shall do the excavation for the conduit installation as shown on the drawings and as follows:
- The excavation of trenches shall be carefully executed at the required depth for conduit installation in undisturbed soil or excavated concrete.
- All soft materials shall be removed from the excavated trenches.
- The Contractor shall keep the excavations dry at all times and when necessary shall pump water outside of excavations without causing any damage to adjacent structures.
- All necessary precautions shall be taken to prevent damages to drainage pipes, telephone, gas, power and other services. The Contractor shall arrange for all necessary locates.

7.13 Backfilling
- The Contractor shall backfill the excavations with compacted material excavated from the trenches. All backfill shall be placed in 6 inch lifts and compacted to 100 % Proctor.
Before backfilling is complete, a red warning tape shall be laid down, 100 mm below finished grade.

7.14 Alignment and Grade
- All trenching shall be laid out according to the information on the drawings. Any deviations from line or grade must be approved by the Owner and the Engineer.

7.15 Underground conduits
- All underground conduits shall be Rigid PVC conduit. All joints shall be solvent cemented.

Conduits shall be dry and dirt free prior to cable installation. A mandrel of the proper diameter shall be pulled through each conduit at the completion of the installation of the conduit to confirm there are no protrubances or foreign material in the ducts. Cable pull ropes (3/16 inch diameter polypropylene) shall be installed in each conduit and both ends of the conduit shall be capped in a waterproof manner. The conduits shall be marked with caution tape.

7.16 Restoration of Surfaces

The final surface of the trench area shall be restored to match the adjacent surfaces.

8 Junction, Pull and Outlet Boxes

8.1 EEMAC 1 enclosures shall be furnished for dry and clean locations. In wet or outdoor locations EEMAC 3 enclosures shall be used.

8.2 Install all boxes so as to be accessible after the contract is complete, set to come flush with the finished lines of the wall where recessed and lined and level where surface mounted.

8.3 Install junction boxes on all conduit work where necessary to permit easy installation of conductors.

8.4 All normally visible exposed surface mounted junction, pull and device boxes less than 8" x8" in size **shall be cast type**.

The device boxes shall be:
1 gang rectangular - RAB (Design) 56xx series
2 gang rectangular - RAB (Design) 53xx series
Rectangular box extension rings - RAB 5671E (1gang), 5672E (2gang)

8.5 All boxes shall be identified with a label to indicate system type. Lamacoid labels shall be used for all exposed boxes. All concealed devices shall be labelled with an indelible marker.

9 Wiring Devices

9.1 All wiring devices shall be as specified below:

Voltage	Current	Description
120 VAC	15 A	3 Wire grounding receptacle, Hubbell HBL5252
120 VAC	15/20 A	3 Wire grounding receptacle, Hubbell HBL5362 (Nema 5-20RA)
120 VAC	15 A	3 Wire grounding GFCI receptacle, Hubbell GF5252-I
120/277 VAC	15 A	Single pole toggle switch, Hubbell 1201.

Note; All Hubbell devices are to be specification grade, construction grade series devices (catalogue numbers beginning with “CR” are not acceptable)
All dedicated computer receptacles shall be grey in colour.
All other devices shall be brown colour, except where otherwise noted.

9.2 Cover Plates shall be stainless steel for interior wiring devices. Weatherproof cover plates shall be used for devices mounted exterior applications. Lockable weatherproof coverplate to be Thomas & Betts Red Dot #CKSDV

9.3 All surface mounted receptacles are to be mounted in cast boxes, Design Electric 5636.

9.4 Each receptacle shall have a lamacoid tag attached to the cover plate to identifying the panel and circuit number. The plate shall be approximately 3/8 inches high and 3/4 inches long, with 1/4 inch high text.

Plate colours to be as follows;
Normal power circuits - black with white letters.

10 Underground Junction Boxes (URD)

10.1 Types Ux.

Underground junction boxes shall be polymer concrete type. Units shall be certified to meet the ANSI/SCTE 77 2007, Tier 22 Loading 22,000 lb. Units shall have a 24" x 13" rectangular opening, 12" depth complete with lid and penta head security bolt. Oldcastle Polymer 1324 with pentahead bolt, or approved equal from CDR or Hubbell.

11 Terminations and Splicing

11.1 The wiring to the lighting poles (except for LS13) shall be continuous from the electrical building to the fuse in the lighting pole. A loop of wire shall be provided in each urd box at each lighting pole for future maintenance requirements.

11.2 Where splices or connections are called for in other URD boxes the following procedure and components shall be used. Splices in URD boxes shall be made with Burndy Type KS Servit copper alloy connectors of the proper size for the wire used and protected by the installation of insulated low voltage H-frame closures rated for 600 volts. The closures shall be Raychem Cat. #GHFC-x-90.

12 **Reinstatement of Disturbed Areas or Damaged Facilities**

12.1 The Contractor shall repair or reinstate any areas disturbed or existing facilities (such as irrigation systems) that are damaged during the execution of the work. The Contractor shall engage a qualified Landscape Contractor to perform the landscape reinstatement of areas disturbed during this contract.

13 **Transformers (less than 750 volts)**

13.1 Dry type transformers shall conform to CSA Standard C9-M1981 and C802-94 "Maximum losses for Oil and Dry type transformers".

13.2 All single phase and three phase dry type transformers shall be supplied in KVA ratings and voltages as specified.

13.3 All transformers shall be self contained free standing units for floor or wall mounting. Where shown or required for wall mounting, all mounted hardware shall be supplied. All transformers shall be supplied with sprinkler drip shields.

13.4 Transformers mounted outdoors shall be complete with EEMAC 3R enclosures.

13.5 All transformers shall be have copper windings.

13.6 Three phase transformers shall have delta connected primary and wye connected, 4 wire secondary unless otherwise shown. No open delta (2 winding) three phase transformers shall be acceptable. Transformers shall have 220 ˚C insulation rating, and be designed for 115˚C rise at full load, thus having a minimum 11% overload capacity. Where shown transformers shall be designed for 80˚C rise at full load, thus having a minimum 29% overload capacity. The core and coil shall be completely isolated from the enclosure by vibration absorbing pads or mounts, The maximum sound levels shall be 3 db below the CSA standard db rating. Transformers 15 through 75 KVA shall be provided with interchangeable mounting for floor, wall, or ceiling. Transformers up to 10 KVA need not be supplied with primary taps. Transformers rated 15 and 25 KVA shall be provided with two 5% FCBN; 30 KVA and larger shall be provided with two 2-1/2% FCAN and four 2-1/2 FCBN taps.

13.7 The 6 KVA transformer for this project shall be an encapsulated type.

13.8 Transformers shall be manufactured by Hammond.

14 **Contactors C1**

14.1 Provide and install separately mounted combination contactor with voltage and current ratings, contact arrangements, and enclosure types as indicated on the drawings, complete with 600 - 120 volt control transformer, two NC/NO auxiliary contacts, terminal screw wiring strip for connection of external control devices and a Hand Off Auto front mounted selector switch. All control transformers shall be sized to provide an additional 25 VA of power for exterior devices. Approved equal manufacturers are Allen Bradley, Square D, Cutler Hammer or Siemens.

15 **Timers**

15.1 Provide and install new timers for the following circuits: exterior lighting. The timer shall be Paragon 4001-00 or approved equal.

16 **Grounding**

16.1 The grounding system as shown on the drawings shall be installed by the Contractor.

16.2 The grounding conductor shall be No. 2/0 AWG soft-drawn bare stranded copper wire.

16.3 The grounding rods shall be copper weld 3/4 inch diameter by 10 feet long, HYDEL Cat. No. 3410-9 or equal.

16.4 Grounding system connections shall be made by the CADWELD Process. Connections shall include, but not be limited to all cable to ground rods, ground rod splices, cable to steel and cast iron and cable lug terminations. Procedures outlined in the CADWELD instructions shall be followed. Molds shall not be altered in the field.

17 **Painting**

17.1 All electrical equipment which comes on the site unpainted, rusty or otherwise defaced due to construction and installation, is to be cleaned and painted to restore original finish.

18 **Parking Gate Control - Div 16 Requirements**

18.1 The electrical contractor shall supply and install the underground conduits, junction boxes and 120 V wiring as shown on Preciselink drawings, Sheets 2, 3, 4 and 5.

18.2 Circuits for the parking gate equipment shall be supplied from URD box U8.

18.3 The gate equipment and control wiring shall be supplied and installed by Preciselink.

19 **Electric Vehicle Charging Stations**

19.1 Supply and install four Level 2 dual electric vehicle charging stations in the locations shown on the drawing. Supply and install two 208V, 1 phase circuits to each electric vehicle charging station. The stations shall be pedestal / bollard mount and be capable of being secured to the concrete surface that they are being mounted on.

19.2 The charging stations shall be capable of simultaneous charging of two vehicles at a power of 7.2 kW each. GFCI circuit interrupters shall be an integral part of the equipment. Type J1772 connectors shall be supplied. The stations shall meet the requirements of SAE J1772 Combo.

19.3 Certifications required by the charging stations include:
- ANSI/UL 2202
- CSA-C22.2
- CSA Technical Information Letters :TIL J-39, TIL A-35, TIL A-35, TIL D-33, TIL I-44
- Ontario Electrical Safety Code.

19.4 The charging stations shall be rated for outdoor use with the appropriate weather resistance rating.

19.5 The charging stations shall include a networked billing system and capability of accepting credit and debit cards for payment of energy delivered by the charging stations via cellular and wifi connection. Software shall be provided to allow the Owner to remotely control the billing system.

19.6 The charging stations shall be manufactured by a recognized electrical equipment manufacturer such as Leviton, Eaton, ChargePoint, Schneider Electric. The Contractor shall submit shop drawings to the Engineer for approval prior to ordering the charging stations.

End of Section

1 General

1.1 This section 16300 provides for the new electrical service and distribution as described herein and on the drawings.

1.2 This section 16300 shall conform to the General Requirements and the Niagara Health System Instructions to Bidders, Form of Contract, General Conditions and Special Provisions sections.

2 Electrical Service

2.1 A new electrical service for the site will be established as shown on the plans..

2.2 The Electrical Contractor shall coordinate with the local utility and with the information shown on the drawings as to the provision of the items which follow, including material and labour which will not be provided by the local utility.

2.3 All work shall comply with the rules and regulations of the local utility. The Electrical Contractor shall be responsible for all coordination with the local utility, including procurement of all data, dimensions, and equipment.

2.4 Costs for the work of the Utility related to the new service will be paid directly by the Owner.

3 Work by Utility and Division 16

3.1 Work by Alectra Utilities

- 3.1.1 Supply and mount transformer on pre-cast pad.
- 3.1.2 Supply and install high voltage cable and terminations.
- 3.1.3 Supply and install the primary cable duct bank (DB1) on public property adjacent to the riser pole.
- 3.1.4 Make final connections of primary and secondary conductors at the transformer.
- 3.1.5 Make final connections of primary conductors at the riser pole.

3.2 Work by Division 16

- 3.2.1 Supply and install new primary duct bank from the property line to the pad mount transformer base.
- 3.2.2 Supply and install the transformer precast base and grounding.
- 3.2.3 Supply and install secondary duct bank conductors and connectors.
- 3.2.4 Supply and install new service equipment and 7 jaw meter base.

4 Grounding

4.1 Equipment Grounding shall be as follows:

- 4.1.1 A new electrical service ground shall be provided. The entire conduit network shall be electrically continuous throughout.
- 4.1.2 Panel boxes, motor frames and other electrically operated equipment shall be grounded per the OHEC and the equipment manufacturer's instructions.
- 4.1.3 Install a green grounding conductor inside all flexible conduit connecting to the equipment serviced and to the nearest outlet or junction box. Install a green grounding conductor in all raceways.
- 4.1.4 All convenience receptacles shall be of the grounding type, grounded to the conduit network and ground conductor except where otherwise specified.
- 4.1.5 All lighting fixtures shall be grounded as per the OHEC and the manufacturer's instructions.

4.2 Grounding conductors shall be sized per the OHEC or the local code.

5 Switchboard

5.1 The switchboard shall be complete with all circuit breakers and devices as shown on the drawings. The general arrangement of the switchboards shall match the floor plans.

5.2 All switchboards shall have an EEMAC Type 1 enclosure and dead front connected, completely front accessible consisting of free standing sections with sprinkler drip shields as shown on the drawings.

5.3 The cubicles shall be made from #12 gauge steel formed and welded. The main section shall have a CSA approved manufacturer's nameplate affixed to its face. Bus bars shall be tin plated copper of sufficient size to limit temperature rise to 65 ˚C. and rated as shown on the drawings and be braced for 65,000 rms amperes short circuit current. The through bus in the end section shall be extended and pre-drilled to allow the addition of future sections with splice plates.

5.4 The switchboard shall have space or provisions for future expansion as noted on the drawings. The switchboard shall be constructed in accordance with the latest EEMAC G8.2 and CSA 22.2.21 standards. Individual sections shall be front accessible.

5.5 All protective devices shall be CSA Approved for application in their intended enclosure for 80% of their continuous ampere rating, except for the main incoming circuit breaker which shall be rated for 100 % of its ampere rating.

5.6 The switchboard shall be a multi section unit with the compartments as shown on the drawings.

5.7 The main circuit breaker shall be a 100% rated three phase stored energy electronic trip insulated case circuit breakers. The circuit breakers shall have ratings as shown on the drawings and the following characteristics.

- Electronic trip system, microprocessor based, with individual adjustments for instantaneous pick-up; short delay pick-up and time; long delay pick-up and time, ground fault. The electronic trip units shall contain an integral indicator panel with a numeric display shall be provided to indicate the following data: Instantaneous value of phase and ground current; Cause of trip; Level of fault current that initiated an automatic trip operation.

5.8 The distribution circuit breakers shall be three phase molded case circuit breakers. All breakers rated below 100 amperes and lower shall have thermal magnetic trip units. All breakers rated 100 amperes or above shall have solid state microprocessor based trip units. Ratings of the circuit breakers are shown on the drawings.

5.9 A power monitor complete with current and voltage transformers shall be provided and mounted in the compartment as shown. The unit shall function as a multi-function digital instrument providing the following information; voltage, current , power, power factor, peak demand with time/date stamp, THD. The unit shall also be capable of communication with other devices on an Ethernet data network.

6 Distribution Panels

6.1 Distribution panels shall be of the dead front construction. Panel covers and doors shall be a minimum 3/16" steel thickness. Doors shall have concealed hinges with locking self catching latch. All panelboards shall come keyed alike. Deliver to the owner four sets of spare keys. Load centers are not acceptable.

6.2 They shall have an EEMAC Type 1 enclosure and be of circuit breaker type as specified in the drawings. The voltage, main bus capacity, short circuit capability and number of circuits shall be as specified. Bus bars shall be tin plated copper. All circuit breakers shall be of bolt on type except Square D type QO breakers are acceptable. All panels and circuit breakers shall have withstand current ratings as shown on the drawings. All surface mounted distribution panels shall be complete with sprinkler drip shields.

. 6.3 The panelboard shall have a nameplate permanently affixed and contain the following information:
Manufacturer's Name
System Voltage/Phase/Wires
Ampacity
Type of Panelboard
Manufacturer's, shop order number and date
CSA listing number.

6.4 The complete lighting panel shall be finished with a light grey paint baked on over a suitable primer.

6.5 Install, level and secure all panels to the manufacturers specifications using approved concrete fasteners.

6.6 Provide grounding and ground bus as required by OESC.

7 Manufacturer

7.1 All power distribution panels and switchboards, shall be of one manufacturer.

7.2 Acceptable panel manufacturers shall be Eaton, Square D and Siemens.

8 Switchboard Breaker Identification

8.1 Switchboard branch circuit identification shall be completed using engraved laminated

nameplates. Lettering shall be 1/8 to 3/16 inch in size. Plates for normal power systems shall be black surface and white core to produce white letters.

8.2 Switchboard branch circuits shall be identified with the following information;
Panel Name: Panel Location:

9 **Panel and Branch Circuit Identification**

9.1 All Distribution panels shown on the drawings shall have new identification installed to meet the requirements below. Panel names, etc. are as indicated on the one line diagrams or the floor plans.

9.2 Panel identification shall be completed using engraved laminated nameplates. Lettering shall be 1/8 to 3/16 inch in size. Plates for normal power systems shall be black surface and white core to produce white letters. Plates for emergency power systems shall be red surface and white core to produce white letters. Plates for vital power systems shall be green surface and white core to produce white letters. All lamacoids shall be attached to panels utilizing a minimum of 2-#8 machine screws drilled and tapped into panel covers.

9.3 Panels shall be identified with the following information;
Panel Name: Panel Location:
Voltage: Phase: Wires:
Fed From
Panel Name: Panel Location:

9.4 Branch circuits shall be identified with the following information;
Panel Name: Panel Location:

End of Section

1 **General**

1.1 This section 16500 provides for the lighting system as described herein and on the drawings.

1.2 This section 16500 shall conform to the General Requirements (Section 0100) and the Niagara Health System Instructions to Bidders, Form of Contract, General Conditions and Special Provisions sections.

2 **Fixtures**

2.1 The fixture schedule at the end of this specification includes type designation, lamp data, mounting, catalog number and special features required.

2.2 Install fixtures accurately, in line and at the proper mounting heights complete with all mounting hardware and lamps.

2.3 All lighting fixtures shall be supplied with accessory items such as adaptors for concrete poles etc., where required for proper installation of the fixtures.

2.4 For uniformity in comparing bids, each contractors's bid shall be based on the fixtures specified on the fixture schedule.

2.5 Replace any fixture showing marks or scratches due to handling or tool marks at no cost to the owner.

3 **LED Light Sources**

3.1 All fixtures shall be supplied complete with LED light sources with the colour temperature and lighting distribution as specified.

4 **LED Power Supply Assemblies**

4.1 The fixtures shall be supplied with LED driver power supplies integral to the fixture. The power supplies shall be CSA approved for the voltage specified.

End of Section

Fixture Type		Description	Load
A	**-**	Elliptical bracket arm mounted single 4000 degree Kelvin LED fixture installed on a square steel pole. The fixture shall be die cast aluminum, with natural aluminum finish, with horizontal slip fitter to allow attachment to the elliptical arm. Type 3 lighting optics, Poles LS2, LS7, LS11, LS12 require provision of security camera mounting arrangement. Details to be provided at shop drawing review.	
		Kim #1SA/WP9L3P35/120L4K/347/BL/HSF	347V136W
		Pole Finish: Black powder coat. Construction: Base mounted, Design standards: CAN/CSA S6-06 Length of Pole: 5.88m Luminaire Mounting: Bracket arm 2.44m long . Top of pole to be capped. Required Options: hand hole mounted at 12 " AFG c/w coverplate, wiring opening at 6" below top of pole, security camera provisions at 5.5m plus wiring hole for camera wiring. Manufacturer: Valmont B-5SS-5.78m	
		Elliptical Backet Arm Finish: Black powder coat. Construction: Tapered aluminum. Length of arm: 2.44m Rise of arm 1.22m Mounting provisions - Bolted to pole Manufacturer: Valmont S 8'x48"x3.5" FS SGL MS	
B	**-**	Pole mounted 4000 degree Kelvin LED fixture installed on a square steel pole. The fixture shall be die cast aluminum, with black finish and bracket to attach to the specified pole. Type 3 lighting optics,	
		Kim #2SB/WP9L3P35/120L4K/347/BL	347V136W
		Pole Finish: Black powder coat. Construction: Base mounted, Design standards: CAN/CSA S6-06 Length of Pole: 6.1m Luminaire Mounting: Direct to pole. Required Options: hand hole mounted at 12 " AFG c/w coverplate. Manufacturer: Valmont B-5SS-20-0.0	

C - Two back to back mounted 4000 degree Kelvin LED fixtures installed on a square steel pole. The fixtures shall be die cast aluminum, with black finish and bracket to attach to the specified pole. Type 3 lighting optics,

Kim #2SB/WP9L3P35/120L4K/347/BL 347V272W

Pole

Finish: Black powder coat.
Construction: Base mounted, Design standards: CAN/CSA S6-06
Length of Pole: 6.1m
Luminaire Mounting: Direct to pole.
Required Options: hand hole mounted at 12 " AFG c/w coverplate.

Manufacturer: Valmont B-5SS-20-0.0

VP - Surface suspended by chains, interior vandal resistant and waterproof 4 foot LED fixture, polycarbonate construction. 4000 degree K

Beghelli #BS100LED-4-HT-48W-WT40-120/277V 120V/48W

End of Section